CONTENTS

ENGINE

2.1 SERVICE INFORMATION

1 How to Use This Manual

(1) General information

This manual includes all necessary procedures for service operations.

These procedures can be divided into following three categories:

- Diagnosis.
- Removal and installation, replacement, disassembly and assembly, inspection and adjustment.
- Inspection.

Following procedures are omitted from this manual. However, they must be performed.

- Use a transmission tray or lifter to perform operations.
- Clean all removed parts.
- Perform a visual check.

WARNING	This indicates that injuries to you or other people may happen.
CAUTION	This indicates that damage to repairing components may happen.
HINT	Provide additional information to help you with service operations.

(2) Service procedure

Illustrations for service procedures are used to identify components, show the assembling relevance of parts, and explain the visual check for parts. Removal and installation procedures are explained in words.

Service procedures include:

- Detailed removal and installation instruction
- Illustration
- Torque specifications
- Specifications

Sometimes, the illustrations of similar models are used. In this case, minor details may be different from actual vehicle.

(3) Diagnosis procedure

Diagnosis procedures are divided as below:

- Diagnostic Trouble Code (DTC)

  DTC is an important hint when troubleshooting is difficult to simulate. The malfunction can be diagnosed quickly and accurately by performing specified DTC diagnosis and check.

- Problem Symptoms Table

  Malfunction locations can be determined quickly by troubleshooting in accordance with symptom type.

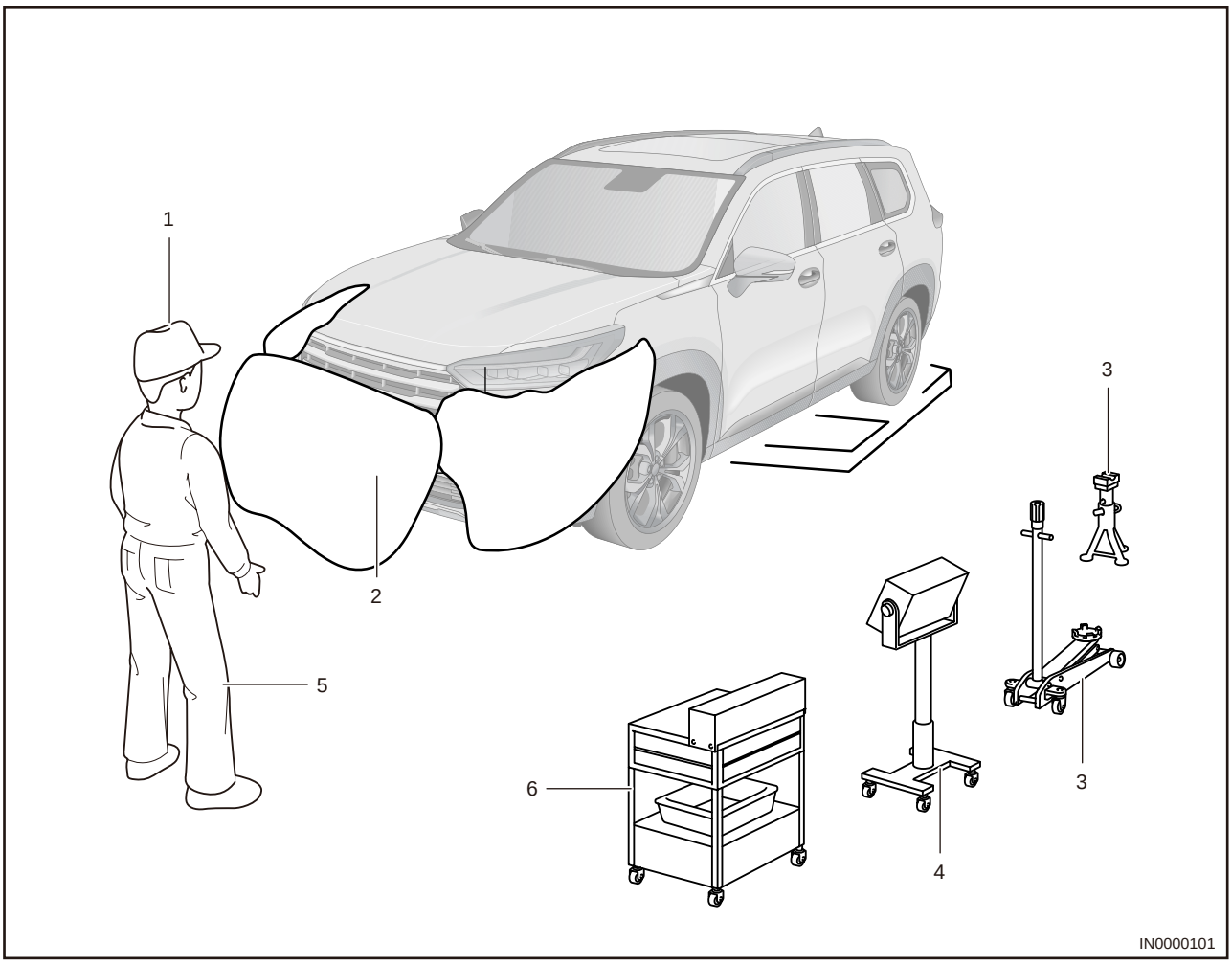
(4) Specifications

This manual categorizes specifications as below:

- Torque specifications
- Clearance specifications
- Capacity specifications

2 Preparation

(1) Preparation for vehicle service



1	Attire	• Always wear a clean uniform. • A hat and safety shoes must be worn.
2	Vehicle Protection	• Before starting work, prepare radiator grille cover, wing cover, seat cover and floor mat.
3	Safety Operation	• When working with two or more persons, be sure to check safety each other. • When working with engine running, make sure to provide ventilation for exhausting gas in the workshop. • When repairing high temperature, high pressure, rotating, moving, or vibrating parts, be sure to wear appropriate safety equipment and take extra care not to injure yourself or others. • When jacking up vehicle, be sure to support specified location with a safety stand. • Use appropriate safety equipment to lift vehicle.
4	Preparation for Tools and Measuring Gauge	• Before starting work, prepare a tool stand, special tools, gauge, oil and replacement parts.

5	Removal and Installation, Disassembly and Assembly Operations	• Diagnose after thoroughly understanding proper service procedures and reported problem. • Before removing parts, inspect general condition of assembly to check for deformation or damage. • Take notes for complicated assembly. For example, record total number of electrical connections, bolts or hoses that are removed. • Add matchmarks to ensure that each component is assembled to its original position. Temporarily mark hoses and their joints if necessary. • Clean and wash removed parts if necessary and assemble them after a thorough inspection.
6	Removed Parts	• Place removed parts in a separate box to avoid mixing them up with new parts or contaminating new parts. • For non-reusable parts (such as gaskets, O-rings, and self-locking nuts), replace them with new ones as instructed in this manual. • Retain removed parts for inspection, if requested by customers.

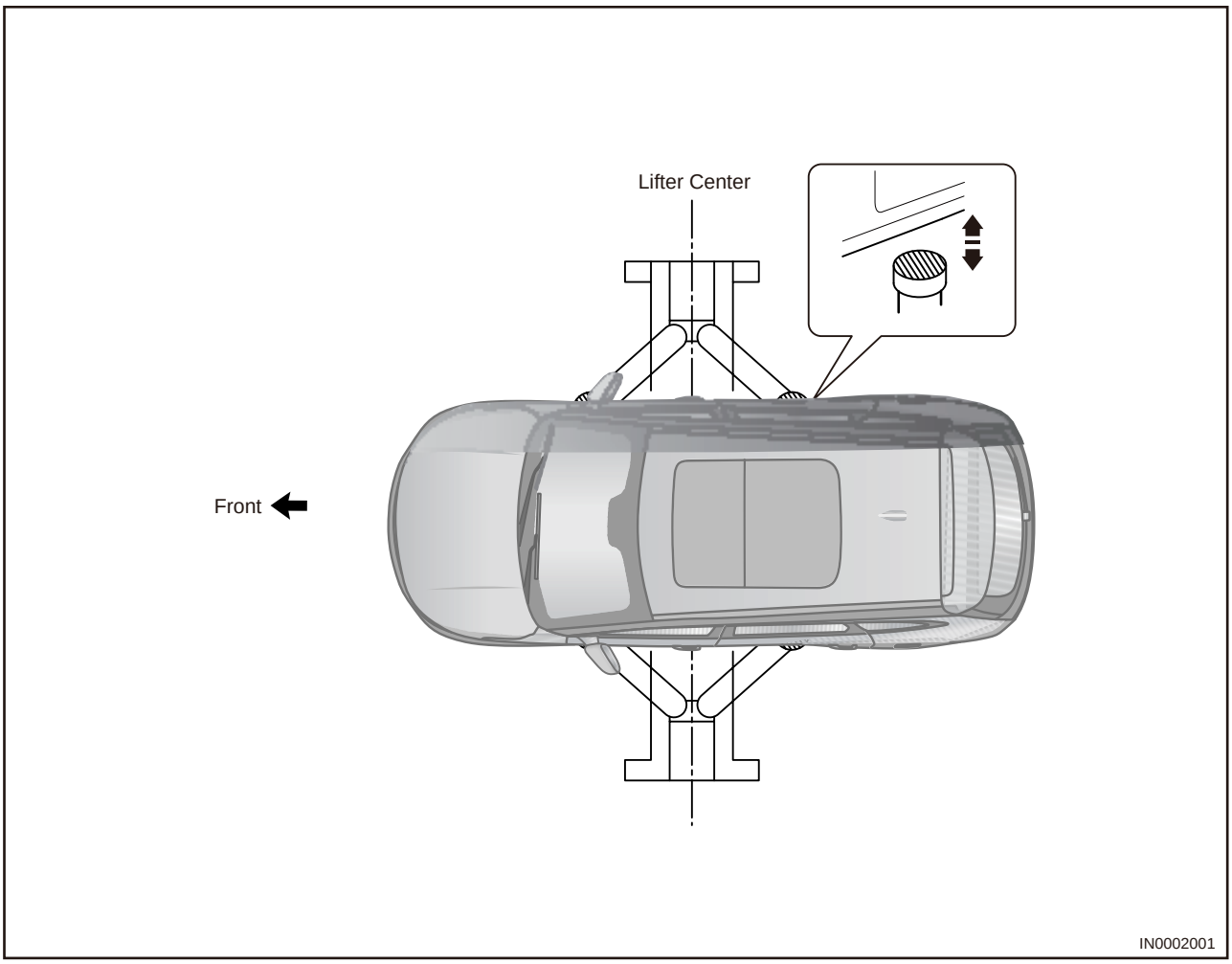
(2) Jacking up and supporting vehicle

Care must be taken when jacking up and supporting vehicle. Be sure to jack up and support vehicle at proper locations.

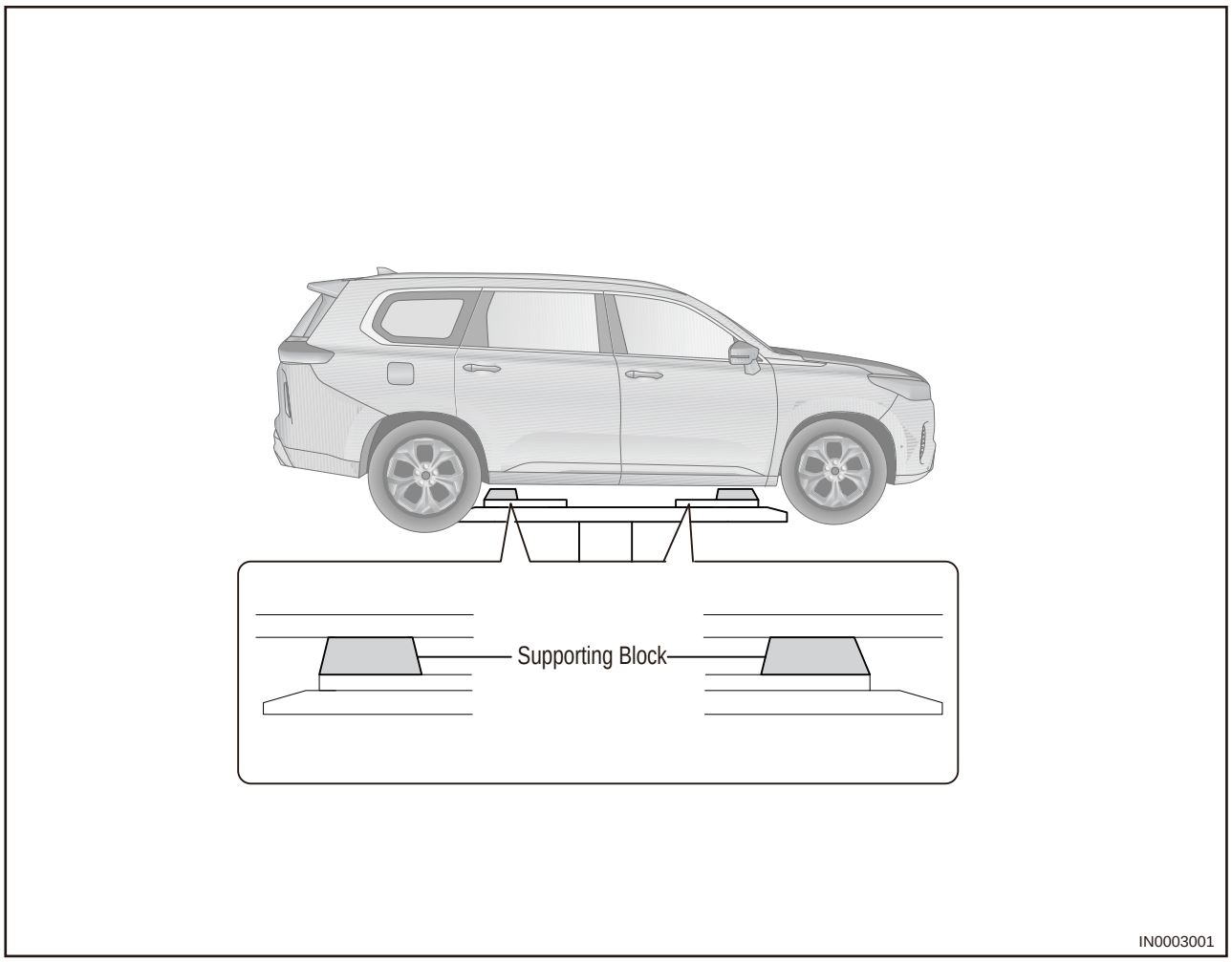
Sometimes, similar illustrations may be used. In this case, minor details may be different from actual vehicle.

1) Precautions for using a swing arm type lift

- Follow safety procedures described in the instruction manual.
- Keep vehicle stable when using a lift to prevent vehicle from tilting during operation. Stabilize vehicle by adjusting the length of lift arm and vehicle position.



2) Precautions for using a plate type lift
   - Follow safety procedures described in the instruction manual.
   - Use plate type lift attachments (rubber lifting blocks) on the plate surface.



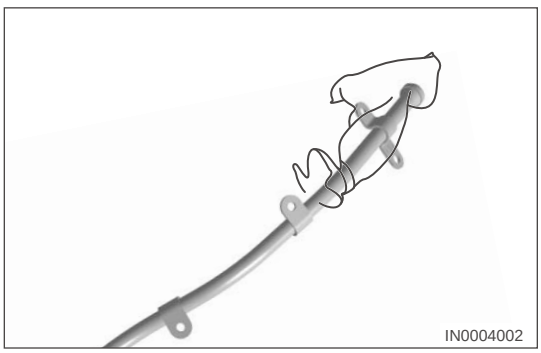
3 Service Operation

(1) How to use fasteners

- Using incorrect fasteners may cause damage to components. Injury and death may occur without observing the instructions below.
- Reference values of fasteners and torque specifications in this service manual use metric unit.
- Recycling all fasteners (nuts, bolts, etc.) during maintenance and service operation is important for assembly.

(2) Remove parts

When repairing malfunction, try to determine the cause. Before starting work, parts or sub-assemblies that have to be removed and replaced should be confirmed first. After removing parts, block all holes and ports to prevent foreign objects from entering.

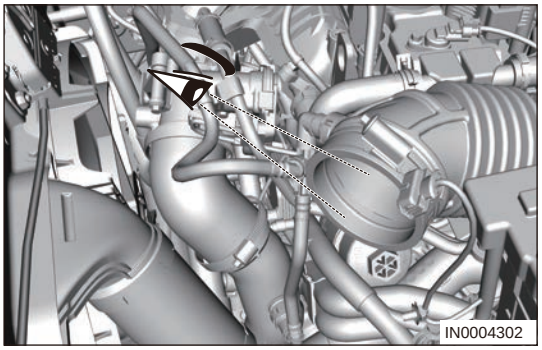


(3) Disassemble components

If disassembly procedures are complicated and multiple parts need to be disassembled, make sure that disassembly methods won't affect the performance or appearance of parts. Identify each part for assembly.

(4) Installation check

After removal, it is necessary to check if there is foreign matter that enters new or used parts when installing new part or resetting used part, preventing unnecessary damage to the vehicle.



(5) Check parts

After removal, check each part for deformation, damage or other problems.

(6) Arrange parts

Carefully arrange all disassembled parts to make assembly easier.Always separately arrange replaced parts and reusable parts, and make marks on them.

(7) Clean parts

Make a thorough and careful cleaning for reusable parts.

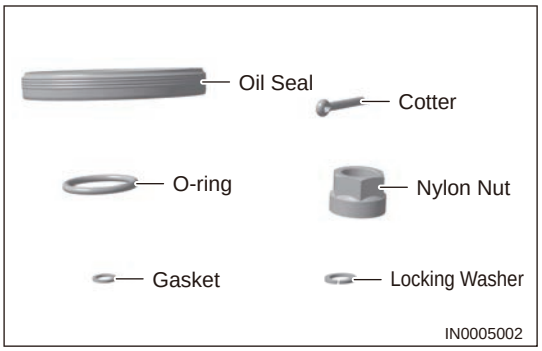
⚠ Caution

Blowing out the dirt or other particles with compressed air may hurt your eyes. Be sure to wear goggles during operation.

(8) Assemble components

When assembling parts, always strictly use standard values (-tightening torque and clearance value, etc.). If following parts need to be replaced, replace them with new ones.

- Oil seal
- Gasket
- O-ring
- Lock washer
- Cotter pin
- Nylon nut



(9) Lubrication and seal

Use seal gum and gasket based on position.

If seal gum is applied, install components before the seal gum dries to prevent leakage.

Apply lubricant to the movable area and friction area of components.

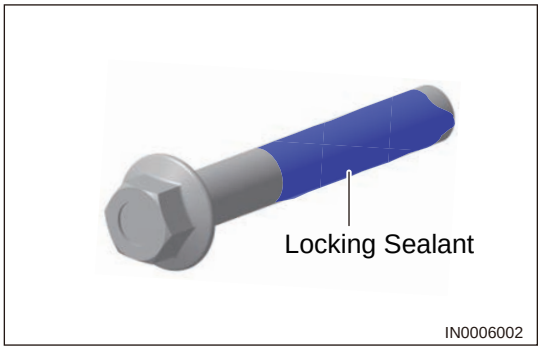
During assembly, apply permitted lubricant or grease to the specified area (such as oil seal).

(10) Adjust

Use proper meter and tester for adjustment.

(11) Pre-coated parts

Pre-coated parts are bolts and nuts that are coated with seal lock adhesive in the factory. If a pre-coated part is retightened, loosened, or moved in any way, be sure to reapply the specified adhesive.



(12) Rubber parts and rubber hoses

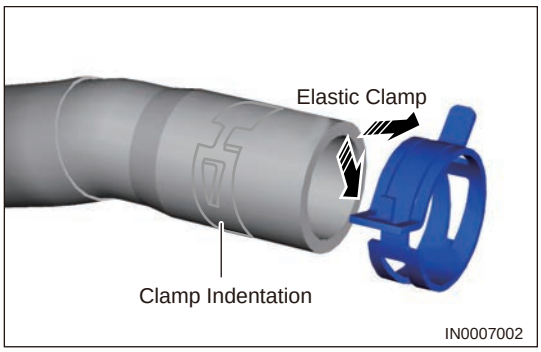
Avoid gasoline or oil dripping on rubber parts or rubber hoses.

(13) Hose clamp

Before removing a hose, observe the position of clamp so as to reinstall it to the same position.

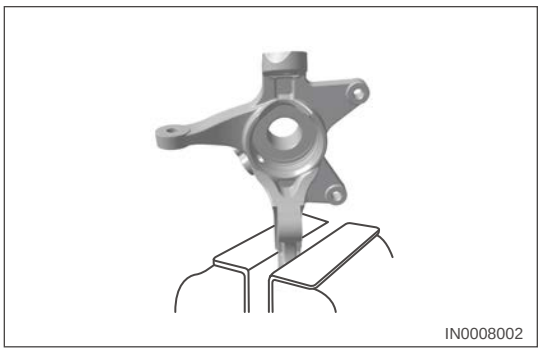
Replace deformed or dented clamps with new ones. When reusing a hose, fix the clamp on the clamp track portion of hose.

For elastic clamp, push tabs in direction of arrow as shown in illustration after installation to widen the tabs slightly.



(14) Vise

When using a vise, install protective plates on jaws of vise to prevent parts from being damaged.



(15) Dynamometer

When testing vehicle on dynamometer, pay attention to the following:

- Place a fan in front of vehicle. It is best to use a fan of which the power changes in proportion to vehicle speed.
- Connect an exhaust gas ventilator.

⚠ Caution

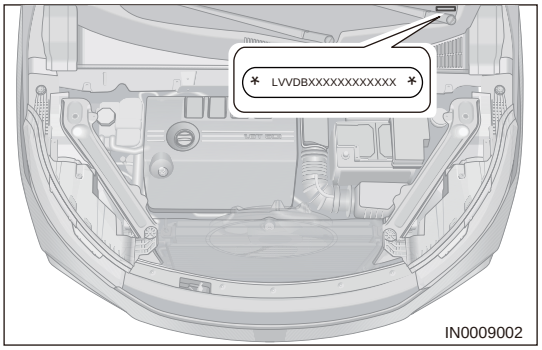
Exhaust gas may cause injury and death. There is odorless, colorless Carbon Oxide (CO) in the exhaust gas. People will faint and get poisoned after inhaling it.

- Cool the exhaust pipe with a fan.
- Keep the area around vehicle clean and tidy.
- Monitor engine coolant thermometer.

4 VEHICLE INFORMATION

(1) Vehicle Identification Number (VIN) on actual vehicle

VIN is located on upper left of driver side instrument panel, and can be seen from the outside through the windshield.



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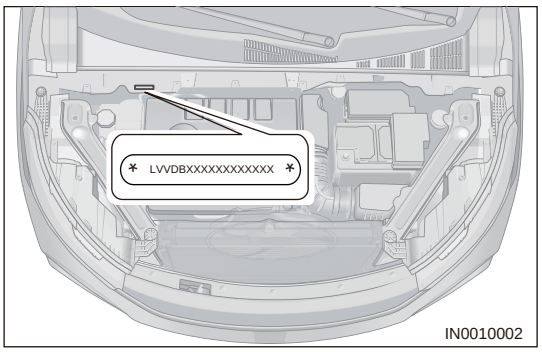
VIN is stamped on right of engine compartment drip channel garnish.



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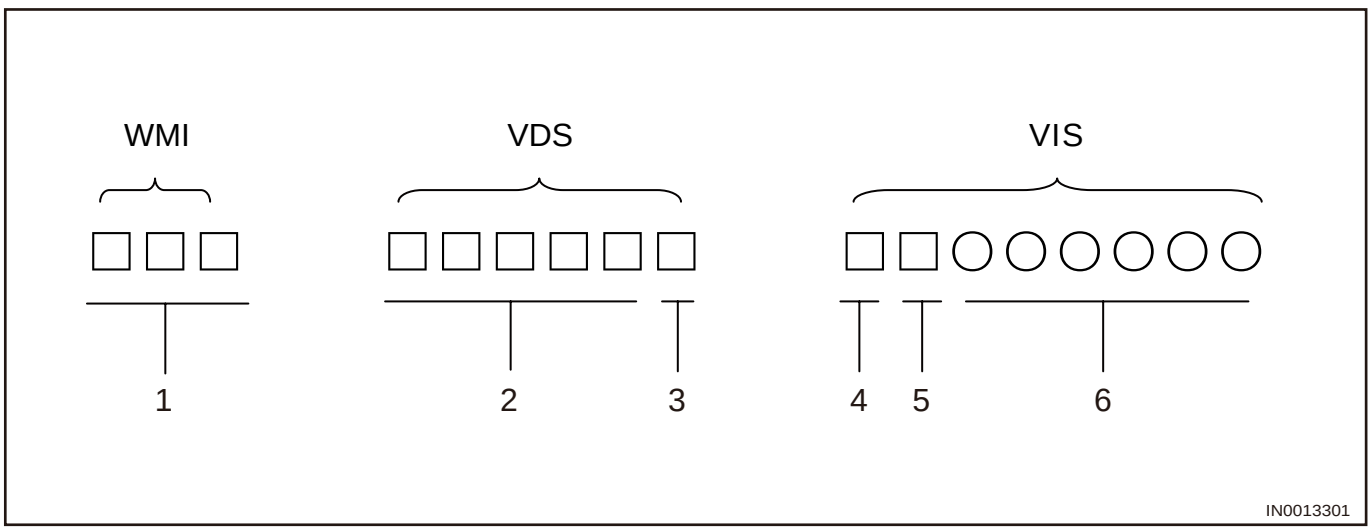
(2) Vehicle Identification Number (VIN)
Vehicle Identification Number (VIN) consists of World Manufacturer Identifier (WMI), Vehicle Descriptor Section (VDS) and Vehicle Indicator Section (VIS), with a total of 17-digit characters. Refer to the following details:



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□：represents a letter or a number (letters I, O and Q cannot be used); ○: represents a number.

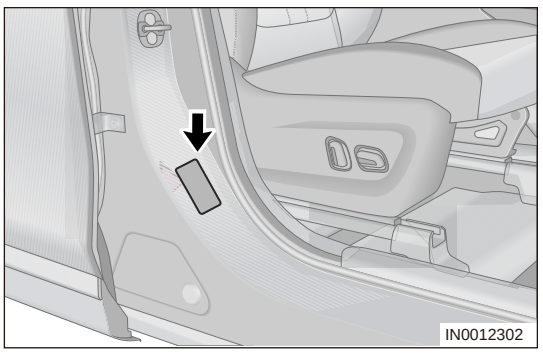
No.	Definition
1	World Manufacturer Identifier
2	Vehicle Features
3	Accuracy Check Digit
4	Model Year
5	Production Plant
6	Sequential Number

- The first three digits of VIN represent world manufacturer identifier.

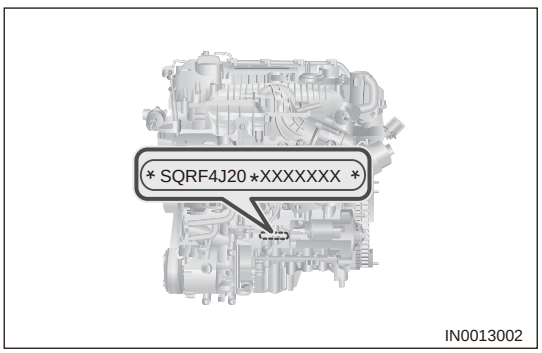
No.	WMI Code	Vehicle Category
1	LVV	Category M1 (for vehicle type number started with 7)

- Fourth digit of VIN represents vehicle type.
  -Letter "D" means all vehicles in category M1.
- Fifth digit of VIN represents vehicle body type and drive type.
  - Letter "B" means 5-door 2-box 4 × 2 type.
- Sixth digit of VIN represents transmission type.
  -"1" means manual transmission.
  -"2" means automatic transmission.
- Seventh digit of VIN represents dynamic characteristics.
  -"1" means gasoline engine that is 1.5 - 2.0 L (2.0 L excluded).
- Eighth digit of VIN represents restraint system.
  -"B" means seat belt and airbag.
- Ninth digit of VIN represents check digit.
  -It is used to check the accuracy of VIN record, and made out through computation after confirming the other sixteen digits of VIN.
- Tenth digit of VIN represents model year.
  -"K" represents 2019.
- Eleventh digit of VIN represents assembly plant code.
  -"D" represents Chery Automobile Co., Ltd.
- Last six digits of VIN represent production sequence number.
  -This number means real production serial number of this model.

(3) Vehicle data plate
The vehicle data plate is fixed on right quarter outer panel.

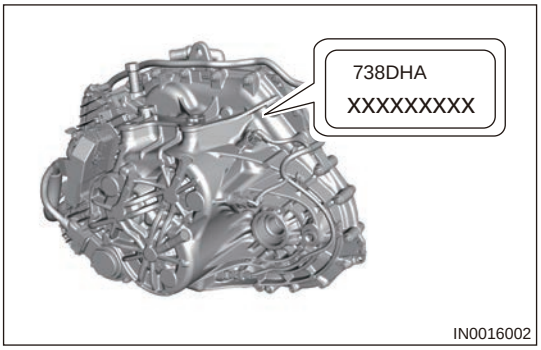


(4) Engine number
Engine number is located on engine block as shown in the illustration.



(5) Transmission number

Transmission number (for 7DCT model) is stamped on front part of transmission case.



5 Symbols

The symbols below are instrument cluster display symbols and some international standard symbols.

 1	 2	 3	 4	 5	 6
 7	 8	 9	 10	 11	 12
 13	 14	 15	 16	 17	 18
 19	 20	 21	 22	 23	 24
 25	 26	 27	 28	 29	 30

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1	Parking Brake Indicator	16	Rear Fog Indicator
2	EPB Warning Light	17	Position Indicator
3	ABS Warning Light	18	Turn Signal Indicator

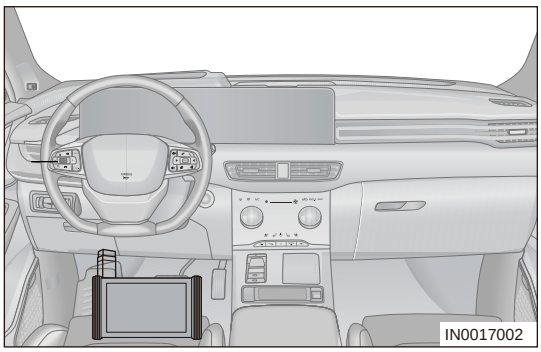
4	Brake System Warning Light	19	Transmission Malfunction Warning Light
5	Engine Oil Pressure Warning Light	20	HDC Indicator
6	Charging System Warning Light	21	Tire Pressure Malfunction Indicator
7	Engine Malfunction Indicator Light	22	Electronic Steering System Warning Light
8	High Coolant Temperature Warning Light	23	Start and Stop System Indicator
9	Low Fuel Level Warning Light	24	Cruise Indicator
10	Driver Seat Belt Reminder Light	25	SPORT Mode Indicator
11	Front Passenger Seat Belt Reminder Light	26	EPC Warning Light
12	SRS Warning Light	27	ECO Mode Indicator
13	Headlight High Beam Indicator	28	ESP OFF Indicator
14	Front Fog Indicator	29	ESP Warning Light
15	Daytime Running Indicator	30	Fatigue Driving Warning Light

6 CIRCUIT DIAGNOSIS INFORMATION

(1) How to Use Tester

Connect tester cable to DLC, turn ignition switch ON and try to use tester. If communication malfunction appears on the display, it indicates that vehicle or tester is defective.

- If communication is normal when the tester is connected to another vehicle, inspect DLC on original vehicle.
- If communication is still not possible when the tester is connected to another vehicle, the tester itself is probably defective.



(2) ECM Control System Troubleshooting

This model uses ECM control system. Most malfunction inspection procedures only involve in checking circuits of ECM control system one by one. An adequate understanding of the system and a basic knowledge of electricity are enough to perform effective troubleshooting, accurate diagnosis and necessary repairs.

(3) Diagnosis and Troubleshooting

1) Diagnosis basis and troubleshooting methods

Procedure Type	Detail	Troubleshooting Method
Diagnosis based on DTCs	Diagnosis based on symptoms (no DTC stored)	Use eliminating method to determine malfunctioning parts in accordance with DTC detection conditions. Inspect relevant parts with tester and eliminate possible malfunctions one by one.
Diagnosis based on symptoms (no DTC stored)	Diagnosis procedure is based on problem symptoms.	Inspect relevant parts with tester and eliminate possible malfunctions one by one.

2) Detailed troubleshooting steps

Step	Description
1	Obtain detailed information when electrical malfunction occurs.
2	Operate affected system, and perform a road test as necessary.
	Confirm malfunction parameter.
	If it is impossible to duplicate malfunction, refer to "Electrical Malfunction Simulation Test".
3	Collect proper diagnosis materials, which includes:
	Circuit Diagram
	System Schematic Diagram
	Relevant Chapter in Service Manual
	Service Bulletin
	Perform diagnosis according to system operation knowledge and customer feedback that we possess.
4	Check if there is any bonding, loose connector or damaged wire harness in the system. Determine related circuits and components, and diagnose according to circuit diagram and wire harness layout diagram.
5	Repair circuit and replace component as necessary.
6	Operate system in all modes. Confirm that system can operate normally in all conditions. Confirm that you have not inadvertently created new malfunctions during your diagnosis or repair steps.

(4) Circuit Simulation Test

Non-regular malfunctions and other malfunctions that cannot be detected through a road test can be detected by circuit simulation test. Possible vehicle malfunction can be determined efficiently by simulating condition/environment when the malfunction occurs.

Simulation test can be classified into following 7 types:

- Vehicle vibration test
- Thermosensitive test
- Freezing test
- Leakage test
- Load test
- Cold/hot start test
- Voltage drop test

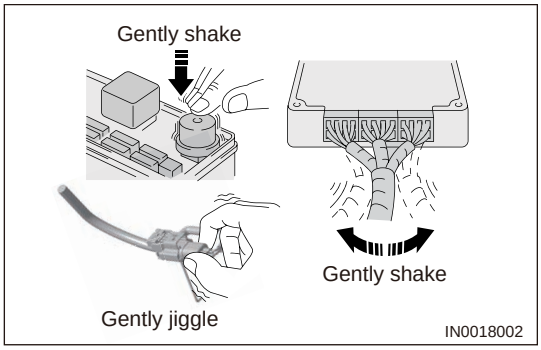
Hint:
It is extremely important to listen carefully to customer's description about the malfunction for simulating the conditions when symptoms occur.

(5) Vehicle vibration test

When vehicle is running on an uneven road or engine is vibrating (A/C is on and engine is idling), malfunctions may occur. In this case, check conditions related to vibration. Check following areas on vehicle:

1) Connectors and wire harnesses

Determine connectors and wire harnesses that may affect the electrical system being inspected. When monitoring whether the system has malfunctions that are being simulated, vibrate or wiggle each connector and wire harness slightly. This test may show loose or poor electrical connections.



Hint:
When a connector is exposed to humid environment, a layer of corrosive film may be formed on its terminals. With connector connected, this condition may not be found by visual check. If an intermittent malfunction occurs, it may be caused by corrosion. It is recommended that terminals of relevant connectors in system should be checked and cleaned after disconnecting the connectors.

2) Sensors and relays

Slightly vibrate sensors and relays in system being checked. The sensors or relays that are loose or poorly installed may be found through this test.

3) Engine compartment

- There are many reasons for electrical malfunction that occurred due to vehicle vibration, and it is necessary to check following conditions:
  - Connectors are not installed correctly.
  - Wire harness is not long enough, so it is extended when engine is vibrating or shaking.
  - Wire harness hangs over brackets or movable components.
  - Ground wire is loose, dirty or corrosive.
  - Wire harness is too close to high temperature components.
- To inspect components under the engine hood, first confirm if ground connection is in perfect condition (refer to the grounding inspection described below). First confirm that system is correctly grounded. Then slightly vibrate the wire harness or components as previously instructed method to check if connection is loose. Refer to the circuit diagram to check continuity of wire harness.

4) Backside of instrument panel

- Improper wire clamping will cause wire harnesses to be entangled when installing accessories. Vibration of vehicle will cause wire harnesses near the bracket or mounting screw to wind excessively.
- When vehicle vibrates, unclamped or loose wire harness will be stuck in seat components (such as slide guide). When wire harness passes through the underside of mounting area, check if it is damaged or stuck.

(6) Thermosensitive test

In hot weather or after vehicle is parked for a short time, some users may worry about the vehicle condition. At this time, it is necessary to perform thermosensitive test. Perform test by heating components with a heat gun or equivalent.

⚠ Caution

- **DO NOT heat components to a temperature higher than 60°C (140°F).**
- **If malfunction occurs when performing heating test for components, replace or properly insulate the components as necessary.**

(7) Freezing test

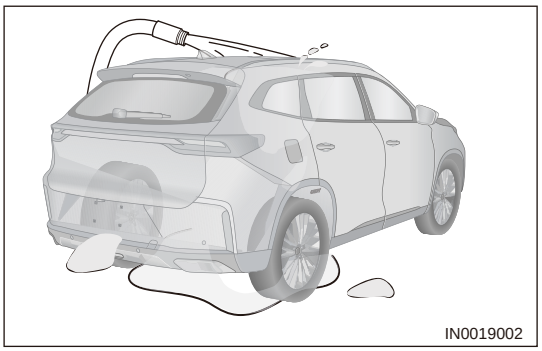
If malfunction disappears after warming up vehicle in winter, it may be caused by freeze of some parts in the wire harness/electrical system. Use following two methods to check this condition:

Method 1: Put vehicle outdoors overnight. Make sure that temperature is low enough to duplicate the malfunction. Perform a quick and thorough diagnosis for component that may be affected in the morning.

Method 2: Put suspected part in refrigerating room and wait until it is frozen. Reinstall the part to vehicle and check if malfunction reoccurs. If malfunction occurs, repair or replace the component.

(8) Leakage test

Malfunction may occur only during high humidity or in rainy or snowy weather. In this case, malfunction may occur due to the water entering electrical parts. Leakage can be checked by spraying water to vehicle (similar to car wash).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(9) Load test

Malfunction occurs only when electrical equipment is turned on. Turn on electrical equipment (A/C, rear window defogger, radio and fog lights, etc.) one by one and determine the relationship between electrical equipment and malfunction. Determine the malfunction by a load test.

(10) Cold/hot start test

Some malfunctions occur in cold start and disappear when engine warms up. In this case, park vehicle without operation for a whole night and restart it the next day. Perform test and determine the cause quickly.

(11) Voltage drop test

Generally, voltage drop test is used to find out the possible causes that affect normal function of electrical components or circuits.

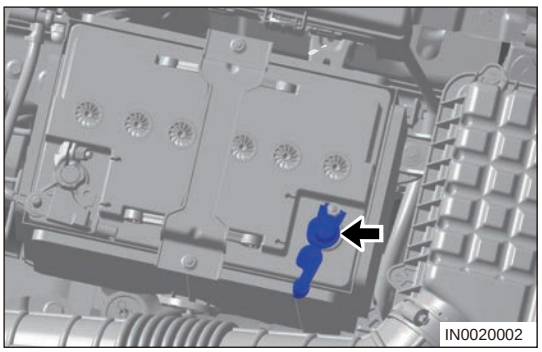
Check circuit with a digital multimeter.

If resistance of single wire harness measured by a digital multimeter is very low (0 Ω or close to 0 Ω), the wire harness or circuit is normal.

Unnecessary resistance in circuit may be caused by poor, loose grounding, corrosive switch contact and loose wire harness connector or adapter.

(12) Precautions for Control Module and Electrical Components Inspection

- Before performing electrical operations, turn ignition switch to LOCK and disconnect negative battery cable (- arrow), then wait for 2 minutes until backup power supply of airbag module is depleted (w/ airbag system).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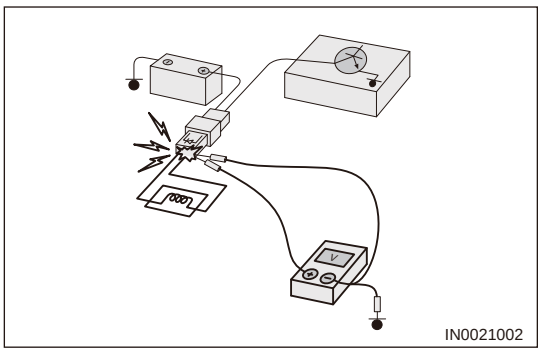
  - Disconnecting battery cable will delete the clock, audio and DTC records. Therefore, it is necessary to confirm these records before disconnecting the cable.
  - Never connect electrodes of battery terminals reversely.
  - Only install components that meet the vehicle specifications.

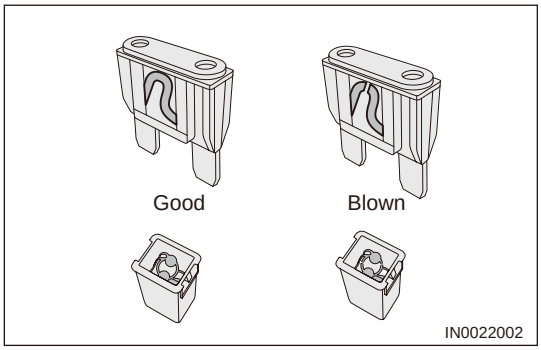
(13) Inspect input and output conditions of components and their functions before replacing control module.

- When disconnecting components:
  - Do not use excessive force when disconnecting connectors.
  - If connector is installed with a tightening bolt, loosen bolt and then disconnect the connector by hand.
- When connecting components:
  - Make sure that terminals are not bent or damaged, and then connect connectors correctly before installation.
  - Tighten bolt until painted area of connector is flush with the surface when installing connector with a tightening bolt.
- Never drop or hit control modules to prevent excessive impact.
- Avoid that condensation is formed on control modules due to extreme change of temperature, and keep them free from water drop or rain. If water is found on the control module, dry it thoroughly and then install it to vehicle.
- Be careful not to allow fluid to adhere to control module connectors.
- Avoid cleaning the control module with volatile fluid.
- When using digital multimeter, be careful not to get testing probes to contact with each other to result in a short circuit. Avoid damaging the battery due to short circuit in power transistor inside a control module.



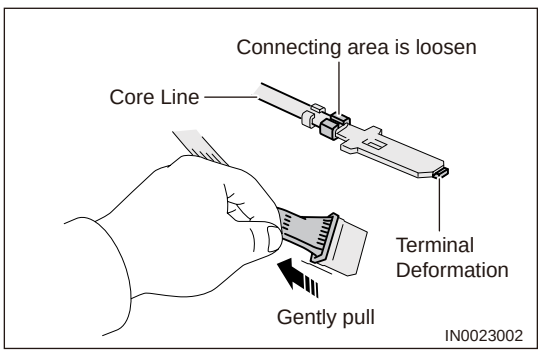
(14) Check fuse

- Check that fuse wire is connected.
- If fuse wire is blown, confirm that there is no short in circuit.
- A fuse with the same rated amperage must be used for replacing.



(15) How to check connector

- Many electrical malfunctions are caused by electrical connections or wire malfunctions, and also may be caused by the bonding of components or relays. Before determining if malfunction is caused by components or wire harness assembly, check if connection of the connectors is good.



(16) Check connector with a digital multimeter

- Damaged connectors and poor connections are caused by incorrect connector detection during circuit inspection.

- Probes of digital multimeter may be connected incorrectly with socket of connector. To detect the connector correctly, use a "T" shaped pin and follow procedures below. To obtain optimal connection, clamp the "T" shaped needle with a spring clamp.

1) Detect from wire harness side

- If there is a back cover for connector, remove the back cover before detecting terminal.

- Do not detect the water-proof connector from wire harness side. Failure to do this may damage the seal between wire harness and connector.

2) Detect from terminal side

- Female terminal： Do not insert any object that is bigger than male terminal into the female connector.

- Male terminal： Carefully detect contact surfaces of each terminal with a "T " shaped needle. Do not bend the terminal.

(17) Check terminal contact spring for proper tension

- Contact spring on terminal may produce intermittent signals in circuit.
- If intermittent open circuit occurs, follow procedures below to check open wire harness and contact spring on female terminal.

- Use a male terminal matched with female terminal.

- Disconnect the suspected defective connector and secure terminal side upward.

- When securing wire harness of male terminal, try to insert male terminal into female terminal.

- Move connector and check if male terminal can be inserted easily.

Hint:
If male terminal can be inserted into female terminal easily, replace the female terminal.

MAINTENANCE

3.1 MAINTENANCE ITEMS

1 Maintenance Schedule Table

The maintenance schedule lists vehicle maintenance items that need to be carried out. Please go to Chery authorized service station for maintenance according to mileage in maintenance schedule.If you vehicles always used in severe driving conditions,you should follow the maintenance requirement each 5,000 km or 6 months (whichever comes first).I: Inspect, adjust, clean or replace if necessary; R: Replace.

Maintenance Item	Months	6	12	18	24	30	36	42	48	54	60
	K-m×1,-000	5	10	15	20	25	30	35	40	45	50
For general driving conditions											
Maintenance Items	**Months**	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**	**120**
	K-m×1,-000	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Meter Indicating System		I	I	I	I	I	I	I	I	I	I
Video and Entertainment System		I	I	I	I	I	I	I	I	I	I
Diagnostic Tester Inspection		I	I	I	I	I	I	I	I	I	I
Front Wiper Blades		I	I	I	I	I	I	I	I	I	I
Rear Wiper Blades		I	I	I	I	I	I	I	I	I	I
Wiper System		I	I	I	I	I	I	I	I	I	I
Cooling Effect		I	I	I	I	I	I	I	I	I	I
Air Conditioning System		I	I	I	I	I	I	I	I	I	I
Air Conditioning Filter		I	I	I	I	I	I	I	I	I	I
Coolant Level		I	I	I	I	I	I	I	I	I	I
Freezing Point of Coolant		I	I	I	I	I	I	I	I	I	I
Brake Fluid		It is recommended to replace every 2 years or 40,000 km (whichever comes first)									
Brake Fluid Level		I	I	I	I	I	I	I	I	I	I
Water Content of Brake Fluid		I	I	I	I	I	I	I	I	I	I
Engine Oil		R	R	R	R	R	R	R	R	R	R
Engine Oil Level		I	I	I	I	I	I	I	I	I	I
Transmission Fluid (738DHA)		Replace every 60,000 km.									
Transfer/Differential Fluid		It is recommended to replace every 50,000 km after the warranty period.									
Power Steering Fluid (If Equipped)		Replace every 2 year or 30,000 km (whichever comes first).									
Timing Chain		Maintenance-free (except for the cause of failure).									

Maintenance Item	Months	6	12	18	24	30	36	42	48	54	60
	K-m×1,-000	5	10	15	20	25	30	35	40	45	50
For general driving conditions											
Maintenance Items	**Months**	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**	**120**
	K-m×1,-000	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Transmission Fluid Level		I	I	I	I	I	I	I	I	I	I
Fuel Filter		External fuel filter: Replace every 30,000 km; Internal fuel filter: The integrated fuel pump is maintenance free type(troubleshoot the cause of failure)									
Battery Voltage		I	I	I	I	I	I	I	I	I	I
Shock Absorber		I	I	I	I	I	I	I	I	I	I
Propeller Shaft and Boot		I	I	I	I	I	I	I	I	I	I
Torque of Chassis Bolt		I	I	I	I	I	I	I	I	I	I
Steering Gear		I	I	I	I	I	I	I	I	I	I
Steering Column		I	I	I	I	I	I	I	I	I	I
Steering Link, Ball and Boot		I	I	I	I	I	I	I	I	I	I
Tire Appearance		I	I	I	I	I	I	I	I	I	I
Tire Pattern		I	I	I	I	I	I	I	I	I	I
Tire Inflation Pressure		I	I	I	I	I	I	I	I	I	I
Spare Tire Inflation Pressure		I	I	I	I	I	I	I	I	I	I
Torque of Wheel Bolt		I	I	I	I	I	I	I	I	I	I
Tire Rotation		It is recommended to rotate tires every 10,000 km (the optimal adjustment range is 5,000 - 7,000 km).									
Spark Plug		I	I	I	I	I	I	I	I	I	I
Brake Plate		I	I	I	I	I	I	I	I	I	I
Air Filter		I	I	I	I	I	I	I	I	I	I
Drive Belt		I	I	I	I	I	I	I	I	I	I
Engine Oil Pan and Drain Bolt		I	I	I	I	I	I	I	I	I	I
Transmission Housing Body		I	I	I	I	I	I	I	I	I	I
Related Fluid Line (such as: steering, braking and fuel etc.) and Wire Harness		I	I	I	I	I	I	I	I	I	I
Charcoal Canister Filter (If Equipped)		Replace every 3 years or 60,000km (whichever comes first)									

Maintenance Item	Months	6	12	18	24	30	36	42	48	54	60
	K-m×1,-000	5	10	15	20	25	30	35	40	45	50
For general driving conditions											
Maintenance Items	**Months**	**12**	**24**	**36**	**48**	**60**	**72**	**84**	**96**	**108**	**120**
	K-m×1,-000	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
Battery		Maintenance-free (except for the cause of failure).									
Throttle Valvet		It is recommended to clean every 15,000 km.									
Four-wheel Alignment		Check four-wheel alignment every 20,000 km and adjust if necessary.									
Fuel Vapor Rubber Pipe		It is recommended to replace every 10 years or 500,000 km (whichever comes first).									
Fuel Filler Hose		It is recommended to replace every 5 years or 200,000 km for products made of ordinary rubber (such as NBR+PVC/CSM, etc.) (whichever comes first); It is recommended to replace every 10 years or 500,000 km for products made of fluororubber (whichever comes first). It is recommended to replace the above hoses timely which may cause performance defect such as crack.									

- The frequency of scheduled inspection and maintenance services in the table is minimal. However, it may be necessary that they be performed more frequently depending on road conditions, weather, atmospheric conditions and vehicle usage. These conditions may differ from one country to another. Therefore, there may be special requirement in your country. We recommend that you ask your Chery authorized service station for the actual maintenance schedule applied to your vehicle.
- Continue periodic maintenance beyond 100,000 km or 120 months by returning to the third column of the maintenance schedule and adding 100,000 km or 120 months to the column headings.
- For special area, there may be special maintenance specifications. We recommend that you ask your Chery authorized service station for the actual maintenance specifications applied to your vehicle.

⚠ Caution

- **The engine oil and oil filter should be replaced more frequently if the vehicle drives under severe conditions mentioned in the following examples*.**
- **It should be checked every 5,000 km or 6 months (whichever comes first) if the vehicle drives under severe conditions mentioned in the following examples*.**
- **The lubricant should be replaced every 5,000 km or 6 months (whichever comes first) if the vehicle drives in the following areas.**
  - **High humidity areas.**
  - **Mountainous areas.**
  - **Extremely cold and hot areas.**
  - **Drive on rough roads (bumpy roads, gravel roads, snow, etc.) for a long time.**
  - **Drive on mountain roads, uphill/downhill for a long time.**
  - **Drive the vehicle for a short distance frequently.**
  - **In many cases, drive in high temperature (higher than 32℃), heavy traffic urban road.**
  - **When used as a police car, taxi, commercial vehicle, trailer, etc.**
- **The air filter and air conditioning filter should be replaced more frequently if the vehicle drives under severe conditions mentioned in the following examples*.**

***Examples of severe driving conditions:**

- **Drive in extremely cold and hot weather (only for engine oil, engine oil level, steering and suspension system).**
- **Drive the vehicle for a short distance frequently (only for engine oil, engine oil level, disc brake pads and discs /front and rear axle boots and axle shaft joint portions, brake lining and drums).**
- **Drive on dusty roads (only for air cleaner element, disc brake pads and discs /front and rear axle boots and axle shaft joint portions, brake lining and drums, air filter element for the climate control system).**
- **Drive on rough and/or muddy roads (only for disc brake pads and discs /- front and rear axle boots and axle shaft joint portions, brake lining and drums, air filter element for the climate control system).**
- **Drive in areas where road salt or other corrosive materials are used (only for fuel system, lines and connections, disc brake pads and discs/front and rear axle boots and axle shaft joint portions, brake lining and drums,inspect brake lines and check operations of parking and service brake system, steering and suspension system).**
- **In the coastal areas (only for fuel system, lines and connections, disc brake pads and discs /front and rear axle boots and axle shaft joint portions, brake lining and drums, inspect brake lines and check operations of parking and service brake system, steering and suspension system).**

2 Lubrication System

Engine Model	SQRF4J20
Oil Filling Amount	4.3 ± 0.2 L (replace the oil and oil filter at the same time)
Oil Grade	Fuchs C5 0W-20

3 Cooling System

Engine Model	SQRF4J20
Coolant	10.4 ± 0.2 L (with Rear Heater)
Coolant Type	Full organic antifreeze(LEC-II)

4 Transmission Fluid

Transmission Type	Transmission Fuel Type	Total Capacity
738DHA	Pentosin FFL-7A	4.25 ± 0.2 L
Transfer	Sinopec GL5 80W-90 gear oil	0.31 ± 0.03 L
Differential	Sinopec GL5 80W-90 gear oil	0.445 ± 0.03 L

Hint:

- Filling amount is equal to discharging amount when there is no oil leakage for automatic transmission, please go to Chery authorized service station for details.

5 Brake System

Vehicle Model		SQRF4J20
Brake	Front Wheel	Disc brake
	Rear Wheel	Disc brake
Brake Booster		Vacuum booster
Parking Brake		Electric parking brake for rear wheels
Reasonable Range of Brake Pedal Free Travel		⩽ 25 mm
Reasonable Range of Use for Brake Friction Pair		Minimum thickness of brake disc: Front 26 mm, rear 8 mm Minimum thickness of brake lining: 2 mm
Brake Fluid		Fluid type: DOT-4. Add fluid to level between "MAX" and "MIN" marks

⚠ Warning

- **In the case of heavy load, the brake fluid should be replaced while the brake plates are being replaced.**
- **When adding brake fluid, make sure it is absolutely clean. If any dirt gets into the brake system, it may result in loss of braking performance.**

6 Wheel Alignment

Items		Parameters
Vehicle Model		SQRF4J20
Front Wheel	Front Wheel Camber	-30′ ± 30′
	Kingpin Caster Angle	6°43’ ± 45'
	Kingpin Inclination Angle	13°54′ ± 45′
	Front Wheel Toein	+8′ ± 6′ (one side)
Rear Wheel	Rear Wheel Toein	+10′ ± 6′ (one side)
	Rear Wheel Camber	-1°11′ ± 30′
Sideslip Value		0 ± 3 m/km

7 Wheel and Tire

Vehicle Model		SQRF4J20
Tire Model		235/60R18; 235/60ZR18; 235/ 55R19;245/45R20; T145/80R18 (Spare tire)
Rim Model		18X7J; 19X7.5J; 20X8J; 18×4T (- Spare tire)
Cold Tire Inflation Pressure (kPa) (Unladen)	Front Wheel	230
	Rear Wheel	230
	Spare Tire	420
Tightening Torque of Wheel Bolt		130 ± 10 N·m
Wheel dynamic balance requirements for vehicle with a maximum design speed of more than 100 km/h		Residual unbalance of wheel tire assembly after leveling with balance block: Outside ⩽ 10 g; Inside ⩽ 10 g

⚠ Caution

- **The tire inflation pressures listed in the table apply to cold tires. The pressure increases slightly when the tire is heated, but it is unnecessary to lower the pressure.**
- **Tire inflation pressure should be checked at least once a month, and tire pressure is especially important at high speeds.**
- **In order to facilitate you to find the specified value for inflation pressure, there is adhesive sticker label on the driver doorsill, which is marked with the specified value for cold tire inflation pressure.**

3.2 INSPECTION ITEMS

1 Off-vehicle Inspection

(1) Check the wheel nut.

3) Check wheel nuts for looseness or missing. Tighten if necessary.

(2) Check the wheel and tire (spare tire included).

(3) Rotate the tires.

1) Chery recommends that you should rotate tires every 10000 km. However, the best rotation time differs depending on driving habits and road conditions.

(4) Check wiper blade.

(5) Check hood and doors.

1) Check the hood.

2) Check the front doors.

3) Check the rear doors.

4) Check the back door.

2 On-vehicle Inspectio

(1) Check the seat belt.

1) Check the seat belt buckle and retractor.

- Pull out the seat belt quickly and repeatedly when the seat belt is static. If the seat belt retractor cannot lock the seat belt at one time during inspection, replace the seat belt assembly.
- Engage the tab on the seat belt buckle, and pull the seat belt by hand repeatedly to check the engagement. If the buckle cannot lock the seat belt at one time, replace the seat belt assembly.

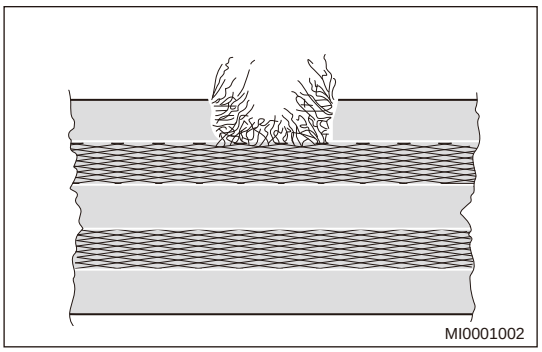
⚠ Caution

When checking impacted vehicle, be sure to check seat belt system. If there is any damage or malfunction in the seat belt system, replace it.

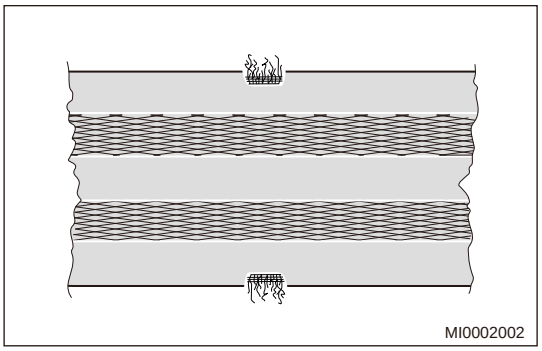
2) Pull out the seat belt and check the belt for oil stains or damage. Clean or replace if necessary.

3) Replace the seat belt as soon as possible if any of the following occurs.

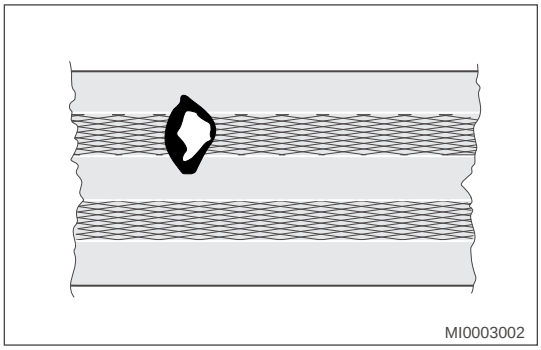
- Seat belt is broken, torn or worn.



- Edge of seat belt webbing is broken.



- There is a burnt mark of cigarette butt on the seat belt.



(2) Check the horn.

- Check that the horn operates.

(3) Check the vehicle lights.

- Check that the headlights, brake lights, taillights, turn signal lights and other vehicle lights illuminate or blink. Furthermore, check the brightness of vehicle lights.

(4) Check the windshield.

- Check for scratches, dents or wear.

(5) Check the windshield wiper and washer.

- Check that washers are properly aligned. Also, check that washer fluid hits the center of operating range of each wiper on the windshield.
- Check whether any wiper blade is damaged. Replace the wiper blade if necessary.

(6) Check the windshield defroster.

- Turn on A/C defroster mode switch, check that air comes out of front defroster outlets.
- Press the rear defroster switch for a period of time, then check that the rear windshield heats.

⚠ Caution
DO NOT touch the heated rear windshield for a long time to prevent burns.

(7) Check the rear view mirror.

- Check that the rear view mirrors are securely installed.

(8) Check the sun visor.

- Check that the sun visors are securely installed and move freely.

(9) Check the seat.

- Check the front seat assembly.
- Check the rear seat assembly.

(10) Check the clutch pedal.

(11) Check the accelerator pedal.

- Check that the accelerator pedal operates smoothly. Check that the pedal does not have uneven resistance or does not get stuck in certain position.

3 Engine Compartment Inspection

(1) Check the engine oil level.

(2) Check the engine drive belt.

(3) Check the engine for oil leakage.

1) Turn off all electrical equipment and the ignition switch, and remove the key.
2) Support and raise the vehicle.
3) Check crankshaft pulley for oil stains. If there are oil stains, check engine crankshaft front oil seal for leakage. If there are leaks, replace the crankshaft front oil seal.
4) Check oil pan and drain plug for oil stains. Repair or replace related parts if necessary.
5) Check transmission filler plug, drain plug and case for oil stains. Repair or replace related parts if necessary.
6) If leakage occurs to the crankshaft front oil seal after repair, it may be caused by 3 reasons as follows:
   - Crankshaft thrust washer wears.
   - Crankcase ventilation system blocks.
   - Engine oil is excessive.

(4) Check battery voltage

- Check the battery and battery voltage.
- Check the charging voltage of charging system.

(5) Check the windshield washer fluid.

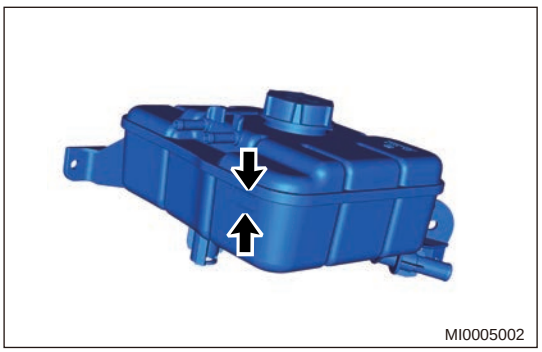
1) If washer nozzle cannot spray washer fluid, the fluid reservoir may be empty. In this case, stop operating washer and add washer fluid to a proper level immediately.

⚠ Caution

DO NOT use water as washer fluid when ambient temperature is below 0°C, otherwise, washer may be damaged due to the frozen water.

(6) Check the coolant level.

1) When engine is cold, check if the coolant level is between "MAX" and "MIN" lines. If the level is below the "MIN" line, it is necessary to add coolant to "MAX" line.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(7) Check the cooling system hose.

- Check that there are no cracks, kinks, corrosion or loose connections on the cooling system hose.

4 Brake System Inspection

⚠ Caution

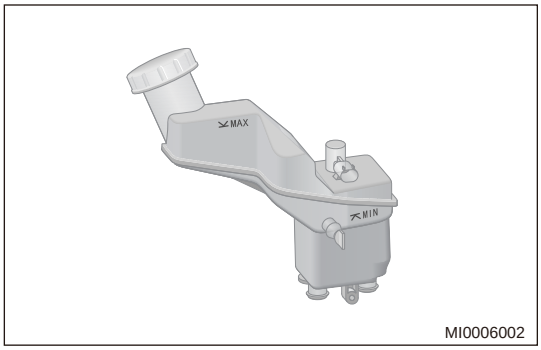
Generally, brake fluid level will change slightly because of the wear of brake pad, but it must be kept between "MIN" and "MAX" lines.

(1) Check the brake fluid level.

Hint:

- When the brake fluid level drops near the "MIN" line, the wear of brake pad may approach its limit.
- After the brake pad is replaced, the brake fluid level should be at the upper part between "MAX" and MIN lines.

1) Park the vehicle on a level ground.
2) Make sure there is no air in the brake system and the depressing feel of brake pedal is well. Perform brake bleeding procedures if necessary.
3) Check if the brake fluid level is between "MAX" and "MIN" lines.
4) If the brake fluid level drops to the "MIN" line or below, add brake fluid and check the brake system for leakage.



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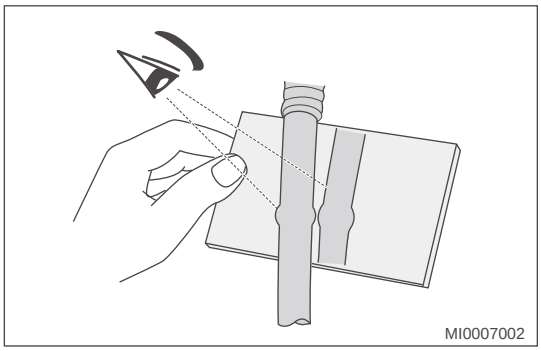
(2) Check the brake pedal.
(3) Check the brake lines and hoses.

Hint:
Work in a well-lighted area. Turn front wheels to the rightmost or leftmost position before inspection.

1) As shown in the illustration, check the entire circumferential surface of brake lines and hoses with a mirror. Check for the following conditions:
   - Damage
   - Wear
   - Deformation
   - Cracks
   - Corrosion
   - Leakage
   - Bending
   - Twists


MI0007002

2) Check all the clamps for tightness and check the connections for leakage.
3) Check that the hoses and lines are not near the sharp edges, moving parts or exhaust system.

(4) Check the parking brake.
- Check that the parking brake can hold the vehicle steadily on a slight slope.

(5) Check the front disc brake assembly.
(6) Check the rear disc brake assembly.

5 Chassis Inspection

(1) Check the front axle hub.
(2) Check the control arm and control arm ball pin.
(3) Check the rear axle hub.
(4) Check the stabilizer bar assembly, stabilizer bar assembly rubber supports and rubber bushing.
(5) Check the rear coil spring assembly.
(6) Check the rear mounting upper swing arm assembly.
(7) Check the rear mounting lower swing arm assembly.
(8) Check the rear trail arm assembly.
(9) Check the exhaust pipe.
Visually check the pipes, hanger blocks and connections for serious corrosion, leakage or damage.

Final Inspection

(1) Check the operation of body parts.

1) Hood.
   - Hood support rod is proper.
   - Hood locks securely when closed.
2) Front and rear doors.
   - Door locks operate properly.
   - Doors close properly.
3) Back door.
   - Door lock operates properly.
   - Back door closes properly.
4) Seats.
   - Seats are adjusted freely and locked securely in any position.
   - Front seatback can be locked securely in any position.
   - Rear seatbacks can be locked securely after folding down.

(2) Be sure to deliver a clean vehicle. Focus on the following items:
- Steering wheel
- Shift lever
- All switch knobs
- Door handles
- Seats

F4J20 ENGINE

4.1 ENGINE ELECTRONIC CONTROL SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Digital multimeter can only be used to perform inspection for electronic injection system.

(2) Use genuine components to perform service work, otherwise appropriate electronic injection system operation cannot be guaranteed.

(3) Only use unleaded gasoline during service.

(4) Please observe normative service and diagnostic flowchart to perform service work.

(5) Never disassemble or remove components of electronic injection system during service.

(6) When holding electronic elements (electronic control unit, sensor etc.), take extra care not to drop them on the ground.

(7) Set up a consciousness of environmental protection and dispose of waste effectively that is produced during service.

(8) Never use an needle multimeter to check electronic fuel injection system circuit.

(9) Never use high power test light to measure when testing each pin voltage signal of sensor.

(10) It is recommended that the measurement status when testing each pin voltage signal of sensor is on-line measurement.

(11) It is recommended to use voltage drop method when measuring sensor, actuator connecting wire harness.

(12) Do not causally remove any electronic injection system component or its connector from its installation position to prevent damaging accidentally, or foreign matter, such as moisture, oil from entering connectors, which will affect the normal operation of electronic injection system.

(13) Be sure to turn ignition switch off when disconnecting and connecting connectors. Otherwise electronic elements may be damaged.

(14) When simulating hot operating condition of malfunction and performing other service work that may cause temperature to rise, never allow temperature of electronic control unit to exceed 80℃.

(15) As the supplying pressure of electronic injection system is high, high pressure resistant fuel pipes are adopted for all fuel lines. Fuel pressure in fuel lines is still high even when the engine is not running. Therefore, be careful not to casually remove fuel pipes during service; When it is necessary to service fuel system, discharge pressure in the fuel system before removing fuel pipes. The way to discharge pressure is as follows: After removing fuel pump controller power supply fuse, start engine and idle it until the engine stops running by itself. Removal of fuel pipes should be performed in a well-ventilated area by professional service men.

(16) Do not energize electric fuel pump when removing it from fuel tank to prevent electric sparks, which will cause a fire.

(17) It is not allowed to perform running test for fuel pump under dry state or in water. Otherwise service life will be reduced. In addition, do not inversely connect fuel pump positive and negative poles.

(18) When performing inspection to ignition system, perform spark jump test only when necessary and make sure that the test time is as short as possible. Do not open the throttle during detection, otherwise a large amount of unburned gasoline will enter the exhaust pipe, thus damaging the three-way catalytic converter.

(19) Since the adjustment of idle speed is completely completed by electronic injection system, manual adjustment is not required. Throttle limit screw of throttle body has been adjusted properly at the factory, and users are not allowed to change its original position at will.

(20) Do not connect battery with its polarity reversed to prevent damage to electronic elements. This system adopts negative ground.

(21) Never remove battery cable when engine is running.

(22) The positive, negative battery cable wires and electronic control unit must be removed before performing welding on vehicle.

(23) Do not puncture wire outer coat to detect electric signals input and output by components.

1.2 Read

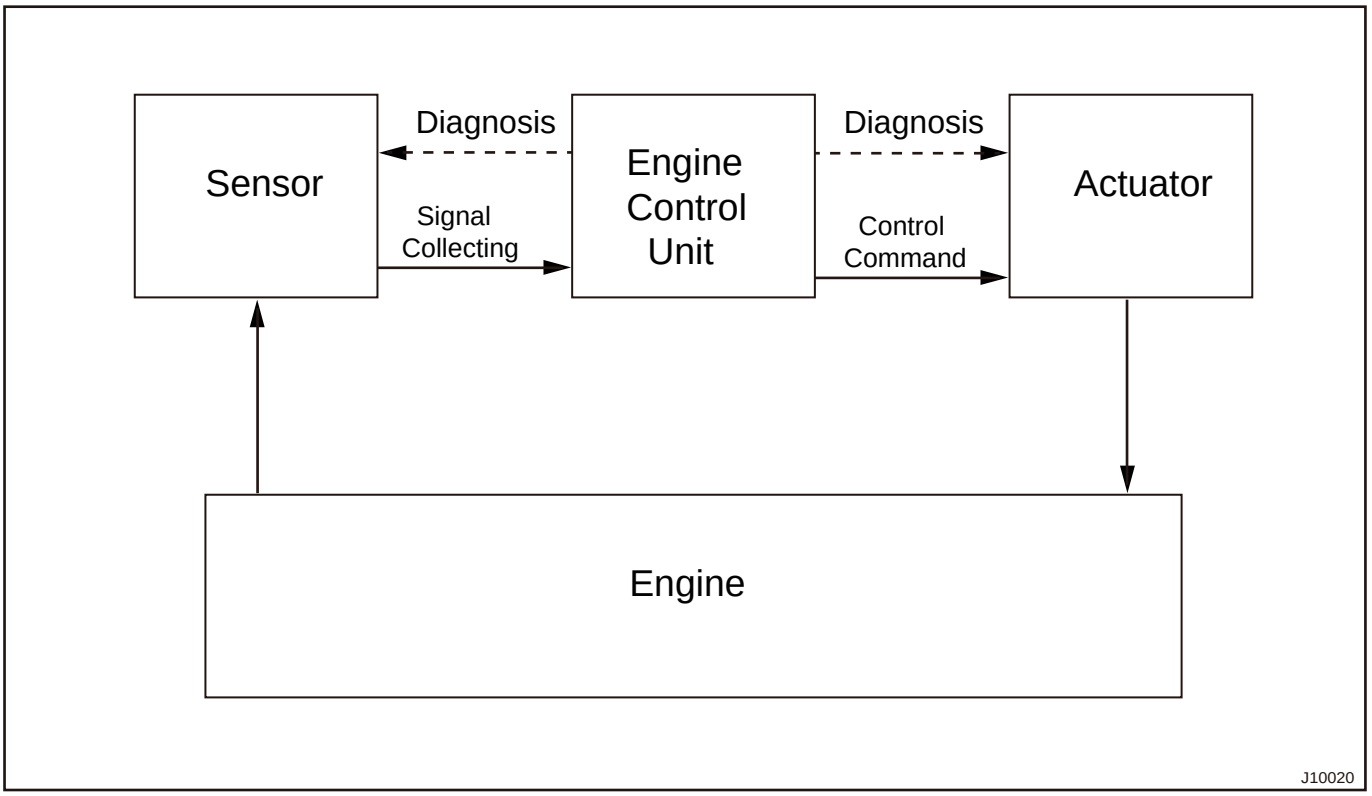
Electronic control sets (abbreviations) include: electronic controller (ECM), intake pressure/temperature sensor (DS-S3-TF), ambient pressure sensor (integrated inside the ECM), coolant temperature sensor (TF), phaser sensor (PG), speed sensor (DG), knock sensor (KS), oxygen sensor (LS), electronic throttle body (DVE), electronic accelerator pedal (APM), low pressure oil pump (EKPT), high pressure oil pump (HDP), high pressure fuel distribution pipe (KSZ-HD), high pressure fuel injector (HDEV), high pressure sensor (DS-HD), canister control valve (TEV), ignition coil (ZS), etc.

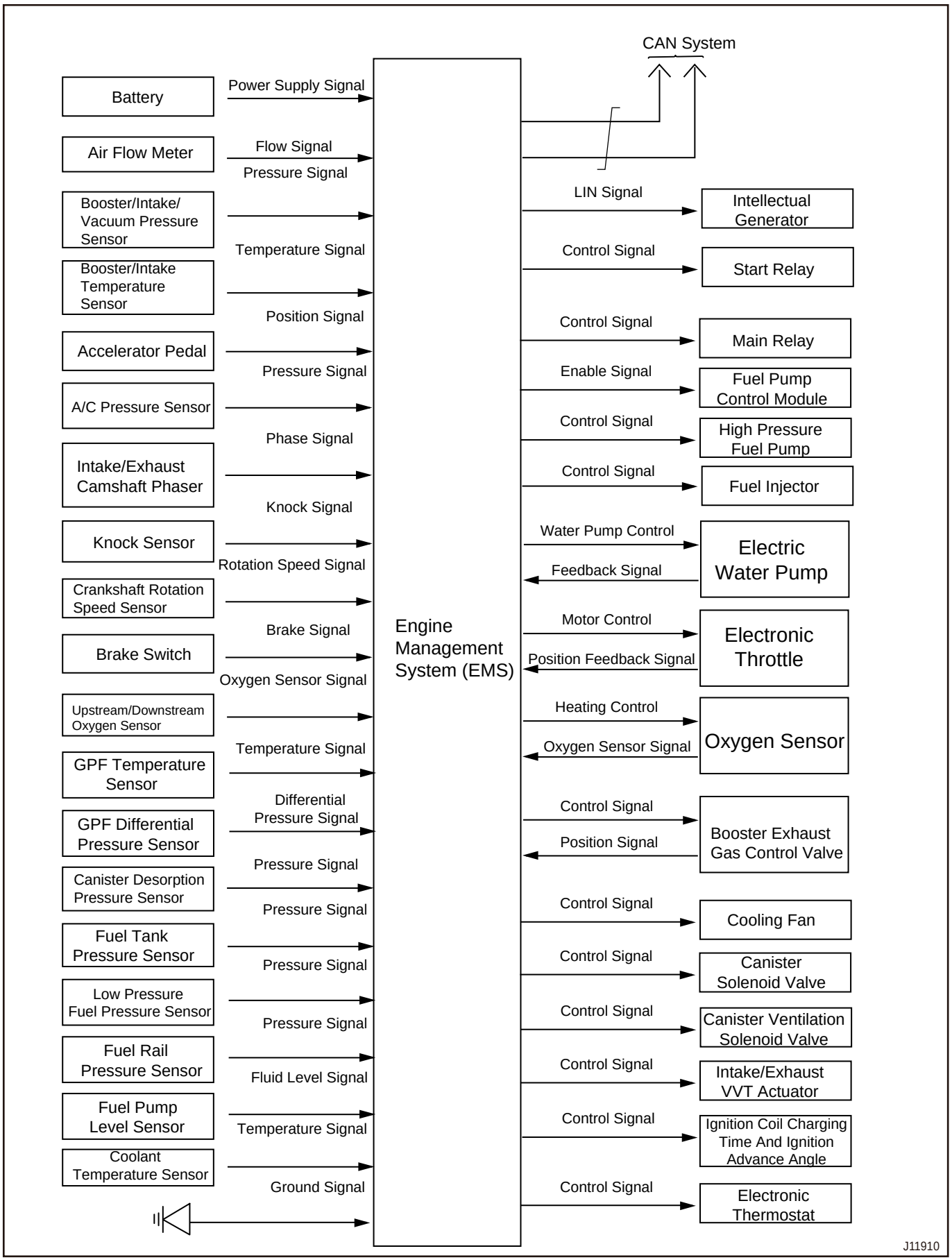
2 System Overview

2.1 System Description

Engine Management System mainly consists of Engine Control Module (ECM), sensors and actuators, which controls intake air amount, injection volume and ignition timing, etc. when engine is operating.In the engine management system, sensors are used as the input part to measure various physical signals (temperature and pressure, etc.), and converts them into corresponding electrical signals; the function of ECM is to receive the input signals from sensors and perform calculation according to set procedure, producing corresponding control signals and outputting them to power drive circuit. The power drive circuit drives each actuator to perform various actions, thus making the engine run according to the preset program. Also, the trouble diagnosis system of ECM monitors each component and control function in this system. Once detecting and confirming a fault, it will store the trouble code. When detecting that fault has been eliminated, it will return to use normal value.UAES GDI (Gasoline Direct Injection) system is a torque control-based system developed on the MG1US008 ECM platform. Its main purpose is to link a large number of different control objectives together and convert various engine requirements into torque or efficiency control variables.MG1US008 system can prioritize these requirements and execute the highest priority requirement. Obtain engine control variables such as intake air volume, injection volume, ignition timing. The execution of each control variable has no effect on other variables. This is the advantage of the torque-based control system.

2.2 System Schematic Diagram




CAN System
Battery
Power Supply Signal
Air Flow Meter
Flow Signal
Pressure Signal
Booster/Intake/ Vacuum Pressure Sensor
Temperature Signal
Booster/Intake Temperature Sensor
Position Signal
Accelerator Pedal
Pressure Signal
A/C Pressure Sensor
Phase Signal
Intake/Exhaust Camshaft Phaser
Knock Signal
Knock Sensor
Rotation Speed Signal
Crankshaft Rotation Speed Sensor
Brake Signal
Brake Switch
Oxygen Sensor Signal
Upstream/Downstream Oxygen Sensor
Temperature Signal
GPF Temperature Sensor
Differential Pressure Signal
GPF Differential Pressure Sensor
Pressure Signal
Canister Desorption Pressure Sensor
Pressure Signal
Fuel Tank Pressure Sensor
Pressure Signal
Low Pressure Fuel Pressure Sensor
Pressure Signal
Fuel Rail Pressure Sensor
Fluid Level Signal
Fuel Pump Level Sensor
Temperature Signal
Coolant Temperature Sensor
Ground Signal
Engine Management System (EMS)
LIN Signal
Intellectual Generator
Control Signal
Start Relay
Control Signal
Main Relay
Enable Signal
Fuel Pump Control Module
Control Signal
High Pressure Fuel Pump
Control Signal
Fuel Injector
Water Pump Control
Feedback Signal
Electric Water Pump
Motor Control
Position Feedback Signal
Electronic Throttle
Heating Control
Oxygen Sensor Signal
Oxygen Sensor
Control Signal
Position Signal
Booster Exhaust Gas Control Valve
Control Signal
Cooling Fan
Control Signal
Canister Solenoid Valve
Control Signal
Canister Ventilation Solenoid Valve
Control Signal
Intake/Exhaust VVT Actuator
Control Signal
Ignition Coil Charging Time And Ignition Advance Angle
Control Signal
Electronic Thermostat
J11910

2.3 System Function Description

MG1US008-Motronic 0 engine management system is an electronically controlled gasoline engine control system, which provides many control features related to the operator and vehicle or equipment. The system adopts a combination of open loop and closed loop (feedback) control to provide various control signals for engine operation. The basic functions of the system include: start control, warm-up and three-way catalytic converter heating control, acceleration/deceleration and motored fuel cut-off control, idle control, λ closed loop control, air-fuel mixture control function, evaporative emission control, knock control, OBD diagnostic control, etc. In addition, additional functions include engine control anti-theft function, start and stop control, fan control, A/C control, VVT control, turbocharger control and so on.

■ Start Control

(1) Start control: During starting, special calculation methods are used to control the filling, fuel injection and ignition timing. At the beginning of the process, the air in intake manifold is still, and the internal pressure of intake manifold is shown to be ambient pressure. The electronic throttle specifies a fixed opening parameter based on the current starting temperature. The fuel injection mode and injection volume is changed according to engine temperature to promote better mixing of oil and air in the cylinder. In order to form a reliable combustible mixture near the spark plug, the mixture must be enriched before the engine reaches a certain speed. Once the engine starts to run, the system starts to gradually reduce the fuel injection volume immediately, until the start condition ends to completely cancel the start and thicken. Ignition angle is constantly adjusted with starting conditions. It varies with engine temperature, intake air temperature and engine speed. High-pressure start is usually used. In failure mode or extremely low temperature, low-voltage start is used.

■ Heating control of engine warm-up and three-way catalytic converter

(1) For a period of time after the engine has been started at low temperature, additional injections are still required to be supplied, there may be several times depending on the operating conditions, and cylinder filling amount and ignition angle are adjusted to compensate for the higher torque requirements of engine; And this process continues until temperature rises to a proper threshold. In this stage, rapid heating of three-way catalytic converter is the most important, since rapid transition to operation of three-way catalytic converter can greatly reduce exhaust emissions. Under this operating condition, use exhaust gas to perform "three-way catalytic converter heating” by adopting methods of appropriate fuel injection mode (multiple injections) and a moderate delay in the ignition advance angle.

■ Acceleration/deceleration and motored fuel cut-off control

(1) In fact, a small part of the fuel injected into the cylinder will not be combusted in time. Conversely, it forms a layer of oil film on the cylinder wall or piston. When the throttle opening increases, a small part of the injected fuel is absorbed by the oil film. Therefore, it is necessary to inject the corresponding fuel amount to compensate and prevent the mixture from becoming lean during acceleration. Once the load factor is reduced, the additional fuel contained in the oil film will be released again, so the corresponding injection duration must be reduced during deceleration.

(2) Motored or traction condition indicates that the power provided by engine at the flywheel is negative. In this case, engine friction and pump air loss can be used to slow down the vehicle. When the engine is in motored or traction condition, the fuel is cut off to reduce fuel consumption and exhaust emissions, and more importantly to protect the three-way catalyst. Once the speed has been reduced to a set recovery of the fuel supply speed above idle speed, the fuel injection system is resupplied. In fact, the ECM program has a range of recovery speed. They vary according to dynamic changes of parameters such as engine temperature, gear position and engine speed, and prevent the speed from falling to the specified minimum threshold by calculation. Once the injection system is resupplied, the system begins to use the initial injection pulse to supply the fuel. After recovery of fuel injection, the torque-based control system increases the engine torque slowly and smoothly (smooth transition).

■ Idle control

(1) Engine does not provide torque to the flywheel at idle. To ensure stable operation of the engine at as low an idle speed as possible, the closed-loop idle speed control system must maintain the balance between the generated torque and the engine power consumption. The idle speed requires a certain amount of power to meet the load requirements of all aspects. They include internal friction from the engine crankshaft and valve gear and auxiliary components such as the water pump. MG1US008 system uses torque based control strategy to determine engine output torque requested by maintaining required idling speed in all working conditions according to closed loop idle control. This output torque increases as engine speed reduces, and reduces as engine speed increases. System responses to the new “interference factor” through requesting higher torque, such as turning on/off air conditioning compressor or shifting of automatic transmission. When engine temperature is low, torque is also needed to be increased to compensate higher internal friction and/or maintain higher idling speed. The sum of

these required output torque will be transmitted to torque coordinator which will process, calculate and obtain corresponding volumetric density, mixture contents and ignition timing.

■ **Closed-loop control**

(1) Exhaust aftertreatment in three-way catalytic converter is an effective method for reducing concentration of harmful substance in exhaust gas. Three-way catalytic converter can reduce hydrocarbon (HC), carbon monoxide (CO) and nitric oxide (NO_x) up to 98% or more, and convert them into water (H_2O), carbon dioxide (CO_2) and nitrogen (N_2). However, such high efficiency can be achieved only within small range of engine excess air coefficient λ=1, λ closed loop control is aimed to ensure mixture concentration within this range. λ closed loop control system functions only when oxygen sensor is equipped. Oxygen sensor on side of three-way catalytic converter monitors oxygen content in exhaust gas, lean mixture (λ > 1) will generate about 100 mV sensor voltage, and rich mixture (λ < 1) will generate about 800mV sensor voltage. When λ = 1, sensor voltage will jump. λ closed loop control responses to input signal (λ > 1 = lean mixture, λ < 1 = rich mixture) to correct control variable, a correction factor is generated as a multiplier to correct the fuel injection duration.

■ **Evaporative emission control**

(1) Due to external transfer of radiant heat and returned fuel heat, the fuel in fuel tank is heated and forms fuel vapor. Due to limits of evaporative emission regulations, these vapors containing a large amount of HC components are not allowed to be discharged directly into the atmosphere. In system, fuel vapor will be collected in activated carbon canister through guide pipe and enters into engine and participates in the combustion process through scour at the right moment. Flow rate of scour airflow is realized by ECM controlling canister control valve. This control operates only under closed loop working condition of λ closed loop control system.

■ **Knock control**

(1) System detects characteristic vibration at moment knock occurs through knock sensor installed in proper position of engine, and converts it into electrical signal to transmit it to ECM for processing. ECM uses special processing method to detect if knock occurs in each combustion cycle in each cylinder. Once knock is detected, knock closed loop control is triggered. After knock danger is eliminated, ignition of affected cylinder will be gradually advanced to predetermined ignition advance angle.

■ **OBD Trouble Diagnosis**

(1) Electronic control unit constantly monitors sensors, actuators, related circuits, malfunction indicator light, battery voltage and so on, and even electronic control unit itself. And it performs rationality detection for sensor output signal, actuator drive signal and internal signals (such as λ closed loop control, coolant temperature, knock control, idle speed control and battery voltage control, etc.). Once a certain step failure or unreasonable signal value is found, electronic control unit will immediately set malfunction information record in RAM malfunction memory. Malfunction information record is stored in the form of trouble code and displays in the order in which malfunctions occurred.

■ **Idle Start and Stop**

(1) Idle automatic start and stop function can realize the automatic start-stop function when the vehicle stops briefly (such as red traffic light) during driving. The system can judge whether the driver has parking or driving intention according to the information of vehicle speed, engine speed, transmission chain state and vehicle body state, and automatically controls the starting and stopping of engine. So as to achieve the purposes of fuel saving and emission reduction, and fuel consumption reduction of end users. The control is the same as 1.6T.

2.4 Introduction to National VI OBD Diagnostic Control

■ **Catalytic Converter Monitor**

(1) The catalytic converter is equipped with two main components of cerium oxide and precious metals (-platinum, rhodium, palladium). The former is a container for storing and releasing oxygen and is used to oxidize CO and HC in the concentrated gas mixture, while the latter is a catalyst to promote oxidation and reduction reactions. Under the premise that the aging speed of the two is basically the same, because the damage degree of precious metals cannot be accurately assessed, and the aging degree of cerium oxide can be expressed by the amount of oxygen storage, research shows that there is a nonlinear relationship between the conversion efficiency and oxygen storage capacity of catalytic converter. The oxygen storage capacity of the catalytic converter, that is, the oxidation capacity of the catalytic converter, decreases over time. Therefore, the current catalytic converter diagnosis strategy is realized by evaluating the oxygen storage capacity of catalytic converter.

(2) During the measurement of oxygen storage, first use the concentrated gas mixture to completely empty the residual oxygen in catalytic converter, and the oxygen in the catalytic converter is considered to be completely empty when the downstream oxygen indicator is rich, and then the lean mixture is used to

oxygenate the catalytic converter, and the downstream oxygen indicator is lean, the catalytic converter is considered to be full of oxygen. Through this process, the oxygen storage capacity of the catalytic converter can be calculated to evaluate the conversion capacity of the catalytic converter. Before the decrease of catalytic converter conversion capacity causes the emission of non-methane hydrocarbons + nitrogen oxides (NMHC＋NOx) in the exhaust pollutants of the vehicle to exceed the OBD threshold, The OBD system alarms and illuminates MIL light.

(3) The catalytic converter is monitored by directly measuring the oxygen storage capacity during the transition process of the gas mixture from rich to lean. In this process, the upstream oxygen sensor accurately controls the air-fuel ratio, and the downstream oxygen sensor is used to measure the oxygen storage capacity of the catalytic converter.

■ Overview of Misfire Monitoring

(1) The basic principle of engine misfire monitoring is based on calculating the crankshaft acceleration during each individual combustion process.

(2) In order to calculate the crankshaft acceleration, a toothed sensor signal wheel with a reference mark is installed on the crankshaft. The sensor signal wheel is divided into several segments, the segment number is equal to half of cylinder number in an engine with even number of cylinder, and the cylinder number is the number of cylinders in an engine with odd-number of cylinder. Each time the combustion pushes the crankshaft to accelerate rotation and generate a certain crankshaft acceleration. The engine speed sensor is used to calculate the time for crankshaft to rotate around each segment window, and the crankshaft acceleration corresponding to each cylinder can be calculated from the relative segment time.

(3) When a cylinder is unburned or not fully burned, it will take longer for the corresponding segment window to pass the crankshaft position sensor, the corresponding segment window acceleration will exceed the matching threshold, and the system will diagnose a misfire.

■ Evaporation System Monitoring (Dual Lines, DTEV + DTESK)

Evaporation system monitor includes two parts:

(1) Monitor the desorption flow of evaporation system. When the desorption flow from the fuel evaporation system to the engine cannot be monitored, the OBD system should detect a fault, that is, the desorption flow monitor. Related faults: P0497 (EVAP System Low Purge Flow) P04F0 (EVAP System High Pressure Purge).

(2) Monitor the integrity of the entire evaporation system except for the lines and connectors between canister valve and the intake manifold to prevent fuel vapor from leaking into the atmosphere, that is, leakage monitor. Related faults: P2422 (EVAP System Vent Valve Stuck Closed), P0455 (EVAP System Leak Detected (Large Leak)), P0442 (EVAP System Leak Detected (Small Leak)).

(3) Pressure sensor-based desorption flow monitoring (DTEV) and fuel tank pressure sensor-based leakage monitoring (DTESK).

- DTEV actively controls the opening and closing of the canister valve, and detects the desorption flow of the evaporation system according to the pressure fluctuations in desorption line during the canister valve opening; DTESK controls the canister valve and canister vent valve to create the vacuum degree, and detects the leakage of evaporation system based on the vacuum attenuation gradient. The system can also monitor the canister valve and canister vent valve. The canister vent valve is used to control the communication between evaporation system and atmosphere, and the canister valve is used to control the communication between evaporation system and engine intake line. If the system leaks, it is recommended to use a smoke-type leak detector for troubleshooting.

■ Fuel System Monitoring

(1) Adaptive feedback monitoring based on upstream oxygen

- P2177 (System Too Lean Off Idle Bank 1)
- P2178 (System Too Rich Off Idle Bank 1)
- P2187 (System Too Lean at Idle Bank 1)
- P2188 (System Too Rich at Idle Bank 1)
- The fuel injection time of the injector is mainly calculated according to the engine load signal, additive correction factor of mixture adaptive feedback, the multiplicative correction factor of mixture adaptive feedback and the mixture closed-loop adjustment factor.
- Considering that different fault sources have different effects on engine operating conditions and have different meanings for mixture correction, the system divides the self-learning region of mixture according to engine speed and load and carries out corresponding correction. Therefore, adaptive feedback learning is divided into two types: (1) Additive self-learning (such as air leakage in intake manifold); (2) Multiplicative self-learning (such as fuel pressure signal error). The corresponding fault

types are also divided into: additive self-learning over-limit fault (P2187/P2188) and multiplicative self-learning over-limit fault (P2177/P2178).

- Under idling conditions, the additive self-learning plays the main role of fuel correction, while under relatively high speed and load conditions, the multiplicative self-learning plays the main role of fuel correction.
- Additive self-learning is carried out under idling conditions, and multiplicative self-learning is carried out under relatively high speed and load conditions. Only when the engine is running to corresponding self-learning operating area, the corresponding self-learning of mixture will be activated.

(2) Fuel correction monitoring based on downstream oxygen

- P2097 (Post Catalyst Fuel Trim System Too Rich Bank 1)
- P2096 (Post Catalyst Fuel Trim System Too Lean Bank 1)
- Downstream oxygen closed loop correction principle
- There are two main functions and meanings of installing the downstream oxygen sensor behind the catalytic converter: One is to monitor the failure of catalytic converter according to the signal of downstream oxygen sensor; the other is to further correct the closed-loop adjustment deviation of upstream oxygen according to the signal feedback of downstream oxygen sensor to ensure that the mixture λ is always within the catalytic converter optimal conversion window.
- For closed-loop adjustment based on downstream oxygen, the principle is to compare the downstream oxygen voltage signal with the target voltage under steady condition. If the downstream oxygen voltage deviates from the target voltage, the system will perform self-learning correction according to the degree of deviation and determine fault based on the self-learning value.

■ Exhaust Sensor Monitoring

The exhaust sensor system monitors the working status of upstream oxygen sensor and upstream oxygen sensor, including oxygen sensor circuit monitoring, heating performance monitoring, responsive monitoring, and upstream oxygen sensor characteristic deviation monitoring.Oxygen sensor circuit monitoring (upstream and downstream oxygen sensors)Oxygen sensor heating monitoring (upstream and downstream oxygen sensors)Upstream oxygen sensor responsive monitoringUpstream oxygen sensor characteristic deviation monitoringDownstream oxygen sensor aging monitoring

(1) Upstream oxygen sensor responsive monitoring

- P0133 (O2 Sensor Circuit Slow Response Bank 1 Sensor 1)
- Aging and pollution will cause the responsiveness of the oxygen sensor to become sluggish, and a upstream oxygen sensor signal with a slower dynamic response will cause emissions to deteriorate. The system response monitoring function can monitor the symmetry response failure of upstream oxygen sensor when the monitoring conditions are met.
- The system monitors the responsiveness of upstream oxygen sensor by adjusting the required air-fuel ratio. When the air-fuel ratio changes, it performs fault monitoring by comparing the reversed actual oxygen sensor signal and the target oxygen sensor signal.

(2) Upstream oxygen sensor characteristic deviation monitoring

- The measured air-fuel ratio signal deviates from the actual value when the characteristics of upstream oxygen sensor deviate. The deviation of the positive or lean side can cause the measured value of the excess air coefficient to be too large (lean). The deviation of the negative or rich side can cause the measured value of the excess air coefficient to be too small (rich). The system monitors the characteristic deviation of upstream oxygen sensor through the fuel self-learning integral value in closed-loop control of downstream oxygen. When the characteristic of upstream oxygen sensor is deviation, the air-fuel ratio indication will be lean or rich, which will cause the downstream oxygen self-learning integral value is too large or too small.
- Malfunction Detection Standard
- P2195 O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1
- P2196 O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1
- When the characteristics of upstream oxygen sensor deviate to the lean side, the upstream oxygen signal will always be lean compared to the actual air-fuel ratio, which leads to the enrichment of upstream oxygen closed-loop control, the mixture will be rich, and downstream oxygen signal will continue to be high and deviate from the target voltage level. At this time, the closed-loop correction factor of downstream oxygen closed-loop control based on the downstream oxygen signal will be

corrected by feedback. When the self-learning integral value of correction factor exceeds the upper fault threshold, the system will report P2195 (Lean Side Fault (Lean Side Deviation Fault).

(3) Upstream Oxygen Sensor Voltage Range Monitoring

- If the upstream oxygen sensor is installed incorrectly, the sensor is likely to be in communication with atmosphere and cannot accurately reflect the oxygen concentration in exhaust gas. Generally, when the oxygen sensor is placed in a mixture with an air-fuel ratio around 1.0, its output voltage is much lower than the output voltage when upstream oxygen sensor is in the air. When upstream oxygen sensor is not correctly installed in the exhaust system, it will be report the fault.
- P2414 O2 Sensor Exhaust Sample Error Bank 1 Sensor 1
- Generally, when the oxygen sensor is placed in a mixture with an air-fuel ratio around 1.0, its output voltage is much lower than the output voltage when upstream oxygen sensor is in the air. When upstream oxygen sensor is not correctly installed in the exhaust system, it will report P2414. Since an empty fuel tank may lead to misdiagnosis, it is necessary to add an empty fuel tank verification before fault confirmation.

(4) Downstream Oxygen Sensor Aging Monitoring

- Downstream oxygen sensor signal continues to be rich
- P2271 O2 Sensor Signal Biased&Stuck Rich Bank 1 Sensor 2
- When downstream oxygen sensor signal is always rich, under the action of fuel cut-off condition or the active adjustment of the air-fuel ratio, when the downstream oxygen voltage still cannot drop to the setting threshold after a certain period of time (considering the oxygen storage factor of catalytic converter), it will report P2271.
- Downstream oxygen sensor signal continues to be lean
- P2270 O2 Sensor Signal Biased&Stuck Lean Bank 1 Sensor 2
- When downstream oxygen sensor signal is always lean, under the action of purging oxygen condition or the active adjustment of the air-fuel ratio, when the downstream oxygen voltage still cannot rise to the setting threshold after a certain period of time (considering the oxygen storage factor of catalytic converter), it will report P2270.
- Responsive monitoring of downstream oxygen sensor under fuel cut-off conditions
- P013A O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2
- In the fuel cut-off condition that meets the diagnostic conditions, when the output voltage time constant of downstream oxygen sensor exceeds the setting threshold, it will report P013A.

(5) Downstream Oxygen Sensor Circuit Monitoring

- Downstream oxygen sensor signal circuit is short to power supply
- P0138 O2 Sensor High Voltage Bank 1 Sensor 2
- When all monitoring conditions are met, if the output voltage of oxygen sensor is greater than threshold, it will report P0138.
- Downstream oxygen sensor signal circuit is short to ground
- P0137 O2 Sensor Low Voltage Bank 1 Sensor 2
- When all monitoring conditions are met, if the output voltage of oxygen sensor is less than threshold, it will report P0137.
- Downstream oxygen sensor signal circuit open
- P0136 O2 Sensor Circuit Bank 1 Sensor 2
- When all monitoring conditions are met, if the output voltage of downstream oxygen sensor stays within the set threshold interval, it will report P0136.
- Unreasonable monitoring of downstream oxygen sensor signal
- P2232 O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 2
- When all monitoring conditions are met, if downstream oxygen sensor signal circuit is coupled with heating line, it will report P2232.

(6) Upstream Oxygen Sensor Heating Monitoring

- When the exhaust temperature is not enough to heat the oxygen sensor to a suitable working temperature, the internal heating circuit of oxygen sensor can auxiliary heating. When the heating circuit of oxygen sensor fails, the oxygen sensor will not work reliably and needs to be monitored for failure.
- P0053 HO2S Heater Resistance Bank 1 Sensor 2

- After engine is started, if the temperature of upstream oxygen ceramic body cannot exceed the setting threshold within a certain period of time, it will report P0053.
- When the heating control circuit is heated at full-power and temperature of upstream oxygen ceramic body cannot exceed the setting threshold, it will report P0053.

(7) Downstream Oxygen Sensor Heating Monitoring

- P0054 HO2S Heater Resistance Bank 1 Sensor 2
- Under high temperature exhaust and circuit heating, the internal resistance of two-point oxygen sensor decreases and the temperature increases. If the circuit heating of oxygen sensor fails, the internal resistance of oxygen sensor is higher than the normal value. Nernst internal resistance monitoring of oxygen sensor.
- When the Nernst internal resistance of oxygen sensor is higher than the normal value, it will report P0054.

■ Engine Cooling Monitoring

(1) Engine coolant temperature (ETC) sensor monitoring

- The engine coolant temperature sensor measures the engine coolant temperature, and its monitoring includes circuit monitoring, various signal rationality monitoring, and cold start rationality monitoring.

(2) Thermostat monitoring

- The system uses a thermal management module to control the temperature of engine coolant, so the thermal management module is required to monitor in accordance with the thermostat monitoring specification. The cooling system is equipped with an engine coolant temperature sensor (ECT sensor) in the small circulation water circuit, which is used to measure the water temperature of small circulation water circuit, and a coolant temperature sensor (ECT sensor 2) is installed in the large circulation water circuit, which is used to measure the water temperature of large circulation water circuit. In the normal state of thermal management module, when the coolant does not reach the regulating temperature, the large circulation water circuit of cooling system is in the closed state, the coolant flows in the small circulation, and the ECT sensor 2 is cold coolant. When the coolant reaches the regulating temperature, the large circulation water circuit of cooling system is in an open state, and the hot coolant flows to the radiator to dissipate heat, and the ECT sensor 2 is the hot coolant that passes through the radiator to dissipate heat. When the thermal management module is stuck in the fully open position, the coolant flows to the radiator to dissipate heat, and the ECT sensor 2 always senses the hot coolant that passes through the radiator to dissipate heat.
- P0128 Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)
- If the water temperature of small circulation water circuit is higher than the threshold, the thermal management module is determined to be normal; if the water temperature of small circulation water circuit is lower than the threshold and the water temperature of large circulation water circuit reaches a certain threshold, it is determined that the thermostat is stuck in the fully open position, and the performance of thermostat module is considered unreasonable.

■ Cold Start Emission Reduction Strategy Monitoring (CSERS)

(1) System overview

- The cold start emission reduction strategy is generally catalytic converter heating, that is, by increasing the engine idle speed, delayed ignition angle, adjusting the variable valve timing, multiple injections and other strategies to achieve the goal of quick ignition of catalytic converter during the warm-up. Cold start emission reduction strategy diagnosis is not a diagnosis of a specific function, but a monitoring and diagnosis of the above strategies, and corresponding diagnosis of key engine parameters corresponding to these strategies.
- Before the failure or deterioration of cold start emission reduction strategy relevant parts or components causes the vehicle emissions to exceed OBD threshold, the OBD system should detect a failure. If the failure of strategy does not lead to emission exceeding the OBD threshold, the corresponding faults should be diagnosed when the function control reaches the adjustment limit. The strategy corresponding to the cold start emission reduction strategy of this project is to increase engine idle speed, delay ignition angle, adjust variable valve timing, perform multiple injection, and increase high pressure fuel rail pressure. Details are as follows:

(2) Engine idle speed control monitoring in catalytic converter heating

- P050A 21 (Cold Start Idle Control System Performance)
- P050A 22 (Cold Start Idle Control System Performance)
- P050D (Cold Start Rough Idle)

- Similar to the normal phase (catalytic converter heating does not work), the engine idle speed control and diagnosis principle is the same in catalytic converter heating. The idle speed uses PID to adjust the engine torque to achieve the actual idle speed consistent with the target idle speed; Idle speed diagnosis is a corresponding diagnosis based on the difference between the target speed and actual speed, and the performance of actual idle speed.

(3) Ignition angle efficiency monitoring when catalytic converter is heated

- P050B 00 (Cold Start Ignition Timing Performance)
- P050B 20 (Cold Start Ignition Timing Performance)
- The important measures of delaying the ignition angle and the quick ignition of catalytic converter are used to shorten the ignition time of catalytic converter, thereby greatly reducing exhaust emissions. This diagnostic function monitors the ignition angle efficiency during catalytic converter heating. The diagnostic principle diagram is as follows, by calculating the deviation of actual ignition angle efficiency and target ignition angle efficiency, considering that the catalytic converter heating is a process, the system obtains the average efficiency difference of the entire catalytic converter heating process, and compares it with the matching threshold at the corresponding operating point.
- Theoretically, only when the actual ignition angle is greater than the set optimal ignition angle (ignition angle delayed when the catalytic converter is heated in the normal state), that is, the ignition angle is not delayed or delayed not enough, the quick ignition of catalytic converter will be adversely affected, therefore, the system only performs the diagnosis, that is, when the average deviation between actual ignition angle efficiency and target ignition angle efficiency is greater than the setting threshold (- ignition angle is not delayed or delayed not enough), and the duration exceeds the setting threshold, it will report P050B 00 (it will report P050B 20 when part load).

(4) Variable Valve Timing Monitoring when Catalytic Converter Heating

- P052A (Cold Start “A” Camshaft Position Timing Over-Advanced Bank 1)
- P054A (Cold Start “B” Camshaft Position Timing Over-Advanced Bank 1)
- The diagnostic method of variable valve timing in catalytic converter heating is to monitor the effective difference between actual position and the expected position of intake and exhaust VVT, and detect the accuracy and timeliness of required valve timing.
- If the catalytic converter heating is activated after the engine is cold-started, and all the secondary factors are satisfied, the VVT diagnosis is performed by comparing the target camshaft angle with the actual camshaft angle.
- If the deviation between expected angle and actual angle is greater than the matching fault threshold within the specified time, the fault will be detected and the P052A/P054A will be confirmed. The fault threshold is obtained based on the engine speed and oil temperature at this time.
- When the deviation between expected angle and actual angle is within the specified range, and the camshaft phase adjustment range exceeds the threshold, no fault diagnosis is completed.

(5) Multi-injection Monitoring when Catalytic Converter Heating

- P05EC (Cold Start Injection Timing Performance)
- One of the advantages of a direct injection engine is that it can effectively carry out multiple injections such as two injections, especially by activating the multiple injection mode, greatly delays the ignition angle to achieves the quick ignition of catalytic converter during the heating process, thus effectively reduce emission pollution. Therefore, just as the ignition angle is an important factor in the catalytic converter heating, the fuel injection pulse width and fuel injection phase corresponding to multiple injections are all important control parameters, that is, corresponding diagnosis is required.
- Monitor the injection pulse width, injection angle, and injection times of the multiple injection control parameters. When the absolute value of difference between expected value and actual value exceeds the setting threshold, it will report P05EC.

(6) High Pressure Oil Passage Pressure Monitoring When Catalytic Converter Heating

- P053F 21 (Cold Start Fuel Pressure Performance)
- P053F 22 (Cold Start Fuel Pressure Performance)
- In the catalytic converter heating process of high pressure direct injection engine, it can reduce the emission pollution by increasing the high pressure oil passage pressure, that is, it is also an important control parameter for cold start to reduce the emission pollution, so effective diagnosis is required. Diagnosis principle for this part is the same as the high pressure oil passage diagnosis when the catalytic converter heating, that is, the expected pressure is compared with the actual pressure, and the corresponding fault is reported when the difference exceeds the setting threshold.

■ Gasoline Particulate Filter (GPF) Monitoring

(1) Gasoline particulate filter (GPF) is installed on engine exhaust pipe to trap particulate in exhaust gas. According to the provisions of the National VI Emission Regulation J.4.13.2.1, it is necessary to monitor the GPF to remove the failure.

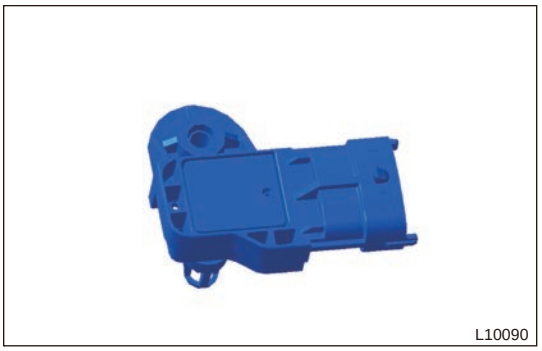
(2) When the particulate trapped in GPF is too much, causing GPF back pressure is too high, it will cause the engine exhaust back pressure to rise, which will affect the engine power performance. Therefore, it is necessary to monitor the fault of high GPF back pressure.

(3) In order to realize the monitoring of GPF removal and high back pressure failure, it is necessary to install a differential pressure sensor on GPF to measure the pressure drop generated when the exhaust gas flows through GPF.

2.5 System Components Description

■ Intake pressure sensor

Intake manifold absolute pressure sensing element consists of a piece of silicon chip. Etch a piece of pressure diaphragm on silicon chip. There are 4 piezoresistors on pressure diaphragm, and the 4 piezoresistors form a Wheatstone bridge as strain element. Except for the pressure diaphragm, silicon chip is also integrated with signal processing circuit. Active surface of the silicon chip is subjected to a pressure close to zero, and its surface is subjected to the absolute pressure of the intake manifold to be measured. Thickness of silicon chip is only several micrometer, so the silicon chip will deform mechanically as intake manifold absolute pressure changes, and 4 piezoresistors will also deform, thus changing the resistance. Voltage signal linearly related to the pressure is generated after processing by signal processing circuit of silicon chip.
Intake temperature sensing element is a negative temperature coefficient (NTC) resistor, whose resistance changes with the intake temperature. This sensor transfers a voltage of intake temperature change to controller.



(1) Pressure sensor limit parameter

Parameters	Value		
	Minimum	Representative	Maximum
Power supply voltage			16V
Pressure			500 kpa
Operating temperature	-40℃		+130℃

(2) Pressure sensor characteristic parameters

Parameters	Value		
	Minimum	Representative	Maximum
Pressure measurement range	10 kpa		300 kpa
Operating temperature	-40℃		130℃
Power supply voltage	4.75 V	5.0 V	5.25 V
Power supply current when U_S = 5.0 V			12.5 mA
Output terminal load current	-1.0 mA		0.5 mA

Parameters		Value		
		Minimum	Representative	Maximum
Load resistance to voltage U_S or ground	Pull-up resistor	5 kΩ		
	Pull-down resistor	10 kΩ		
Response time $t_{10/90}$				1.0 ms
Weight			24g	

(3) Temperature sensor limit parameters

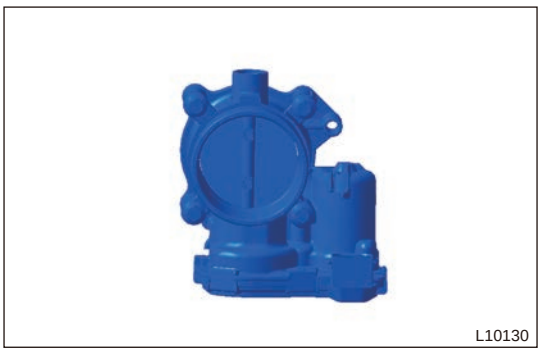
- Storage temperature: -40/+130˚C;
- The maximum power at 25˚C: 100 mW.

(4) Temperature sensor characteristic parameters

- Operating temperature: -40/+130°C;
- Rated voltage: Pull-up resistor (power is 1 kW) operates at 5 V or operates at a constant current of £1mA;
- Rated resistance at 20°C: 2.5 kW ± 5%;

■ Electronic Throttle Body

Electronic throttle body is a critical part for engine intake system in EGAS system. Its main function is to control intake air volume by adjusting intake passage area according to driver' s driving intention to meet intake requirements in different engine operating conditions, and send back position signals of throttle valve plate to control unit to achieve accurate control.
DVE consists of four parts: drive module, train module, executive module and feedback module, and all components are integrated into the same throttle valve housing. Throttle feedback module uses two redundant structures. When malfunction occurs, throttle valve plate will stop at the limp home position (NLP) determined by mechanical way, which is located above mechanical bottom dead center. DVE performs control only by corresponding electronic control unit or electronic test circuit. In principle, it is necessary to ensure that the throttle valve plate does not operate dynamically to the mechanical dead center.


L10130

(1) Basic performance parameters:

Test Item	Potentiometer Voltage				Response Time (ms)		Return Time (ms)
	Mechanical Bottom Dead Center (%)		Mechanical Top Dead Center (%)				
	IP1S	IP2S	IP1S	IP2S	Open	Close	
Parameter range	10 ± 4	90 ± 4	93 ± 4	7 ± 4	⩽ 100	⩽ 100	⩽ 300

■ Knock Sensor

Knock sensor is installed on cylinder block, and used to detect engine vibration caused by detonation. You can install one or more.
The sensitive element of sensor is a piezoelectric ceramic. Vibration of engine cylinder block is transferred to the piezoelectric ceramic through a mass block in the sensor. Due to the pressure generated by vibration of mass block, the piezoelectric ceramic generates a voltage at both electrode faces, and converts the vibration signal to an A/C voltage signal to output it.
Because intensity of vibration signal caused by engine knocking is far more than that of normal engine vibration signal, ECM can distinguish between knock or non-knock signals by processing these signals from knock sensor.


J12860

(1) Limit data

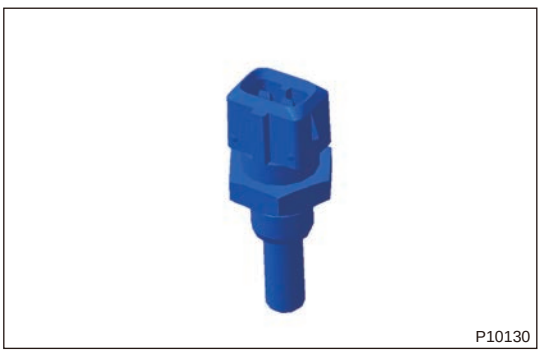
Quantity	Value		
	Minimum	Representative	Maximum
Operating temperature	-40˚C		130˚C

(2) Characteristic data (cable type)

Quantity		Value
Sensitivity of new sensor to 7 kHz signal		23.6~35.4 mV/g
Sensitivity of new sensor to 19kHz signal		28.3~42.4 mV/g
Linearity between 5 and 15 kHz		±10% of 5 kHz (based on 10m/s²)
Main resonance frequency		＞30 kHz
Impedance	Resistance (terminal and copper bush)	＞1 MΩ
	Capacitance (probe)	1150 ± 200 pF
Leakage resistance (resistance between two output terminals of sensor)		4.9 ± 20% MΩ
Variation in sensitivity due to temperature (9 kHz)		≤ -0.04 mV/g°C

■ Coolant Temperature Sensor

Temperature sensor function is used to monitor engine coolant temperature, On the one hand, it makes the electronic system judge the engine operating condition by outputting resistance signal; On the other hand, it also outputs signals to relevant instrument cluster, so that operators can directly judge the engine operating condition through visual inspection. Coolant temperature sensor encapsulates NTC thermistor in temperature sensor, its resistance varies in accordance with ambient temperature, so that the small change of outside temperature can be measured accurately and timely. Temperature of contact medium can be reflected by measuring its output resistance.


P10130

(1) Limit data

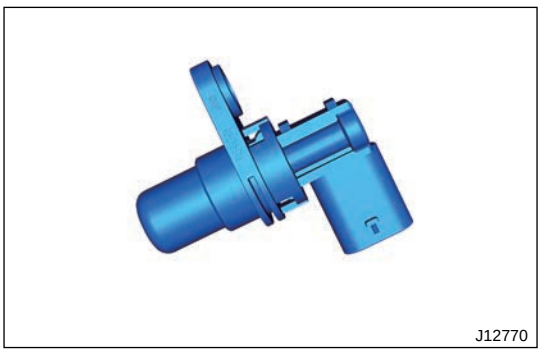
Quantity	Value
Rated voltage	Operates with ECM connected, standard operating condition is 5 V (power of pull-up resistor is 1 kW)
Rated resistance at 20°C	2.5 ± 5% kΩ
Operating temperature range	-40 ~ +130℃
Vibration level	⩽ 600 m/s²

(2) Characteristic data

Temperature (℃)	Resistance (Ω)
-40	45313
-30	26114
-20	15462
-10	9397
0	5896
10	3792
20	2500
30	1707
40	1175
50	833.9
60	595.5
70	435.7
80	322.5
90	243.2
100	186.6
110	144.2
120	112.7
130	89.30

■ Speed Sensor

Speed sensor is a component of the engine management system. This sensor is installed on engine block, which used to detect crankshaft position and speed. Rotation of the signal plate causes the magnetic field at the induction point inside the speed sensor to alternate. The alternating magnetic field is induced by the differential Hall chip, and the induced alternating magnetic signal is converted into an electrical signal by the internal processing circuit of the sensor and output.

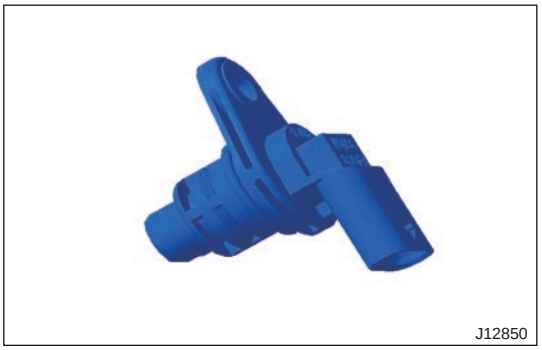

J12770

(1) Technical Characteristic Parameters

Parameters	Minimum	Representative	Maximum
Storage temperature	-40 ˚C		+80 ˚C
Speed range	20 rpm		8000 rpm
Air clearance	0.2 mm	1.0 mm	1.8 mm
Phase accuracy (falling edge of 800 rpm)	-1 deg		+1 deg
Operating temperature (-plug area)	-40 ˚C		+150 ˚C
Operating temperature (sensor)	-40 ˚C		+150 ˚C
Power supply voltage range	4.75 V	5.0 V	16 V
Power supply current		4.2 mA	10 mA
Output signal rising time (Low - High)			25 us
Output signal falling time (-High - Low)			1 us
Output signal power supply voltage			18 V
Output current			20 mA
Output signal low voltage			0.5 V
Output signal high voltage	$U_{S,0}$—0.5 V	$U_{S,0}$—0.3 V	
Power-on time			250 ms
n: Repeated accuracy at 800 rpm	-0.1 deg	+0.1 deg	

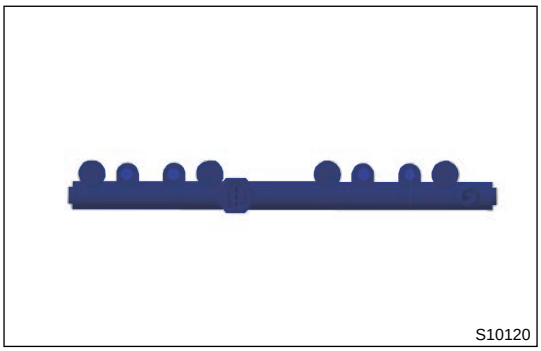
■ Camshaft Position Sensor

Camshaft position sensor is a Hall type sensor. A phaser is installed on camshaft. When phaser is in high teeth, the applicable circuit outputs low voltage; when phaser is in missing teeth, the applicable circuit outputs high voltage. As a result, the crankshaft phase information is provided to Engine Control Module (ECM), so that the compression top dead center and exhaust top dead center of crankshaft can be distinguished.



■ High pressure fuel distribution pipe assembly

The high pressure fuel distribution pipe assembly is integrated with high pressure fuel distribution pipe (fuel rail), high pressure fuel injector and high pressure sensor. Its operation principle is to optimize design through structure of high pressure fuel distribution pipe, the accurate fuel rail pressure signal feedback can uniformly and precisely distribute fuel for engine through injector.



(1) Technical Characteristic Parameters

Items	Target Specifications
System pressure	35 MPa
Target life	10/160,000 y/km
Temperature Condition	-40 ~ 130 ˚C

■ High Pressure Fuel Injector

Operation principle of solenoid valve type high pressure fuel injector: When the electricity is applied, electromagnetic coil generates magnetic force, and the needle valve set is sucked up, and separated from valve seat, so that fuel is injected. When the power is off, compression spring returns and needle valve set moves downwards, so that it contacts valve seat eventually to seal the fuel.

(1) Technical Characteristic Parameters

Electronic Control Fuel Injection	High pressure direct injection system
Fuel Entering Direction	Injector axial
System Pressure	35 Mpa
Maximum Operating Voltage	65 V
Target Life	240,000 kilometers, up to 15 years

■ Ignition Coil

Ignition coil consists of primary winding, secondary winding, iron core and housing etc. When the ground passage of a primary winding is on, this primary winding is charged. If ECM cuts off the primary winding circuit, the charging will be suspended, and a high voltage will be induced in the secondary winding at same time, cause spark plugs to discharge.

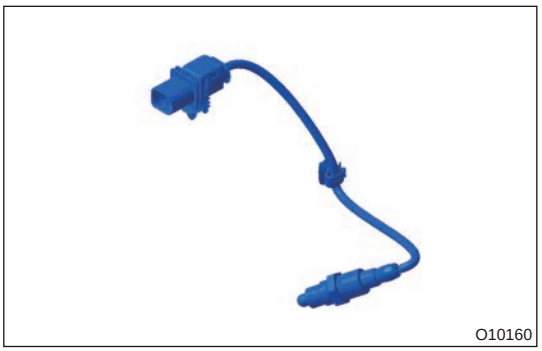

N10180

(1) Technical Parameters

Primary current	8.5A X (1 ± 8%)
Secondary voltage	⩾ 37 KV (40 pF ± 5 pF of load)
Load (Zener diode)	1000 ± 20 V
Ignition energy	⩾ 90mJ

■ Upstream Oxygen Sensor

LSU oxygen sensor is much more advanced in functions than LSH and LSF. It is a combination of ceramic body principle and a "micro pump" for oxygen ion delivery. Sufficient oxygen is supplied to the electrode on contact side of exhaust by the pump to keep the voltage on both sides constant at about 450 mV. Electronic controller converts the electric energy consumption of the pump into the excess air coefficient, and the output current has an almost linear relationship with it, which λ = 0.65 ~ ∞, so it is also called linear oxygen sensor. Not only can determine λ is more than 1 or less than 1, but also can measure specific values of λ in lean and rich areas, so that excess air coefficient in a large range (that is, wide frequency) can be measured, and enables continuous control from λ<1 to λ>1.


O10160

(1) Characteristic Data

Description	New	After Platform Test
λ signal when λ = 1.7	1.70 ± 0.077	1.70 ± 0.132
λ signal when λ = 0.8	0.80 ± 0.012	0.80 ± 0.020

(2) Sensor electrical data

Description		Value
Resistance between housing and each flat insert pieces	Room temperature, 800 V DC	⩾ 10 MΩ
Power supply voltage on connector	Rated voltage	6.8 V
	Continuous operating voltage	⩽ 12 V
	Maximum system power supply voltage	⩽ 16.5 V

Description		Value
	Short time voltage peak value within 60 ms (10 times in life cycle, ceramic temperature ⩾ 20℃)	⩽ 28 V
	Minimum system power supply voltage	⩾ 9.8 V
Heating power for 6.8V of operating voltage		8.1 W

■ Downstream Oxygen Sensor

Sensing element of LSF oxygen sensor is a ceramic planar body with pores, and the outside of ceramic body is surrounded by engine exhaust, and the inside is ventilated. Sensing ceramic body wall is a type of solid electrolyte with heating electrodes inside. Operation of oxygen sensor is realized by converting the concentration difference of oxygen ions inside and outside the sensing ceramic body into voltage signals for output. When the temperature of sensing ceramic body reaches 350 ℃, it will have the characteristics of solid electrolyte. Oxygen ions can freely pass through it due to special material of ceramic body. It is precisely by taking advantage of this characteristic, it converts the concentration difference into the potential difference, thus forming the electrical signal output. If the gas mixture is rich, oxygen ion concentration difference in and out of the ceramic is high, electric potential difference is high, a large number of oxygen ions move from the inside to the outside, and the output voltage is higher (approximately 800mV-1000mV); If the mixture concentration is too lean, oxygen ion concentration difference in and out of the ceramic is low, electric potential difference is low, only a small amount of oxygen ion moves from the inside to the outside, and the output voltage is lower (approximately 100mV). Signal voltage changes abruptly at about the theoretical equivalent air fuel ratio (λ=1).

(1) Characteristic Data

Description	New		After 500 Hours of Platform Test	
Exhaust temperature when characteristic data is established	350°C	850°C	350°C	850°C
When λ=0.97 (CO= 1%); Sensing element voltage (mV)	800 ± 55	700 ± 55	800 ± 60	700 ± 60
When λ=1.10: Sensing element voltage (mV)	50 ± 30	50 ± 30	50 ± 40	50 ± 40
Sensing element internal resistance (kΩ)	⩽ 0.5	⩽ 0.25	⩽ 1	⩽ 0.5

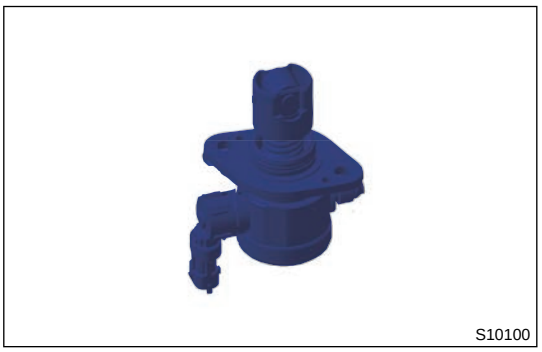
Description	New		After 500 Hours of Platform Test	
Response Time (ms) (600 mV to 300 mV)	< 250	< 250	< 400	< 250
Response Time (ms) (300mV to 600mV)	< 100	< 60	< 200	< 60

(2) Sensor electrical data

Description		Value
Between heating circuit and signal circuit	Room temperature, 800 V DC	⩾ 30
Power supply voltage on connector	Rated voltage	12 V
	Continuous operating voltage	12 to 14 V
	Operating voltage which can be maintained 1% of the total life at most (exhaust temperature ⩽ 850° C)	15 V
	Operating voltage which can be maintained 75 seconds at most (- exhaust temperature ⩽ 350°C)	18 V
	Test voltage	13 V
Heating power for 13 V of operating voltage, and 350°C of exhaust temperature		7 W
Short time heating current at 13 V of operating voltage and -40˚C of ambient temperature		⩽2.1 A

■ High Pressure Fuel Pump

High pressure fuel pump is an element specially used for direct injection engine. It functions to increase the system pressure and provide high pressure fuel for the fuel rail assembly. High pressure fuel pump supplies fuel for system as demands, thus providing a better fuel economy. It is made of stainless steel material and has a wide fuel application; also, it has the advantages of light weight, small volume, zero evaporative emission, etc. At present, high pressure fuel pump of the main vehicle factory widely used in the world adopts the single plunger pump design of integrated voltage regulator, flow control valve, relief valve, its working principle is through cam drive high pressure pump plunger movement up and down to achieve fuel absorption and fuel discharge. ECM controls high pressure fuel flow via flow control valve according to the set control program through pressure sensor on fuel rail, thus performing closed loop control for pressure in high pressure fuel rail. Regulator functions to suppress the pressure pulsation at the low pressure end and improve the stability of system. Pressure relief valve will open when high pressure fuel rail pressure exceeds the safety limit, so as to protect the system.

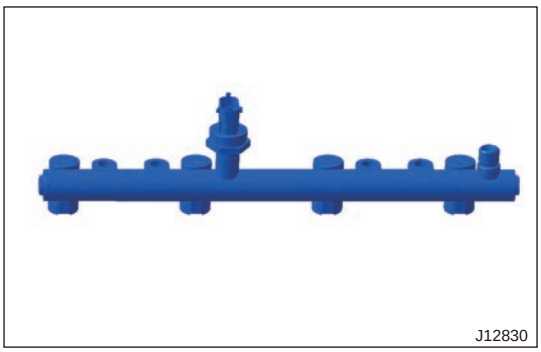

S10100

(1) Characteristic parameters

Items	Target Specifications
Mass	Approx. 083 kg
Oil outlet pressure	2-20 MPa
Maximum oil inlet pressure	9.0 bar
Relief valve opening pressure	35 MPa system: 39.9-41.4 for new parts, 36.5-42.4 MPa for durable parts
Driving voltage	10.8-16 V
Control type	Applied to ECM, which adopts current control

■ High pressure fuel rail pressure sensor

Oil pressure acts on metal diaphragm of pressure sensor to deform the diaphragm. There is a Wheatstone bridge composed of 4 metal strain gauge on diaphragm. The deformation of diaphragm causes a change in the resistance of strain gauge. After the signal processing of peripheral circuit, form the voltage signal that is linearly related to the pressure.



(1) Limit data

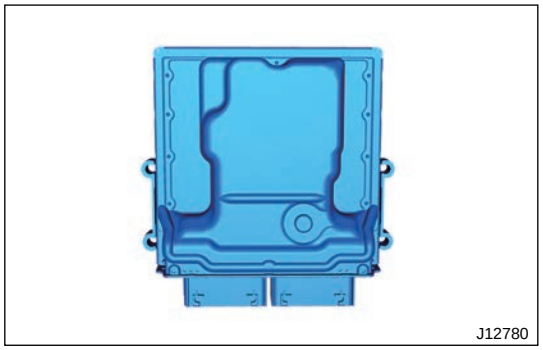
Parameters	Value		
	Minimum	Representative	Maximum
Power supply voltage (MAX. 1h)			18 V
Pressure			32 Mpa
Burst pressure			375 Mpa
Operating temperature			150 ˚C

(2) Characteristic data

Parameters	Value		
	Minimum	Representative	Maximum
Pressure measurement range	0 Mpa		42 Mpa
Operating temperature	-40 ˚C		140 ˚C
Power supply voltage	4.75 V	5.0 V	5.25 V
Power supply current when U_S = 5.0 V	9 mA	12 mA	15 mA
Response time $t_{10/90}$			1.0 mS

■ Electronic Controller Unit

Engine Control Module (ECM) is a pre-programmed microprocessor digital computer, which is used to adjust ignition timing, air-fuel ratio, emission control device, speed control, A/C compressor and idle speed etc. Engine Control Module (ECM) enables the program to suit ever-changing operation conditions.

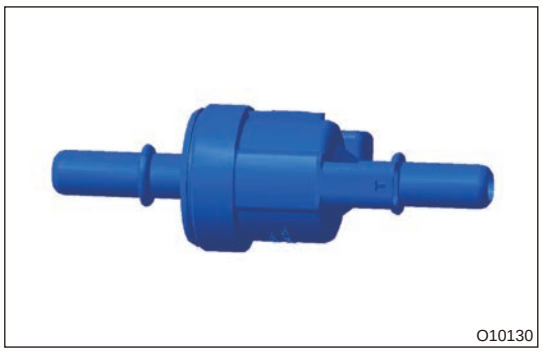


(1) Limit data

Quantity		Value	
		Minimum	Maximum
Battery voltage	Normal operation	10.8 V	16 V
	Limit function	6.5 to 9 V	16 to 28 V
Limits and time for withstanding battery overvoltage	24 V	Keep starting some functions	60 s

■ Canister solenoid valve

Canister control valve consists of solenoid coil, armature, valve body and other parts.
Air volume through canister control valve is related to the electric pulse duty ratio output from ECM to canister control valve and the differential pressure between canister control valve inlet and outlet. When there is no electric pulse, canister control valve closes.



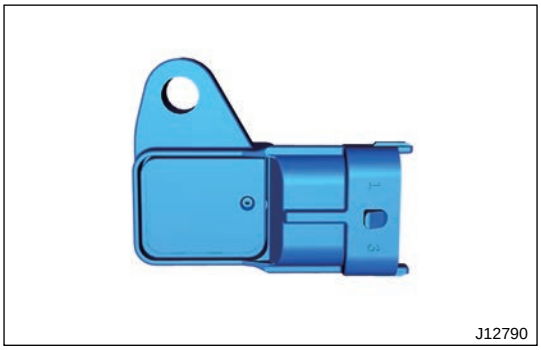
(1) Technical Characteristic Parameters

Quantity	Value		
	Minimum	Representative	Maximum
Rated Voltage	10 V	13.5 V	16 V
Resistance at +20°C	14 Ω	16 Ω	18 Ω
Current under rated voltage		0.85 A	
Frequency of control pulse	5 Hz		30 Hz
Rate of flow when differential pressure is 700 mbar and duty ratio is 100%	6 m^3/h	6.5 m^3/h	7 m^3/h

Quantity	Value		
	Minimum	Representative	Maximum
Permitted operating temperature	-40°C		140 °C
Allowable differential pressure between inlet and outlet			-800 mbar
Permitted vibration acceleration marked on products			300 m/s^2
Leakage amount when differential pressure is 700 mbar			33 mL/min

■ **Brake vacuum pressure sensor**

Absolute pressure sensing element consists of a piece of silicon chip. Etch a piece of pressure diaphragm on silicon chip. There are 4 piezoresistors on pressure diaphragm, and the 4 piezoresistors form a Wheatstone bridge as strain element. Except for the pressure diaphragm, silicon chip is also integrated with signal processing circuit. Active surface of the silicon chip is subjected to a pressure close to zero, and its surface is subjected to the absolute pressure of the intake manifold to be measured. Thickness of silicon chip is only several micrometer, so the silicon chip will deform mechanically as line absolute pressure changes, and 4 piezoresistors will also deform, thus changing the resistance. Voltage signal linearly related to the pressure is generated after processing by signal processing circuit of silicon chip.



(1) Limit parameters

Parameters	Value		
	Minimum	Representative	Maximum
Power supply voltage			16 V
Pressure			500 kpa
Operating temperature	-40°C		+130 ˚C

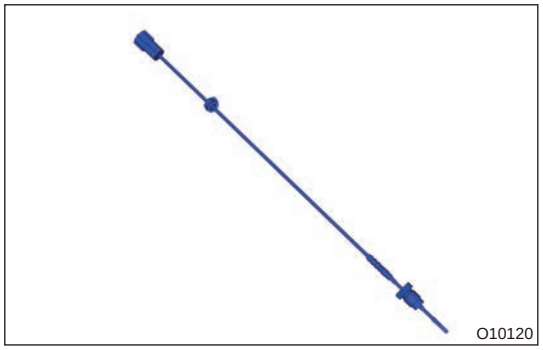
(2) Characteristic parameters

Parameters	Value		
	Minimum	Representative	Maximum
Pressure measurement range	20 kpa		115 kpa
Operating temperature	-40°C		130 ˚C
Power supply voltage	4.75 V	5.0 V	5.25 V
Power supply current when U_S = 5.0 V			12.5 mA
Output terminal load current	-1.0 mA		0.5 mA

Parameters		Value		
		Minimum	Representative	Maximum
Load resistance to voltage U_S or ground	Pull-up resistor	5 kΩ		
	Pull-down resistor	10 kΩ		
Response time $t_{10/90}$				1.0 ms
Weight			17 g	

■ GPF temperature sensor

The temperature sensor uses Pt200 type thermal-sensitive platinum resistor sensing element as the temperature sensing element. The outside of the sensing element is encapsulated by a stainless steel shell with high temperature resistance and corrosion resistance. The sensing element and the stainless steel shell are filled with heat conduction materials to facilitate the timely transfer of exhaust gas heat to the surface of sensing element. During operation, the sensor head is placed inside the engine exhaust pipe, and the high temperature airflow transmits heat to the sensing element, so that the temperature of the sensing element interior platinum resistor changes accordingly, and the resistance value of platinum resistor varies with the temperature. Through a specific monitoring circuit, the engine controller (ECM) monitors the resistance signal output by the sensor to calculate the corresponding exhaust gas temperature signal.



(1) Signal Accuracy

Signal accuracies of sensor (new parts) are shown as follows:

Temperature Range	Signal Accuracy
-40˚C ~ 300˚C	± 2.5˚C
301˚C ~ 900˚C	± 1.0 % of temperature in ˚C
901 ˚C ~ 950 ˚C	± 2.0 % of temperature in ˚C

Signal accuracies of sensor (deteriorated parts) are shown as follows:

Temperature Range	Signal Accuracy
10 ˚C	± 3.8 Ω (± 5˚C)
650 ˚C	± 8 Ω (± 13 ˚C)

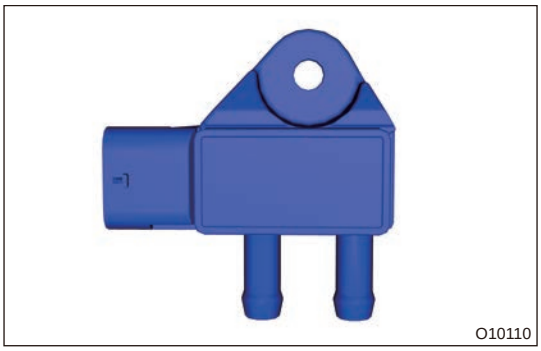
(2) Dynamic response performance

Dynamic response performance of the exhaust temperature sensor is based on the change speed of output signal when the ambient temperature changes abruptly, which should meet the requirements of the following table

Temperature Jump	Air-flow Velocity	Response Time
300 ˚C	11 m/s	< 12 s

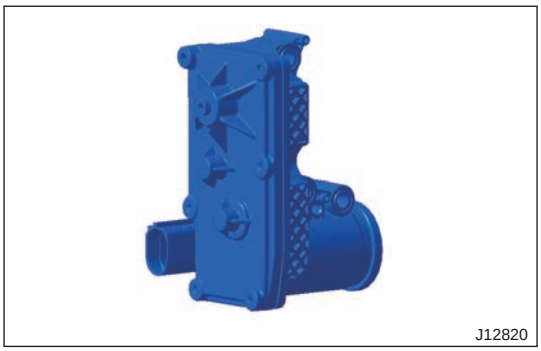
■ GPF differential pressure sensor

Differential pressure sensor (double membrane) unit consists of housing, two same LGA (Land Grid Array) sensing element modules, cover plate, sealing glue, connecting glue, bonding wire and other sub components. The values measured by sensor are upstream gas absolute pressure and downstream gas absolute pressure of GPF.
Differential pressure sensor (double membrane) unit consists of housing, two same LGA (Land Grid Array) sensing element modules, cover plate, sealing glue, connecting glue, bonding wire and other sub components. The values measured by sensor are upstream gas absolute pressure and downstream gas absolute pressure of GPF. Sensing element module of differential pressure sensor (LPS4-2ABS) consists of a piece of silicon chip. Etch a piece of pressure diaphragm on silicon chip. There are 4 piezoresistors on pressure diaphragm, and the 4 piezoresistors form a Wheatstone bridge as strain element. Silicon chip will deform mechanically as emission gas pressure changes, and 4 piezoresistors will also deform, thus changing the resistance. Output the information in SENT signal format to ECM after processing by signal processing circuit of silicon chip.


O10110

■ Electronic control actuator

Electronic control actuator is used to drive exhaust gas by-pass valve of turbocharger. Its main function is to adjust waste gate opening angle and control rotation speed of turbocharger according to driver’ s driving intention, so as to control intake air demand when the intake air amount meets different engine operating conditions, and feed back the position signal of waste gate to control unit to realize accurate control.
Electronic control actuator consists of four parts: drive module, train module, executive module and feedback module, and all sub components of drive module, train module and feedback module are integrated into the same housing. Feedback module contains non-contact type sensors, which can accurately feedback the valve position according to Hall principle. Electronic control actuator performs control only by corresponding electronic control unit or electronic test circuit. In principle, it is necessary to ensure that the actuator connecting rod does not operate dynamically to the mechanical dead center.


J12820

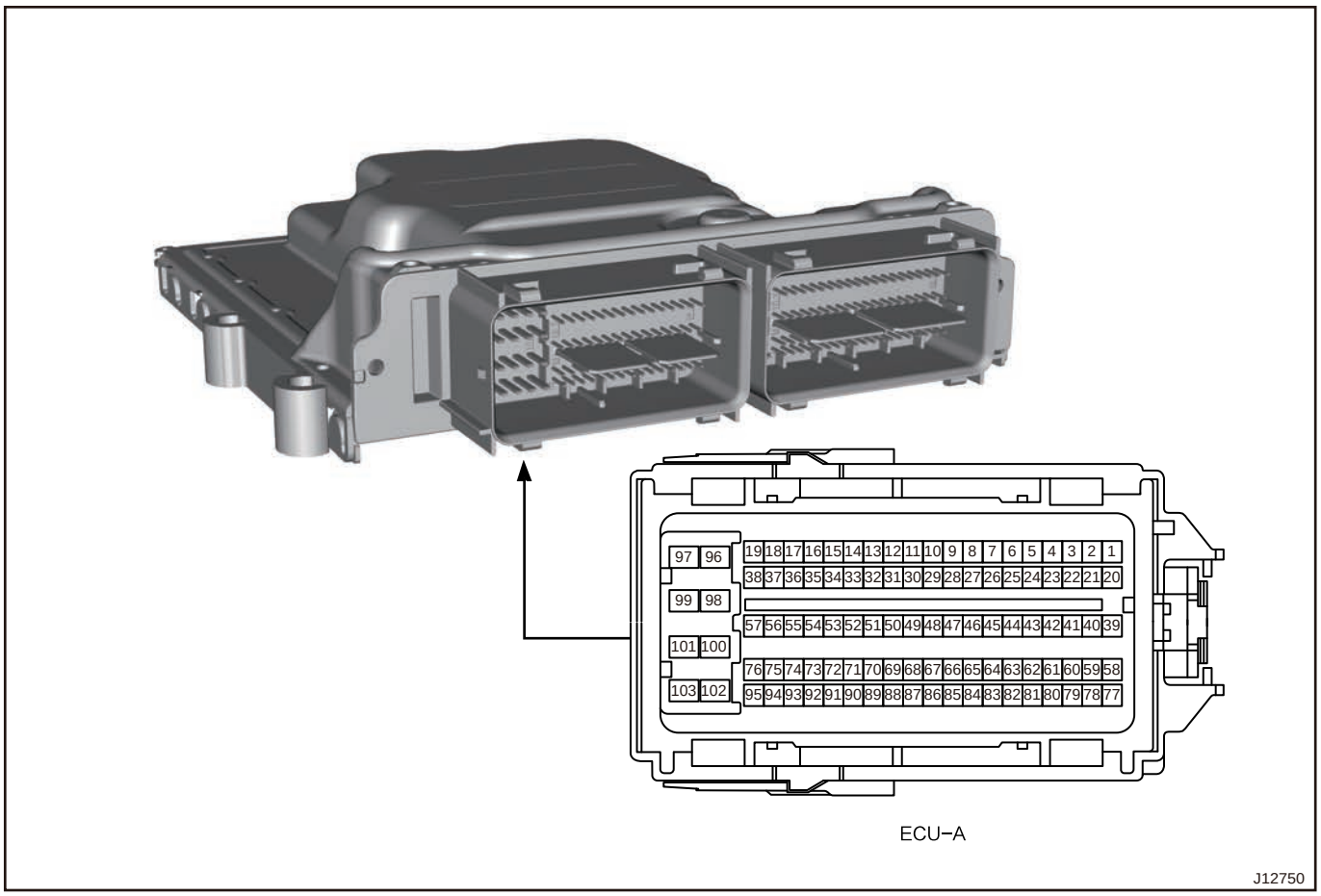
(1) Technical Characteristic Parameters

Test Item	Potentiometer Voltage		Response Time (ms)		Driving Torque (New Parts) (Nm)
	Mechanical Top Dead Center (%)	Mechanical Bottom Dead Center (%)	Open	cλose	
Parameter range	5+/-2.2	95+/-2.2	⩽ 200	⩽ 200	⩾ 0.8

3 System Circuit Diagram

3.1 Module Terminal Definition

Terminal A Definition

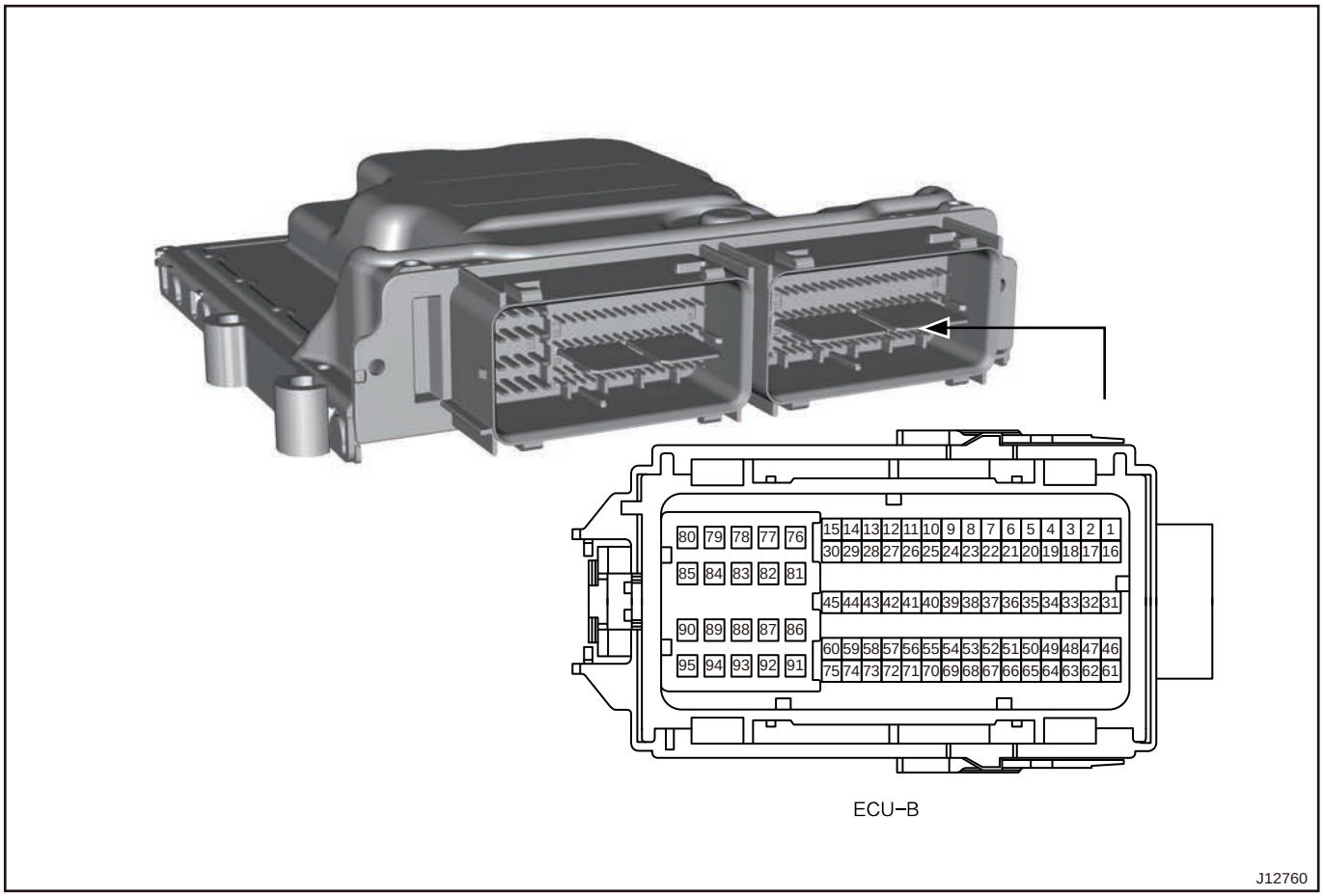


Pin	Definition	Pin	Definition
A1	Starter Control LSD	A53	—
A2	—	A54	—
A3	—	A55	Brake Light Switch Signal
A4	—	A56	Brake Switch
A5	—	A57	Starter State Feedback Signal
A6	Main Relay	A58	Activated Charcoal Canister Cut-off Valve
A7	Crankshaft Heating Valve	A59	Variable Oil Pump
A8	Downstream Oxygen Sensor	A60	Electronic Thermostat
A9	Analog Sensor Ground 5	A61	Downstream Oxygen Sensor Heater
A10	Analog Sensor Ground 6	A62	Upstream Oxygen Sensor Heater
A11	Analog Sensor Ground 7	A63	Continuous Power Supply
A12	Analog Sensor Ground 8	A64	Refresh and Body CAN Low
A13	Accelerator Pedal Sensor 1 Ground	A65	Refresh and Body CAN High
A14	Analog Sensor Power Supply 1	A66	Upstream Oxygen IA
A15	Accelerator Pedal Position Sensor 1 Power Supply	A67	Upstream Oxygen VN

Pin	Definition	Pin	Definition
A16	Accelerator Pedal Position Sensor 2 Power Supply	A68	—
A17	—	A69	—
A18	Sensor Power Supply (5 V)	A70	—
A19	—	A71	—
A20	—	A72	—
A21	Electronic Vacuum Pump	A73	—
A22	—	A74	—
A23	—	A75	—
A24	A/C Compressor Relay	A76	—
A25	Pressure Discharge Control Valve	A77	—
A26	Fuel Control Enable Signal	A78	—
A27	Vacuum Pressure Sensor	A79	—
A28	Oxygen Sensor Ground	A80	—
A29	Accelerator Pedal Sensor 2 Ground	A81	—
A30	—	A82	—
A31	Accelerator Pedal Position Sensor 1	A83	—
A32	—	A84	—
A33	—	A85	—
A34	A/C Pressure Sensor	A86	—
A35	—	A87	—
A36	Fuel Level Sensor	A88	—
A37	—	A89	—
A38	—	A90	—
A39	PWM Cooling Fan	A91	—
A40	Variable Valve Timing Valve (Exhaust)	A92	—
A41	Variable Valve Timing Valve (Intake)	A93	—
A42	Canister Control Valve	A94	—
A43	—	A95	—
A44	—	A96	ECM Ground 4
A45	—	A97	ECM Ground 3
A46	Ignition Switch	A98	ECM Ground 2
A47	LIN Bus	A99	ECM Ground 1
A48	Upstream Oxygen IP	A100	Main Relay Power Supply 1
A49	Upstream Oxygen VM	A101	Main Relay Power Supply 2

Pin	Definition	Pin	Definition
A50	—	A102	Main Relay Power Supply 3
A51	Accelerator Pedal Position Sensor 2	A103	Main Relay Power Supply 4
A52	GPF Front Temperature Sensor		

B Terminal Definition

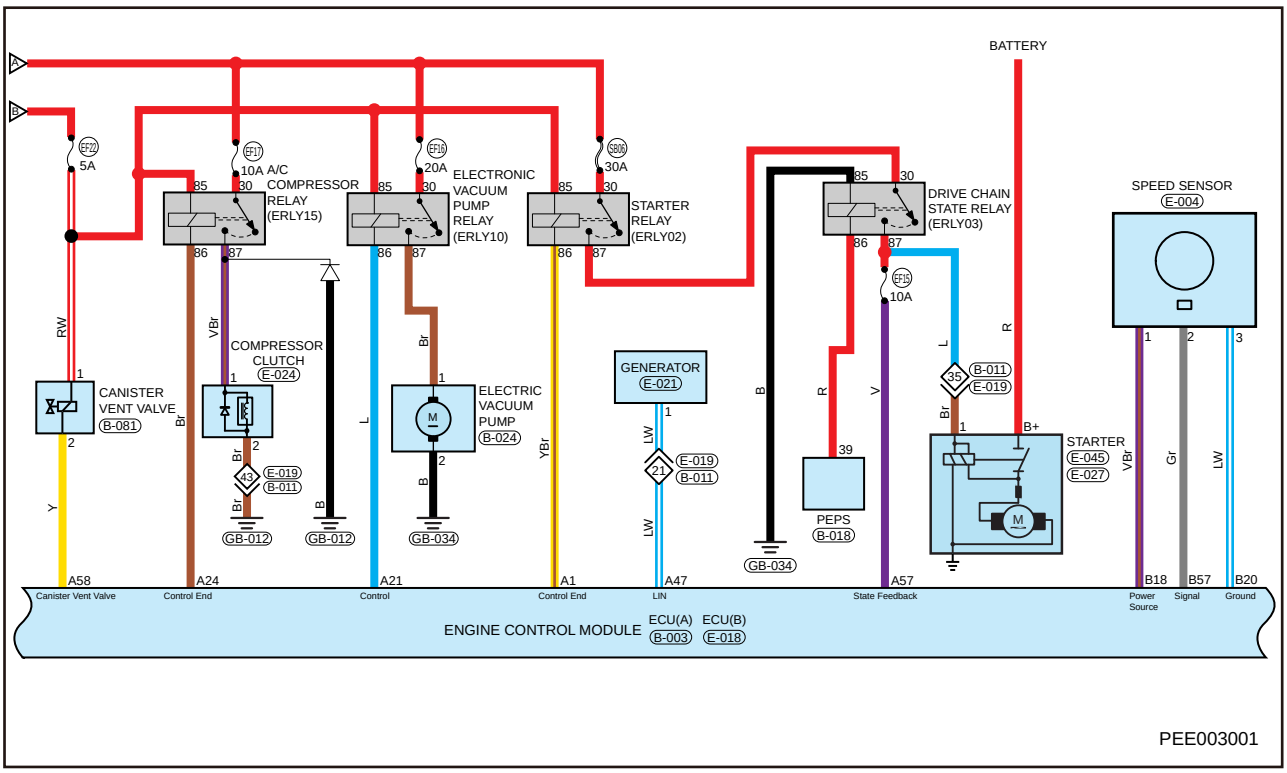


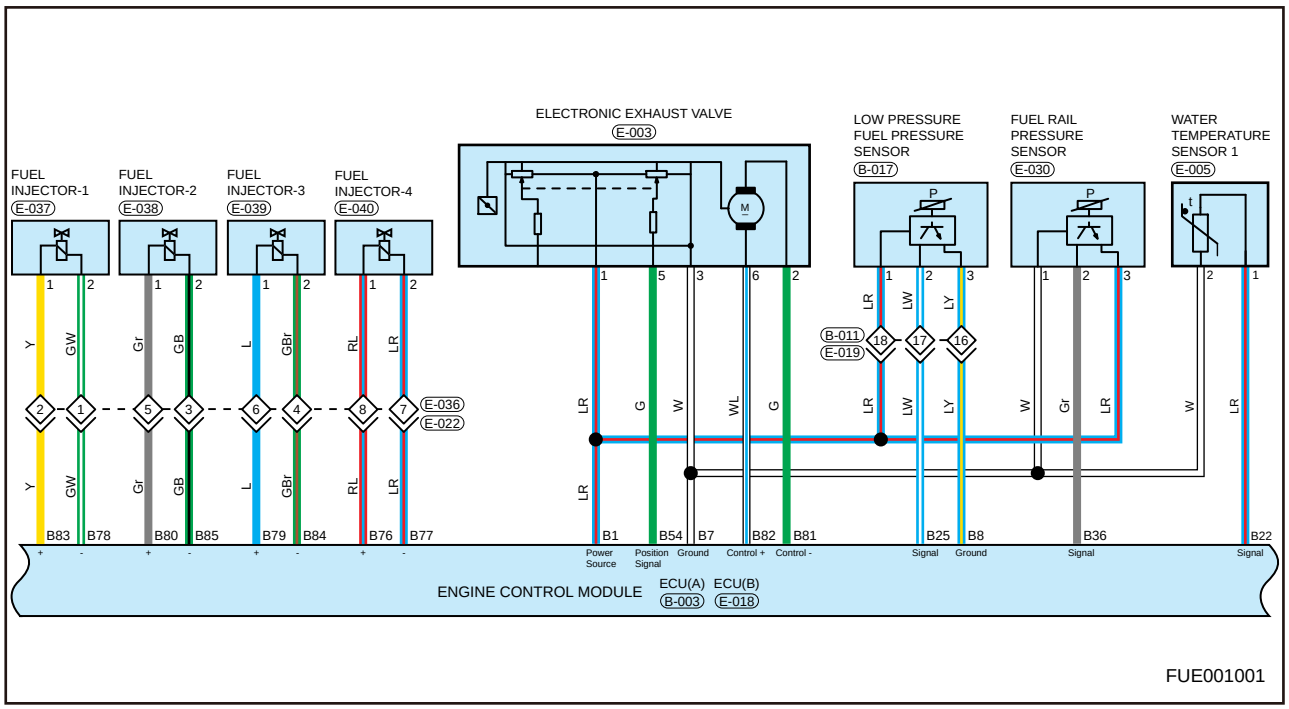
Pin	Definition	Pin	Definition
B1	Sensor Power Supply (5 V)	B49	—
B2	Sensor Power Supply (5 V)	B50	—
B3	Sensor Power Supply (5 V)	B51	—
B4	—	B52	—
B5	Digital Sensor Ground 2	B53	—
B6	Analog Sensor Ground 1	B54	Electronic Waste Gate Position Signal
B7	Analog Sensor Ground 2	B55	—
B8	Analog Sensor Ground 3	B56	—
B9	Analog Sensor Ground 4	B57	Engine Speed Sensor Signal
B10	Exhaust Phase Sensor Ground	B58	—
B11	Intake Phase Sensor Ground	B59	—

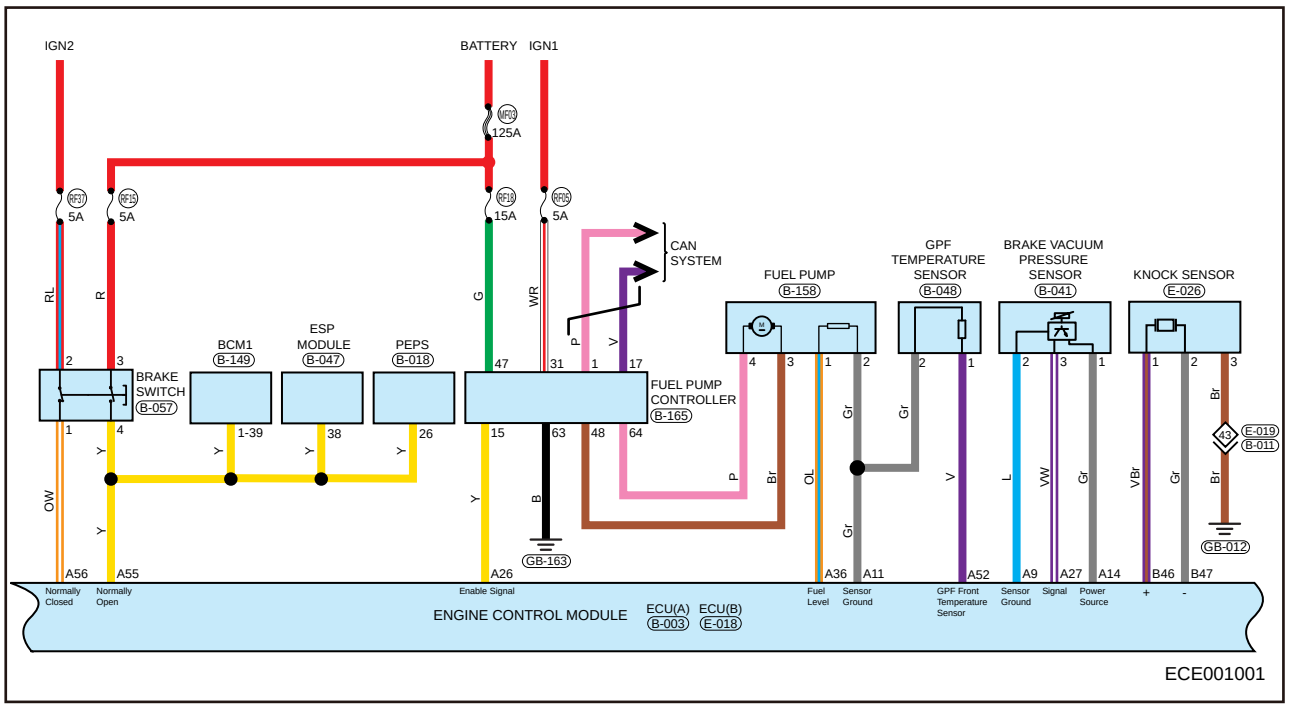
Pin	Definition	Pin	Definition
B12	2nd Cylinder Ignition	B60	—
B13	4th Cylinder Ignition	B61	—
B14	1st Cylinder Ignition	B62	—
B15	3rd Cylinder Ignition	B63	—
B16	Sensor Power Supply (5 V)	B64	—
B17	Exhaust Phase Sensor Power Supply	B65	—
B18	Speed Sensor Power Supply	B66	—
B19	—	B67	—
B20	Speed Sensor Ground	B68	—
B21	—	B69	—
B22	Engine Coolant Temperature Sensor Signal 1	B70	—
B23	—	B71	—
B24	—	B72	—
B25	Low Pressure Fuel Rail Pressure Sensor	B73	—
B26	Charcoal Canister Desorption Pressure Sensor	B74	—
B27	Boost Pressure Sensor Signal	B75	—
B28	Intake Pressure Sensor Signal	B76	4th Cylinder Injector+
B29	Boost Temperature Sensor Signal	B77	4th Cylinder Injector-
B30	Intake Phase Sensor Signal	B78	1st Cylinder Injector-
B31	Fuel Tank Pressure Sensor	B79	3rd Cylinder Injector+
B32	—	B80	2nd Cylinder Injector+
B33	—	B81	Electronic Waste Gate Control-
B34	Electronic Throttle Feedback Signal 2	B82	Electronic Waste Gate Control+
B35	Engine Coolant Temperature Sensor Signal 2	B83	1st Cylinder Injector+
B36	High Pressure Fuel Rail Sensor Signal	B84	3rd Cylinder Injector-
B37	—	B85	2nd Cylinder Injector-
B38	Manifold Temperature Sensor Signal	B86	Electronic Throttle Control-
B39	—	B87	—
B40	Electronic Throttle Feedback Signal 1	B88	—
B41	Dual-mode GPF Differential Pressure Sensor (SENT 2)	B89	—
B42	Dual-mode GPF Differential Pressure Sensor (SENT 1)	B90	Fuel Pressure Control Valve-

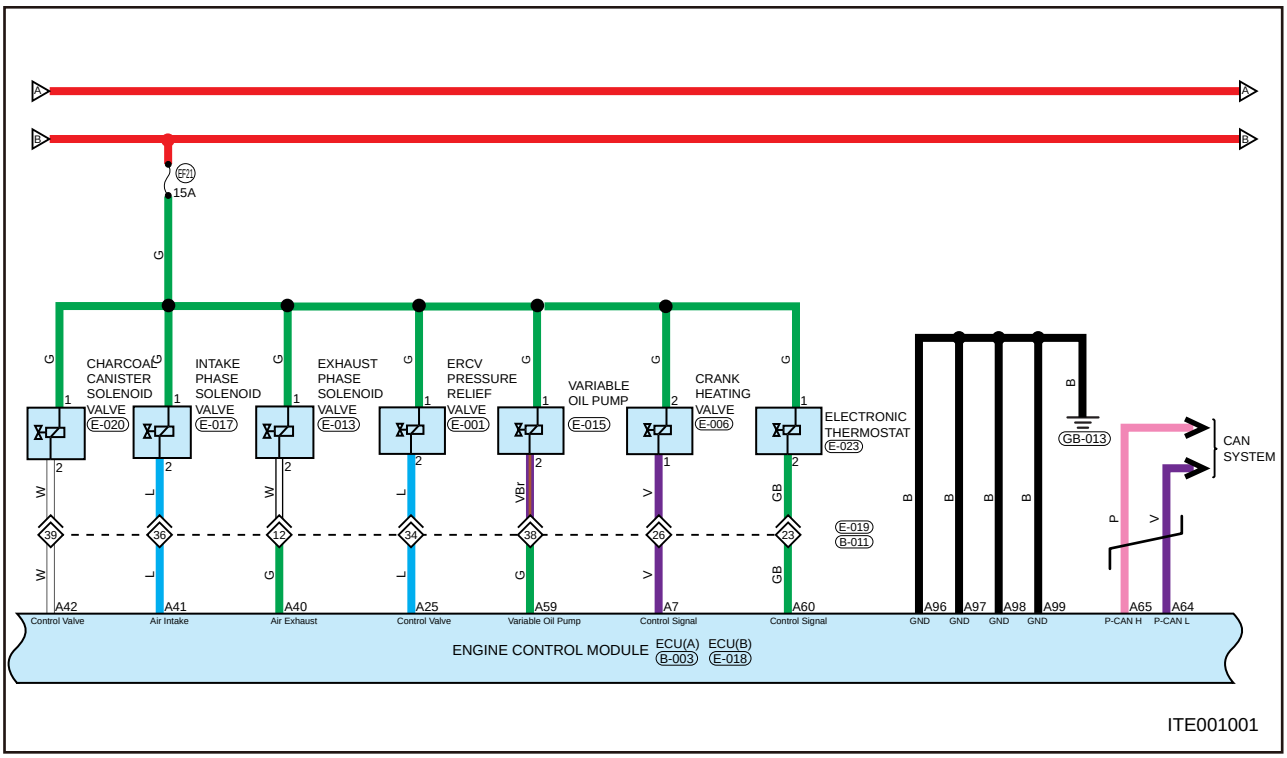
Pin	Definition	Pin	Definition
B43	—	B91	Electronic Throttle Control+
B44	—	B92	—
B45	Exhaust Phase Sensor Signal	B93	—
B46	Knock Sensor (+)	B94	—
B47	Knock Sensor (-)	B95	Fuel Pressure Control Valve+
B48	—		

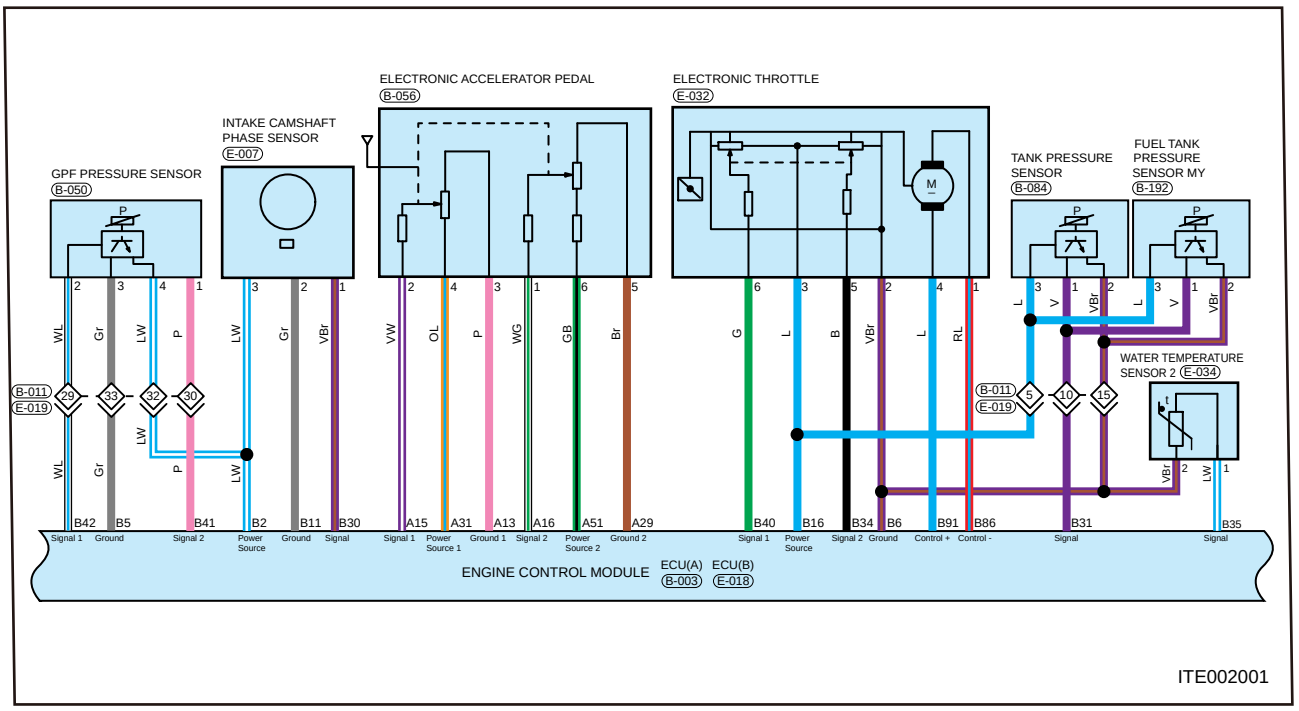
3.2 Circuit Diagram

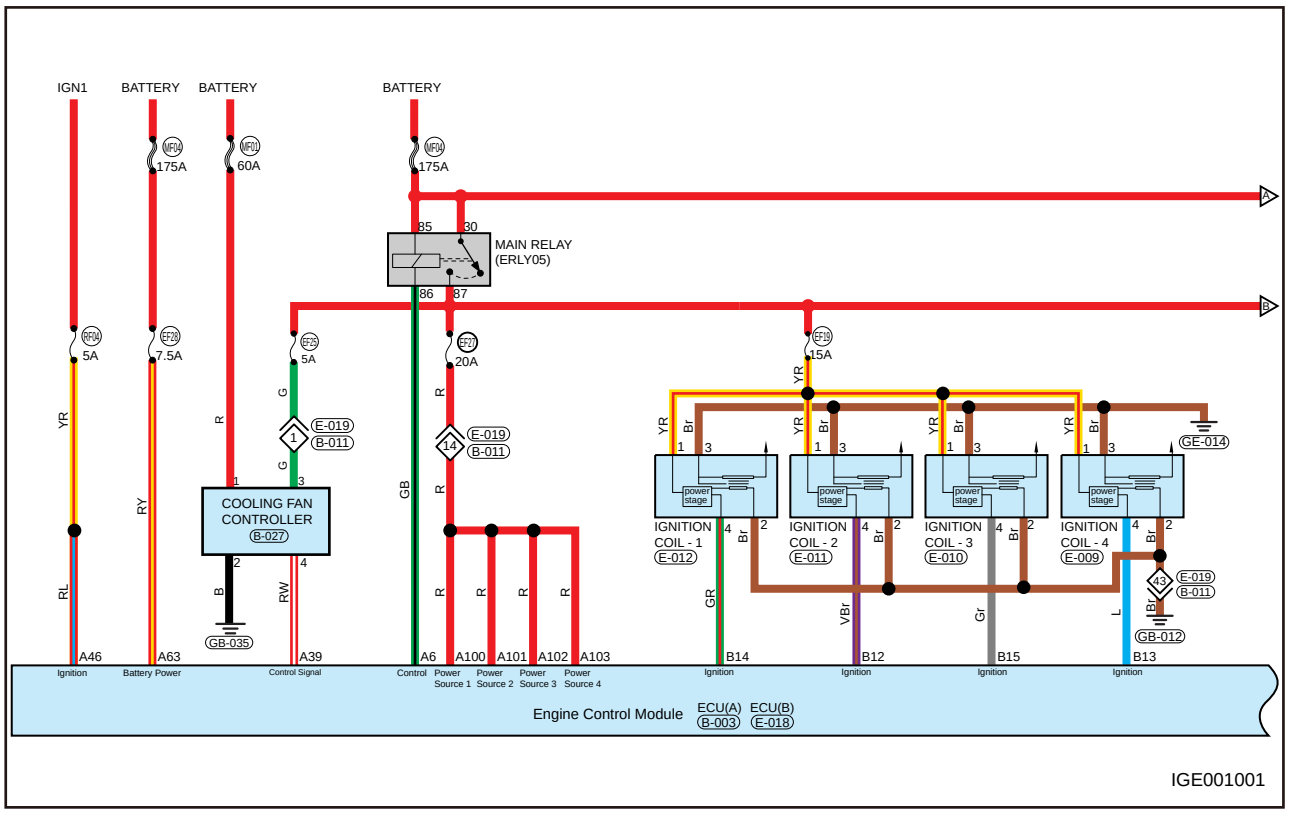



FUEL INJECTOR-1 (E-037)
FUEL INJECTOR-2 (E-038)
FUEL INJECTOR-3 (E-039)
FUEL INJECTOR-4 (E-040)
ELECTRONIC EXHAUST VALVE (E-003)
LOW PRESSURE FUEL PRESSURE SENSOR (B-017)
FUEL RAIL PRESSURE SENSOR (E-030)
WATER TEMPERATURE SENSOR 1 (E-005)
(E-036) (E-022)
(B-011) (E-019)
B83 B78 B80 B85 B79 B84 B76 B77 B1 B54 B7 B82 B81 B25 B8 B36 B22
Power Source
Position Signal
Ground
Control +
Control -
Signal
Ground
Signal
Signal
ENGINE CONTROL MODULE
ECU(A) (B-003)
ECU(B) (E-018)
FUE001001

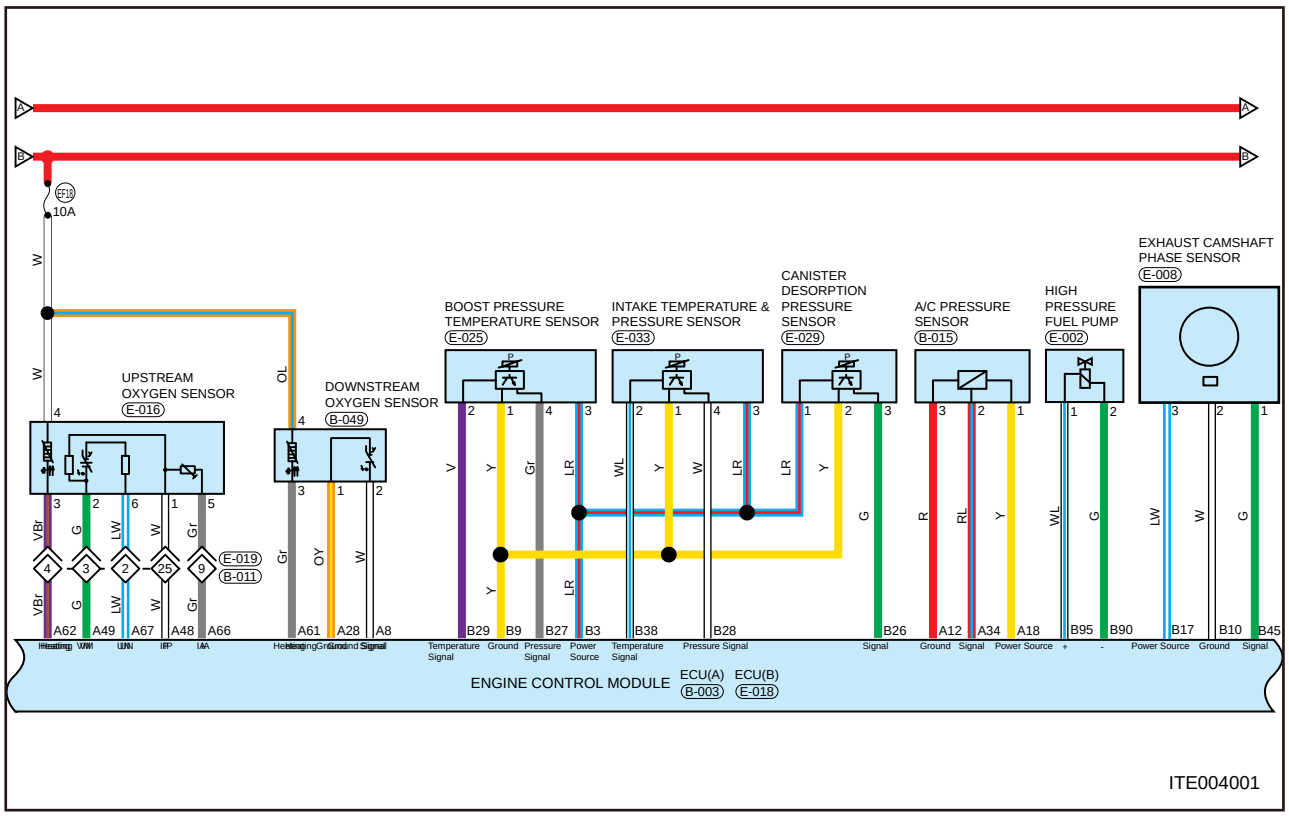

IGN2
BATTERY
IGN1
125A
5A
15A
5A
CAN SYSTEM
FUEL PUMP (B-158)
GPF TEMPERATURE SENSOR (B-048)
BRAKE VACUUM PRESSURE SENSOR (B-041)
KNOCK SENSOR (E-026)
BRAKE SWITCH (B-057)
BCM1 (B-149)
ESP MODULE (B-047)
PEPS (B-018)
FUEL PUMP CONTROLLER (B-165)
(GB-163)
(GB-012)
(E-019) (B-011)
A56 A55 A26 A36 A11 A52 A9 A27 A14 B46 B47
Normally Closed
Normally Open
Enable Signal
Fuel Level
Sensor Ground
GPF Front Temperature Sensor
Sensor Ground
Signal
Power Source
ENGINE CONTROL MODULE
ECU(A) (B-003)
ECU(B) (E-018)
ECE001001


F21
15A
CHARCOAL CANISTER SOLENOID VALVE E-020
INTAKE PHASE SOLENOID VALVE E-017
EXHAUST PHASE SOLENOID VALVE E-013
ERCV PRESSURE RELIEF VALVE E-001
VARIABLE OIL PUMP E-015
CRANK HEATING VALVE E-006
ELECTRONIC THERMOSTAT E-023
GB-013
CAN SYSTEM
E-019
B-011
A42 Control Valve
A41 Air Intake
A40 Air Exhaust
A25 Control Valve
A59 Variable Oil Pump
A7 Control Signal
A60 Control Signal
A96 GND
A97 GND
A98 GND
A99 GND
A65 P-CAN H
A64 P-CAN L
ENGINE CONTROL MODULE ECU(A) B-003 ECU(B) E-018
ITE001001


ELECTRONIC ACCELERATOR PEDAL B-056
ELECTRONIC THROTTLE E-032
INTAKE CAMSHAFT PHASE SENSOR E-007
GPF PRESSURE SENSOR B-050
TANK PRESSURE SENSOR B-084
FUEL TANK PRESSURE SENSOR MY B-192
WATER TEMPERATURE SENSOR 2 E-034
B-011
E-019
B42 Signal 1
B5 Ground
B41 Signal 2
B2 Power Source
B11 Ground
B30 Signal
A15 Signal 1
A31 Power Source 1
A13 Ground 1
A16 Signal 2
A51 Power Source 2
A29 Ground 2
B40 Signal 1
B16 Power Source
B34 Signal 2
B6 Ground
B91 Control +
B86 Control -
B31 Signal
B35 Signal
ENGINE CONTROL MODULE ECU(A) B-003 ECU(B) E-018
ITE002001



IGE001001



ITE004001

4 Diagnosis & Testing

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
Engine does not crank or cranks slowly while starting	Battery
	Starter
	Wire harness or ENGINE START STOP switch
	Starter relay
	ECM, TCU
	Engine mechanical
Engine cranks normally but cannot start successfully while starting	No fuel in tank
	Fuel pump
	Fuel injector
	Engine speed sensor
	Ignition coil
	Engine immobilizer
	ECM
	Engine mechanical
Difficult to start with hot engine	Engine speed sensor
	Ignition coil
	Fuel pump
	Coolant temperature sensor
	Engine mechanical
	Camshaft sensor
Difficult to start with cold engine	Fuel pump
	Coolant temperature sensor
	Fuel injector
	Ignition coil
	Engine mechanical
Engine speed is normal, but it is difficult to start at anytime	Fuel quality
	Fuel pump
	Coolant temperature sensor
	Fuel injector

Symptom	Possible Cause
	Ignition coil
	Intake passage
	Ignition timing
	Spark plug
	Engine mechanical
Engine starts normally, but idles roughly at anytime	Fuel quality
	Fuel pump
	Coolant temperature sensor
	Fuel injector
	Electronic throttle body
	Intake passage
	Ignition timing
	Spark plug
	Engine mechanical
Engine starts normally, but idles roughly after warming up	Fuel quality
	Coolant temperature sensor
	Electronic throttle body
	Intake passage
	Spark plug
	Engine mechanical
Engine starts normally, but idles roughly or stalls with part load (for example, A/C is ON)	Electronic throttle
	Alternator
Engine starts normally, but idle speed is too high	Electronic throttle body
	Intake pipe air leaked
	Coolant temperature sensor
Low engine speed or stalls when accelerating	Intake pressure sensor
	Intake pipe
	Exhaust pipe
	Ignition timing
	Throttle position sensor
	Fuel injector
	Spark plug
Slow response when accelerating	Intake pressure sensor

Symptom	Possible Cause
	Intake pipe
	Exhaust pipe
	Ignition timing
	Throttle position sensor
	Fuel injector
	Spark plug
Lack of power and poor performance when accelerating	Intake pressure sensor
	Intake pipe
	Exhaust pipe
	Ignition timing
	Throttle position sensor
	Fuel injector
	Spark plug

4.2 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

NEXT

2	**Examine vehicle and check basic items**

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK

3	**Using a diagnostic tester, read related DTC and data stream information**

Result

Result	Go to
No DTC	A
DTC is output	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B

5	**According to airbag system malfunction repair completion inspection and delivery, confirm that malfunction is resolved**

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A → **Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

4.3 DTC Confirmation Procedure

Confirm that battery voltage is normal before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in engine system.
- Turn ENGINE START STOP switch to OFF and wait for several seconds.
- Turn ENGINE START STOP switch to ON, and then select Read DTC.
- If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check engine system components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P000A00	"A" Camshaft Position Slow Response Bank 1	The actual position of VVT has poor follow-up to the target position	1. Insufficient OCV oil valve pressure 2.OCV oil valve is blocked or leaking	• Check if operating condition of cam phase regulator is normal (dirt blocked, oil leakage, stuck) • Check if operating condition of OCV oil control valve is normal
P003C00	“A" Camshaft Profile Control Performance/ Stuck Off Bank 1	The actual position of VVT cannot be moved to the vicinity of the target position	1. Insufficient OCV oil valve pressure 2.OCV oil valve is blocked or leaking	• Check if operating condition of cam phase regulator is normal (dirt blocked, oil leakage, stuck) • Check if operating condition of OCV oil control valve is normal
P000B00	“B" Camshaft Position Slow Response Bank 1	The actual position of VVT has poor follow-up to the target position	1. Insufficient OCV oil valve pressure 2.OCV oil valve is blocked or leaking	• Check if operating condition of cam phase regulator is normal (dirt blocked, oil leakage, stuck) • Check if operating condition of OCV oil control valve is normal
P005A00	“B" Camshaft Profile Control Performance/ Stuck Off Bank 1	The actual position of VVT cannot be moved to the vicinity of the target position	1. Insufficient OCV oil valve pressure 2.OCV oil valve is blocked or leaking	• Check if operating condition of cam phase regulator is normal (dirt blocked, oil leakage, stuck) • Check if operating condition of OCV oil control valve is normal
P001000	“A” Camshaft Position Actuator Control Circuit Open Bank 1	Drive channel self-diagnosis failure	1. Open circuit in intake VVT control circuit corresponding pin 2. Connector looseness or open 3.Actuator side circuit is damaged	• Open circuit in intake VVT control circuit corresponding pin • Connector looseness or poor contact • Intake VVT circuit damaged • Control pin fault of VVT corresponding to ECM
P001300	“B” Camshaft Position Actuator Control Circuit Open Bank 1	Drive channel self-diagnosis failure	1. Open circuit in exhaust VVT control circuit corresponding pin 2. Connector looseness or open 3.Actuator side circuit is damaged	• Open circuit in exhaust VVT control circuit corresponding pin • Connector looseness or poor contact • Intake VVT circuit damaged • Control pin fault of VVT corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P001676	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Relative position self-learning deviation absolute value of intake camshaft and crankshaft is greater than 20 degrees of crankshaft angle	1. Installation deviation	• Check if relative installation position of crankshaft and intake camshaft is correct
P001678	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	Absolute value of offset deviation between intake camshaft and crankshaft is greater than 15 degrees of crankshaft angle	1. Intake camshaft is aging and twisted	• Check whether the position of intake camshaft has a large deviation from the installation
P001776	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	Relative position self-learning deviation absolute value of exhaust camshaft and crankshaft is greater than 20 degrees of crankshaft angle	1. Installation deviation	• Check if relative installation position of crankshaft and exhaust camshaft is correct
P001778	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B	Absolute value of offset deviation between exhaust camshaft and crankshaft is greater than 15 degrees of crankshaft angle	1. Exhaust camshaft is aging and twisted	• Check whether the position of exhaust camshaft has a large deviation from the installation
P003000	HO2S Heater Control Circuit Bank 1 Sensor 1	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Open circuit in upstream oxygen sensor heater control circuit pin terminal 3. Upstream oxygen sensor heater control circuit power supply terminal is not connected to main relay 4. Sensor is damaged 5. Open circuit or internal circuit damage in upstream oxygen sensor heater pin circuit corresponding to ECM terminal	• Check connector for looseness or poor contact • • Open circuit in upstream oxygen sensor heater control circuit pin terminal • Upstream oxygen sensor heater control circuit power supply terminal is not connected to main relay • Sensor is damaged • Open circuit or internal circuit damage in upstream oxygen sensor heater pin circuit corresponding to ECM terminal
P003100	HO2S Heater Control Circuit Low Bank 1 Sensor 1	Drive channel self-diagnosis failure	1. Upstream oxygen sensor heater control circuit pin terminal is short to ground 2. Upstream	• Check upstream oxygen sensor heater control circuit pin terminal for short to ground • Check upstream oxygen sensor heater control

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			oxygen sensor heater control circuit power supply terminal is grounded 3. Upstream oxygen sensor heater pin corresponding to ECM terminal is short to ground	circuit power supply terminal for ground • Check upstream oxygen sensor heater pin corresponding to ECM terminal for short to ground
P003200	HO2S Heater Control Circuit High Bank 1 Sensor 1	Drive channel self-diagnosis failure	1. Upstream oxygen sensor heater control circuit pin terminal is short to power supply 2. Upstream oxygen sensor heater pin corresponding to ECM terminal is short to power supply	• Check upstream oxygen sensor heater control circuit pin terminal for short to power supply • Check upstream oxygen sensor heater pin corresponding to ECM terminal for short to power supply
P003313	Boost Discharge Control Valve Drive Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Open circuit in boost discharge control valve drive circuit pin 3. Open circuit or internal circuit damage in boost discharge control valve drive circuit pin corresponding to ECM terminal	• Check connector for looseness or poor contact • Check boost discharge control valve drive circuit pin for open circuit • Check boost discharge control valve drive circuit pin corresponding to ECM terminal for open circuit or internal circuit damage
P003411	Boost Discharge Control Valve Drive Circuit Short to Ground	Drive channel self-diagnosis failure	1. Short circuit to ground in boost discharge control valve drive circuit 2. Short circuit to ground in boost discharge control valve drive circuit corresponding to ECM terminal	• Check boost discharge control valve drive circuit pin for short circuit to ground • Check boost discharge control valve drive circuit pin corresponding to ECM terminal for short circuit to ground
P003512	Boost Discharge Control Valve Drive Circuit Short to Power Supply	Drive channel self-diagnosis failure	1. Short circuit to power supply in boost discharge control valve	• Check boost discharge control valve drive circuit pin for short circuit to power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			drive circuit 2. Short circuit to power supply in boost discharge control valve drive circuit corresponding to ECM terminal	• Check boost discharge control valve drive circuit pin corresponding to ECM terminal for short circuit to power supply
P003600	HO2S Heater Control Circuit Bank 1 Sensor 2	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Open circuit in downstream oxygen sensor heater control pin 3. Downstream oxygen sensor heater power supply terminal is not connected to main relay 4. Sensor is damaged 5. Internal circuit damage in downstream oxygen sensor heater pin corresponding to ECM terminal	• Check connector for looseness or poor contact • Check downstream oxygen sensor heater control pin for open • Check downstream oxygen sensor heater circuit power supply terminal for not connected to main relay • Check sensor for damage • Check downstream oxygen sensor heater pin corresponding to ECM terminal for open or internal circuit damage
P003700	HO2S Heater Control Circuit Low Bank 1 Sensor 2	Drive channel self-diagnosis failure	1. Downstream oxygen sensor heater control circuit pin terminal is short to ground 2. Downstream oxygen sensor heater control circuit power supply terminal is grounded 3. Downstream oxygen sensor heater pin corresponding to ECM terminal is short to ground	• Check downstream oxygen sensor heater control circuit pin terminal for short to ground • Check downstream oxygen sensor heater control circuit power supply terminal for ground • Check downstream oxygen sensor heater pin corresponding to ECM terminal for short to ground
P003800	HO2S Heater Control Circuit High Bank 1 Sensor 2	Drive channel self-diagnosis failure	1. Downstream oxygen sensor heater control circuit pin terminal is short to power supply 2. Downstream oxygen sensor	• Check downstream oxygen sensor heater control circuit pin terminal for short to power supply • Check downstream oxygen sensor heater pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			heater pin corresponding to ECM terminal is short to power supply	terminal for short to power supply
P003A22	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned for the first time exceeds the upper limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	• Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC • Check for foreign matter near turbocharger closed position
P003A21	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned for the first time exceeds the lower limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	• Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC • Check for foreign matter near turbocharger closed position
P003A72	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned exceeds the upper limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	• Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC • Check for foreign matter near turbocharger closed position
P003A73	Turbocharger/ Supercharger Boost Control "A" Position Exceeded Learning Limit	The zero point voltage learned exceeds the lower limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	• Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC • Check for foreign matter near turbocharger closed position
P024477	Turbocharger/ Supercharger Wastegate Actuator "A" Range/ Performance	The deviation between target position of turbocharger electronic waste gate and actual position exceeds the threshold	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	• Check electronic waste gate for stuck • Check wire harness and connector for aging
P024437	Turbocharger/ Supercharger Wastegate Actuator "A" Range/ Performance	The duty ratio of turbocharger electronic waste gate control exceeds the limit	1. Actuator status is inconsistent with SPEC 2. Closed position of actuator is blocked by foreign objects	• Check electronic waste gate for stuck • Check wire harness and connector for aging

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P256400	Turbocharger Boost Control Position Sensor "A" Circuit Low	The voltage of turbocharger electronic waste gate position sensor is below the limit	1. Sensor circuit short to ground 2. Pin corresponding to ECM short to ground	• Check electronic waste gate position sensor wire harness for short to ground
P256500	Turbocharger Boost Control Position Sensor "A" Circuit High	The voltage of turbocharger electronic waste gate position sensor is higher than the limit	1. Sensor circuit short to power supply or open 2. Pin corresponding to ECM short to power supply or open	• Check electronic waste gate position sensor wire harness for short to power supply
P170300	Communication Failure of Supercharger Wastegate Control Circuit	Communication failure of supercharger wastegate control circuit SPI	1. Communication failure of supercharger wastegate control circuit SPI	• Check electronic waste gate control circuit for problem
P005300	HO2S Heater Resistance Bank 1 Sensor 1	Current internal resistance value is higher than the threshold value of corresponding working condition	1. Heating circuit failure 2. Oxygen sensor resistor deteriorated	• Do not disconnect oxygen sensor connector, measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. • Disconnect upstream oxygen sensor wire connector to remove upstream oxygen sensor. Place the oxygen sensor at room temperature to cool it down. Measure if resistance between sensor terminal No.1 interface (white, heater power supply positive) and No.2 interface (- white, heater power supply grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				room temperature. (- Oxygen sensor resistance measurement must be performed when temperature of oxygen sensor cools down to room temperature, as resistance is related to temperature.)
P005400	HO2S Heater Resistance Bank 1 Sensor 2	Current internal resistance value is higher than the threshold value of corresponding working condition	1. Heating circuit failure 2. Oxygen sensor resistor deteriorated	• Do not disconnect oxygen sensor connector, measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. • Disconnect upstream oxygen sensor wire connector to remove upstream oxygen sensor. Place the oxygen sensor at room temperature to cool it down. Measure if resistance between sensor terminal No.1 interface (white, heater power supply positive) and No.2 interface (- white, heater power supply grounded) is higher than 15 Ω with a multimeter when temperature of oxygen sensor cools down to room temperature. (- Oxygen sensor resistance measurement must be performed when temperature of oxygen sensor cools down to room temperature, as resistance is related to temperature.)
P222900	Barometric Pressure Sensor "A" Circuit High	The sensor sends fault information by itself	1. The built-in ambient pressure sensor in ECM fails.	• Check whether the signal value of ambient

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P222800	Barometric Pressure Sensor "A" Circuit Low Problem			pressure sensor is too large or too small
P222722	Barometric Pressure Sensor "A" Circuit Range/ Performance	The sensor sends fault information by itself	1. The built-in ambient pressure sensor in ECM fails.	• Check whether the signal value of ambient pressure sensor is significantly different from the current atmospheric pressure
P222721	Barometric Pressure Sensor “A” Circuit Range/ Performance			
P222785	Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P222784	Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P120200	Barometric Pressure Sensor "A" Circuit Range/ Performance			
P120300	Barometric Pressure Sensor “A" Circuit Range/ Performance			
P008985	Fuel Pressure Regulator 1 Performance-Pressure Too Low	PID control deviation of high pressure oil supply is higher than 5MPa	1. Oil passage is leakage 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced	• Check for leakage in oil passage • Check if fuel is insufficient • Check low pressure oil pump for damage • Check whether the working capacity of high pressure oil pump has decreased
P008984	Fuel Pressure Regulator 1 Performance-Pressure Too High	PID control deviation of high pressure oil supply is lower than -5MPa	1. High pressure oil pump control failure 2. Pressure relief valve blocked	• Check whether the high pressure oil pump control is normal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				• Check relief valve for blockage or abnormal operation
P008700	Fuel Rail/System Pressure - Too Low	High pressure fuel rail pressure control deviation is lower than -3MPa	1. Oil passage is leakage 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced	• Check for leakage in oil passage • Check if fuel is insufficient • Check low pressure oil pump for damage • Check whether the working capacity of high pressure oil pump has decreased
P008800	Fuel Rail/System Pressure - Too High	High pressure fuel rail pressure control deviation is higher than 3MPa	1. High pressure oil pump control failure 2. Pressure relief valve blocked	• Check whether the high pressure oil pump control is normal • Check relief valve for blockage or abnormal operation
P009000	Short Circuit in High Side and Low Side Control Circuit of Flow Control Valve	Drive channel self-diagnosis failure	1. High-side and low-side control circuits of flow control valve are short circuit	• Check whether the high-side and low-side control circuits of flow control valve are short circuit
P009626	Intake Air Temp. Circ. Performance Non-plausible	The measured value of boost temperature sensor remains unchanged	1. Sensor aging deviation	• Connect the diagnostic tester and turn ignition switch to ON. Do not start engine, and observe if “Intake Temperature Sensor Measured Value” in data flow is too high. If value is higher than normal condition, observe maximum boost temperature range. You can also use a multimeter to measure if boost temperature sensor signal terminal voltage is close to or equal to 0 V. • Sensor aging deviation
P009800	Intake Air Temperature Sensor 2 Circuit High Bank 1	Temperature sensor voltage is higher than 4.9 V	1. Boost temperature sensor signal terminal is short to power supply or open 2. Open circuit in sensor reference ground 3. Short circuit to power supply, open	• Connect the diagnostic tester and turn ignition switch to ON. Do not start engine, and observe if “Intake Temperature Sensor Measured Value” in data flow is too low. If value is lower than normal condition, observe minimum intake

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			circuit or internal circuit damage in boost temperature sensor signal pin corresponding to ECM terminal 4. Sensor is damaged	manifold temperature range. You can also use a multimeter to measure if voltage between boost temperature sensor signal terminal and ground is close to or equal to 5 V. • Turn ignition switch OFF and check connector for looseness or poor contact • Check sensor signal terminal for short to power supply or open • Check sensor reference ground for open • Check sensor for damage • Check if short circuit to power supply, open or internal circuit damage in boost temperature sensor signal pin corresponding to ECM
P009700	Intake Air Temperature Sensor 2 Circuit Low Bank 1	Temperature sensor voltage is lower than 0.1 V	1. Boost temperature sensor signal terminal is short to ground 2. Short circuit to ground in boost temperature sensor signal pin corresponding to ECM terminal	• Connect the diagnostic tester and turn ignition switch to ON. Do not start engine, and observe if “Intake Temperature Sensor Measured Value” in data flow is too low. If value is lower than normal condition, observe minimum intake manifold temperature range. You can also use a multimeter to measure if voltage between boost temperature sensor signal terminal and ground is close to or equal to 5 V. • Turn ignition switch OFF and check connector for looseness or poor contact • Check sensor signal terminal for short to ground • Check if short circuit to ground in boost temperature sensor signal pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P009900	Intake Air Temperature Sensor 2 Circuit Intermittent Bank 1	Boost temperature sensor voltage discontinuity is higher than 4.9 V	1. Boost temperature sensor signal terminal is poor contact 2. Connector looseness 3. Poor contact in boost temperature sensor signal pin corresponding to ECM terminal	• Connect the diagnostic tester and turn ignition switch to ON. Do not start engine, and observe if “Intake Temperature Sensor Measured Value” in data flow is too low. If value is lower than normal condition, observe minimum boost temperature range. You can also use a multimeter to measure if voltage between boost temperature sensor signal terminal and ground is close to or equal to 5 V. • Turn ignition switch OFF and check connector for looseness or poor contact • Check sensor signal terminal for poor contact • Check if there is poor contact in boost temperature sensor signal pin corresponding to ECM
P01062A	Manifold Absolute Pressure Sensor Circuit Range/ Performance	The difference between intake pressure value and initial pressure value at startup is always less than 20 hPa	1. Sensor is icing and oily 2. Incorrect installation position of sensor 3. Intake line is detached or seriously air leaked	• Do not start engine, and observe if “Intake Pressure” item in data flow is seriously deviated from ambient pressure by about 101 kpa (- specific value is related to current pressure). • Turn ignition switch to “OFF”, and check if there is any freeze, oil stain, etc. on measurement terminal, which will affect normal measurement. • Check if intake pressure sensor installation position is incorrect, intake pipe is disconnected or seriously leaked.
P010622	Manifold Absolute Pressure Sensor Circuit Range/ Performance	The intake pressure value exceeds the reasonableness threshold	1. Sensor is icing and oily 2. Sensor is aging 3. Intake line is detached or	• Do not start engine, and observe if “Intake Pressure” item in data flow is seriously deviated from ambient pressure by about 101 kpa

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P010621	Manifold Absolute Pressure Sensor Circuit Range/ Performance		seriously air leaked	(specific value is related to current pressure). • Turn ignition switch to “OFF”, and check if there is any freeze, oil stain, etc. on measurement terminal, which will affect normal measurement. • Check if intake pressure sensor installation position is incorrect, intake pipe is disconnected or seriously leaked.
P120000	Manifold Absolute Pressure Sensor Circuit Range/ Performance			
P120100	Manifold Absolute Pressure Sensor Circuit Range/ Performance			
P00C721	Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P00C722	Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1			
P120400	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance	The boost pressure value exceeds the reasonableness threshold	1. Sensor is icing and oily 2. Sensor is aging 3. Intake line is detached or seriously air leaked	• Turn ignition switch to “OFF”, and check if there is any freeze, oil stain, etc. on measurement terminal, which will affect normal measurement. • Check if boost pressure sensor installation position is incorrect, intake pipe is disconnected or seriously leaked
P120500	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance			
P023622	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance			
P023621	Turbocharger/ Supercharger Boost Sensor "A" Circuit Range/ Performance			
P010700	Intake Manifold Pressure Sensor Circuit Voltage Too Low	Sensor voltage is lower than the threshold	1. Intake pressure sensor signal terminal is short to ground 2. 5 V	• Connect the diagnostic tester and turn ignition switch to ON. Use a multimeter to measure whether the intake

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			reference voltage of sensor is open 3. Short circuit to ground in intake pressure sensor signal pin corresponding to ECM terminal	manifold pressure sensor signal terminal voltage is close to or equal to 0 V without starting the engine. • Turn ignition switch “OFF”, check pressure sensor signal terminal for short to ground • Check 5 V reference voltage terminal of sensor for open • Check if short circuit to ground in intake pressure sensor signal pin terminal corresponding to ECM
P010800	Intake Manifold Pressure Sensor (Electric) Circuit Short to Battery	Sensor voltage is higher than the threshold	1. Intake manifold pressure sensor signal terminal is short to power supply or open 2. Sensor reference ground terminal is open 3. Short circuit to power supply or open circuit in intake pressure sensor signal pin terminal corresponding to ECM terminal 4. Sensor is damaged	• Connect the diagnostic tester and turn ignition switch to ON. Use a multimeter to measure whether the voltage between intake manifold pressure sensor signal terminal and ground is close to or equal to 5 V without starting the engine. • Turn ignition switch OFF and check connector for looseness or poor contact • Check for short circuit to power supply or open circuit in intake manifold pressure sensor signal terminal • Check sensor reference ground terminal for open • Check sensor for damage • Check if short circuit to power supply, open or internal circuit damage in intake pressure sensor signal pin terminal corresponding to ECM terminal
P011126	Intake Air Temp. Circ. Performance Non-plausible	No fluctuations in intake temperature sensor measured value	1. Intake manifold temperature sensor signal end circuit interference 2.	• Check whether there is interference or contact resistance in signal end circuit of intake manifold temperature sensor • Sensor is damaged

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			Sensor is damaged	
P011200	Intake Air Temp. Circ. Low Input	Temperature sensor voltage is lower than 0.1 V	1. Intake manifold temperature sensor signal terminal short to ground 2. Sensor is damaged	• Use a multimeter to measure if intake temperature sensor signal terminal voltage is close to or equal to 0 V • Turn ignition switch “OFF”, and check if intake manifold temperature sensor signal terminal is short to ground. • Sensor is damaged • short to ground in intake manifold temperature sensor signal pin terminal corresponding to ECM terminal.
P011300	Intake Air Temp. Circ. High Input	Temperature sensor voltage is higher than 4.9 V	1. Intake manifold temperature sensor signal terminal is short to power supply or open 2. Open circuit in sensor reference ground 3. Short circuit to power supply, open circuit or internal circuit damage in intake manifold temperature sensor signal pin corresponding to ECM terminal 4. Sensor is damaged	• Use a multimeter to measure if voltage between intake manifold temperature sensor signal terminal and ground is close to or equal to 5 V • Turn ignition switch OFF and check connector for looseness or poor contact • Check sensor signal terminal for short to power supply or open • Check sensor reference ground for open • Check sensor for damage • Check if short circuit to power supply, open or internal circuit damage in intake manifold temperature sensor signal pin corresponding to ECM terminal
P011400	Poor Contact in Intake Manifold Temperature Sensor Circuit	Temperature sensor voltage discontinuity is higher than 4.9 V	1. Intake manifold temperature sensor signal terminal is poor contact 2. Connector looseness 3. Poor contact in intake manifold temperature	• Use a multimeter to measure if voltage between intake manifold temperature sensor signal terminal and ground is close to or equal to 5 V • Turn ignition switch OFF and check connector for looseness or poor contact

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			sensor signal pin corresponding to ECM terminal	• Check sensor signal terminal for poor contact • Check if there is poor contact in intake manifold temperature sensor signal pin corresponding to ECM
P00CE23	Intake Air Temperature Sensor 2 Multiple Check Bank1	The intake air temperature sensor deviates too much from the average model during cold start	1. Internal resistance of intake air temperature sensor is unreasonable	• Check wire harness for contact resistance • Check whether the internal resistance of sensor has a large deviation from the normal value
P138024	Intake Air Temperature Sensor 2 Multiple Check Bank1			
P138023	Intake Air Temperature Sensor 2 Multiple Check Bank1			
P011623	Coolant Temperature Sensor 1 Signal Not Plausible	Coolant temperature sensor 1 signal is less than 30℃ of lowest model value	1. Internal resistance of coolant temperature sensor is unreasonable	• Check wire harness for contact resistance • Check whether the internal resistance of sensor has a large deviation from the normal value
P011626	Engine Coolant Temperature Sensor 1 Circuit Range/ Performance	Coolant temperature sensor 1 signal remains unchanged		
P050C24	Cold Start Engine Coolant Temperature Performance	Deviation of coolant temperature sensor 1 cold start and the model value is too large		
P050C23	Cold Start Engine Coolant Temperature Performance	Deviation of coolant temperature sensor 1 cold start and the model value is too large		
P011700	Engine Coolant Temperature Sensor 1 Circuit Low	Coolant temperature sensor 1 voltage is lower than 0.09 V	1. Coolant temperature sensor signal terminal is short to ground 2. Short circuit to ground in coolant temperature sensor 1 signal pin corresponding to ECM terminal 3. Sensor is damaged	• Connect the diagnostic tester and turn ignition switch to ON. Do not start engine, and observe if “Coolant Temperature Sensor Measured Value” in data flow is much higher than proper temperature range. You can also use a multimeter to measure if coolant temperature sensor 1 signal terminal voltage is close to or equal to 0 V. • Turn ignition switch “OFF”, check coolant

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				temperature sensor 1 signal terminal for short to ground • Check sensor for damage • Check coolant temperature sensor 1 signal pin terminal corresponding to ECM for short to ground
P011800	Engine Coolant Temperature Sensor 1 Circuit High	Coolant temperature sensor 1 voltage is higher than 4.9 V	1. Connector looseness or poor contact 2. Short circuit to power supply or open in coolant temperature sensor signal terminal 3. Short circuit to power supply or open in coolant temperature sensor signal pin corresponding to ECM terminal 4. Sensor is damaged	• Connect the diagnostic tester and turn ignition switch to ON. Do not start engine and observe if “Intake Temperature Sensor Measured Value” in data flow is much lower than current ambient temperature. You can also use a multimeter to measure if voltage between coolant temperature sensor 1 signal terminal and ground is close to or equal to 5 V • Turn ignition switch OFF and check connector for looseness or poor contact • Check for short circuit to power supply or open circuit in sensor signal terminal • Open circuit in sensor reference ground • Sensor is damaged • Short circuit to power supply, open circuit or internal circuit damage in coolant temperature sensor signal pin terminal corresponding to ECM
P011900	Engine Coolant Temperature Sensor 1 Circuit Intermittent	Coolant temperature sensor voltage jumps	1. Coolant temperature sensor signal terminal circuit is in poor contact	• Check if the signal terminal circuit of coolant temperature sensor is in poor contact
P012800	Coolant Thermostat (- Coolant Temperature Below Thermostat	Coolant temperature below thermostat regulating temperature	1. Thermostat normally open 2. Coolant temperature sensor	• Check if thermostat is normally open or damaged • Short circuit to power supply, open circuit or

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Regulating Temperature)		measurement value offset	internal circuit damage in coolant temperature sensor signal pin terminal corresponding to ECM
P013100	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1	Upstream oxygen sensor signal line IA, IP, UN, VM signal is zero	1. The signal circuit voltage of upstream oxygen sensor is too low (APE IPE RE circuit is short to ground)	• Start the vehicle, keep it idling and slightly change the accelerator pedal to run for a period of time, puncture the red (IP), yellow (VM), green (IA), and black (UN) wire insulation layer of wire harness connector near ECM terminal with the red probe of a multimeter, ground the black probe, and check whether the voltage is short circuit. • Replace LSU oxygen sensor, check if failure will continue to be reported. • Check whether there is any abnormality in LSU processing circuit inside ECM.
P013200	O2 Sensor Circuit High Voltage Bank 1 Sensor 1	Upstream oxygen sensor signal line IA, IP, UN, VM signal is always high	1. Upstream oxygen sensor signal circuit voltage is too high (APE IPE RE wire is short to power supply)	• Start the vehicle, keep it idling and slightly change the accelerator pedal to run for a period of time, puncture the red (IP), yellow (VM), green (IA), and black (UN) wire insulation layer of wire harness connector near ECM terminal with the red probe of a multimeter, ground the black probe, and check whether the voltage is always high and has small changes. • Replace LSU oxygen sensor, check if failure will continue to be reported. • Check whether there is any abnormality in LSU processing circuit inside ECM.
P013300	O2 Sensor Circuit Slow Response Bank 1 Sensor 1	The dynamic factor of upstream oxygen sensor is less than the threshold	1. The oxygen sensor is aging and the response becomes slow	• Check intake and exhaust system for air leakage.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				• Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears.
P013600	O2 Sensor Circuit Bank 1 Sensor 2	The voltage range of downstream oxygen sensor exceeds the limit	1. Oxygen sensor signal wire is short to heating power supply ground wire 2. Oxygen sensor is damaged	• Do not disconnect oxygen sensor connector, measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.4 wire (- black, oxygen sensor signal wire) and No.3 wire (gray, oxygen sensor signal grounded) is about 0.45 V. • Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.4 wire (- black, oxygen sensor signal wire) and No.3 wire (gray, oxygen sensor signal grounded) is changed in range of 0 V - 1 V. • Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect downstream oxygen sensor connector, measure if

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				there is short circuit between oxygen sensor terminal No.2 wire (-white, heater power grounded) and No.4 wire (black, oxygen sensor signal wire). • Connect downstream oxygen sensor connector properly, repeat steps 5-6 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V and 1 V respectively.
P013700	O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	The downstream oxygen sensor voltage range is less than 0.06 V	1. Downstream oxygen sensor signal circuit is short to ground	• Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.2 wire (-black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45 V. • Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.2 wire (-black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V - 1V. • Disconnect downstream oxygen sensor connector, measure if sensor terminal No.1 wire (gray, oxygen sensor signal grounded) and No.2 wire (black, oxygen sensor signal wire) are short circuit with a multimeter. • Connect downstream oxygen sensor connector properly, repeat steps 3-4 and check if voltage signal changes between

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				0.44 V and 0.46 V, 0 V and 1 V respectively.
P013800	O2 Sensor Circuit High Voltage Bank 1 Sensor 2	The downstream oxygen sensor voltage range is higher than 1.2 V	1. Downstream oxygen sensor signal circuit is short to power supply	• Do not disconnect oxygen sensor connector, measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.4 wire (white, heater power supply positive) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage of downstream oxygen sensor wire oxygen sensor terminal No.3 wire (white, heater power supply grounded) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.2 wire (- black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is about 0.45 V. • Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.2 wire (- black, oxygen sensor signal wire) and No.1 wire (gray, oxygen sensor signal grounded) is changed in range of 0V - 1V. • Disconnect downstream oxygen sensor connector, measure if there is short circuit between sensor terminal No. 4 wire (white, heater power supply positive) and No. 2 wire (black, oxygen sensor signal wire) with a multimeter.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				• Connect downstream oxygen sensor connector properly, repeat steps 5-6 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V and 1 V respectively.
P019200	Fuel Rail Pressure Sensor Circuit Short to Ground	Fuel rail pressure sensor circuit voltage is lower than 0.2 V	1. Fuel rail pressure sensor circuit short to ground 2. Fuel rail pressure sensor pin corresponding to ECM short to ground	• Check sensor signal terminal for short to ground • Check sensor for damage • Check for short circuit to power supply, open or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P019300	Fuel Rail Pressure Sensor Circuit Short to Power Supply	Fuel rail pressure sensor circuit voltage is higher than 4.8 V	1. Fuel rail pressure sensor circuit short to power supply 2. Fuel rail pressure sensor pin corresponding to ECM short to power supply	• Check sensor signal terminal for short to power supply or open • Check sensor for damage • Check for short circuit to power supply, open or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P019400	Fuel Rail Pressure Sensor Circuit Intermittent/ Erratic Bank 1	The maximum fluctuation value of fuel rail pressure sensor signal voltage before and after fuel injection is lower than the threshold	1. Fuel rail pressure sensor is damaged 2. Injector is blocked or damaged 3. High pressure fuel rail is abnormal	• Replace the fuel rail pressure sensor, start vehicle for 10 minutes and check whether the fault reappears • Replace the injector, start vehicle for 10 minutes and check whether the fault reappears • Check if high pressure fuel rail system is abnormal • Repair or replace the corresponding components, start vehicle for 10 minutes and check whether the fault reappears
P020113	Cylinder 1 Fuel Injector Control Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Open circuit in fuel injector 3. Open circuit in	• Check connector for looseness or poor contact • Check for open circuit in corresponding fuel injector circuit

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P020213	Cylinder 2 Fuel Injector Control Circuit Open		fuel injector power supply terminal or fuel injector damage 4. Open or internal circuit damage in injector control pin corresponding to ECM	• Check for open circuit in corresponding fuel injector power supply terminal or fuel injector damage • Check for open or internal circuit damage in injector control pin corresponding to ECM
P020313	Cylinder 3 Fuel Injector Control Circuit Open			
P020413	Cylinder 4 Fuel Injector Control Circuit Open			
P230112	Ignition Coil “A” Primary Control Circuit High	Drive channel self-diagnosis failure	1. Short circuit to power supply in ignition coil circuit 2. Short circuit to power supply in ignition coil power supply terminal 3. Short to power supply in ignition coil control pin corresponding to ECM	• Check for short circuit to power supply in corresponding ignition coil circuit • Check for short circuit to power supply in ignition coil control pin corresponding to ECM
P230412	Ignition Coil “B” Primary Control Circuit High			
P230712	Ignition Coil “C” Primary Control Circuit High			
P231012	Ignition Coil “D” Primary Control Circuit High			
P230011	Ignition Coil “A” Primary Control Circuit Low	Drive channel self-diagnosis failure	1. Connector is short to ground 2. Short circuit to ground in ignition coil circuit 3. Short circuit to ground in ignition coil control pin corresponding to ECM	• Check connector for short to ground • Check for short circuit to ground in corresponding ignition coil circuit • Check for short circuit to ground in ignition coil control pin corresponding to ECM
P230311	Ignition Coil “B” Primary Control Circuit Low			
P230611	Ignition Coil “C” Primary Control Circuit Low			
P230911	Ignition Coil “D” Primary Control Circuit Low			
P026200	Cylinder 1 Fuel Injector Control Circuit Short to Power Supply	Drive channel self-diagnosis failure	1. Injector circuit is short to power supply 2. Injector power supply terminal is short to power supply 3. Short to power supply in injector control pin	• Check for short circuit to power supply in corresponding injector circuit • Check for short circuit to power supply in injector control pin corresponding to ECM
P026800	Cylinder 3 Fuel Injector Control Circuit Short to Power Supply			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P027100	Cylinder 4 Fuel Injector Control Circuit Short to Power Supply		corresponding to ECM	
P026500	Cylinder 2 Fuel Injector Control Circuit Short to Power Supply			
P025100	Flow Control Valve Positive or Negative Control Circuit Open	Hardware circuit self-diagnostic	1. Open circuit in positive or negative control circuit of flow control valve 2. Open circuit in positive or negative control circuit of flow control valve corresponding to ECM	• Check if actuator terminal is open • Check if open or internal circuit damage in actuator pin corresponding to ECM terminal
P025400	Flow Control Valve High Side Control Circuit Voltage Too High or Too Low	Hardware circuit self-diagnostic	1. flow control valve high side control circuit short to power supply or ground 2. Short to power supply or ground in high side control valve circuit corresponding to ECM	• Check for short circuit to power supply or ground in actuator terminal • Check for short circuit to power supply or ground in actuator pin corresponding to ECM terminal
P025900	Injection Pump Fuel Metering Control "A" Low (Cam/Rotor/ Injector)	Hardware circuit self-diagnostic	1. Flow control valve low side control circuit short to power supply or ground 2. Short to power supply or ground in low side control valve circuit corresponding to ECM	• Check for short circuit to power supply or ground in actuator terminal • Check for short circuit to power supply or ground in actuator pin corresponding to ECM terminal
P030000	Random/Multiple Cylinder Misfire Detected	Misfire counter exceeds threshold	1) Injector circuit failure 1) Ignition coil circuit failure 1) Injector control pin or ignition coil pin corresponding to ECM failure	• Check if there is any DTC related to corresponding cylinder and injector • Connector looseness or disengagement • Check if there is open circuit or short circuit to power supply in ignition coil signal terminal • Check if there is open circuit or short circuit to
P030100	Cylinder 1 Misfire Detected			
P030200	Cylinder 2 Misfire Detected			
P030300	Cylinder 3 Misfire Detected			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P030400	Cylinder 4 Misfire Detected			ground in ignition coil power supply terminal • Check if there is open circuit or short circuit to power supply in ignition coil grounded terminal • Check ignition coil for malfunction • Check if spark plug is abnormal • Check for open circuit or internal circuit damage in ignition coil control pin corresponding to ECM
P036300	Cylinder Selective Fuel Cutoff Active due to Catalyst Damaging Misfire			
P033900	Crankshaft Position Sensor “A” Circuit Intermittent	The speed sensor signal failure counter exceeds the threshold	1. Connector looseness or disengagement 2. Open circuit in signal terminal 3. Sensor damage	• Connector looseness or disengagement • Open circuit in speed sensor signal terminal • Short to power supply or ground, or short circuit in sensor signal terminal pins • Sensor is damaged • Pin corresponding to speed sensor signal on ECM fault
P261700	Crankshaft Position Signal Output Circuit Open			
P032700	Knock Sensor Signal Short to Ground (A)			• Connector looseness or poor contact • Check knock sensor signal terminal pin for short circuit to ground or open circuit • Replace the knock sensor, reconnect it, and check whether the fault is eliminated • Check knock sensor signal terminal pin corresponding to ECM terminal for short circuit to ground or open circuit
P032714	Knock Sensor Signal Short to Ground (B)			
P032800	Knock Sensor Signal Short to Power Supply (A)			• Connector looseness or poor contact • Check knock sensor signal terminal pin for short to power supply • Replace the knock sensor, reconnect it, and check whether the fault is eliminated • Check if short to power supply in knock sensor signal terminal pin
P032815	Knock Sensor Signal Short to Power Supply (B)			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				corresponding to ECM terminal
P032500	Knock Sensor Signal Circuit Voltage Too Low	The average value of knock sensor port voltage is less than 0.7 V	1. Connector looseness or disengagement 2. Open circuit in signal terminal 3. Sensor damage	• Check connector for looseness or poor contact • Check knock sensor signal terminal for short circuit to ground or open circuit • Check whether the knock sensor connection wire is a non-standard shielded wire and is subject to electromagnetic interference • Check knock sensor for damage • Check knock sensor pin or circuit corresponding to ECM terminal for damage
P151000	Knock Control System Failure	The number of window length errors is higher than 4, and the number of non-measurement window output is higher than 28	1. Sensor is damaged 2. ECM is damaged	• Check knock sensor for damage • Check ECM for damage
P032600	Knock/ Combustion Vibration Sensor 1 Circuit Bank 1 or Single Sensor	Knock background noise is greater than the maximum noise signal threshold	1. Sensor is damaged 2. ECM is damaged 3. Engine is abnormal	• Check knock sensor for damage • Check ECM for damage • Check whether engine is abnormal
P034100	Intake Camshaft Phaser Sensor Signal Improper	Intake camshaft phase sensor signal failure counter exceeds threshold	1. Connector looseness or disengagement 2. Relative installation position between intake phase sensor and its signal plate do not meet the installation requirements 3. Intake phase signal plate teeth mechanical malfunction	• Check connector for looseness or poor contact • Check if there is external interference on wire harness • Check if relative installation position between phase sensor and its signal plate are meet the installation requirements (such as too far, misaligned, etc.) • Check intake phase signal plate teeth for mechanical malfunction
P034200	Camshaft Position Sensor “A" Circuit Low Bank 1 or Single Sensor	Intake camshaft phase sensor signal failure counter exceeds threshold	1. Intake phase sensor power supply failure 2. Intake phase sensor signal	• Unplug the intake phase sensor connector on wire harness, and use a multimeter to check whether the voltage

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			terminal is short to ground 3. Intake phase sensor signal terminal ECM pin is short to ground	between power supply terminal pin and ground terminal pin of the phase sensor is about 12 V. • Check whether the voltage between intake phase sensor signal terminal pin and ground terminal pin is 0 V • Check whether the intake phase sensor power supply terminal pin is open or short to ground, and whether the ground terminal pin is in poor contact • Check whether the intake phase sensor signal terminal pin is short to ground • Check whether the intake phase sensor signal terminal pin corresponding to ECM is short to ground
P034300	Camshaft Position Sensor “A" Circuit High Bank 1 or Single Sensor	Intake camshaft phase sensor signal failure counter exceeds threshold	1. Intake phase sensor ground terminal failure 2. Intake phase sensor signal terminal is short to power supply 3. Intake phase sensor signal terminal ECM pin is short to power supply	• Unplug the intake phase sensor connector on wire harness, and use a multimeter to check whether the voltage between power supply terminal pin and ground terminal pin of the phase sensor is about 12 V. • Check whether the voltage between intake phase sensor signal terminal pin and power supply terminal pin is 12 V • Check intake phase sensor ground terminal pin for open or short to power supply • Check intake phase sensor signal terminal pin for short to power supply or open • Check if short to power supply, open or internal circuit damage in intake phase sensor signal terminal pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P035113	Ignition Coil "A" Primary Control Circuit Failure	Drive channel self-diagnosis failure	1. Short circuit to ground or open circuit in ignition coil circuit 2. Short circuit to ground or open circuit in ignition coil control pin corresponding to ECM	• Check corresponding ignition coil circuit for short to ground or open • Check ignition coil control pin corresponding to ECM for short circuit to ground or open circuit
P035213	Ignition Coil "B" Primary Control Circuit Failure			
P035313	Ignition Coil "C" Primary Control Circuit Failure			
P035413	Ignition Coil "D" Primary Control Circuit Failure			
P036600	Exhaust Camshaft Phaser Sensor Signal Improper	Exhaust camshaft phase sensor signal failure counter exceeds threshold	1. Connector looseness or disengagement 2. Relative installation position between exhaust phase sensor and its signal plate do not meet the installation requirements 3. Exhaust phase signal plate teeth mechanical malfunction	• Check connector for looseness or poor contact • Check if there is external interference on wire harness • Check if relative installation position between exhaust phase sensor and its signal plate are meet the installation requirements (such as too far, misaligned, etc.) • Check exhaust phase signal plate teeth for mechanical malfunction
P036700	Camshaft Position Sensor “B” Circuit Low (Bank1)	Exhaust camshaft phase sensor signal failure counter exceeds threshold	1. Exhaust phase sensor power supply failure 2. Exhaust phase sensor signal terminal is short to ground 3. Exhaust phase sensor signal terminal ECM pin is short to ground	• Unplug the exhaust phase sensor connector on wire harness, and use a multimeter to check whether the voltage between power supply terminal pin and ground terminal pin of the phase sensor is about 12 V. • Check whether the voltage between exhaust phase sensor signal terminal pin and ground terminal pin is 0 V • Check whether the exhaust phase sensor power supply terminal pin is open or short to ground, and whether the ground terminal pin is in poor contact • Check whether the exhaust phase sensor signal terminal pin is short to ground

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				• Check whether the exhaust phase sensor signal terminal pin corresponding to ECM is short to ground
P036800	Camshaft Position Sensor "B" Circuit High (Bank1)	Exhaust camshaft phase sensor signal failure counter exceeds threshold	1. Exhaust phase sensor ground terminal failure 2. Exhaust phase sensor signal terminal is short to power supply 3. Exhaust phase sensor signal terminal ECM pin is short to power supply	• Unplug the exhaust phase sensor connector on wire harness, and use a multimeter to check whether the voltage between power supply terminal pin and ground terminal pin of the phase sensor is about 12 V. • Check whether the voltage between exhaust phase sensor signal terminal pin and power supply terminal pin is 12 V • Check exhaust phase sensor ground terminal pin for open or short to power supply • Check exhaust phase sensor signal terminal pin for short to power supply or open • Check if short to power supply, open or internal circuit damage in exhaust phase sensor signal terminal pin corresponding to ECM
P06DA13	Secondary Oil Pump Drive Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Secondary oil pump drive circuit pin is open 3. Open circuit or internal circuit damage in secondary oil pump drive circuit pin corresponding to ECM terminal	• Check connector for looseness or poor contact • Check secondary oil pump drive circuit pin for open • Check if open or internal circuit damage in secondary oil pump drive circuit pin corresponding to ECM terminal
P06DB11	Secondary Oil Pump Drive Circuit Short to Ground	Drive channel self-diagnosis failure	1. Short to ground in secondary oil pump drive circuit 2. Short to ground in secondary oil pump drive	• Check secondary oil pump drive circuit pin for short to ground • Check secondary oil pump drive circuit pin corresponding to ECM terminal for short to ground

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			circuit corresponding to ECM terminal	
P06DC12	Secondary Oil Pump Drive Circuit Short to Power Supply	Drive channel self-diagnosis failure	1. Secondary oil pump drive circuit short to power supply 2. Short to power supply in secondary oil pump drive circuit corresponding to ECM terminal	• Check secondary oil pump drive circuit pin for short to power supply • Check if short to power supply in secondary oil pump drive circuit pin corresponding to ECM terminal
P042000	Catalyst System Efficiency Below Threshold Bank 1	The calculated oxygen storage capacity of catalytic converter is lower than the threshold	1. Check exhaust system for leakage, gasket for damage 2. Catalytic converter is aging	• Check exhaust system for leakage, gasket for damage. • Replace the catalytic converter. Check if malfunction reappears after returning vehicle to customer.
P044413	Evaporative Emission System Purge Control Valve Circuit Open	Drive channel self-diagnosis failure	3. Connector looseness or poor contact 2. Canister control valve circuit is open 3. Canister control valve circuit corresponding to ECM terminal is open	• Connector looseness or poor contact • Open circuit in canister control valve signal terminal pin • Open circuit in canister control valve power supply terminal pin • Canister control valve damaged • Open circuit or internal circuit damage in canister control terminal pin corresponding to ECM terminal
P045811	Evaporative Emission System Purge Control Valve Circuit Low	Drive channel self-diagnosis failure	1. Canister control valve signal terminal is short to ground 2. Canister control terminal pin corresponding to ECM terminal is short to ground	• Canister control valve signal terminal short to ground • Canister control valve power supply terminal pin short to ground • Canister control terminal pin corresponding to ECM terminal short to ground
P045912	Evaporative Emission System Purge Control Valve Circuit High	Drive channel self-diagnosis failure	1. Canister control valve signal terminal is short to power supply 2. Canister control terminal pin	• Canister control valve signal terminal is short to power supply • Canister control terminal pin corresponding to

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			corresponding to ECM terminal is short to power supply	ECM terminal short to power supply
P050600	Idle Control System RPM Lower Than Expected	Idle speed control speed is lower than the target idle speed 100r/min	1. Electronic throttle is stuck in a position with a small opening. 2. Check if intake manifold is leakage, injector is blocked, exhaust resistance is too large, oil supply pressure is too low	• Check if electronic throttle is stuck in smaller opening position due to ice or oil. • Check if intake manifold is leakage, fuel injector is blocked, exhaust resistance is too large, oil supply pressure is too low
P050A21	Cold Start Idle Control System Performance			
P050700	Idle Control System RPM Higher than Expected	Idle speed control speed is higher than the target idle speed 200r/min	1.Electronic throttle is stuck in a position with a large opening. 2. Check if system is leakage, injector is leaked, oil supply pressure is too high	• Check if electronic throttle is stuck in larger open position due to ice or oil. • Check if system is air leaked, fuel injector is leaked, fuel supply pressure is too high
P050500	Unreasonable Engine Idling-large Fluctuation	Idle control speed fluctuates too much		
P050A22	Cold Start Idle Control System Performance	Idle control speed is higher than the target idle 200r/min during the heating process of catalytic converter		
P050D00	Cold Start Rough Idle	Engine idle fluctuates too much during the heating process of catalytic converter		
P056200	System Voltage Low	Power supply voltage is lower than 6 V	1. Open circuits in all pins on ECM which are connected with battery or main relay 2. Battery electric leakage or damage	• Connect diagnostic tester, turn ignition switch to OFF. Measure battery voltage with a multimeter and check if it is too low. • Check if there are open circuits in all pins on ECM which are connected with battery or main relay • Check engine wire grounded point for malfunction • Regulator failure • Battery electric leakage or damage • Alternator failure
P056300	System Battery Voltage High	Power supply voltage is higher than 20 V	1. Engine wire harness ground point is	• Connect diagnostic tester, turn ignition switch to OFF. Measure battery

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			malfunction 2. Alternator regulator malfunction, motor power generation cannot be controlled effectively	voltage with a multimeter and check if it is too high • Check engine wire grounded point for malfunction • Alternator regulator malfunction, motor power generation cannot be controlled effectively
P061513	Starter Relay Control Circuit Error	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Starter relay control high terminal is open 3. Starter control high terminal pin corresponding to ECM terminal is open or damage	• Connector looseness or poor contact • Starter relay control high terminal is open • Starter relay 1 fuse blown or damaged • Open or damage in starter control high terminal pin corresponding to ECM
P061611	Starter Relay “A” High Circuit Low	Drive channel self-diagnosis failure	1. Starter control circuit high terminal is short to ground 2. Starter control high terminal pin corresponding to ECM is short to ground	• Starter control circuit high terminal is short to ground • Starter control high terminal pin corresponding to ECM is short to ground
P061712	Starter Relay “A” Circuit High	Drive channel self-diagnosis failure	1. Starter control circuit high terminal is short to power supply 2. Starter control high terminal pin corresponding to ECM is short to power supply	• Starter relay control circuit high terminal is short to power supply • Starter control high terminal pin corresponding to ECM is short to power supply
P055700	Brake Booster Pressure Sensor Circuit Low	Sensor voltage is lower than the threshold	1. Brake vacuum sensor signal terminal is short to ground 2. 5 V reference voltage of sensor is open 3. Short circuit to ground in brake vacuum sensor signal pin corresponding to ECM terminal	• Connect the diagnostic tester and turn ignition switch to ON. Use a multimeter to measure whether the brake vacuum sensor signal terminal voltage is close to or equal to 0 V without starting the engine. • Turn ignition switch “OFF”, check brake vacuum sensor signal terminal for short to ground • Check 5 V reference voltage terminal of sensor for open

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				• Check terminal if short circuit to ground in brake vacuum sensor signal pin corresponding to ECM
P055800	Brake Booster Pressure Sensor Circuit High	Sensor voltage is higher than the threshold	1. Brake vacuum sensor signal terminal is short to power supply or open 2. Brake vacuum sensor reference ground terminal is open 3. Short circuit to power supply or open circuit in brake vacuum sensor signal pin terminal corresponding to ECM terminal 4. Sensor is damaged	• Connect the diagnostic tester and turn ignition switch to ON. Use a multimeter to measure whether the voltage between brake vacuum sensor signal terminal and ground is close to or equal to 5 V without starting the engine. • Turn ignition switch OFF and check connector for looseness or poor contact • Check brake vacuum sensor signal terminal for short circuit to power supply or open • Check sensor reference ground terminal for open • Check sensor for damage • Check brake vacuum sensor signal pin terminal corresponding to ECM terminal for short circuit to power supply, open or internal circuit damage
P064513	A/C Clutch Relay Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Open circuit in A/C compressor relay control circuit 3. Open circuit or short circuit to ground in A/C compressor relay control circuit power supply terminal 4. A/C compressor relay fuse is blown or damaged 5. Open circuit or internal circuit damage in A/C compressor	• Connector looseness or poor contact • Open circuit in A/C compressor relay control circuit • Open circuit or short circuit to ground in A/C compressor relay control circuit power supply terminal • A/C compressor relay fuse blown or damaged • Open circuit or internal circuit damage in A/C compressor control pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			control pin corresponding to ECM	
P064611	A/C Compressor Relay Circuit Low	Drive channel self-diagnosis failure	1. A/C compressor relay control circuit is short to ground 2. A/C compressor relay pin corresponding to ECM terminal is short to ground	• A/C compressor relay control circuit is short to ground • A/C compressor relay pin corresponding to ECM terminal is short to ground
P064712	A/C Compressor Relay Control Circuit High	Drive channel self-diagnosis failure	1. A/C compressor relay circuit is short to power supply 2. A/C compressor relay pin corresponding to ECM terminal is short to power supply	• A/C compressor relay circuit is short to power supply • A/C compressor relay pin corresponding to ECM terminal is short to power supply
P208800	“A" Camshaft Position Actuator Control Circuit Low Bank 1	Drive channel self-diagnosis failure	1. Intake VVT control solenoid valve signal terminal is short to ground 2. Intake VVT control solenoid valve power supply terminal is short to ground 3. Intake VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground	• Intake VVT control solenoid valve signal terminal is short to ground • Intake VVT control solenoid valve power supply terminal is short to ground • Intake VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground
P208900	“A" Camshaft Position Actuator Control Circuit High Bank 1	Drive channel self-diagnosis failure	1. Intake VVT control solenoid valve signal terminal is short to power supply 2. Intake VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply	• Intake VVT control solenoid valve signal terminal is short to power supply • Intake VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P209000	“B" Camshaft Position Actuator Control Circuit Low Bank 1	Drive channel self-diagnosis failure	1. Exhaust VVT control solenoid valve signal terminal is short to ground 2. Exhaust VVT control solenoid valve power supply terminal is short to ground 3. Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground	• Exhaust VVT control solenoid valve signal terminal is short to ground • Exhaust VVT control solenoid valve power supply terminal is short to ground • Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM is short to ground
P209100	“B" Camshaft Position Actuator Control Circuit High Bank 1	Drive channel self-diagnosis failure	1. Exhaust VVT control solenoid valve signal terminal is short to power supply 2. Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply	• Exhaust VVT control solenoid valve signal terminal is short to power supply • Exhaust VVT control solenoid valve signal terminal pin corresponding to ECM terminal is short to power supply
P217700	System Too Lean Off Idle Bank 1	Self-learning factor exceeds the threshold	1. Oil system hardware leakage or blockage 2. Intake pipe failure 3. Oxygen sensor wire harness connector circuit failure 4. Oxygen sensor failure	• Connect the fuel pressure gauge (the connection position is the front end of fuel distribution pipe assembly inlet pipe), start the engine and check whether the fuel pressure is normal when the fuel pressure is under idle conditions and when the fuel pressure regulator vacuum tube is removed? • Use a special tool to check whether the injector is leaking or blocked. • Check the fuel condition, and ask the customer whether to fill the designated gasoline? After filling, does the vehicle work abnormally? • Check whether the intake line is blocked,
P217800	System Too Rich Off Idle Bank 1			
P218700	System Too Lean at Idle Bank 1			
P218800	System Too Lean at Idle Bank 1			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				leakage, crush or damage; whether the carbon canister control valve is stuck; whether the valve clearance is abnormal; whether the throttle body is contaminated, causing the air passage to be blocked. • Check whether the ignition coil, cylinder wire, and spark plug work abnormally? • Do not disconnect oxygen sensor connector, measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.1 wire (white, heater power supply positive) is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage of upstream oxygen sensor wire oxygen sensor terminal No.2 wire (white, heater power supply grounded) is 12 V. • Puncture wire harness connector near ECM terminal No. 1 wire insulation layer (white, heater power supply positive) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 2 wire insulation layer (-white, heater power supply grounded) with black pole of multimeter. Check if voltage between two ends is about 12 V. • Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal No.4 wire (-black, oxygen sensor signal wire) and No.3 wire (gray, oxygen sensor signal grounded) is about 0.45 V.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				• Start and keep vehicle idling until coolant temperature reaches normal value. Puncture wire harness connector near ECM terminal No. 4 wire insulation layer (- black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 3 wire insulation layer (gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is between 0 V and 1 V. • Disconnect upstream oxygen sensor connector, measure if there is short circuit between sensor terminal No.3 interface (gray, oxygen sensor signal grounded) and No.4 interface (black, oxygen sensor signal wire) with a multimeter. Connect upstream oxygen sensor connector properly, repeat step 6-7 and check if voltage signal is changed in range of 0.44 V- 0.46 V and 0 V - 1 V respectively.
P219500	O2 Sensor Signal Biased/ Stuck Lean Bank 1 Sensor 1	Downstream oxygen control integral value exceeds the upper limit	1. Exhaust system leaks 2. Oxygen sensor is aging	• Check intake and exhaust system for air leakage. • Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears.
P219600	O2 Sensor Signal Biased/ Stuck Rich Bank 1 Sensor 1	Downstream oxygen control integral value exceeds the lower limit	1. Exhaust system leaks 2. Oxygen sensor is aging	• Check intake and exhaust system for air leakage. • Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears.
P227000	O2 Sensor Signal Biased&Stuck	Downstream oxygen voltage continues to be high	1. Exhaust system leaks 2.	• Check exhaust system for leakage, gasket for damage.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Lean Bank 1 Sensor 2		Oxygen sensor is aging	• Downstream oxygen sensor: Puncture wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (-gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V — 0.46 V • Start and keep vehicle idling until coolant temperature reaches normal value. Downstream oxygen sensor: Puncture wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (-gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V • Start and keep vehicle idling until coolant temperature reaches normal value. Depress and release accelerator pedal frequently and alternately for 90 s, at the same time, puncture downstream oxygen sensor wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (-gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				beyond range of 0.55 V - 0.65 V
P227100	O2 Sensor Signal Biased&Stuck Rich Bank 1 Sensor 2	Downstream oxygen voltage continues to be low	1. Exhaust system leaks 2. Oxygen sensor is aging	• Check exhaust system for leakage, gasket for damage. • Downstream oxygen sensor: Puncture wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (- gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is in range of 0.44 V — 0.46 V • Start and keep vehicle idling until coolant temperature reaches normal value. Downstream oxygen sensor: Puncture wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1 wire insulation layer (- gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage changes in range of 0 V - 1 V • Start and keep vehicle idling until coolant temperature reaches normal value. Depress and release accelerator pedal frequently and alternately for 90 s, at the same time, puncture downstream oxygen sensor wire harness connector near ECM terminal No. 2 wire insulation layer (black, oxygen sensor signal wire) with red pole of multimeter, and puncture wire harness connector near ECM terminal No. 1

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				wire insulation layer (-gray, oxygen sensor signal grounded) with black pole of multimeter. Check if voltage is beyond range of 0.55 V - 0.65 V
P023400	Turbocharger Boost Pressure Too High	The boost pressure is higher than the target pressure plus a certain offset	1. Turbocharger relief valve is damaged 2. Exhaust gas by-pass valve is damaged (-normally closed)	• Turbocharger relief valve is damaged • Exhaust gas by-pass valve is damaged (-normally closed)
P023700	Turbocharger/ Supercharger Boost Sensor "A" Circuit Low	Boost pressure sensor voltage is lower than 0.15 V	1. Sensor signal terminal pin is short to ground 2. Short to ground in sensor signal terminal pin corresponding to ECM	• Sensor signal terminal pin is short to ground • Sensor power supply terminal pin is short to ground • Offset or damage to sensor resistance and other characteristics • Short to ground in sensor signal terminal pin corresponding to ECM
P023800	Turbocharger/ Supercharger Boost Sensor "A" Circuit High	Boost pressure sensor voltage is higher than 4.85 V	1. Sensor signal terminal pin is short to power supply or open 2. Connector looseness or disengagement 3. Short circuit to power supply or open in sensor signal terminal pin corresponding to ECM	• Connector looseness or disengagement • Sensor signal terminal pin is short to power supply or open • Sensor power supply terminal, grounded terminal pin open • Offset or damage to sensor resistance and other characteristics • Short circuit to power supply, open circuit or internal circuit damage in sensor signal terminal pin corresponding to ECM
P024300	Booster Exhaust Gas Control Circuit Open	Drive channel self-diagnosis failure	1. Control valve drive circuit is open 2. Connector looseness or disengagement 3. Pin corresponding to ECM is open	• Connector looseness or disengagement • Exhaust gas control valve drive circuit pin is open • Exhaust gas control valve power supply terminal is open • Open circuit or internal circuit damage in drive pin corresponding to ECM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P024600	Booster Exhaust Gas Control Circuit Voltage Too High or Too Low	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Exhaust gas control valve drive circuit pin is short to power or ground 3. Short to power supply or ground in drive circuit pin corresponding to ECM	• Connector looseness or poor contact • Exhaust gas control valve drive circuit pin is short to power supply or ground • Short to power supply or ground or internal circuit damage in drive pin corresponding to ECM
P029900	Turbocharger Boost Pressure Too Low	The actual boost pressure is the target boost pressure minus a certain offset	1. The line between compressor outlet and throttle valve is leaking 2. Leakage between turbine and exhaust pipe 3. Failure of waste gate valve or discharge valve 4. Turbocharger damaged 5. Working parts such as compressor impeller are dirty or damaged 6. Exhaust manifold is leaking or blocked 7. Air filter dirty	• Line between compressor outlet and throttle valve is leaking • Leakage between turbine and exhaust pipe • Exhaust manifold is leaking or blocked • Air filter dirty • The waste gate valve or discharge valve failure and is in a normally open state • Working parts such as compressor impeller are dirty or damaged • Turbocharger damaged
P226100	Turbocharger/ Supercharger Bypass Valve "A" - Mechanical	Number of pressure fluctuations front of throttle is greater than a certain threshold	1. Discharge control valve wire harness interrupted 2. Discharge control valve is damaged 3. Discharge control valve pin corresponding to ECM terminal is damaged	• Discharge control valve Wire Harness interrupted • Discharge control valve is damaged • Discharge control valve pin corresponding to ECM terminal is damaged
P224300	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1	After the heating control of oxygen sensor starts, the internal resistance of LSU is unreasonably high	1. Upstream oxygen sensor RE wire is open	• Check whether the pins of black wire at oxygen sensor connector is poor contacted • Check the continuity of oxygen sensor wire

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				harness, whether there is an open circuit • Check the connector between wire harness and ECM for pin abnormality, resulting in poor contact • Clear DTC, start the vehicle and run until the coolant temperature reach the normal valve, and check whether the fault is reported again. • Check whether there is any abnormality in LSU oxygen sensor processing circuit inside ECM
P225100	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1	After the heating control of oxygen sensor starts, the internal resistance of LSU and signal terminal voltage is remains 1.5 V	1. Upstream oxygen sensor IPE wire is open	• Check whether the pins of yellow wire at connector of oxygen sensor is poor contacted • Check the continuity of oxygen sensor wire harness, whether there is an open circuit • Check the connector between wire harness and ECM for pin abnormality, resulting in poor contact • Clear DTC, start the vehicle and run until the coolant temperature reach the normal valve, and check whether the fault is reported again. • Check whether there is any abnormality in LSU oxygen sensor processing circuit inside ECM
P241400	O2 Sensor Exhaust Sample Error Bank 1 Sensor 1	LSU is sensing lean, no circuit failure and target air-fuel ratio is lean	1. Expose LSU in the air or LSU connector is in poor connection	• Check whether the oxygen sensor is not installed correctly, check if it is installed outside of exhaust manifold and contact with air • Check the regulating resistance in oxygen sensor connector for failure or infinity • Check whether the resistance between IA and IP circuit in oxygen

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				sensor processing circuit inside of ECM is infinity
P019128	Fuel Rail Pressure Sensor Circuit Bank 1-Negative Offset	After fully cold soaking, the start fuel rail pressure is higher than the threshold, and the oil passage self-learning failure is reported in this driving cycle.	1. Fuel rail pressure sensor internal circuit and wire harness are deteriorated	• Check whether there is gas in the fuel rail, causing the rail pressure to fail to build up quickly? • Replace the fuel rail pressure sensor, return the vehicle to customer, and check whether the fault will be reported again?
P019129	Fuel Rail Pressure Sensor Circuit Bank 1-Positive Offset	After fully cold soaking, the start fuel rail pressure is lower than the threshold, and the oil passage self-learning failure is reported in this driving cycle.	1. Fuel rail pressure sensor internal circuit and wire harness are deteriorated	• Check whether there is a large contact resistance at the connector of fuel rail pressure sensor or in the wire harness? • Replace the fuel rail pressure sensor, return the vehicle to customer, and check whether the fault will be reported again?
U012287	Lost Communication With ESP (-Electronic Stability Program)	ECM receiving ESP information timed out	1. ESP connector looseness or separation 2. Transmission line between ESP and ECM damaged or interrupted 3. ESP is damaged and signal cannot be transmitted to ECM normally	• ESP connector looseness or separation • There is wire harness signal interference • Transmission line between ESP and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • ESP is damaged and signal cannot be transmitted to ECM normally
U014687	Lost Communication With GW (Gateway)	ECM receiving GW information timed out	1. GW connector looseness or separation 2. Transmission line between GW and ECM damaged or interrupted 3. GW is damaged and signal cannot be transmitted to ECM normally	• GW connector looseness or separation • There is wire harness signal interference • Transmission line between GW and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • GW is damaged and signal cannot be transmitted to ECM normally
U012687	Lost Communication	ECM receiving SAS information timed out	1. SAS connector looseness or	• SAS connector looseness or separation

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	With SAS (-Steering Angle)		separation 2. Transmission line between SAS and ECM damaged or interrupted 3. SAS is damaged and signal cannot be transmitted to ECM normally	• There is wire harness signal interference • Transmission line between SAS and ECM damaged or interrupted • Check if there is SAS hardware circuit fault • SAS is damaged and signal cannot be transmitted to ECM normally
U010187	Lost Communication With TCM (-Transmission Controller)	ECM receiving TCM information timed out	1. TCM connector looseness or separation 2. Transmission line between TCM and ECM damaged or interrupted 3. TCM is damaged and signal cannot be transmitted to ECM normally	• TCM connector looseness or separation • There is wire harness signal interference • Transmission line between TCM and ECM damaged or interrupted • Check if TCM hardware circuit fault • TCM is damaged and signal cannot be transmitted to ECM normally
U110017	CAN Module Input Power Voltage High	CAN communication voltage is higher than the threshold	1. CAN bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN bus interface pin 3. Short circuit to power supply / ground, open circuit or internal circuit damage in CAN bus interface pin corresponding to ECM terminal	• CAN bus interface looseness or poor contact • Short circuit to power supply / ground or open circuit in CAN bus interface pin • There is wire harness signal interference • Short circuit to power supply / ground, open circuit or internal circuit damage in CAN bus interface pin corresponding to ECM terminal
P141500	Response Reception Time Out Error of LIN Bus (Contact Between EMS and Intellectual Generator)	ECM receives LIN communication and sends fault information	1. Alternator LIN bus interface looseness or poor contact 2. LIN wire interference 3. LIN line is broken or interrupted 4. Alternator is damaged and cannot normally transmit signals to ECM	• Alternator LIN bus interface looseness or poor contact • There is wire harness signal interference • Alternator LIN bus is damaged or interrupted • Alternator is damaged and signal cannot be transmitted to ECM normally

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P141700	Checksum Error of LIN Bus (-Contact Between EMS and Intellectual Generator)	ECM receives LIN communication and sends fault information	1.LIN communication version of intelligent alternator is inconsistent with ECM	• Whether the LIN communication version of intelligent alternator is consistent with ECM
P051300 P063300 P161000 P161400 P161200 P161300 P161100	Immobilizer Malfunction	Anti-theft data authentication failed	1. ECM does not perform anti-theft matching or anti-theft status is wrong	• Immobilizer connector looseness or separation • Immobilizer circuit fault • If ECM has been replaced, check if anti-theft authentication code is incorrect or not updated • Immobilizer fault • Anti-theft module circuit fault corresponding to ECM terminal
P242200	Canister Vent Valve Stuck Normally Closed	Fuel tank pressure is below the threshold	1. Canister vent valve pin is low, which makes the canister vent valve close 2. Canister vent valve is stuck in the normally closed position and cannot be opened 3. Canister vent valve line is blocked 4. Canister valve stuck in normally open position 5. Fuel tank pressure sensor is damaged	• Keep the sensor connector normal, use a multimeter to check whether the canister vent valve pin voltage is low and whether it is short to ground • Remove the canister vent valve line and check whether it is blocked • Check if canister vent valve is stuck in closed position • Check if canister vent valve is stuck in normally open position • Replace the fuel tank pressure sensor, start vehicle for 10 minutes, and check whether the fault reappears
P045300	Fuel Tank Pressure Sensor Signal Short to Power Supply	Pressure sensor voltage signal is higher than 4.8 V	1. Fuel tank pressure sensor signal terminal is short to power supply 2. Short to power supply in fuel tank pressure sensor signal pin corresponding to ECM terminal	• Use a multimeter to measure if fuel tank pressure signal wire voltage is close to or equal to 5 V • Measure whether the wire harness terminal voltage corresponding to fuel tank pressure signal is close to or equal to 5 V • Check if short circuit to power supply or internal circuit damage in intake pressure sensor signal pin terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				corresponding to ECM terminal
P045200	Fuel Tank Pressure Sensor Signal Short to Ground	Boost sensor voltage signal is lower than 0.2 V	1. Fuel tank pressure sensor signal terminal is short to ground 2. Short to ground in fuel tank pressure sensor signal pin corresponding to ECM terminal	• Use a multimeter to measure if fuel tank pressure signal wire voltage is close to or equal to 0V • Measure whether the wire harness terminal voltage corresponding to fuel tank pressure signal is close to or equal to 0V • Check if short circuit to ground or internal circuit damage in intake pressure sensor signal pin terminal corresponding to ECM terminal
P128200	EVAP System Pressure Sensor/ Switch Circuit Range Performance	Fuel tank pressure sensor pressure signal is continuously higher than the threshold	1. Canister vent valve closed 2. Line from fuel tank to canister is blocked 3. Fuel tank pressure sensor is damaged	• Check whether canister vent valve is closed • Check whether the line from fuel tank to the canister is blocked • Replace fuel tank pressure sensor. Start vehicle for 10 minutes, and check whether the fault reappears
P128300	EVAP System Pressure Sensor/ Switch Circuit Range Performance	Fuel tank pressure sensor pressure signal is continuously lower than the threshold	1. Canister vent valve closed 2. Line from fuel tank to canister is blocked 3. Fuel tank pressure sensor is damaged 4. Canister valve stuck in normally open position	• Check whether canister vent valve is closed • Check whether the line from fuel tank to the canister is blocked • Replace fuel tank pressure sensor. Start vehicle for 10 minutes, and check whether the fault reappears • Check if canister vent valve is stuck in normally open position
P04512A	EVAP System Pressure Sensor&Switch Circuit Range Performance	Difference between maximum and minimum fuel tank pressure is below the threshold	1. Canister solenoid valve stuck in normally closed or normally open position 2. Line from fuel tank to canister is blocked or disconnected 3. Line from canister to canister valve is	• Check whether the carbon canister solenoid valve is in normally closed or normally open position • Check whether the line from fuel tank to the canister is blocked/ disconnect • Check whether the line from canister to canister

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			blocked or disconnected 4. Fuel tank pressure sensor is damaged	valve is blocked/ disconnect • Replace fuel tank pressure sensor. Start vehicle for 10 minutes, and check whether the fault reappears
P045125	EVAP System Pressure Sensor&Switch Circuit Range Performance	Fluctuating amount of fuel tank pressure continues to exceed the threshold	1. Fuel tank pressure sensor damaged 2. Canister valve is damaged	• Replace the fuel tank pressure sensor, restart vehicle for 10 minutes, and check whether the fault reappears • Replace ECM. Restart vehicle for 10 minutes, and check whether the fault reappears • Check the canister valve wire harness and replace the canister valve, restart vehicle for 10 minutes, and check whether the fault reappears
P045128	EVAP System Pressure Sensor&Switch Circuit Range Performance	Difference between fuel tank pressure value and reference fuel tank pressure value during cold start exceeds the threshold	1. Fuel tank pressure sensor damaged 2. Line from fuel tank to canister is blocked	• Replace the fuel tank pressure sensor, and check whether the fault reappears • Check whether the line from fuel tank to the canister is blocked • Replace ECM, and check whether the fault reappears
P046300	Fuel Level Sensor "A" Circuit High	Self-diagnosis of fuel level signal circuit connectivity	1. Abnormal connection of fuel level sensor wire harness 2. Abnormal connection of fuel level sensor wire harness 3. ECM internal circuit abnormal	• Using multimeter, check whether the sensor pin voltage is normal • Check whether CAN signal is normal • Check whether wire harnesses is normal • Replace ECM, and check whether the fault reappears
P046200	Fuel Level Sensor “A” Circuit Low	Self-diagnosis of fuel level signal circuit connectivity	1. Abnormal connection of oil level sensor wire harness 2. Fuel level sensor is damaged 3. ECM internal circuit abnormal	• Using multimeter, check whether the sensor pin voltage is normal • Check whether CAN signal is normal • Check whether wire harnesses is normal • Replace ECM, and check whether the fault reappears

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P25B000	Fuel Level Sensor "A" Stuck	Fuel level signal change does not exceed the threshold	1. ECM CAN signal is abnormal 2. Fuel level sensor is damaged 3. Fuel level float inside fuel tank is stuck	• Replace the fuel level sensor, and check whether the fault reappears • Check whether the fuel level float inside fuel tank is stuck • Replace ECM, and check whether fault reappears
P046129	Fuel Level Sensor Unreasonable	There is a big difference between liquid level change and the calculated fuel consumption	1. ECM CAN signal is abnormal 2. Fuel level sensor is damaged	• Check whether CAN signal is normal • Replace ECM, and check whether fault reappears • Replace the fuel level sensor, and check whether the fault reappears
P044200	EVAP System Leak Detected (-Small Leak)	The vacuum attenuation gradient of evaporation system exceeds the threshold	1. Fuel tank cap is not tightened or there is a leak 2.Canister vent valve cannot be completely closed 3. There is leakage in fuel tank - line - canister valve - canister solenoid valve - canister vent valve 4. Canister solenoid valve cannot be completely closed	• Check whether the fuel tank cap is tightened • Check the fuel tank - line - canister valve - canister solenoid valve - canister vent valve for leakage/ blockage, and whether the connectors are installed correctly • Check whether canister vent valve completely closed, and short to pin • Check whether the carbon canister solenoid valve is completely closed when power-on
P045500	EVAP System Leak Detected (-Large Leak)	The vacuum degree of evaporation system cannot reach the target vacuum degree during the vacuuming process	1. Fuel tank cap is not tightened or there is a leak 2.Canister vent valve cannot be completely closed 3. There is leakage in fuel tank - line - canister valve - canister solenoid valve - canister vent valve 4. Canister solenoid valve cannot be	• Check whether the fuel tank cap is tightened • Check the fuel tank - line - canister valve - canister solenoid valve - canister vent valve for leakage/ blockage, and whether the connectors are installed correctly • Check whether canister vent valve completely closed, and short to pin • Check whether the carbon canister solenoid valve is completely closed when power-on

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			completely closed	
P049700	EVAP System Low Purge Flow	The pressure fluctuation of low load desorption line does not reach the threshold	1. Low load desorption line, check valve and connection between canister valve and engine are blocked or disconnected 2. Canister valve stuck in normally closed or normally open position	• Check whether the desorption line, check valve (if equipped) and connection between canister valve and engine are blocked or disconnected. • Replace the corresponding line. • Check whether the canister valve hardware is stuck in normally closed/normally open position • Replace canister valve
P04F000	EVAP System High Pressure Purge	The pressure fluctuation of high load desorption line does not reach the threshold	1. High load desorption line, check valve, venturi tube and connection between canister valve and engine are blocked or disconnected 2. The check valve of low load line is damaged and cannot function correctly 3. Canister valve stuck in normally open or normally closed position	• Check whether the desorption line, check valve (if equipped), venturi tube (if equipped) and connection between canister valve and engine are blocked or disconnected. • • Replace the corresponding line. • Check whether the check valve of low load line is damaged or not functioning correctly • Check whether the canister valve hardware is stuck in normally closed/normally open position • Replace canister valve
P046800	EVAP Purge Flow Sensor Circuit High	high load desorption line pressure sensor voltage signal is higher than 4.88 V	1. Pressure sensor signal terminal is short to power supply 2. Short to power supply in high load desorption line voltage sensor signal corresponding to the ECM terminal	• Use a multimeter to measure whether the voltage of high load desorption line voltage sensor signal wire is close to or equal to 5 V • Measure whether the pressure sensor wire harness terminal voltage is close to or equal to 5 V • Check if short circuit to power supply or internal circuit damage in high load desorption line pressure sensor signal pin terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				corresponding to ECM terminal
P046700	EVAP Purge Flow Sensor Circuit Low	High load desorption line pressure sensor voltage signal is lower than 0.2 V	1. Pressure sensor signal terminal is short to ground 2. Short to ground in high load desorption line voltage sensor signal corresponding to the ECM terminal	• Use a multimeter to measure whether the voltage of high load desorption line voltage sensor signal wire is close to or equal to 0V • Measure whether the pressure sensor wire harness terminal voltage is close to or equal to 0V • Check if short circuit to ground or internal circuit damage in high load desorption line pressure sensor signal pin terminal corresponding to ECM terminal
P128500	EVAP Purge Flow Sensor Circuit Range Performance	High load desorption line pressure sensor pressure signal exceeds the threshold	1. Pressure sensor signal terminal is short to power supply 2. Short to power supply in high load desorption line voltage sensor signal corresponding to the ECM terminal 3. High load desorption line pressure sensor is damaged 4. Check valve of low load desorption line is damaged and cannot function correctly 5. Venturi tube is disconnected	• Use a multimeter to measure whether the voltage of high load desorption line voltage sensor signal wire is close to or equal to 5 V • Measure whether the pressure sensor wire harness terminal voltage is close to or equal to 5 V • Check if short circuit to power supply or internal circuit damage in high load desorption line pressure sensor signal pin terminal corresponding to ECM terminal • Replace the high-load desorption line pressure sensor and drive the vehicle with a heavy load, check whether the fault reappears • Replace the low load desorption line check valve and drive the vehicle with a heavy load, check whether the fault reappears • Check whether the venturi tube is disconnected
P128600	EVAP Purge Flow Sensor Circuit Range Performance	High load desorption line pressure sensor pressure signal is lower than the threshold	1. Pressure sensor signal terminal is short to ground 2.	• Use a multimeter to measure whether the voltage of high load desorption line voltage

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			Short to ground in high load desorption line voltage sensor signal corresponding to the ECM terminal 3. High load desorption line pressure sensor is damaged 4. Venturi tube or check valve of high load desorption line is blocked	sensor signal wire is close to or equal to 0V • Measure whether the pressure sensor wire harness terminal voltage is close to or equal to 0V • Check if short circuit to ground or internal circuit damage in high load desorption line pressure sensor signal pin terminal corresponding to ECM terminal • Replace the high-load desorption line pressure sensor and drive the vehicle, check whether the fault reappears • Replace the high load desorption line check valve or venturi tube, drive the vehicle and check whether the fault reappears
P019000	Fuel Rail Pressure Sensor Circuit Bank 1	Fuel rail pressure sensor circuit voltage is lower than 0.2 V or higher than 4.8 V	1. Fuel rail pressure sensor signal terminal is short to ground or power supply 2. Short to power or ground in fuel rail pressure sensor pin corresponding to ECM	• Check whether the sensor signal terminal is short to power supply or ground • Check sensor for damage • Check if short circuit to power supply or ground or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P209700	Post Catalyst Fuel Trim System Too Rich Bank 1	The offset value of upstream oxygen characteristic based on downstream oxygen exceeds the upper threshold	1. Upstream oxygen has a negative characteristic deviation (rich) 2. A certain degree of aging occurs in downstream oxygen 3. Leakage in intake and exhaust system 4. Catalytic converter is seriously degraded	• Check intake and exhaust system for leakage • Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears • Replace the downstream oxygen sensor, and check whether the fault reappears • Check whether the catalytic converter is degraded • Replace catalytic converter, and check whether the fault reappears

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P209600	Post Catalyst Fuel Trim System Too Lean Bank 1	The offset value of upstream oxygen characteristic based on downstream oxygen is lower than the lower threshold	1. Upstream oxygen has a positive characteristic deviation (lean) 2. A certain degree of aging occurs in downstream oxygen 3. Leakage in intake and exhaust system 4. Catalytic converter is seriously degraded	• Check intake and exhaust system for leakage • Replace upstream LSU oxygen sensor, return vehicle to the customer, and check whether fault reappears • Replace the downstream oxygen sensor, and check whether the fault reappears • Check whether the catalytic converter is degraded • Replace catalytic converter, and check whether the fault reappears
P223200	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 2	Within a certain number of times that the downstream oxygen sensor is heated and turned off, the change in voltage of downstream oxygen sensor is higher than the threshold	1. Downstream oxygen sensor wire harness and connector are abnormal 2. Oxygen sensor terminal heater power supply ground is short to oxygen sensor signal line	• Do not disconnect oxygen sensor connector, measure if heater power supply positive voltage of downstream oxygen sensor wire harness oxygen sensor terminal is 12 V. • Do not disconnect oxygen sensor connector, measure if heater power supply grounded voltage of downstream oxygen sensor wire oxygen sensor terminal is 12 V. • Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal oxygen sensor signal wire and oxygen sensor signal grounded is about 0.45 V. • Start and keep vehicle idling until coolant temperature reaches normal value. Do not disconnect oxygen sensor connector, measure if voltage between downstream oxygen sensor wire ECM terminal oxygen sensor signal wire and oxygen

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				sensor signal grounded is changed in range of 0V - 1V. • Start and keep vehicle idling until coolant temperature reaches normal value. Disconnect downstream oxygen sensor connector, measure if oxygen sensor terminal heater power grounded and oxygen sensor signal wire are short circuit. • Connect downstream oxygen sensor connector properly, repeat steps 5-6 and check if voltage signal changes between 0.44 V and 0.46 V, 0 V and 1 V respectively.
P013A00	O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2	The transition time from rich to lean of downstream oxygen sensor voltage signal exceeds the threshold	1. Downstream oxygen sensor is aging	• Replace downstream oxygen sensor and connect wire harness properly. Start the vehicle and run until the coolant temperature reach the normal valve. The accelerator pedal was released at a speed about 70 km/h for several times, and the fault reappears.
P064D00	LSU Integrated Ship Failure	Chip communication self-diagnostic	1. LSU oxygen sensor is damaged 2. ECM internal communication is abnormal	• Replace oxygen sensor, and check whether the fault reappears • Replace ECM, and check whether the fault reappears
P064D13	Upstream Oxygen Sensor Sensing Element Failure			
P223700	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (Close to ECM)	Chip fault memory diagnosis	1. Open circuit in LSU oxygen sensor APE line, which is close to ECM terminal 2. ECM internal circuit is abnormal	• Replace oxygen sensor, and check whether the fault reappears • Replace ECM, and check whether the fault reappears
P223713	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1	Before and after applying the pump current, the current difference between APE wire and IPE wire is lower than threshold, and current difference between RE wire and IPE wire is higher than threshold	1. LSU oxygen sensor APE wire is disconnected	• Check whether the wire harness and connector of oxygen sensor are disconnected or poor connection. • Replace upstream oxygen sensor. Start the

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				vehicle and run until the coolant temperature reach the normal valve. Fault reappears.
P053F21	Cold Start Fuel Pressure Performance	During the catalytic converter is heating, the deviation between target fuel rail pressure of high pressure fuel rail and the actual fuel rail pressure exceeds the threshold	1. Oil passage is leakage 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced	• Check for leakage in oil passage • Check if fuel is insufficient • Check low pressure oil pump for damage • Check whether the working capacity of high pressure oil pump has decreased
P053F22	Cold Start Fuel Pressure Performance	During the catalytic converter is heating, the deviation between target fuel rail pressure of high pressure fuel rail and the actual fuel rail pressure is lower than the threshold	1. High pressure oil pump control failure 2. Pressure relief valve blocked	• Check whether the high pressure oil pump control is normal • Check relief valve for blockage or abnormal operation
P00C600	Fuel Rail Pressure Too Low - Engine Cranking Bank 1	The fuel rail pressure is low when starting and the high pressure starting is unsuccessful	1. Oil passage is leakage 2. Insufficient fuel 3. Low pressure oil pump is damaged 4. The working capacity of high pressure oil pump is reduced 5. Injector is damaged 6. Replace the new fuel pipe or new vehicle has just off the production line, the oil passage pressure has not been established yet, and a malfunction may be reported	• Check for leakage in oil passage • Check if fuel is insufficient • Check low pressure oil pump for damage • Check whether the working capacity of high pressure oil pump has decreased • Check injector for damage • Whether the new fuel pipe has been replaced or the new vehicle has just off the production line • Repair the malfunction, drive the vehicle for 10 minutes, let the oil pressure be fully established, turn off the engine and start again, check whether the fault reappears
P02CD00	Cylinder 1 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 1 injector exceeds the upper threshold	1. Cylinder 1 injector is damaged	• Check cylinder 1 injector for damage
P02D100	Cylinder 3 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 3 injector exceeds the upper threshold	1. Cylinder 3 injector is damaged	• Check cylinder 3 injector for damage

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P02D300	Cylinder 4 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 4 injector exceeds the upper threshold	1. Cylinder 4 injector is damaged	• Check cylinder 4 injector for damage
P02CF00	Cylinder 2 Fuel Injector Offset Learning At Max Limit	CVO self-learning value of cylinder 2 injector exceeds the upper threshold	1. Cylinder 2 injector is damaged	• Check cylinder 2 injector for damage
P02CC00	Cylinder 1 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 1 injector is lower than the lower threshold	1. Cylinder 1 injector is damaged	• Check cylinder 1 injector for damage
P02D000	Cylinder 3 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 3 injector is lower than the lower threshold	1. Cylinder 3 injector is damaged	• Check cylinder 3 injector for damage
P02D200	Cylinder 4 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 4 injector is lower than the lower threshold	1. Cylinder 4 injector is damaged	• Check cylinder 4 injector for damage
P02CE00	Cylinder 2 Fuel Injector Offset Learning At Min Limit	CVO self-learning value of cylinder 2 injector is lower than the lower threshold	1. Cylinder 2 injector is damaged	• Check cylinder 2 injector for damage
P02EE00	Cylinder 1 Fuel Injector Control Circuit Short	Drive channel self-diagnosis failure	1. Injector high side control circuit is short to low side control circuit	• Check whether the high side control circuit of corresponding injector is short to low side control circuit
P02EF00	Cylinder 2 Fuel Injector Control Circuit Short			
P02F000	Cylinder 3 Fuel Injector Control Circuit Short			
P02F100	Cylinder 4 Fuel Injector Control Circuit Short			
P062B9A	Internal Control Module Fuel Injector Control Performance - Component Internal Failure	All cylinders have CVO self-learning values that exceed the threshold or have unreasonable circuit signals	1. Injector wires for all cylinders are abnormal 2. ECM internal circuit is abnormal	• Check whether all cylinder injector wire harness connections are normal • Replace the injectors of all cylinders, start the vehicle, and check whether the fault reappears • After replacing ECM, start the vehicle, and check whether the fault reappears
P062B64				
P062B96				
P012200	Electronic Throttle 1st Path	The voltage value of a certain path of throttle signal	1. The first/ second signal line of the	• Collect the both paths signal voltage values ThrVlv_uRawSens1B1,
P022200				

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	/ 2nd Path Signal Voltage Minimum	is lower than a certain value and lasts for a period of time	electronic throttle is open 2.The first/ second signal wire of electronic throttle is short to GND 3. An open circuit of electronic throttle 5 V power supply line will cause two faults to be reported at the same time	ThrVlv_uRawSens2B1 of electronic throttle valve and check whether it drops to near zero. • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Through the electronic throttle flying wire connection to verify whether it is the cause by the wire harness resistance. • Replace the throttle body to determine whether there is an internal problem of throttle. • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P012300 P022300	Electronic Throttle 1st Path / 2nd Path Signal Voltage Maximum	The voltage value of a certain path of throttle signal is higher than a certain value and lasts for a period of time	1. The first/ second signal wire of the electronic throttle is short to 5 V 2. An open circuit of electronic throttle signal ground wire cause two faults to be reported at the same time	• Collect the both paths signal voltage values ThrVlv_uRawSens1B1, ThrVlv_uRawSens2B1 of electronic throttle valve and check whether it drops to near zero. • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Through the electronic throttle flying wire connection to verify whether it is the cause by the wire harness resistance. • Replace the throttle body to determine whether there is an internal problem of throttle. • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P012100 P022100	Electronic Throttle 1st Path / 2nd Path Signal Voltage Improper	Compare the first path signal of electronic throttle body with 5 V minus the second path signal. When the deviation exceeds threshold and after a period of time, compare the both paths	1. The first path signal of electronic throttle is short to the second path signal 2. There is resistance on	• Collect and observe whether the voltage value of the two DVE signals ThrVlv_ uRawSens1B1 and ThrVlv_uRawSens2B1

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		signals with the signal after inflation pressure conversion, the signal that deviates from the main inflation pressure signal exceeds a certain value and is confirmed after a period of time reports a failure	electronic throttle 5 V power supply wire or GND wire, causing the pedal voltage to drop by 5 V or the zero voltage to be raised	deviate from 5 V in addition • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Measure the voltage drop of each section on wire harness by AD-Scan. If the wire harness is normal, there is no voltage drop, and if there is a voltage drop, it means that there is resistance in wire harness or connector. • Through the electronic throttle flying wire connection to verify whether it is the cause by the wire harness • Replace the throttle body to determine whether there is an internal problem of throttle • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P155400 P155500 P156100	Max Error of DV-E Return Spring Check Failure	After each ignition ON, the system will command DVE to open to a certain opening through ECM, and then check whether DVE can be reached within the specified time, and then check whether DVE can be returned within the specified time; if it cannot be reached to the specified position within the specified time, it is judged as P1555; if it cannot return to the specified range within the specified time after opening, it is judged as P1554. When ECM drives the throttle, the ECM will always compare the target opening with the actual throttle feedback. When the deviation between target and actual exceeds a certain value and after a certain period of time to confirmed, it will be judged as P1561	1.The PIN of electronic throttle drive motor is open or short 2. Electronic throttle body valve plate is dirty or there are foreign matters, which makes the valve plate stuck	• Whether the actual opening ThrVlv_ ratActIntB1 is consistent with the target opening ThrVlv_ratDesB1 • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Through the electronic throttle flying wire connection to verify whether it is the cause by the wire harness • Replace the throttle body to determine whether there is an internal problem of throttle • Clear DTC, restart the vehicle, and check whether the DTC is eliminated

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P156000	Electronic Throttle PID Adjustment Malfunction	When the duty ratio that ECM output to the throttle valve continues to exceed 80% and maintains for 5 seconds, P1560 (DFC_ ThrVlvDycB1) is reported	1.The PIN of electronic throttle drive motor is open or short 2. Electronic throttle body valve plate is dirty or there are foreign matters, which makes the valve plate resistance large and sticky 3. Throttle drive chip in ECM is abnormal	• It may be caused by foreign matter sticking on throttle valve plate (the possibility is greater); it may be caused by the failure of throttle drive motor pin; or it may be also caused the DVE drive module inside ECM may have a hardware failure (the possibility is less) • By replacing the throttle body to determine whether there is an internal problem of throttle • By replacing ECM to determine whether there is a fault in ECM internal throttle drive module • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P155000 P155100	Electronic Throttle Self-learning Unable to Complete / Throttle Initial Self-learning Unable to Complete	Throttle self-learning must meet 7 conditions at the same time: no DVE or monitoring failure; speed is 0; vehicle speed is 0; pedal is 0; battery voltage is higher than 10 V; engine coolant temperature is higher than 5℃; intake air temperature is higher than 5℃. When the above 7 conditions cannot be met at the same time, P155000 will be reported. ECM will report P1551 if the conditions are not met during the first self-learning	1. The conditions of DVE self-learning are not met, please refer to the above 7 conditions 2. When the coolant temperature or intake air temperature sensor is faulty, the temperature condition will not be met because the correct temperature is not collected. 3. Some vehicle assembly factories do not turn on the heater in workshop in winter, and the fault may be caused when the temperature is too low	• Compare the above 7 conditions and find out whether there are any unsatisfied ones one by one • Clear DTC, restart the vehicle, and check whether the DTC is eliminated

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P210000 P210300 P210600 P211800	Electronic Throttle Drive Level Malfunction	Monitor DVE power driver stage-SPI bus or signal failure	1. Throttle valve failure (valve plate stuck or motor failure) 2. Throttle drive module failure in ECM	• By replacing the throttle body to determine whether there is an internal problem of throttle • By replacing ECM to determine whether there is a fault in ECM internal throttle drive module • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P155800 P155900 P155A00 P155B00	Not Plausible Error of DV-E Limphome Learning Position	The NLP position learned by throttle is out of the reasonable range, and a fault is reported	1. Throttle valve or ECM is abnormal during throttle self-learning	• In an environment with a temperature higher than 5℃, ignition ON again, use the diagnostic tester to trigger throttle self-learning once, and observe whether the throttle can successfully complete the self-learning • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P155600 P155700	Electronic Throttle Lower Mechanic Stop Re-learning Error	When the bottom dead center position learned by throttle is out of the reasonable range, and a fault is reported	1. Throttle valve or ECM is abnormal during throttle self-learning	• In an environment with a temperature higher than 5℃, ignition ON again, use the diagnostic tester to trigger throttle self-learning once, and observe whether the throttle can successfully complete the self-learning • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P15A000	CPU0: MPU Error (Memory, DSPR, PSPR)	ECM chip hardware premier error	ECM hardware fault	• Replace ECM • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P15A100	CPU0: DCACHE/DSPR ECC Uncorrectable Error			
P15A200	CPU0: DCACHE/ DSPR Address Error			
P15A300	CPU0:DCACHE TAG SRAM ECC			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Uncorrectable Error			
P15A400	CPU0:DCACHE TAG SRAM Address Error			
P15A500	CPU0:PCACHE TAGRAM ECC Uncorrectable Error			
P15A600	CPU0:PCACHE TAGRAM Address Error			
P15A700	CPU0: PCACHE/ PSPR ECC Uncorrectable Error			
P15A800	CPU0:PCACHE/ PSPR Address Error			
P15A900	CPU1:Lockstep Comparator Error			
P15AA00	CPU1:MPU Error (Memory, DSPR, PSPR)			
P15AB00	CPU1:DCACHE/ DSPR ECC Uncorrectable Error			
P15AC00	CPU1:DCACHE/ DSPR Address Error			
P15AD00	CPU1:DCACHE TAGRAM ECC Uncorrectable Error			
P15AE00	CPU1:DCACHE TAGRAM Address Error			
P15AF00	CPU1:PCACHE TAGRAM ECC Uncorrectable Error			
P15B000	CPU1:PCACHE TAGRAM Address Error			
P15B100	CPU1:PCACHE TAGRAM Address Error			
P15B100	CPU1:PCACHE/ PSPR ECC			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Uncorrectable Error			
P15B200	CPU1:PCACHE/ PSPR Address Error			
P15B300	LMU:SRAM ECC Monitoring Error			
P15B400	LMU:SRAM ECC Uncorrectable Error			
P15B500	LMU:SRAM Address Error			
P15B600	SMU: Recover Timer 0 Timeout Error			
P15B700	SMU: Recover Timer 1 Timeout Error			
P15B800	PMU:PFLASH ECC Uncorrectable Multi-bit Error			
P15B900	PMU:PFLASH Address Error			
P15BA00	PMU: PFLASH ECC Monitoring Error (Cover All ECC Module)			
P15BB00	PMU: PFLASH EDC Comparator Error (Cover All PFLASH Instances)			
P15BC00	SCU/CGU: System PLL OSC_WDT: Input Clock Exceeds Limit Error			
P15BD00	SCU/CGU: System PLL VCO Clock Event Loss Error			
P15BE00	SCU/EVR: EVR 1.3V Digital Undervoltage Error			
P15BF00	SCU/EVR: EVR 3.3V Overvoltage Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P15C000	SCU/EVR: External Power Supply Overvoltage Error			
P15C100	SCU/WDTS: Safety Watchdog Timeout Error			
P15C200	SCU/WDTCPU0: Watchdog CPU0 Timeout Error			
P15C300	SCU/WDTCPU1: Watchdog CPU1 Timeout Error			
P15C400	SCU/CGU: PLL_ ERAY VCO Clock Event Loss Error			
P15C500	SCU/WDTCPU2: Watchdog CPU2 Timeout Error			
P15C600	SCU/DTS: Temperature Sensor Overflow Error			
P15C700	Registers: Register Monitor Detects Error			
P15C800	SCU/LSCU: SCU Configuration Error: Monitor Dual-track Properties (- Inverted Signal) Alarm from Lockstep Comparator (LSCU)			
P15C900	SCU/CGU: Clock Monitoring: STM Exceed Frequency Range Error			
P15CA00	SCU/CGU: Clock Monitoring: PLL_ ERAY Exceed Frequency Range Error			
P15CB00	SCU/CGU: Clock Monitoring: PLL Exceed			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Frequency Range Error			
P15CC00	SCU/CGU: Clock Monitoring: SRI Exceed Frequency Range Error			
P15CD00	SCU/CGU: Clock Monitoring: SPB Exceed Frequency Range Error			
P15CE00	SCU/CGU: Clock Monitoring: GTM Exceed Frequency Range Error			
P15CF00	SCU/CGU: Clock Monitoring: ADC Exceed Frequency Range Error			
P15D000	GTM: SRAMs Uncorrectable Error			
P15D100	FLEXRAY:SRAM Address Error			
P15D200	Misc SRAMs: SRAM ECC Uncorrectable Error			
P15D300	Misc SRAMs: SRAM Address Error			
P15D400	GTM: SRAMs Address Error			
P15D500	CAN: SRAM Uncorrectable Error			
P15D600	CAN: SRAM Address Error			
P15D700	FLEXRAY:SRAM ECC Uncorrectable Error			
P15D800	CPU2:MPU Error (Memory, DSPR, PSPR)			
P15D900	CPU2: DCACHE/ DSPR ECC			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Uncorrectable Error			
P15DA00	CPU2: DCACHE/ DSPR Address Error			
P15DB00	CPU2: DCACHE TAG SRAM ECC Uncorrectable Error			
P15DC00	CPU2:DCACHE TAG SRAM Address Error			
P15DD00	CPU2:121 PCACHE TAGRAM ECC Uncorrectable Error			
P15DE00	CPU2:PCACHE TAGRAM Address Failure			
P15DF00	CPU2: PCACHE/ PSPR ECC Uncorrectable Error			
P15E000	CPU2: PCACHE/ PSPR Address Error			
P061A00	Safely Monitor Torque Exceeds Limit	In the 2nd layer monitoring, when the actual torque calculated by ECM exceeds the 2nd layer allowable torque and the duration exceeds 520 ms, a fault is reported	1. ECM data settings are wrong, usually because the EGAS safety monitoring function is not matched or preset 2. The external torque increase request was not considered during the data setting process	• Communicate with EGAS safety monitoring matching engineer to confirm whether it is necessary to perform safety monitoring presetting or matching • Confirm with the customer whether there is an external torque increase request (ESP increase torque request, TCU increase torque request, etc.) • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P060D00	Accelerator Pedal 2nd Layer Monitoring Error	In the 2nd layer of monitoring, when the deviation of pedal two signals exceeds the limit, a fault will be reported	1. ECM data settings are wrong, usually because the EGAS safety monitoring function is not matched or	• Communicate with EGAS safety monitoring matching engineer to confirm whether it is necessary to perform safety monitoring presetting or matching

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			preset 2. The application layer data of pedal module does not match the monitoring layer data during the data setting process	• Confirm with the customer whether the pedal model has been changed • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P152000	Function Monitoring: Check of Predicted Air Mass Failed	In the 2nd layer of monitoring, when recognizing that there is a deviation between the calculation of load to fuel injection volume and calculation of monitoring layer in the calculation of ECM application layer, the fault is reported.	1. ECM data settings are wrong, usually because the EGAS safety monitoring function is not matched or preset 2. The calculation of application layer from load to fuel injection volume is wrong	• Communicate with EGAS safety monitoring matching engineer to confirm whether it is necessary to perform safety monitoring presetting or matching • Check whether there is any error in calculation process from load to fuel injection volume at the application layer • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P152100	Function Monitoring: Fault of ECM Check of Injection Cut-off			
P152200	Function Monitoring: Fault of ECM in Check of Cylinder Individual Fuel Corrections			
P153900	Synchronization process rationality check (based on speed and synchronization count)			
P153700	Function Monitoring: Fault of ECM or Sensor in rl-Comparison			
P153500	Function Monitoring: Fault of ECM or Sensor in Mixture Check			
P153600	Function Monitoring: Fault of ECM Comparison of Lambda and Operation Mode			
P153800	Electronic Throttle Safety Monitoring Function Error (-Ignition Angle Signal, Wire	ECM Bottom Fault Response Measure Error	1. ECM Internal Malfunction	• Replace ECM • Clear DTC, restart the vehicle, and check whether the DTC is eliminated

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Harness or ECM Error)			
P152700	Function Monitoring: Monitoring of ICO From Level1	Monitoring layer recognizes an abnormal safety oil cut-off	1. ECM Internal Malfunction	• Replace ECM • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P152800	Function Monitoring: Monitoring of ICO From Level2			
P061C00	Safety Monitoring Function Error (2nd Layer Engine Speed Monitoring Error)	The monitoring layer speed signal is inconsistent with the application layer speed signal	1. ECM Internal Malfunction	• Replace ECM • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P152900	Function Monitoring: Fault of Starter Control	2nd layer of monitoring identified an abnormal start-stop function	1. ECM Internal Malfunction	• Replace ECM • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P153000	Function Monitoring: Fault of ECM ADC - Null Load Test Pulse	Hardware bottom data error	1. ECM Internal Malfunction	• Replace ECM • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P153100	Function Monitoring: Fault of ECM ADC - Test Voltage			
P157100	Closed Path Checking, Driver Level Check Error Or Communication Error			
P157200	Under Normal Voltage, ABE Activated			
P157300	Diagnostic Fault Check to Report "WDA active" Due to Errors in Query/Response Communication			
P157400	Errorpin Activated and Monitoring Communication Normal			
P157500	Diagnostic Fault Check to Report "WDA active"			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Due to Overvoltage Detection			
P213800	Deviation Between Both Paths Signal of Accelerator Pedal Out of Limit	Both paths signal of accelerator pedal are compared. When the deviation exceeds the threshold and confirmed after a period of time, the fault will be reported.	1. There is a short circuit or resistance between first path and second path signal wires of accelerator pedal 2. There is resistance on first path/second path 5 V power supply wire of accelerator pedal or GND wire, causing the pedal terminal voltage to drop by 5 V or the zero voltage to be raised	• Collect the both paths voltage value APP_ uRaw1 and APP_uRaw2 of accelerator pedal, and observe whether the relationship between them is two times when the fault occurs • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Measure the voltage drop of each section on wire harness by AD-Scan. If the wire harness is normal, there is no voltage drop, and if there is a voltage drop, it means that there is resistance in wire harness or connector. • Verify whether it is caused by the wire harness resistance by connecting the accelerator pedal flying wire • Determine whether there is an internal problem with the pedal by replacing it • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P212300 P212800	Accelerator Pedal 1st Path / 2nd Path Signal Voltage High	The voltage value of one path of pedal is higher than APP_uRaw1SRCHigh_C / APP_uRaw2SRCHigh_C and continues for TUPWGO time	1. The first path /second path signal ground wire GND of accelerator pedal is open 2. First path /- second path signal wire of accelerator pedal is short to 5 V	• Collect the both paths voltage value APP_ uRaw1 and APP_uRaw2 of accelerator pedal, and observe whether it is up to 5 V at the moment the fault occurs • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Verify whether it is caused by the wire harness by connecting

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				the accelerator pedal flying wire • Replace the pedal, check whether it is the cause of pedal • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P212200 P212700	Accelerator Pedal 1st Path / 2nd Path Signal Voltage Low	The voltage value of one path of pedal is lower than APP_uRaw1SRCLow_C / APP_uRaw2SRCLow_C and continues for TUPWGU time	1. The 5 V power supply line of the first path /second path signal of accelerator pedal is open 2. The first path /-second path signal wire of accelerator pedal is open 3. First path /-second path signal wire of accelerator pedal is short to GND	• Collect the both paths voltage value APP_uRaw1 and APP_uRaw2 of accelerator pedal, and observe whether it is down to 5 V at the moment the fault occurs • Will actions such as unplugging and plugging connectors and shaking the wire harness affect the frequency of faults? • Verify whether it is caused by the wire harness by connecting the accelerator pedal flying wire • Replace the pedal, check whether it is the cause of pedal • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P049900	EVAP System Vent Control Circuit Short to Power Supply	Drive channel self-diagnosis failure	1. Canister vent valve control circuit is short to power supply 2. Canister vent valve control circuit pin corresponding to ECM terminal is short to power supply	• EVAP System Vent Control Circuit Short to Power Supply • Canister vent valve control circuit pin corresponding to ECM terminal is short to power supply
P049800	EVAP System Vent Control Circuit Short to Ground	Drive channel self-diagnosis failure	1. Canister vent valve control circuit is short to ground 2. Canister vent valve control circuit pin is short to ground	• Canister vent valve control circuit is short to ground • Canister vent valve control circuit pin is short to ground
P044700	EVAP System Vent Control Circuit Short to Ground	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Canister vent	• Connector looseness or poor contact

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			valve control circuit is open 3. Canister vent valve control circuit power supply terminal is open or shorted to ground 4. Canister vent valve control circuit fuse is blown or damaged 5. Open or internal circuit damage in canister vent valve control circuit pin corresponding to ECM	• Canister vent valve control circuit is open • Canister vent valve control circuit power supply terminal open or short to ground • Canister vent valve control circuit fuse is blown or damaged • Open circuit or internal circuit damage in canister vent valve control circuit pin corresponding to ECM terminal
P069100	Fan Control Circuit Low	Drive channel self-diagnosis failure	1. Cooling fan relay control circuit is short to ground 2. Cooling fan relay control pin corresponding to ECM terminal is short to ground	• Cooling fan relay control circuit is short to ground • Cooling fan relay control pin corresponding to ECM terminal short to ground
P069200	Fan Control Circuit High	Drive channel self-diagnosis failure	1. Cooling fan relay control circuit is short to power supply 2. Cooling fan relay control pin corresponding to ECM terminal is short to power supply	• Cooling fan relay control circuit is short to power supply • Cooling fan relay control pin corresponding to ECM terminal is short to power supply
P048000	Cooling Fan Control Circuit Error	Drive channel self-diagnosis failure	1. Cooling fan relay control circuit is open 2. Cooling fan relay control circuit pin corresponding to ECM terminal is open	• Connector looseness or poor contact • Open circuit in cooling fan relay circuit signal terminal • Cooling fan relay malfunction (fuse blown or damaged) • Open circuit or internal circuit damage in cooling fan relay pin corresponding to ECM terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P063400	Cooling Fan Drive Chip Overheating	Drive channel self-diagnosis failure	1. Cooling fan relay control circuit is short to power supply 2. Cooling fan relay control pin corresponding to ECM terminal is short to power supply	• Cooling fan relay control circuit is short to power supply • Whether there is a fault in internal chip of ECM
P214800	Cylinder 1 or Cylinder 4 Fuel Injector Control Circuit Short to Power Supply	Drive channel self-diagnosis failure	1. Injector high side control circuit is short to power supply 2. Short to power supply in injector high side control pin corresponding to ECM	• Check corresponding injector high side control circuit for short to power supply • Check whether injector high side control circuit pin corresponding to ECM is short to the power supply
P215100	Cylinder 2 or Cylinder 3 Fuel Injector Control Circuit Short to Power Supply			
P070000	TCU Requests to Illuminate MIL Light	TCU Requests to Illuminate MIL Light	1. TCU fault	• Check whether TCU fault memory is faulty
P145000	Brake Booster Pressure Sensor Circuit Range/ Performance (High)	The brake chamber pressure is higher than the possible limit	1. Brake vacuum sensor characteristics have deviation 2. Brake vacuum chamber leakage	• Check whether there is contact resistance in brake vacuum sensor wire harness • Check whether sensor is damaged • Check whether brake vacuum chamber is leakage
P145100	Brake Booster Pressure Sensor Circuit Range/ Performance (Low)	The brake chamber pressure is lower than the possible limit		
P121200	Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Maximum Range)	Vehicle speed signal exceeds maximum possible value	1. ESP sends wrong speed signal	• Check whether the CAN signal sent by ESP is too high
P050184	Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Minimum Range)	Vehicle speed signal exceeds minimum possible value	1. ESP sends wrong speed signal 2. Vehicle speed signal frame communication between ESP and ECM is lost	• Check whether the communication between ESP and ECM is lost • Check whether the CAN signal sent by ESP is still 0
P050165	Vehicle speed sensor performance failure (vehicle speed is too low when oil cut-off during coasting)	Vehicle speed signal exceeds minimum possible value		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P050166	Vehicle Speed Sensor "A" Circuit Range/ Performance	Vehicle speed signal exceeds minimum possible value		
P050000	Vehicle Speed Sensor Input Signal Fault	CAN speed signal received by ECM is wrong		
P050B00	Cold Start Ignition Timing Performance	The ignition angle efficiency exceeds the setting threshold during heating of parking idle catalytic converter	1. There are other DTC such as throttle valve failure or misfire failure, resulting in a decrease in intake air flow and abnormal ignition angle efficiency 2. Electronic throttle is stuck in a position with a small opening 3 check whether the intake manifold is leakage, exhaust resistance is too large, and the oil supply pressure is too low 4. ECM failure	• Use diagnostic tester to check if there are other failures such as misfire failure and throttle failure • Electronic throttle is stuck in a position with a small opening • Check whether the intake manifold is leakage, whether the fuel injector is blocked, whether the exhaust resistance is too large, and whether the oil supply pressure is too low • Check whether ECM is faulty
P050B20	Cold Start Ignition Timing Performance	The ignition angle efficiency exceeds the setting threshold during heating of running catalytic converter	1. There are other DTC such as throttle valve failure or misfire failure, resulting in a decrease in intake air flow and abnormal ignition angle efficiency 2. Electronic throttle is stuck in a position with a small opening 3 Electronic throttle is stuck in a position with a small opening 4. ECM failure	• Use diagnostic tester to check if there are other failures such as misfire failure and throttle failure • Electronic throttle is stuck in a position with a small opening • Check whether the intake manifold is leakage; whether the exhaust resistance is too large; whether the fuel supply pressure is too low; whether the boost system has insufficient supercharging • Check whether ECM is faulty
P057100	Brake Pedal Signal Synchronization Malfunction	When the both paths of brake signal Brk_stMn and Brk_stRed are out of synchronization for more than 1 second, and the number of consecutive times exceeds Brk_	1. The brake switch or the brake light switch is open or short circuit 2. The switch in brake pedal has	• Collect the brake switch main signal Brk_stMn and brake redundancy signal Brk_stRed, check whether they meet the requirements of UMC: the brake can not be set

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		cntrSynErrThd_C, a fault will be reported	a mechanical failure	when the brake is lightly depressed, and the stroke of two asynchronous sections cannot be too long • Check whether the brake pedal wire harness connection is reliable and whether the brake pedal mechanical structure is abnormal • Clear DTC, restart the vehicle, and check whether the DTC is eliminated
P142000	CAN Hardware Memory Response Timeout	CAN module initialization failed	1. CAN module of MCU initialization failed	• Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P142100	LIN Hardware Memory Response Timeout	LIN module initialization failed	1. LIN module of MCU initialization failed	• Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P064100	5 V Power Supply Module 1 Fail	5 V power supply module 1 has an overvoltage or undervoltage problem	1.5 V power supply module 1 has an overvoltage or undervoltage problem	• There is wire harness signal interference
P065100	5 V Power Supply Module 2 Fail	5 V power supply module 2 has an overvoltage or undervoltage problem	1.5 V power supply module 2 has an overvoltage or undervoltage problem	• There is wire harness signal interference
P069700	5 V Power Supply Module 3 Fail	5 V power supply module 3 has an overvoltage or undervoltage problem	1.5 V power supply module 3 has an overvoltage or undervoltage problem	• There is wire harness signal interference
P068500	Main Relay Open Circuit Error	When ECM is powered on, the main relay is open	1. Open circuit in main relay	• There is wire harness interference • Transmission line between main relay and ECM damaged or interrupted

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P068700	Main Relay Short to Power Supply	When ECM is powered on, the main relay is short to power supply	1. Open circuit in main relay	• There is wire harness interference • Transmission line between main relay and ECM is damaged, resulting in short to power supply
P068600	Main Relay Short to Ground	When ECM is powered on, the main relay is short to ground	1. Short to ground in main relay	• There is wire harness interference • Transmission line between main relay and ECM is damaged, resulting in short to ground
P06869E	ECM/PCM Power Relay Control Circuit Low	When ECM is powered off, the UBR voltage is greater than the reasonable range after main relay is disconnected	1. When ECM is powered off, the UBR voltage is greater than the reasonable range after main relay is disconnected	• Main relay is stuck • There is interference in BR wire harness, and it is short to UBD
P261000	Unreasonable Shutdown Timing	When ECM is powered on, shutdown timing data is unreasonable	1. Shutdown timing data is unreasonable	• Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P06B842 P06B843	Error when Reading/Writing Flash Block	When ECM is powered on, failure occurs when reading/ writing Flash Block	1. Failure occurs when reading/ writing Flash Block	• Power off the key until the ECM is completely powered off, then power on the key to check whether the fault is eliminated
P126100	Cylinder 1 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 1 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness for cylinder 1 is abnormal 2. ECM internal circuit is abnormal	• Check whether cylinder 1 injector wire harness connection is normal • Replace the injector of cylinder 1, start the vehicle, and check whether the fault reappears • After replacing ECM, start the vehicle, and check whether the fault reappears
P126300	Cylinder 3 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 3 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness of cylinder 3 is abnormal 2. ECM internal circuit is abnormal	• Check whether cylinder 3 injector wire harness connection is normal • Replace the injector of cylinder 3, start the vehicle, and check

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				whether the fault reappears • After replacing ECM, start the vehicle, and check whether the fault reappears
P126400	Cylinder 4 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 4 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness of cylinder 4 is abnormal 2. ECM internal circuit is abnormal	• Check whether cylinder 4 injector wire harness connection is normal • Replace the injector of cylinder 4, start the vehicle, and check whether the fault reappears • After replacing ECM, start the vehicle, and check whether the fault reappears
P126200	Cylinder 2 Injector Circuit Range/ Performance - Signal Plausibility Failure	The first five times the voltage signal value of cylinder 2 injector is lower than the lower threshold, or the last three times the voltage signal value exceeds the upper threshold	1. Injector wire harness of cylinder 2 is abnormal 2. ECM internal circuit is abnormal	• Check whether cylinder 2 injector wire harness connection is normal • Replace the injector of cylinder 2, start the vehicle, and check whether the fault reappears • After replacing ECM, start the vehicle, and check whether the fault reappears
P143000	Battery Has Been Changed and Long Time No Tester Confirmation	ECM receives LIN communication and sends fault information	1. The battery type has changed	• Check whether the battery type has changed
P143100	EBS or Battery Error	ECM receives LIN communication and sends fault information	1. EBS circuit is open 2. EBS is damaged	• Check whether the EBS circuit is open • EBS damaged
P143200	EBS Temporary Error	ECM receives LIN communication and sends fault information	1. Wire harness interference in EBS LIN communication	• Check whether there is wire harness interference in EBS LIN communication
P144200	Communication Fault of Generator	ECM receives LIN communication and sends fault information	1. Interference or damage in generator LIN wire harness	• Check whether there is interference or damage in generator LIN communication module
P144100	Mechanical Fault of Generator	ECM receives LIN communication and sends fault information	1. The mechanical part of generator is stuck or damaged	• Check whether the mechanical part of generator is stuck or damaged

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P144000	Generator Circuit Error	ECM receives LIN communication and sends fault information	1. Electronic part of generator is damaged	• Check whether the electronic part of generator is damaged
P001100	“A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	When the engine starts, the intake camshaft is not in the locked position and exceeds the calibrated threshold	1. Intake VVT phase regulator and oil control valve are failure	• Check the operating status of intake VVT phase regulator and oil control valve (Blocked by dirt, stuck, oil pressure not completely relieved, lock pin invalid, etc.)
P001400	"B" Camshaft Position - Timing Over-Advanced or System Performance Bank 1	When the engine starts, the exhaust camshaft is not in the locked position and exceeds the calibrated threshold	1. Exhaust VVT phase regulator and oil control valve are failure	• Check the operating status of intake VVT phase regulator and oil control valve (Blocked by dirt, stuck, oil pressure not completely relieved, lock pin invalid, etc.)
P062700	Fuel Pump “A” Control Circuit Open	Hardware circuit self-diagnostic	1. Open circuit in fuel pump relay control circuit 2. Open circuit in fuel pump relay control terminal corresponding to ECM	• Check whether the fuel pump relay control circuit is open • Check whether the fuel pump relay control pin corresponding to ECM terminal is open
P062800	Fuel Pump “A” Control Circuit Low	Hardware circuit self-diagnostic	1. Fuel pump relay control circuit is short to ground 2. Fuel pump relay control terminal corresponding to ECM is short to ground	• Check whether the fuel pump relay control circuit is short to ground • Check whether the fuel pump relay control pin corresponding to ECM terminal is short to ground
P062900	Fuel Pump “A” Control Circuit High	Hardware circuit self-diagnostic	1. Fuel pump relay control circuit is short to power supply 2. Fuel pump relay control terminal corresponding to ECM is short to power supply	• Check whether the fuel pump relay control circuit is short to power supply • Check whether the fuel pump relay control pin corresponding to ECM terminal is short to power supply
P05BD00	Start and Stop Main Switch is Stuck Failure	The sticky time of start and stop main switch exceeds the threshold	1. The start and stop main switch is damaged 2. The corresponding pin of the start and stop main switch is short to power supply	• Check whether the start and stop main switch is damaged, whether it cannot be reset for a long time after being pressed • Check whether the corresponding pin of the start and stop main

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				switch is short to power supply
P26F100	Starter Relay R1 (Crank Relay) or Starter (Drive Chain) Relay R2 (Pt State Relay) Cannot Be Combined	There is a start request but no starter feedback signal	1. Start relay R1 is damaged 2. Starter (drive chain) relay R2 is damaged	• Check whether the start relay R1 is damaged • Check whether the starter (drive chain) relay R2 is damaged
P26F200	Starter (Drive Chain) Status Relay R2 (PT State Relay) Cannot Be Disconnected	The starter feedback signal can be detected by sending the start test pulse when the drive chain is locked	1. Starter (drive chain) relay R2 switch adhesion damage	• Check whether the switch of starter (drive chain) relay R2 is adhesion
P26F000	Starter Relay R1 (Crank relay) Cannot Be Disconnected	After the start, the starter feedback signal is detected when there is no start request	1. Starter relay R1 switch adhesion damage	• Check whether the starter relay R1 switch is adhesion
P14AD00	Engine Block or Starter is not Engaged	There is voltage drop and start feedback signal when starting, but the engine does not turn	1. Engine crankshaft or flywheel is stuck 2. The starter and the flywheel cannot be meshed	• Check whether the engine crankshaft and flywheel are blocked by foreign matters • Turn the key to "start", and check whether the starter and flywheel can mesh normally
P14AF00	KL50r Wire Short Circuit to Ground	The engine can start normally, but there is no starter feedback voltage signal	1. Start feedback signal circuit is open 2. Start feedback signal circuit is short to ground	• Check whether the starter feedback voltage signal circuit is short to ground or open
P14AE00	KL50r Wire Short Circuit to Battery	No start request, but the starter feedback voltage signal setting time exceeds the threshold	1. Start feedback signal circuit is short to power supply	• Check whether the start switch feedback signal circuit is short to power supply
P14AC00	Starter Damaged or Wire Dropped	There is no voltage drop and start feedback signal when starting, and engine does not turn	1. The starter power supply circuit is disconnected or damaged and short to power supply 2. The starter body is damaged or cannot work normally	• Check whether the starter power supply circuit is disconnected or damaged • Check whether the starter body is damaged or not working properly
P1388 24	Ambient Temperature Sensor Cold Start Test Positive		1. The initial value of ambient temperature is much higher than the basic	

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Deviation Unreasonable		calibration value (main water temperature, average intake air temperature) 2. The initial value of ambient temperature is much lower than the basic calibration value (main water temperature, average intake air temperature)	
P1388 23	Ambient Temperature Sensor Cold Start Test Negative Deviation Unreasonable			
P0070	Ambient Air Temperature Sensor Circuit "A"		1. ECM failed to normally receive the ambient temperature status transmitted from CAN 2. The transmitter of ambient temperature fails to send the signal normally	• Read ambient temperature value on CAN and check if it is reasonable • Read ambient temperature value on CAN and check if it is reasonable • Read ambient temperature status on CAN and check if it is reasonable
U0128	Lost Communication With EPB Module	ECM receiving EPB information timed out	1. EPB connector looseness or separation 2. Transmission line between EPB and ECM damaged or interrupted 3. EPB is damaged and signal cannot be transmitted to ECM normally	• EPB connector looseness or separation • There is wire harness signal interference • Transmission line between EPB and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • EPB is damaged and signal cannot be transmitted to ECM normally
U0131	Lost Communication With EPS (HS CAN)	ECM receiving EPS information timed out	1. EPS connector looseness or separation 2. Transmission line between EPS and ECM damaged or interrupted 3. EPS is damaged and signal cannot be transmitted to ECM normally	• EPS connector looseness or separation • There is wire harness signal interference • Transmission line between EPS and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • EPS is damaged and signal cannot be transmitted to ECM normally

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U0151	Lost Communication With Airbag Module (SDM) (HS CAN)	ECM receiving SDM information timed out	1. SDM connector looseness or separation 2. Transmission line between SDM and ECM damaged or interrupted 3. SDM is damaged and signal cannot be transmitted to ECM normally	• SDM connector looseness or separation • There is wire harness signal interference • Transmission line between SDM and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • SDM is damaged and signal cannot be transmitted to ECM normally
U0073	Control Module Communication Bus 1 Off (CAN1 Bus off)	CAN 1 bus is off	1. CAN 1 bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN bus interface pin 3. Short circuit to power supply / ground, open circuit or internal circuit damage in CAN 1 bus interface pin corresponding to ECM terminal	• CAN 1 bus interface looseness or poor contact • Short circuit to power supply / ground or open circuit in CAN 1 bus interface pin • There is wire harness signal interference • Short circuit to power supply / ground, open circuit or internal circuit damage in CAN 1 bus interface pin corresponding to ECM terminal
P150100	Airbag Communicate Message Unplausible	The signal sent by airbag controller to engine ECM has not passed the verification	1. There is wire harness interference or unreliable signal transmission 2. The signal sent by airbag controller to engine ECM has not passed the verification, check whether the signal is abnormal	• Wire harness interference or unreliable signal transmission • The signal sent by airbag controller to engine ECM has not passed the verification, check whether the signal is abnormal
P150000	EMS Received Crash Signal	CAN information is unreasonable	1. The vehicle crashes and airbag pops up 2. There is electromagnetic interference in the connection wire harness between airbag and ECM 3. There is electromagnetic	• The vehicle crashes and airbag pops up • There is electromagnetic interference in the connection wire harness between airbag and ECM • The signal sent by airbag to ECM is error and unreasonable

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			interference in the connection wire harness between airbag and ECM	
P053300	A/C Refrigerant Pressure Sensor "A" Circuit High	Sensor voltage is higher than the threshold	1. Intake manifold pressure sensor signal terminal is short to power supply or open 2. Sensor reference ground terminal is open 3. Short circuit to power supply or open circuit in intake pressure sensor signal pin terminal corresponding to ECM terminal 4. Sensor is damaged	• Connect the diagnostic tester and turn ignition switch to ON. Use a multimeter to measure whether the voltage between intake manifold pressure sensor signal terminal and ground is close to or equal to 5 V without starting the engine. • Turn ignition switch OFF and check connector for looseness or poor contact • Check for short circuit to power supply or open circuit in intake manifold pressure sensor signal terminal • Check sensor reference ground terminal for open • Check sensor for damage • Check if short circuit to power supply, open or internal circuit damage in intake pressure sensor signal pin terminal corresponding to ECM terminal
P053200	A/C Refrigerant Pressure Sensor "A" Circuit Low	Sensor voltage is lower than the threshold	1. A/C pressure sensor signal terminal is short to ground 2. 5 V reference voltage of sensor is open 3. Short circuit to ground in A/C pressure sensor signal pin corresponding to ECM terminal	• Connect the diagnostic tester and turn ignition switch to ON. Use a multimeter to measure whether the A/C pressure sensor signal terminal voltage is close to or equal to 0 V without starting the engine. • Turn ignition switch “OFF”, check pressure sensor signal terminal for short to ground • Check 5 V reference voltage terminal of sensor for open • Check if short circuit to ground in intake pressure sensor signal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				pin terminal corresponding to ECM
P050F00	Brake Assist Vacuum Too Low	When the vacuum pump is working, the differential pressure between front and rear of brake disc vacuum is lower than the setting threshold within a certain period of time (such as 1 second)	1. There is a problem with the sealing characteristics of brake booster system 2. Vacuum pump is damaged	• Check whether the sealing characteristics of brake booster system are abnormal • Check whether the vacuum pump is damaged
P258A00	Vacuum Pump Control Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Brake vacuum pump relay control circuit is open 3. Brake vacuum pump relay control circuit power supply terminal is open or shorted to ground 4. Brake vacuum pump relay fuse is blown or damaged 5. Open or internal circuit damage in brake vacuum pump control pin corresponding to ECM	• Connector looseness or poor contact • Brake vacuum pump relay control circuit is open • Brake vacuum pump relay control circuit power supply terminal open or short to ground • Brake vacuum pump relay fuse blown or damaged • Open circuit or internal circuit damage in brake vacuum pump control pin corresponding to ECM
P258C00	Vacuum Pump Control Circuit "A" Low	Drive channel self-diagnosis failure	1. Brake vacuum pump relay control circuit is short to ground 2. Brake vacuum pump relay pin corresponding to ECM terminal is short to ground	• Brake vacuum pump relay control circuit is short to ground • Brake vacuum pump relay pin corresponding to ECM terminal is short to ground
P258D00	Vacuum Pump Control Circuit "A" High	Drive channel self-diagnosis failure	1. Brake vacuum pump relay circuit is short to power supply 2. Brake vacuum pump relay pin corresponding to ECM terminal is short to power supply	• Brake vacuum pump relay circuit is short to power supply • Brake vacuum pump relay pin corresponding to ECM terminal is short to power supply

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U015187 U010387 U012887 U118787 U024887 U021287 U01B000 U010987	Lose Communication With ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS or Signal Abnormal	ECM receiving ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS information timed out	1. ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS connector looseness or separation 2. Transmission line between ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS and ECM damaged or interrupted 3. ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS is damaged and signal cannot be transmitted to ECM normally	• ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS connector looseness or separation • There is wire harness signal interference • Transmission line between ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • ABM/EGS/EPB/MFS/PEPS/SAM/EBS/DECOS is damaged and signal cannot be transmitted to ECM normally
U041681 U040281 U045281 U042281 U042481 U040481 U041781 U041081 U042381 U059B81 U042681 U042981	Data Received by ECM from ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM Module not Reliable	Data from ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM module is invalid	1. The checksum value sent by ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM module is abnormal 2. The Alive counter value sent by ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM module is abnormal 3. The value sent by ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM module contains an Invalid value	• ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM connector looseness or separation • There is wire harness signal interference • Transmission line between ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM is damaged and signal cannot be transmitted to ECM normally
P059700	Thermostat Heater Control Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Electronic thermostat drive circuit pin is open 3. Open circuit or internal circuit damage in electronic thermostat drive	• Check connector for looseness or poor contact • Check electronic thermostat drive circuit pin for open • Check if open or internal circuit damage in electronic thermostat drive circuit pin

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			circuit pin corresponding to ECM terminal	corresponding to ECM terminal
P059800	Thermostat Heater Control Circuit Low	Drive channel self-diagnosis failure	1. Electronic thermostat drive circuit short to ground 2. Short to ground in electronic thermostat drive circuit corresponding to ECM terminal	• Check electronic thermostat drive circuit pin for short to ground • Check if short to ground in electronic thermostat drive circuit pin corresponding to ECM terminal
P059900	Thermostat Heater Control Circuit High	Drive channel self-diagnosis failure	1. Electronic thermostat drive circuit short to power supply 2. Short to power supply in electronic thermostat drive circuit corresponding to ECM terminal	• Check electronic thermostat drive circuit pin for short to power supply • Check if short to power supply in electronic thermostat drive circuit pin corresponding to ECM terminal
U007388	CAN1 Bus OFF (Communication Closed)	CAN 1 bus is off	1. CAN 1 bus interface looseness or poor contact 2. Short circuit to power supply / ground or open circuit in CAN bus interface pin 3. Short circuit to power supply / ground, open circuit or internal circuit damage in CAN 1 bus interface pin corresponding to ECM terminal	• CAN 1 bus interface looseness or poor contact • Short circuit to power supply / ground or open circuit in CAN 1 bus interface pin • There is wire harness signal interference • Short circuit to power supply / ground, open circuit or internal circuit damage in CAN 1 bus interface pin corresponding to ECM terminal
P007200	Ambient Air Temperature Sensor Circuit "A" Low	Ambient temperature sensor circuit connectivity self-diagnosis	1. Wire harness of ambient temperature sensor is abnormally connected 2 Ambient temperature sensor is damaged	• Using multimeter, check whether the sensor pin voltage is normal • Check whether CAN signal is normal • Check whether wire harnesses is normal • Replace ECM, and check whether the fault reappears
P007300	Ambient Air Temperature Sensor Circuit "A" High	Ambient temperature sensor signal circuit connectivity self-diagnosis	1. Wire harness of ambient temperature sensor is	• Using multimeter, check whether the sensor pin voltage is normal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			abnormally connected 2 Ambient temperature sensor is damaged	• Check whether CAN signal is normal • Check whether wire harnesses is normal • Replace ECM, and check whether the fault reappears
P254200	DECOS Oil Passage Pressure Sensor Circuit High Voltage	Fuel rail pressure sensor circuit voltage is higher than 4.8 V	1. Fuel rail pressure sensor circuit short to power supply 2. Fuel rail pressure sensor pin corresponding to ECM short to power supply	• Check sensor signal terminal for short to power supply or open • Check sensor for damage • Check for short circuit to power supply, open or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P254100	DECOS Oil Passage Pressure Sensor Circuit Low Voltage	Fuel rail pressure sensor circuit voltage is lower than 0.2 V	1. Fuel rail pressure sensor circuit short to ground 2. Fuel rail pressure sensor pin corresponding to ECM short to ground	• Check sensor signal terminal for short to ground • Check sensor for damage • Check for short circuit to power supply, open or internal circuit damage in fuel rail pressure sensor signal pin corresponding to ECM terminal
P254029	DECOS Oil Passage Pressure Sensor Circuit Bank 1-Positive Offset	The low pressure fuel rail pressure signal during the end of engine operation is higher than the upper threshold	1. Low pressure oil passage sensor internal circuit and wire harness are deteriorated	• Check whether there is a large contact resistance at the connector of DECOS pressure sensor or in the wire harness? • Replace the DECOS pressure sensor, return the vehicle to customer, and check whether the fault will be reported again?
P254028	DECOS Oil Passage Pressure Sensor Circuit Bank 1-Negative Offset	The low pressure fuel rail pressure signal during the end of engine operation is lower than the threshold	1. Low pressure oil passage sensor internal circuit and wire harness are deteriorated	• Check whether there is a large contact resistance at the connector of DECOS pressure sensor or in the wire harness? • Replace the DECOS pressure sensor, return the vehicle to customer, and check whether the fault will be reported again?

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P137000	DECOS Oil Passage Pressure Sensor Relative Pressure Too Low	The relative pressure of pressure sensor is lower than the fault threshold	1. Oil passage is leakage 2. Insufficient fuel 3. Check valve is damaged 4. Low pressure oil pump is damaged	• Check for leakage in oil passage • Check if fuel is insufficient • Check if the check valve is damaged • Check low pressure oil pump for damage
P137100	DECOS Oil Passage Pressure Sensor Relative Pressure Too High	The low pressure fuel rail pressure signal is higher than the upper threshold	1. Relief valve is blocked 2. Low pressure oil pump is damaged	• Check whether the relief valve of low pressure oil passage is blocked • Check low pressure oil pump for damage
P025D00	Fuel Pump Module "A" Control Circuit High	Hardware circuit self-diagnostic	1. Low pressure oil pump control circuit short to power supply 2. Short to power supply in low pressure oil pump pin corresponding to ECM	• Check whether the actuator terminal is short to the power supply • Check whether the actuator pin corresponding to ECM is short to the power supply
P025A00	Fuel Pump Module "A" Control Circuit Open	Hardware circuit self-diagnostic	1. Low pressure oil pump control circuit is open 2. Open circuit in low pressure oil pump pin corresponding to ECM	• Check if actuator terminal is open • Check whether the actuator pin corresponding to ECM terminal is open
P008A00	DECOS Low Pressure Oil Passage Pressure Too Low	The low pressure fuel rail pressure is lower than the expected value	1. Oil passage is leakage 2. Insufficient fuel 3. Check valve is damaged 4. Low pressure oil pump is damaged	• Check for leakage in oil passage • Check if fuel is insufficient • Check if the check valve is damaged • Check low pressure oil pump for damage
P008B00	Low Pressure Fuel System Pressure - Too High	The low pressure fuel rail pressure is higher than the expected value	1. Low pressure oil pump is damaged 2. Relief valve is blocked	• Check whether the damage of low pressure oil pump is normal • Check relief valve for blockage or abnormal operation
P016F00	DECOS Low Pressure Oil Passage PWM Control Deviation Too Large	Control deviation exceeds the maximum	1. Relief valve is blocked 2. Low pressure oil pump is damaged	• Check whether the relief valve of low pressure oil passage is blocked • Check low pressure oil pump for damage

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P062A00	Fuel Pump Module Control Circuit High	Drive channel self-diagnosis failure	1. Fuel pump relay control circuit is short to power supply 2. Fuel pump relay control pin corresponding to ECM is short to power supply	• Check whether the fuel pump relay terminal is short to power supply • Whether there is a fault in internal chip of ECM
P013000	Upstream Oxygen Sensor Compensating Circuit Open	Under the condition of low exhaust temperature and oil cut-off, the oxygen sensor voltage signal is high for a long time	1. Upstream oxygen sensor compensation circuit is open	• Check whether there is poor contact at the connector of oxygen sensor (pin opposite to green wire) • Check the continuity of oxygen sensor wire harness, whether there is an open circuit • Check the connector between wire harness and ECM for pin abnormality, resulting in poor contact • Clear DTC, start the vehicle and run until the coolant temperature reach the normal valve, and check whether the fault is reported again. • Check whether there is any abnormality in LSU processing circuit inside ECM
P223700	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (Close to ECM)	Chip fault memory diagnosis	1. Open circuit in LSU oxygen sensor APE line, which is close to ECM terminal 2. ECM internal circuit is abnormal	• Replace oxygen sensor, and check whether the fault reappears • Replace ECM, and check whether the fault reappears
P208062	Particulate Filter Upstream Temperature Sensor Signal Measured Value Unreasonable	The measured value of upstream temperature sensor of particulate filter is too different from the model value	1. There is interference in upstream temperature sensor circuit of particulate filter 2. The particulate filter upstream temperature sensor characteristic is aging and deviation	• Check the upstream temperature sensor circuit of particulate filter for interference • Check whether the upstream temperature sensor of particulate filter is aging and deviation

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P20802A	Particulate Filter Upstream Temperature Sensor Signal Stuck	The signal of upstream temperature sensor of particulate filter is sticky	1. There is interference in upstream temperature sensor circuit of particulate filter 2. The particulate filter upstream temperature sensor characteristic is aging and deviation	• Check the GPF temperature sensor circuit for interference • Check whether the GPF temperature sensor is aging and deviation
P054500	Particulate Filter Upstream Temperature Sensor Circuit Voltage Low	The voltage of upstream temperature sensor circuit of particulate filter is below the limit	1. The upstream temperature sensor signal terminal of particulate filter is short to the ground	• Use a multimeter to measure if upstream temperature sensor signal terminal voltage of particulate filter is close to or equal to 0 V • Turn ignition switch “OFF”, and check if particulate filter upstream temperature sensor signal terminal is short to ground • Sensor is damaged • The particulate filter upstream temperature sensor signal pin terminal corresponding to the ECM terminal is short to ground
P054600	Particulate Filter Upstream Temperature Sensor Circuit Voltage High	The voltage of upstream temperature sensor circuit of particulate filter is higher than the limit	1. Particulate filter upstream temperature sensor signal terminal is short to power supply or open 2. Short circuit to power supply, open circuit or internal circuit damage in particulate filter upstream temperature sensor signal pin	• Use a multimeter to measure if the voltage between particulate filter upstream temperature sensor signal terminal and ground is close to or equal to 5 V • Turn ignition switch OFF and check connector for looseness or poor contact • Check sensor signal terminal for short to power supply or open • Check sensor reference ground for open • Check sensor for damage • Check if short circuit to power supply, open or internal circuit damage in particulate filter upstream temperature

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				sensor signal pin corresponding to ECM
P20E224	Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (-Positive Deviation)	The particulate filter upstream temperature sensor signal is too high for cold start calibration	1. There is interference in upstream temperature sensor circuit of particulate filter 2. The particulate filter upstream temperature sensor characteristic is aging and deviation	• Check the upstream temperature sensor circuit of particulate filter for interference • Check whether the upstream temperature sensor of particulate filter is aging and deviation
P20E223	Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (-Negative Deviation)	The particulate filter upstream temperature sensor signal is too low for cold start calibration		
P218324	Engine Coolant Temperature Sensor 2 Circuit Range/ Performance	Deviation of coolant temperature sensor 2 cold start and the model value is too large	1. Internal resistance of coolant temperature sensor 2 is unreasonable	• Check wire harness for contact resistance • Check whether the internal resistance of sensor has a large deviation from the normal value
P218323	Engine Coolant Temperature Sensor 2 Circuit Range/ Performance			
P12A300	Particulate Filter Differential Pressure Sensor Line Connection Error	The measured value of particulate filter differential pressure sensor is unreasonable	1. The front/rear differential pressure sensor line falls off or leaks 2. The front and rear differential pressure sensor lines are reversed	• Check whether the front and rear differential pressure sensor lines fall off or leak • Check whether there is a reverse connection between the front and rear differential pressure sensor lines
U060100	Particulate Filter Differential Pressure Sensor Sent Communication Failure	Sent message indicates communication failure	1. Differential pressure sensor itself failure	• Check whether the differential pressure sensor circuit harness is faulty • Check whether the sensor itself is faulty
U060141	Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible	Sent information indicates that the data check is unreasonable		
P129300	Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-	Channel 1 digital signal is unreasonable		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	plausible (SENT Signal High or Low)			
P245500	Particulate Filter Differential Pressure Sensor Circuit Voltage High	Particulate Filter Differential Pressure Sensor Circuit Voltage High	1. The differential pressure sensor circuit is short to power supply	• Check whether the wire harness of differential pressure sensor circuit is short to power supply • Check whether the sensor itself is short
P245400	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	1. The differential pressure sensor circuit is short to ground	• Check whether the wire harness of differential pressure sensor circuit is short to ground • Check whether the sensor itself is short
P129100	Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible	The measured value of particulate filter differential pressure does not match the flow model	1. Differential pressure sensor failure 2. Frozen in the sampling line	• Check whether the differential pressure sensor line is frozen • Replace the sensor and check if the fault is repaired
P226D00	Particulate Filter Removed	The calculation amount of particulate filter differential pressure model is lower than the threshold	1. The particulate filter is removed 2. Particulate filter is burnt	• Check whether the particulate filter has been removed • Check whether the particulate filter is burnt
P129000	Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable	The running learning value of particulate filter differential pressure sensor exceeds the limit	1. The zero offset of differential pressure sensor is too large	• Check whether there is contact resistance in differential pressure sensor circuit wire harness • Check whether the characteristic deviation of sensor itself is too large
P054A00	Exhaust VVT actual position deviation fault during catalytic converter heating	The actual position of exhaust VVT during the heating process of catalytic converter is too different from the target position	1. Insufficient OCV oil valve pressure 2.OCV oil valve is blocked or leaking	• Check if operating condition of cam phase regulator is normal (dirt blocked, oil leakage, stuck) • Check if operating condition of OCV oil control valve is normal
P048371	Fan Rationality Check Error (-Type 1)	The fan feedback signal type is fault type 1	1. Fun blocking	• Check if the cooling fan is blocked
P048372	Fan Rationality Check Error (-Type 2)	The fan feedback signal type is fault type 2	1. Fan overload	• Check whether the cooling fan load is too high

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P048373	Fan Rationality Check Error (-Type 3)	The fan feedback signal type is fault type 3	1. Fan power supply is too high or too low	• Check whether the cooling fan power supply is too high or too low
P048374	Fan Rationality Check Error (-Type 4)	The fan feedback signal type is fault type 4	1. Fan control circuit over temperature	• Check whether the cooling fan control circuit is short circuit or overload
U010187	Lost Communication With TCM (-Transmission Controller)	ECM receiving TCM information timed out	1. TCM connector looseness or separation 2. Transmission line between TCM and ECM damaged or interrupted 3. TCM is damaged and signal cannot be transmitted to ECM normally	• TCM connector looseness or separation • There is wire harness signal interference • Transmission line between TCM and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • TCM is damaged and signal cannot be transmitted to ECM normally
U012287	Lost Communication With ESP (-Electronic Stability Program)	ECM receiving ESP information timed out	1. ESP connector looseness or separation 2. Transmission line between ESP and ECM damaged or interrupted 3. ESP is damaged and signal cannot be transmitted to ECM normally	• ESP connector looseness or separation • There is wire harness signal interference • Transmission line between ESP and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • ESP is damaged and signal cannot be transmitted to ECM normally
P218400	Engine Coolant Temperature Sensor 2 Circuit Low	Coolant temperature sensor 2 voltage is lower than 0.09 V	1. Coolant temperature sensor 2 signal terminal is short to ground 2. Short circuit to ground in coolant temperature sensor 2 signal pin corresponding to ECM terminal 3. Sensor is damaged	• Use a multimeter to measure if coolant temperature sensor 2 signal terminal voltage is close to or equal to 0 V • Turn ignition switch “OFF”, check coolant temperature sensor 2 signal terminal for short to ground • Check sensor for damage • Check coolant temperature sensor 2 signal pin terminal corresponding to ECM for short to ground

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P218500	Engine Coolant Temperature Sensor 2 Circuit High	Coolant temperature sensor 2 voltage is higher than 4.9 V	1. connector looseness or poor contact 2. Coolant temperature sensor 2 signal terminal is short to power supply or open 3. Short circuit to power supply or open in coolant temperature sensor 2 signal pin corresponding to ECM terminal 4. Sensor is damaged	• Use a multimeter to measure if voltage between coolant temperature sensor 2 signal terminal and ground is close to or equal to 5 V • Turn ignition switch OFF and check connector for looseness or poor contact • Check for short circuit to power supply or open circuit in sensor signal terminal • Open circuit in sensor reference ground • Sensor is damaged • Short circuit to power supply, open circuit or internal circuit damage in coolant temperature sensor 2 signal pin terminal corresponding to ECM
U015587	Lost Communication With IP (-Instrument Cluster)	ECM receiving IP information timed out	1. IP connector looseness or separation 2. Transmission line between IP and ECM damaged or interrupted 3. IP is damaged and signal cannot be transmitted to ECM normally	• IP connector looseness or separation • There is wire harness signal interference • Transmission line between IP and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • IP is damaged and signal cannot be transmitted to ECM normally
U016487	Communication between ECM and AC Control Module Failure	ECM receiving AC information timed out	1. AC connector looseness or separation 2. Transmission line between AC and ECM damaged or interrupted 3. AC is damaged and signal cannot be transmitted to ECM normally	• AC connector looseness or separation • There is wire harness signal interference • Transmission line between AC and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • AC is damaged and signal cannot be transmitted to ECM normally
U014087	Lost Communication With BCM (Body Control Module)	ECM receiving BCM information timed out	1. BCM connector looseness or separation 2.	• BCM connector looseness or disengagement

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			Transmission line between BCM and ECM damaged or interrupted 3. BCM is damaged and signal cannot be transmitted to ECM normally	• There is wire harness signal interference • Transmission line between BCM and ECM damaged or interrupted • Check if there is CAN hardware circuit fault • BCM is damaged and signal cannot be transmitted to ECM normally
P12E000	Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable	The running learning value of particulate filter differential pressure sensor exceeds the limit	1. The zero offset of differential pressure sensor is too large	• Check whether there is contact resistance in differential pressure sensor circuit wire harness • Check whether the characteristic deviation of sensor itself is too large
P12E100	Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible	The measured value of particulate filter differential pressure does not match the flow model	1. Differential pressure sensor failure 2. Frozen in the sampling line	• Check whether the differential pressure sensor line is frozen • Replace the sensor and check if the fault is repaired
P12E300	Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (SENT Signal High or Low)	Channel 1 digital signal is unreasonable	1. Differential pressure sensor itself failure	• Check whether the differential pressure sensor circuit harness is faulty • Check whether the sensor itself is faulty
P12A200	Particulate Filter Differential Pressure Sensor Line Connection Error	The measured value of particulate filter differential pressure sensor is unreasonable	1. The front/rear differential pressure sensor line falls off or leaks 2. The front and rear differential pressure sensor lines are reversed	• Check whether the front and rear differential pressure sensor lines fall off or leak • Check whether there is a reverse connection between the front and rear differential pressure sensor lines
P246100	Particulate Filter Differential Pressure Sensor Circuit Voltage High	Particulate Filter Differential Pressure Sensor Circuit Voltage High	1. The differential pressure sensor circuit is short to power supply	• Check whether the wire harness of differential pressure sensor circuit is short to power supply • Check whether the sensor itself is short

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P246000	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	Particulate Filter Differential Pressure Sensor Circuit Voltage Low	1. The differential pressure sensor circuit is short to ground	• Check whether the wire harness of differential pressure sensor circuit is short to ground • Check whether the sensor itself is short
U060200	Particulate Filter Differential Pressure Sensor Sent Communication Failure	Sent message indicates communication failure	1. Differential pressure sensor itself failure	• Check whether the differential pressure sensor circuit harness is faulty • Check whether the sensor itself is faulty
U060241	Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible	Sent information indicates that the data check is unreasonable	1. Differential pressure sensor itself failure	• Check whether the differential pressure sensor circuit harness is faulty
P025C00	Fuel Pump Module "A" Control Circuit Low	Hardware circuit self-diagnostic	1. Low pressure oil pump control circuit short to ground 2. Short to ground in low pressure oil pump pin corresponding to ECM	• Check whether the actuator terminal is short to the ground • Check whether the actuator pin corresponding to ECM is short to the ground
P016E00	Closed Loop Fuel Pressure Control At Limit - Pressure Too High	Control deviation is below minimum	1. Low pressure oil pump is damaged 2. Relief valve is blocked	• Check whether the damage of low pressure oil pump is normal • Check relief valve for blockage or abnormal operation
P053A00	Crankcase Heating Line Circuit Open	Drive channel self-diagnosis failure	1. Connector looseness or poor contact 2. Open circuit in crankcase line heater control circuit pin terminal 3. Crankcase line heater control circuit power supply terminal is not connected to main relay 4. Sensor is damaged 5. Open circuit or internal circuit damage in crankcase line heater pin circuit corresponding to ECM terminal	• Check connector for looseness or poor contact • Open circuit in crankcase line heater control circuit pin terminal • Crankcase line heater control circuit power supply terminal is not connected to main relay • Sensor is damaged • Open circuit or internal circuit damage in crankcase line heater pin circuit corresponding to ECM terminal

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P053C00	Crankcase Heating Line Circuit Voltage Too High	Drive channel self-diagnosis failure	1. Short to power supply in crankcase line heater control circuit pin terminal	• Check whether the crankcase line heater control circuit pin terminal is short to power supply • Check whether the crankcase line heater pin corresponding to ECM terminal is short to power supply
P053B00	Crankcase Heating Line Circuit Voltage Too Low	Drive channel self-diagnosis failure	1. Crankcase line heater control circuit pin terminal is short to ground 2. Crankcase line heater control circuit power supply terminal is grounded 3. Crankcase line heater pin corresponding to ECM terminal is short to ground	• Check connector for looseness or poor contact • Open circuit in crankcase line heater control circuit pin terminal • Crankcase line heater control circuit power supply terminal is not connected to main relay
P121B00	Front Left Wheel Speed Sensor Signal NG	ABS-ECM sends the front left wheel speed sensor fault flag bit	1. The front left wheel speed sensor is faulty	• Check whether the ABS-ECM fault memory is faulty
P121C00	Front Right Wheel Speed Sensor Signal NG	ABS-ECM sends the front right wheel speed sensor fault flag bit	1. The front right wheel speed sensor is faulty	• Check whether the ABS-ECM fault memory is faulty
P121D00	Rear Left Wheel Speed Sensor Signal NG	ABS-ECM sends the rear left wheel speed sensor fault flag bit	1. The rear left wheel speed sensor is faulty	• Check whether the ABS-ECM fault memory is faulty
P121E00	Rear Right Wheel Speed Sensor Signal NG	ABS-ECM sends the rear right wheel speed sensor fault flag bit	1. The rear right wheel speed sensor is faulty	• Check whether the ABS-ECM fault memory is faulty
P063449	Brake Vacuum Pump Drive Chip Overheat	Drive channel self-diagnosis failure	1. Short circuit to power supply in brake vacuum pump control circuit 2. Brake vacuum pump control pin corresponding to ECM terminal is short to power supply	• Short circuit to power supply in brake vacuum pump control circuit • Whether there is a fault in internal chip of ECM

4.7 DTC Diagnosis Procedure

■ Intake/Exhaust Phaser Operation (Slow, Stuck) Malfunctions

DTC	**P000A00**	**"A" Camshaft Position Slow Response Bank 1**
DTC	**P003C00**	**"A" Camshaft Profile Control Performance/Stuck Off Bank 1**
DTC	**P000B00**	**"B" Camshaft Position Slow Response Bank 1**
DTC	**P005A00**	**"B" Camshaft Profile Control Performance/Stuck Off Bank 1**
DTC	**P001100**	**"A" Camshaft Position - Timing Over-Advanced or System Performance Bank 1**
DTC	**P001400**	**"B" Camshaft Position - Timing Over-Advanced or System Performance Bank 1**
DTC	**P054A00**	**Exhaust VVT actual position deviation fault during catalytic converter heating**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check phaser solenoid valve, valve body bolt components state**

(a) Disconnect the negative battery cable.
(b) Remove intake/exhaust phaser solenoid valve; Check for blockage or dirty.
(c) Remove intake/exhaust phaser valve body bolts; Check for blockage or dirt.

NG → **Clean or replace phaser solenoid valve and valve body bolts.**

OK

2	**Check engine maintenance condition**

(a) Check if engine oil level is normal, and check for oil leakage and oil seepage.
(b) Remove valve trim cover, and check engine lubrication and cleaning conditions, and check for wear or sludge dirty

NG → **Clean and maintain the engine, replace the damaged components.**

OK

3	Check engine oil pressure

(a) Remove oil pressure sensor; Connect oil pressure tester to test oil pressure.

Main oil passage pressure: Limit pressure range (0.9 - 10 bar)

NG → **Check or replace oil pump assembly.**

OK

4	Check intake/exhaust phaser assembly

(a) Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck, etc.).

NG → **Replace intake/exhaust phaser assembly.**

OK

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Intake Phaser Solenoid Valve Control Circuit Open

DTC	P001000	"A" Camshaft Position Actuator Control Circuit Open Bank 1

■ Description

Control schematic diagram

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check intake phaser solenoid valve connector

(a) Disconnect the negative battery.
(b) Unplug intake phaser solenoid valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

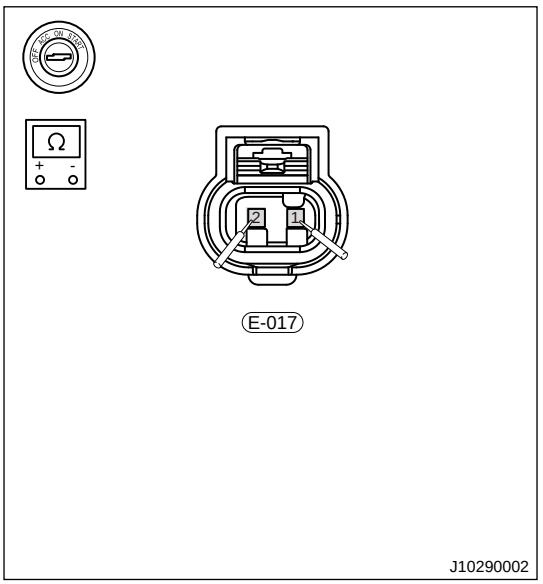
NG → **Repair connector or replace intake phaser solenoid valve.**

OK

2	Check intake phaser solenoid valve internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of intake phaser solenoid valve E-017 (1-2) are normal with red and black probes respectively.

Resistance at ambient temperature: 6 Ω



NG → **Replace intake phaser solenoid valve assembly.**

OK

3	Check intake phaser solenoid valve power supply fuse

(a) Turn ENGINE START STOP switch to ON.
(b) Check fuse EF21 15A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG

It indicates that there is short to ground in circuit.

OK

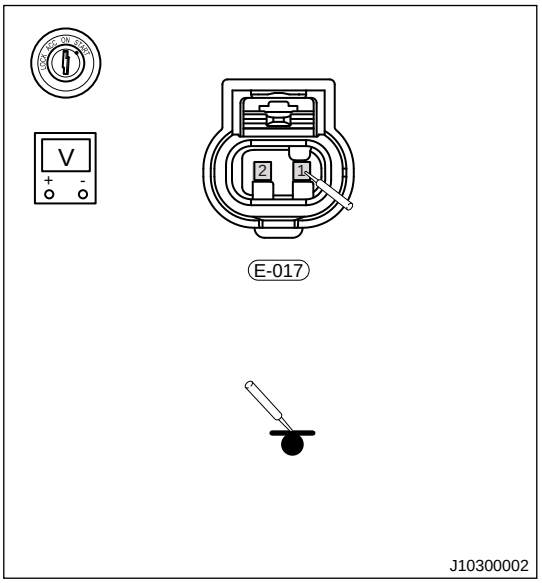
4	Check intake phaser solenoid valve power supply and control terminal

(a) Connect intake phaser solenoid valve connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake phaser solenoid valve E-017 (1, 2) with red probe.

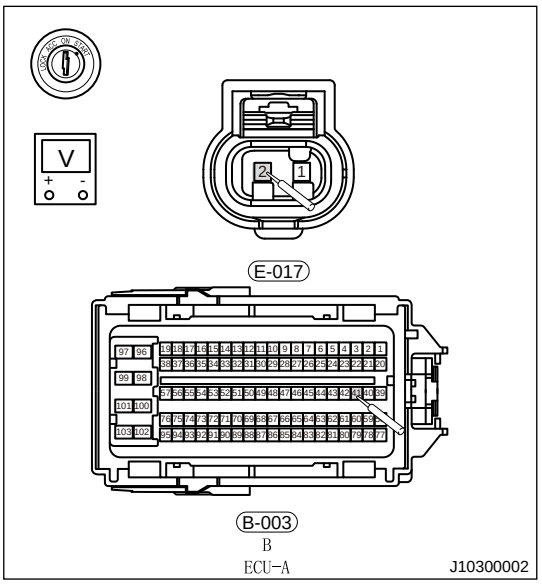
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-003 (A41), measure voltages of intake phaser solenoid valve E-017 (2) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG

Repair wire harness.

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → Repair or replace new module.

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → Conduct test and confirm malfunction has been repaired.

■ **Exhaust Phaser Solenoid Valve Control Circuit Open**

DTC	P001300	"B" Camshaft Position Actuator Control Circuit Open Bank 1

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check exhaust phaser solenoid valve connector

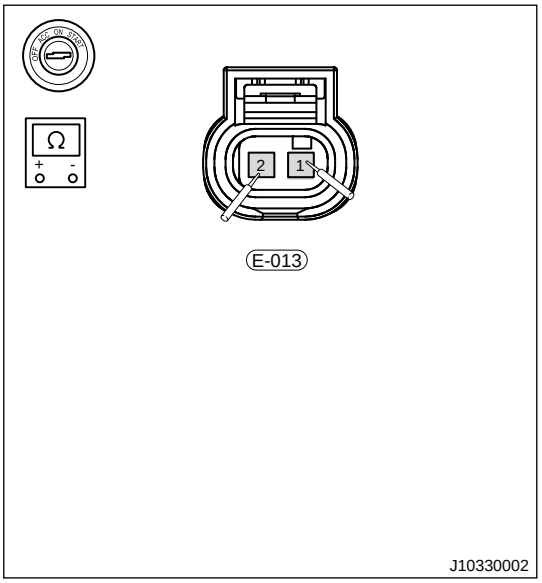
(a) Disconnect the negative battery.
(b) Unplug exhaust phaser solenoid valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → Repair connector or replace exhaust phaser solenoid valve.

OK

2	Check exhaust phaser solenoid valve internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of exhaust phaser solenoid valve E-013 (1-2) are normal with red and black probes respectively.



NG → **Replace exhaust phaser solenoid valve assembly.**

OK

3	**Check exhaust phaser solenoid valve power supply fuse**

(a) Turn ENGINE START STOP switch to ON.
(b) Check fuse EF21 15A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK

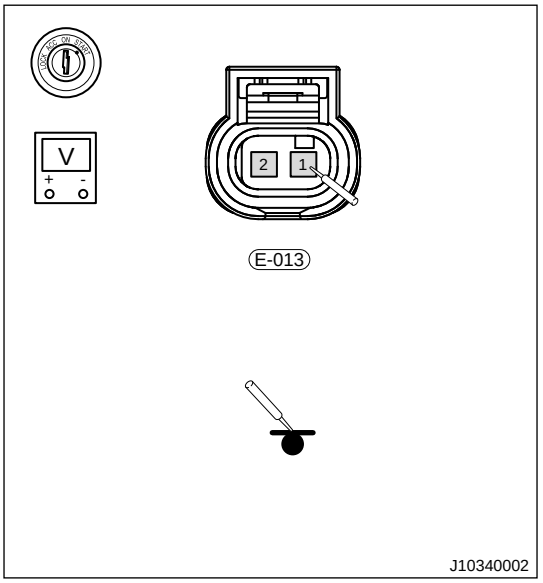
4	**Check exhaust phaser solenoid valve power supply and control terminal**

(a) Connect exhaust phaser solenoid valve connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of exhaust phaser solenoid valve E-013 (1, 2) with red probe.

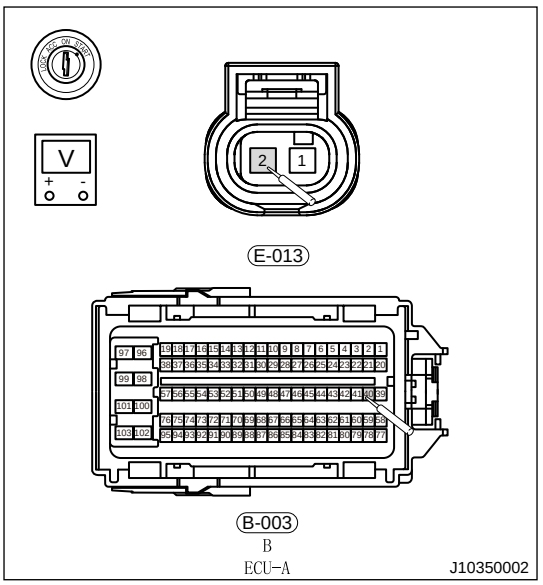
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-003 (A40), measure voltages of exhaust phaser solenoid valve E-013 (2) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair wire harness.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Crankshaft - Intake/Exhaust Camshaft Installation Position Non-plausible/Deviation Excessive Malfunction

DTC	**P001676**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A**
DTC	**P001678**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A**
DTC	**P001776**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B**
DTC	**P001778**	**Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor B**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check phaser solenoid valve, valve body bolt components state**

(a) Disconnect the negative battery cable.
(b) Remove intake/exhaust phaser solenoid valve; Check for blockage or dirty.
(c) Remove intake/exhaust phaser valve body bolts; Check for blockage or dirt.

NG → **Clean or replace phaser solenoid valve and valve body bolts.**

OK

2	**Check engine maintenance condition**

(a) Check if engine oil level is normal, and check for oil leakage and oil seepage.
(b) Remove valve trim cover, and check engine lubrication and cleaning conditions, and check for wear or sludge dirty

NG → **Clean and maintain the engine, replace the damaged components.**

OK ↓

3	**Check engine oil pressure**

(a) Remove oil pressure sensor; Connect oil pressure tester to test oil pressure.

Main oil passage pressure: Limit pressure range (0.9 - 10 bar)

NG → **Check or replace oil pump assembly.**

OK ↓

4	**Check valve mechanism timing**

(a) Check if valve mechanism timing is normal, and check timing chain for teeth skipping, misalignment, elongation, etc.
(b) Check camshaft signal plate for misalignment, looseness, etc.

NG → **Replace timing chain or camshaft assembly.**

OK ↓

5	**Check intake/exhaust phaser assembly**

(a) Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck, etc.).

NG → **Replace intake/exhaust phaser assembly.**

OK ↓

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired.**

■ Downstream Oxygen Sensor Heater Control Circuit Open/Low/High/Faulty

DTC	**P003000**	**HO2S Heater Control Circuit Bank 1 Sensor 1**
DTC	**P003100**	**HO2S Heater Control Circuit Low Bank 1 Sensor 1**
DTC	**P003200**	**HO2S Heater Control Circuit High Bank 1 Sensor 1**
DTC	**P005300**	**HO2S Heater Resistance Bank 1 Sensor 1**
DTC	**P064D00**	**LSU Integrated Ship Failure**
DTC	**P064D13**	**Upstream Oxygen Sensor Sensing Element Failure**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check upstream oxygen sensor connector**

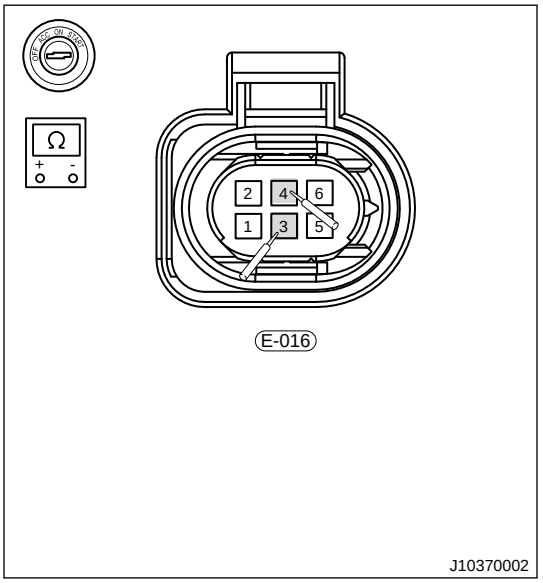
(a) Disconnect the negative battery.
(b) Unplug upstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG	**Repair and adjust connector, or replace upstream oxygen sensor.**

OK

2	**Check upstream oxygen sensor heater internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of upstream oxygen sensor E-016 (3-4) are normal with red and black probes respectively.



NG → **Replace upstream oxygen sensor assembly.**

OK

3	Check upstream oxygen sensor heater power supply fuse

(a) Turn ENGINE START STOP switch to ON.
(b) Check fuse EF18 10A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK

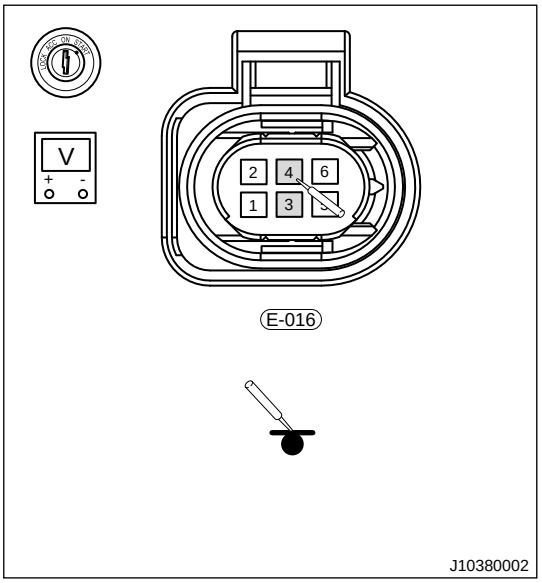
4	Check upstream oxygen sensor heater power supply and heater control terminal

(a) Install the upstream oxygen sensor connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of upstream oxygen sensor E-016 (3, 4) with red probe.

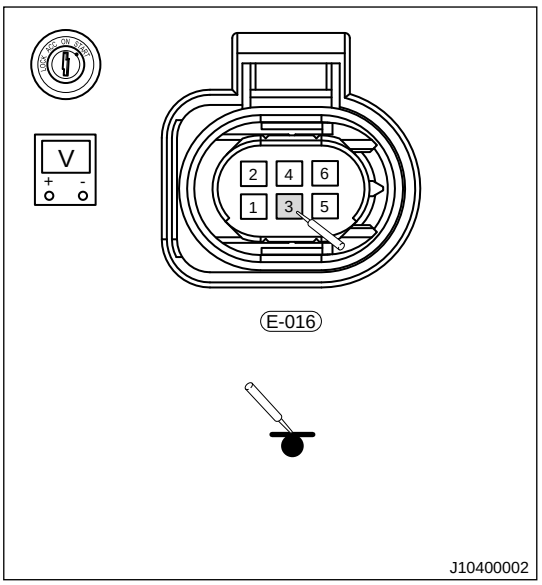
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of upstream oxygen sensor E-016 (3) with red probe.

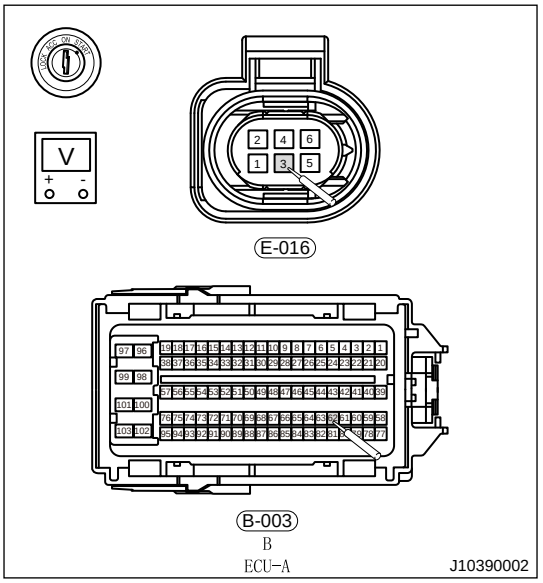
Control heating voltage should be within 0 V and current battery voltage



(f) Start the engine.

(g) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-003 (A62), measure voltage of upstream oxygen sensor E-016 (3) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Boost Discharge Control Valve Drive Circuit Short to Ground/Power Supply

DTC	**P003411**	**Boost Discharge Control Valve Drive Circuit Short to Ground**
DTC	**P003512**	**Boost Discharge Control Valve Drive Circuit Short to Power Supply**

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check boost discharge control valve connector**

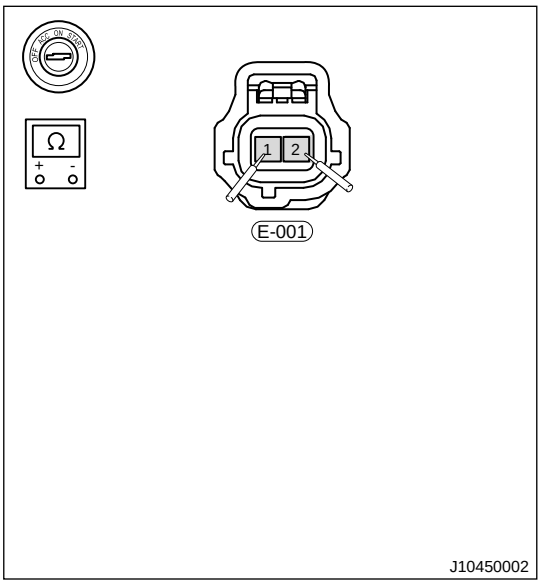
(a) Disconnect the negative battery.
(b) Unplug boost discharge valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace boost discharge valve connector.**

OK

2	**Check boost discharge valve internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of boost discharge valve E-001 (1-2) are normal with red and black probes respectively.



NG → **Replace boost discharge valve assembly.**

OK

3	Check boost discharge valve power supply fuse

(a) Turn ENGINE START STOP switch to ON.

(b) Check fuse EF21 15A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG → **It indicates that there is short to ground in circuit.**

OK

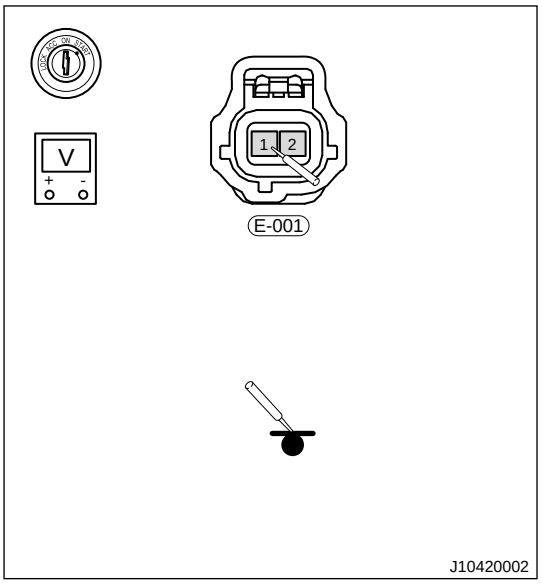
4	Check boost discharge valve power supply and heater control terminal

(a) Connect the boost discharge valve connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of boost discharge valve E-001 (1, 2) with red probe.

Test voltage is current battery voltage

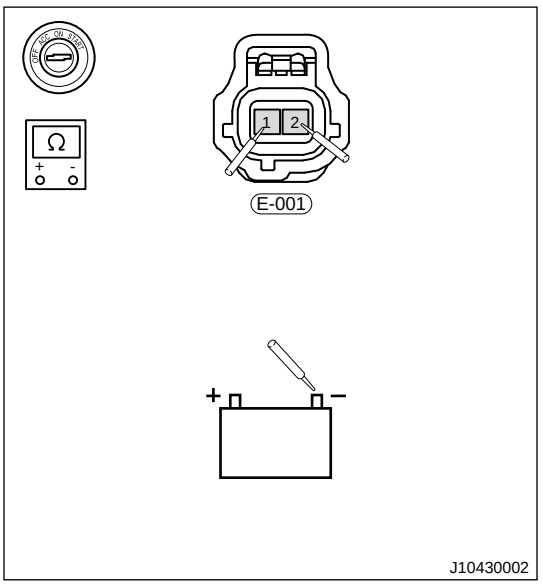


(d) Disconnect the boost discharge valve connector.

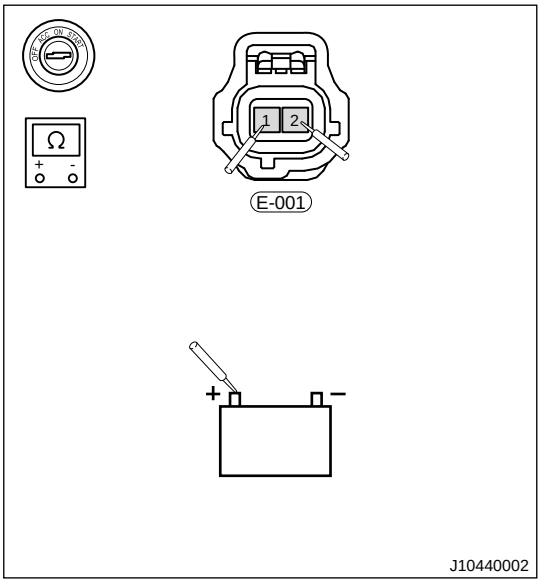
(e) Disconnect engine compartment fuse and relay box fuse EF21 15A.

(f) Disconnect the ECM connector (B-003).

(g) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of boost discharge valve E-001 (1, 2) with red probe respectively. Check if circuit is short to ground.



(h) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of boost discharge valve E-001 (1, 2) with red probe respectively. Check if circuit is short to power supply.



NG → **Repair or replace wire harness.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Downstream Oxygen Sensor Heater Control Circuit Open/Low/High/Heater Internal Resistance Non-plausible

DTC	**P003600**	**HO2S Heater Control Circuit Bank 1 Sensor 2**
DTC	**P003700**	**HO2S Heater Control Circuit Low Bank 1 Sensor 2**

DTC	P003800	HO2S Heater Control Circuit High Bank 1 Sensor 2
DTC	P005400	HO2S Heater Resistance Bank 1 Sensor 2
DTC	P223200	O2 Sensor Signal Circuit Shorted to Heater Circuit Bank 1 Sensor 2

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check downstream oxygen sensor connector**

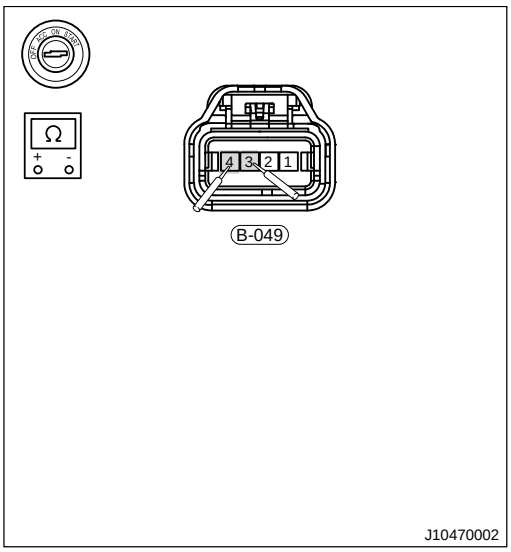
(a) Disconnect the negative battery.
(b) Unplug downstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace downstream oxygen sensor.**

OK

2	**Check downstream oxygen sensor heater internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of downstream oxygen sensor E-049 (3-4) are normal with red and black probes respectively.



NG → **Replace downstream oxygen sensor assembly.**

OK

3	Check downstream oxygen sensor heater power supply fuse

(a) Turn ENGINE START STOP switch to ON.

(b) Check fuse EF18 10A in engine compartment fuse and relay box with 21 W test light.

Test light should be bright

NG

It indicates that there is short to ground in circuit.

OK

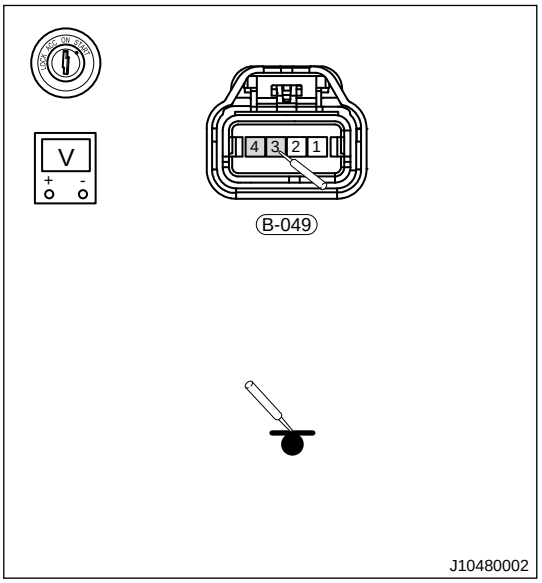
4	Check downstream oxygen sensor heater power supply and heater control terminal

(a) Install the upstream oxygen sensor connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of downstream oxygen sensor E-049 (3, 4) with red probe.

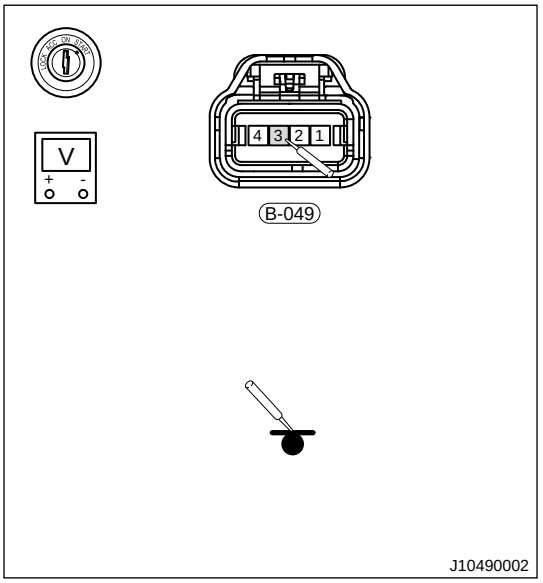
Test voltage is current battery voltage



(d) Start the engine.

(e) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of downstream oxygen sensor E-049 (3) with red probe.

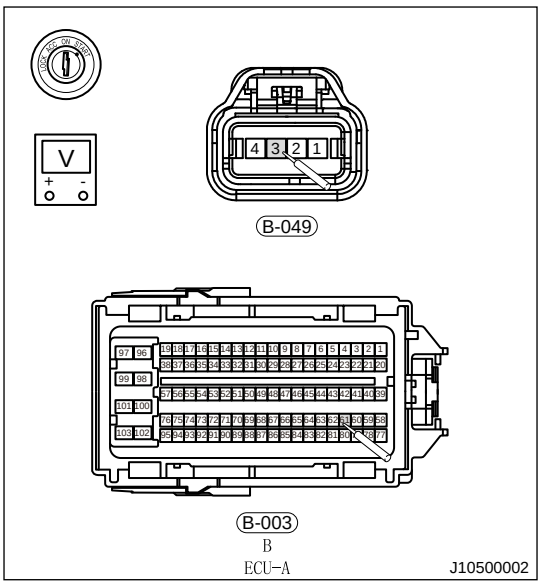
Control heating voltage should be within 0 V and current battery voltage



(f) Start the engine.

(g) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-003 (A61), measure voltage of downstream oxygen sensor E-049 (3) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Turbocharger Electronic Waste Gate Self-learning/Duty Ratio Out of Limit**

DTC	**P003A22**	**Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit**
DTC	**P003A21**	**Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit**
DTC	**P003A72**	**Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit**
DTC	**P003A73**	**Turbocharger/Supercharger Boost Control "A" Position Exceeded Learning Limit**
DTC	**P024437**	**Turbocharger/Supercharger Wastegate Actuator "A" Range/ Performance**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check by-pass valve actuator conditions

(a) Check for foreign matter near turbocharger closed position.
(b) Check if electronic waste gate is stuck.
(c) Push the turbocharger to closed position manually, read position voltage to check if it is out of the range of SPEC.

NG → **Clean up foreign matter or replace turbocharger assembly.**

OK

2	Check by-pass valve actuator connector

(a) Check if connector and wire harness are deteriorated.

NG → **Repair or replace wire harness.**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Turbocharger Electronic Waste Gate Position Sensor Voltage Low/High**

DTC	**P256400**	**Turbocharger Boost Control Position Sensor "A" Circuit Low**
DTC	**P256500**	**Turbocharger Boost Control Position Sensor "A" Circuit High**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electronic waste gate connector

(a) Disconnect the negative battery.
(b) Unplug electronic waste gate connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check electronic waste gate position sensor power supply and ground

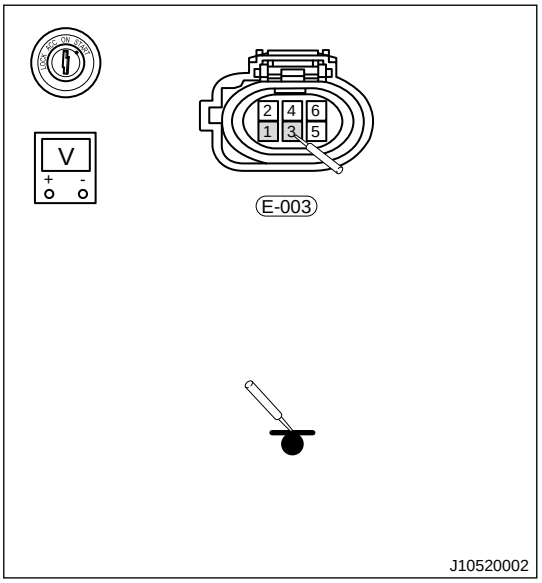
(a) Connect electronic waste gate connector.

(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of electronic waste gate position sensor E-003 (1, 3) with red probe.

Reference power supply: 5 V

Ground: 0 V



NG → **Repair wire harness or replace engine control unit.**

OK

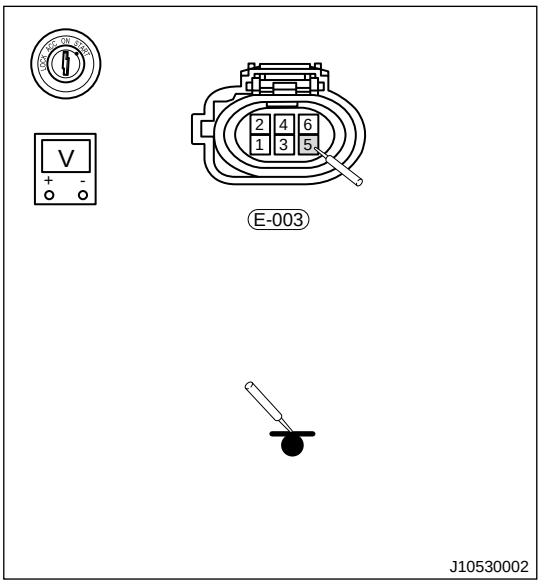
3	**Check electronic waste gate position sensor signal terminal**

(a) Connect the boost discharge valve connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure if voltage of electronic waste gate position sensor E-003 (5) varies according to opening angle with red probe.

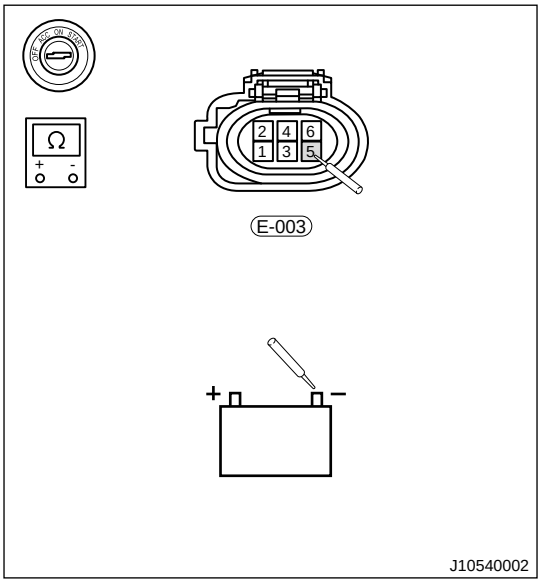
Test voltage is current battery voltage



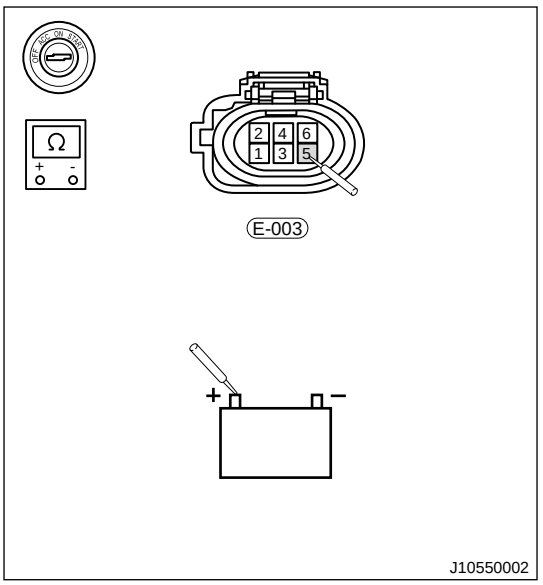
(d) Disconnect the electronic waste gate connector.

(e) Disconnect the ECM connector (E-018).

(f) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of electronic waste gate position sensor E-003 (5) with red probe respectively. Check if circuit is short to ground.



(g) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of electronic waste gate position sensor E-003 (5) with red probe respectively. Check if circuit is short to power supply.



NG → **Repair or replace wire harness or replace turbocharger assembly.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Communication Failure of Supercharger Wastegate Control Circuit

DTC	P170300	Communication Failure of Supercharger Wastegate Control Circuit

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electronic waste gate connector

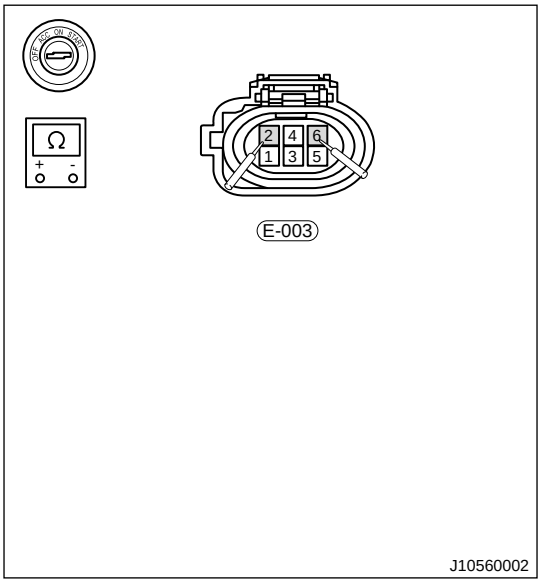
(a) Disconnect the negative battery.
(b) Unplug electronic waste gate connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check electronic waste gate internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of boost discharge valve E-003 (6-2) are normal with red and black probes respectively.



NG → **Replace turbocharger assembly.**

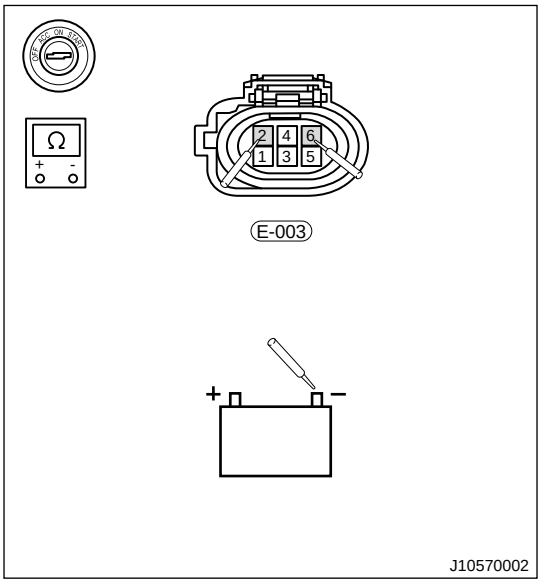
OK →

3	**Check for short circuit to ground / power supply in electric waste gate control circuit**

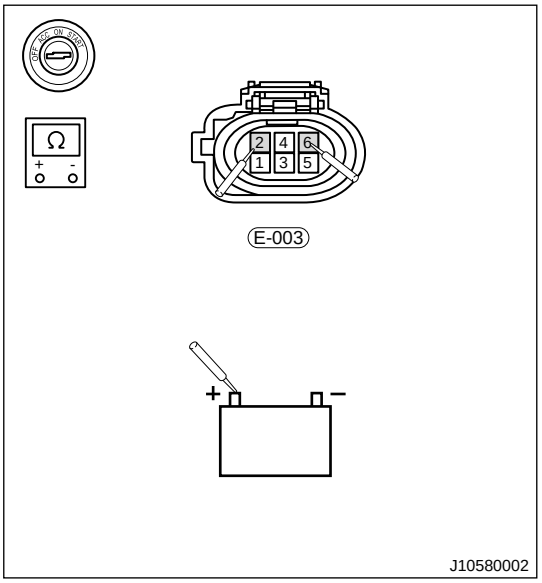
(a) Disconnect the electronic waste gate connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of waste gate E-003 (6, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of waste gate E-003 (6, 2) with red probe respectively. Check if circuit is short to power supply.



NG → **Repair or replace wire harness.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Ambient pressure sensor malfunction**

DTC	P222900	Barometric Pressure Sensor "A" Circuit High
DTC	P222800	Barometric Pressure Sensor "A" Circuit Low Problem

DTC	P222722	Barometric Pressure Sensor "A" Circuit Range/Performance
DTC	P222721	Barometric Pressure Sensor “A” Circuit Range/Performance
DTC	P222785	Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1
DTC	P222784	Barometric Pressure Measurement System - Multiple Sensor Correlation Bank 1
DTC	P120200	Barometric Pressure Sensor "A" Circuit Range/Performance
DTC	P120300	Barometric Pressure Sensor “A" Circuit Range/Performance

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check Engine Control Module (ECM)**

(a) The built-in ambient pressure sensor in ECM fails.
(b) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(c) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ High Pressure Fuel Supply Control Deviation Too High/Too Low/Fuel Rail Pressure Too Low/Too High

DTC	P008985	Fuel Pressure Regulator 1 Performance-Pressure Too Low
DTC	P008984	Fuel Pressure Regulator 1 Performance-Pressure Too High
DTC	P008700	Fuel Rail/System Pressure - Too Low
DTC	P008800	Fuel Rail/System Pressure - Too High

DTC	P053F21	Cold Start Fuel Pressure Performance
DTC	P053F22	Cold Start Fuel Pressure Performance
DTC	P00C600	Fuel Rail Pressure Too Low - Engine Cranking Bank 1

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check if fuel is insufficient**

(a) Check that fuel in fuel tank is sufficient.

NG → **Add the fuel.**

OK

2	**Check fuel connecting line for leakage**

(a) Check low pressure/high pressure fuel connecting lines for squash, leakage.

NG → **Replace the corresponding line.**

OK

3	**Check low pressure fuel pressure**

(a) Connect fuel pressure gauge to test if low pressure fuel pressure is met the standard.

NG → **Replace fuel pump assembly.**

OK

4	**Check high pressure fuel pump**

(a) Remove the high pressure fuel pump;
(b) Check high pressure fuel pump for fuel leakage.
(c) Check relief valve for blockage or abnormal operation.

NG → **Replace high pressure fuel pump assembly.**

OK

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Short Circuit in High Side and Low Side Control Circuit of Flow Control Valve

DTC	P009000	Short Circuit in High Side and Low Side Control Circuit of Flow Control Valve

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check flow control valve connector

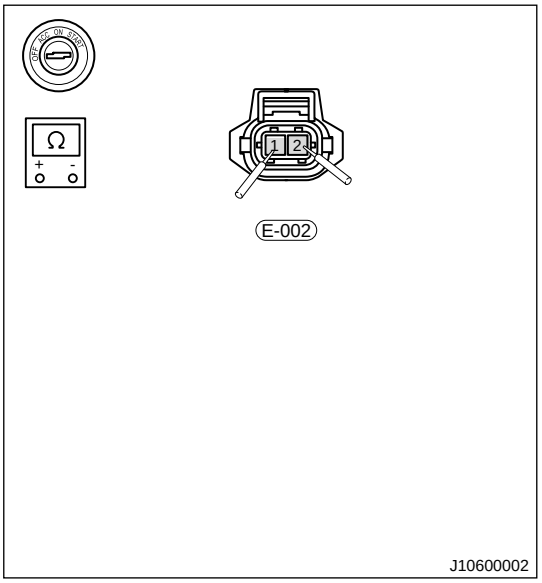
(a) Disconnect the negative battery.
(b) Unplug flow control valve connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check flow control valve internal resistance

(a) Using ohm band of multimeter, measure if internal resistances of flow control valve E-002 (1-2) are normal with red and black probes respectively.



NG → **Replace high pressure fuel pump assembly.**

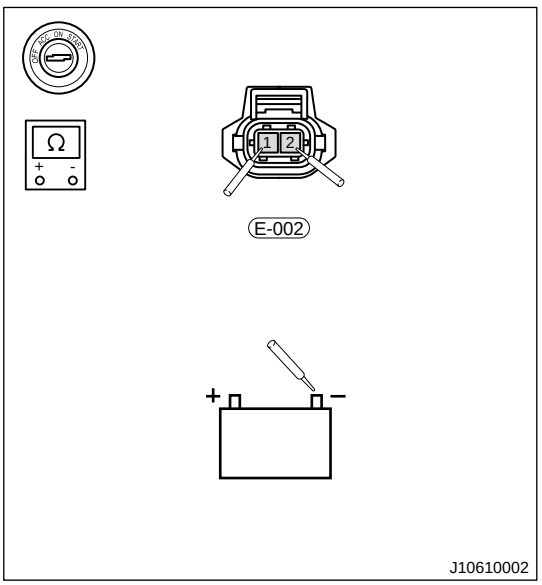
OK

3	**Check for short circuit to ground / power supply in flow control valve control circuit**

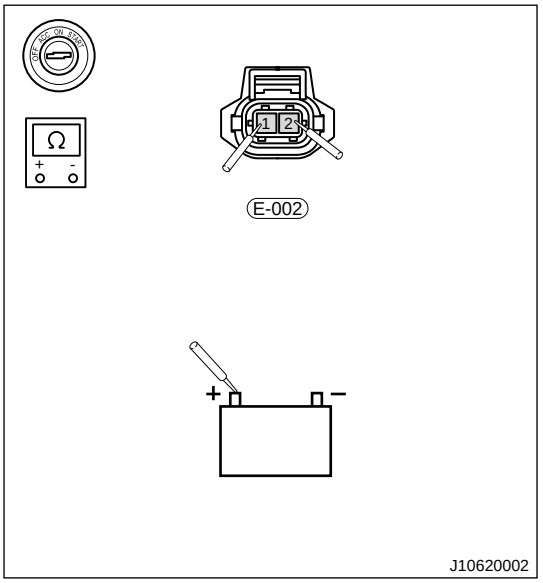
(a) Disconnect the high pressure fuel pump connector.

(b) Disconnect the ECM connector (E-018).

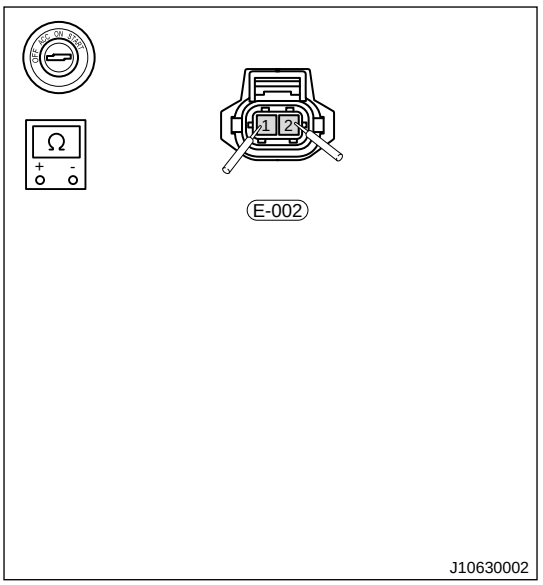
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of high pressure fuel pump E-002 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of high pressure fuel pump E-003 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of high pressure fuel pump E-003 (1, 2) with red and black probes respectively. Check if control circuits are shorted with each other.



NG → **Repair or replace wire harness.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Intake Air Sensor 2 Voltage Too High/Too Low/Signal Non-plausible

DTC	P009626	Intake Air Temp.Circ. Performance Non-plausible
DTC	P009800	Intake Air Temperature Sensor 2 Circuit High Bank 1
DTC	P009700	Intake Air Temperature Sensor 2 Circuit Low Bank 1
DTC	P009900	Intake Air Temperature Sensor 2 Circuit Intermittent Bank 1

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check boost pressure/temperature sensor connector

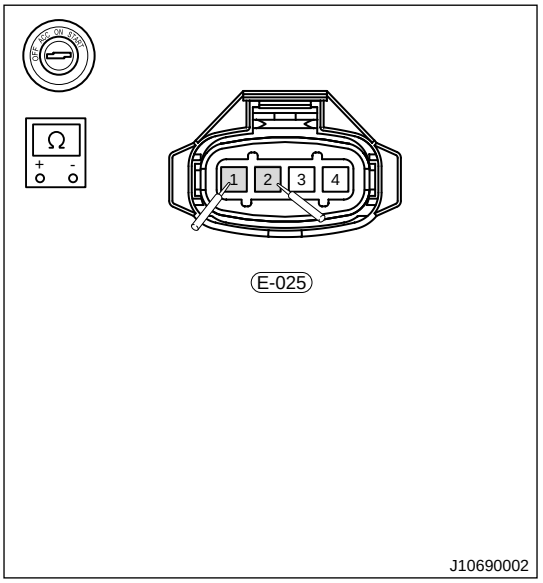
(a) Disconnect the negative battery.
(b) Unplug boost pressure/temperature sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace boost pressure/temperature sensor.**

OK

2	Check boost pressure/temperature sensor internal resistance

(a) Using ohm band of multimeter, measure if resistances of boost pressure/temperature sensor E-025 (1-2) are normal with red and black probes respectively. They should vary in accordance with intake temperature.



NG → **Replace boost pressure/temperature sensor assembly.**

OK

3	**Check boost pressure/temperature sensor signal terminal and ground terminal**

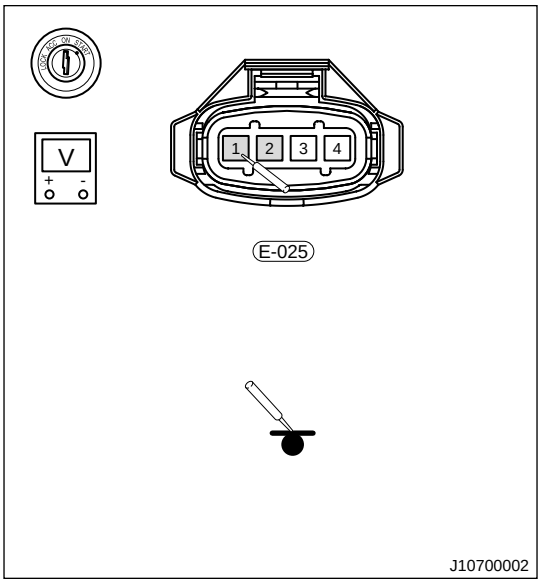
(a) Connect boost pressure/temperature sensor connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of boost pressure/temperature sensor E-025 (1, 2) with red probe.

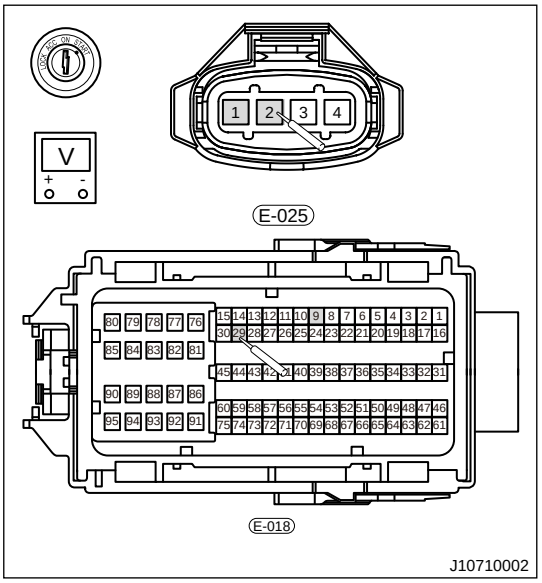
Signal terminal: Voltage signal should vary in accordance with intake temperature.

Ground terminal: Voltage < 0.2 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B29, B9), measure voltages of boost pressure/temperature sensor E-025 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Intake Pressure/Temperature Sensor Malfunction**

DTC	**P01062A**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**
DTC	**P010622**	**Manifold Absolute Pressure Sensor Circuit Range/Performance**

DTC	P010621	Manifold Absolute Pressure Sensor Circuit Range/Performance
DTC	P120000	Manifold Absolute Pressure Sensor Circuit Range/Performance
DTC	P120100	Manifold Absolute Pressure Sensor Circuit Range/Performance
DTC	P00C721	Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1
DTC	P00C722	Intake Air Pressure Measurement System - Multiple Sensor Correlation Bank 1
DTC	P010700	Intake Manifold Pressure Sensor Circuit Voltage Too Low
DTC	P010800	Intake Manifold Pressure Sensor (Electric) Circuit Short to Battery

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check intake pressure/temperature sensor connector**

(a) Disconnect the negative battery.
(b) Unplug intake pressure sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace intake pressure sensor.**

OK

2	**Check intake pressure/temperature sensor power supply and ground terminals**

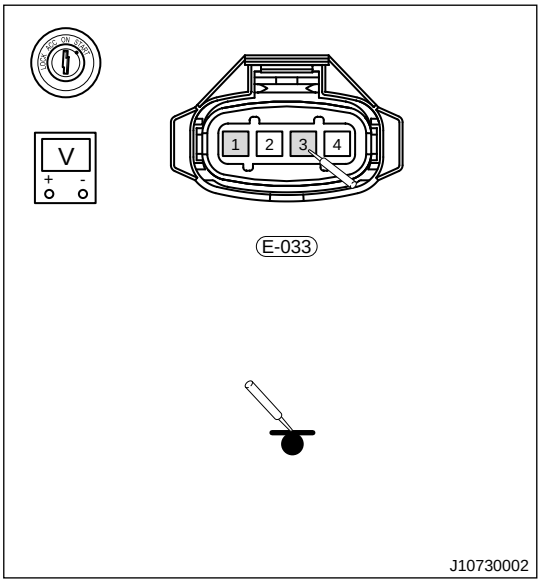
(a) Connect boost pressure/temperature sensor connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake pressure/temperature sensor E-033 (1, 3) with red probe.

Power supply terminal: 5 V

Ground terminal: Voltage < 0.2 V



NG → **Repair or replace wire harness.**

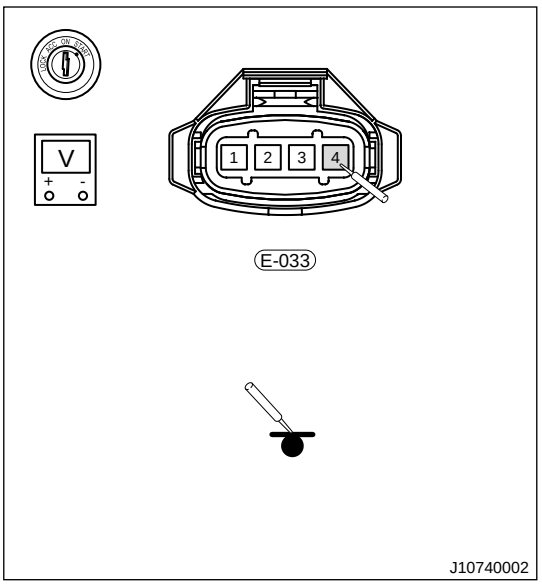
OK

3	**Check intake pressure/temperature sensor signal terminal**

(a) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of intake pressure/temperature sensor E-033 (4) with red probe.

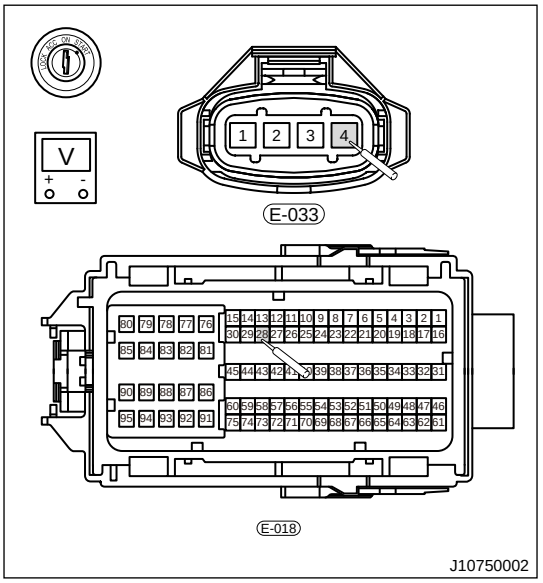
Under idling state: 1 V

When the vehicle accelerates rapidly, voltage can instantly reach 4 V, and then drop to 1.7 V



(b) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B28), measure voltage of intake pressure/temperature sensor E-033 (4) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair and replace wire harness, or replace intake pressure/temperature sensor.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Boost Pressure Out of Range High/Low/Non-plausible**

DTC	**P120400**	**Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance**
DTC	**P120500**	**Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance**
DTC	**P023622**	**Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance**
DTC	**P023621**	**Turbocharger/Supercharger Boost Sensor "A" Circuit Range/ Performance**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check intake line condition**

(a) Check if intake line is detached or seriously air leaked.

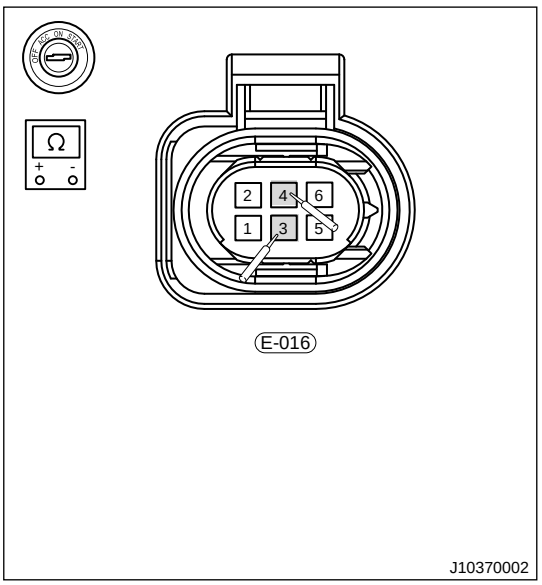
NG → **Repair and adjust or replace related connecting lines.**

OK

2	**Check boost pressure/temperature sensor**

(a) Check boost pressure/temperature sensor connector for looseness or poor contact.

(b) Check if there is any freeze, oil stain, etc. on measurement terminal of boost pressure/temperature sensor, which will affect normal measurement.



NG → **Adjust connector, or replace boost pressure/ temperature sensor.**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Intake pressure sensor malfunction**

DTC	P011126	Intake Air Temp.Circ. Performance Non-plausible
DTC	P011200	Intake Air Temp.Circ. Low Input
DTC	P011300	Intake Air Temp.Circ. High Input
DTC	P011400	Poor Contact in Intake Manifold Temperature Sensor Circuit
DTC	P00CE23	Intake Air Temperature Sensor 2 Multiple Check Bank1
DTC	P138024	Intake Air Temperature Sensor 2 Multiple Check Bank1
DTC	P138023	Intake Air Temperature Sensor 2 Multiple Check Bank1

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check intake pressure/temperature sensor connector

(a) Disconnect the negative battery.
(b) Unplug intake pressure/temperature sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

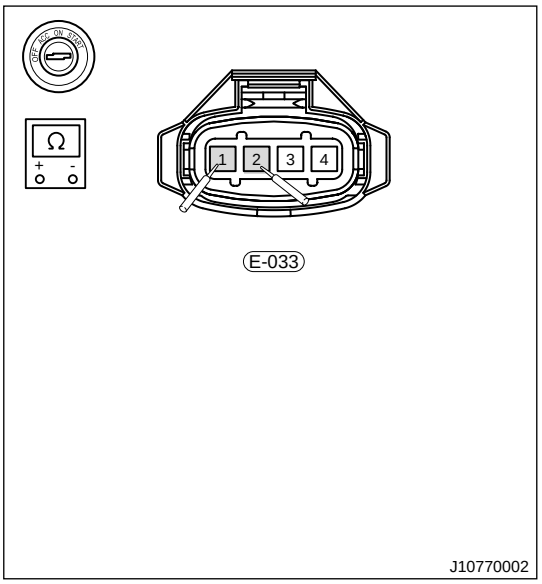
NG → **Repair and adjust connector, or replace intake pressure/temperature sensor.**

OK

2	Check intake pressure/temperature sensor resistance

(a) Using ohm band of multimeter, measure if resistances of intake pressure/temperature sensor E-033 (1-2) are normal with red and black probes respectively.

Rated resistance at 20˚C: 2.5 KΩ ± 5%



NG → **Replace intake pressure/temperature sensor assembly.**

OK

3	Check intake pressure/temperature sensor signal and ground terminals

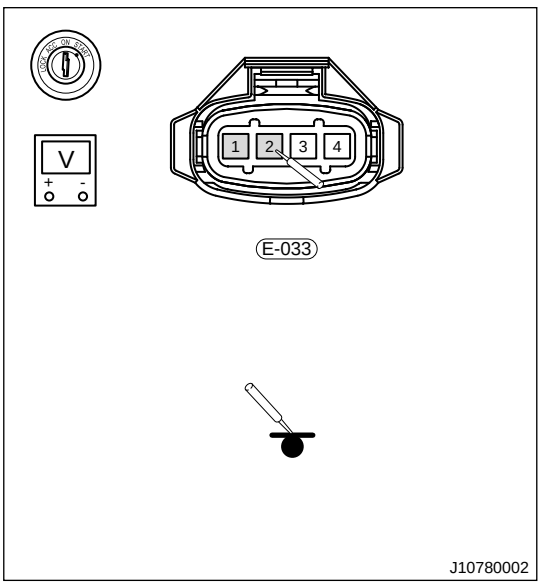
(a) Connect the intake pressure/temperature sensor connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake pressure/temperature sensor E-033 (1, 2) with red probe.

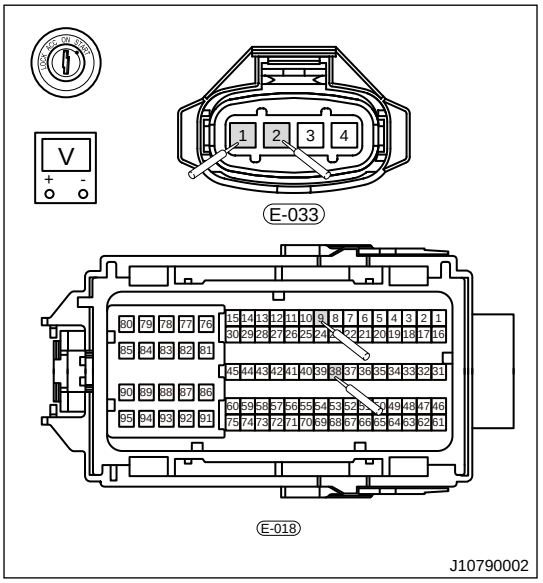
Signal terminal: Signal voltage should vary in accordance with temperature

Ground terminal: Voltage < 0.2 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B38, B9), measure voltage of intake pressure/temperature sensor E-033 (1, 2) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Coolant Temperature Sensor 1 Malfunction**

DTC	**P011623**	**Coolant Temperature Sensor 1 Signal Not Plausible**
DTC	**P011626**	**Engine Coolant Temperature Sensor 1 Circuit Range/Performance**

DTC	P050C24	Cold Start Engine Coolant Temperature Performance
DTC	P050C23	Cold Start Engine Coolant Temperature Performance
DTC	P011700	Engine Coolant Temperature Sensor 1 Circuit Low
DTC	P011800	Engine Coolant Temperature Sensor 1 Circuit High
DTC	P011900	Engine Coolant Temperature Sensor 1 Circuit Intermittent

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check coolant temperature sensor 1 connector**

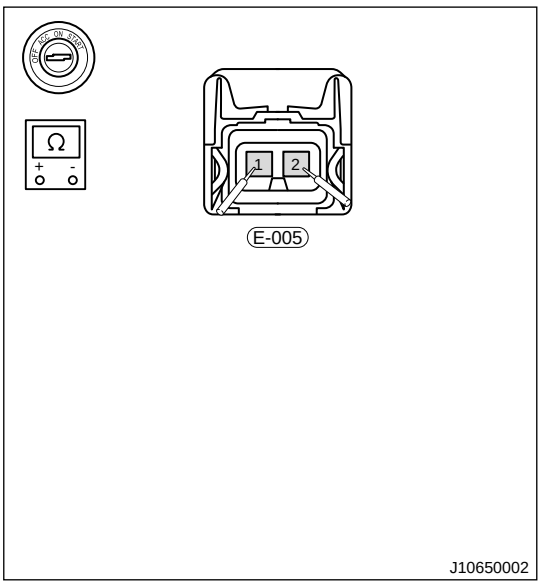
(a) Disconnect the negative battery.
(b) Unplug coolant temperature sensor 1 connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace coolant temperature sensor 1.**

OK

2	**Check coolant temperature sensor internal resistance**

(a) Using ohm band of multimeter, measure if internal resistances of coolant temperature sensor 1 E-005 (2-1) are normal with red and black probes respectively. They should vary in accordance with coolant temperature.



NG → **Replace coolant temperature sensor 1 assembly.**

OK

3	**Check coolant temperature sensor 1 signal terminal and ground terminal**

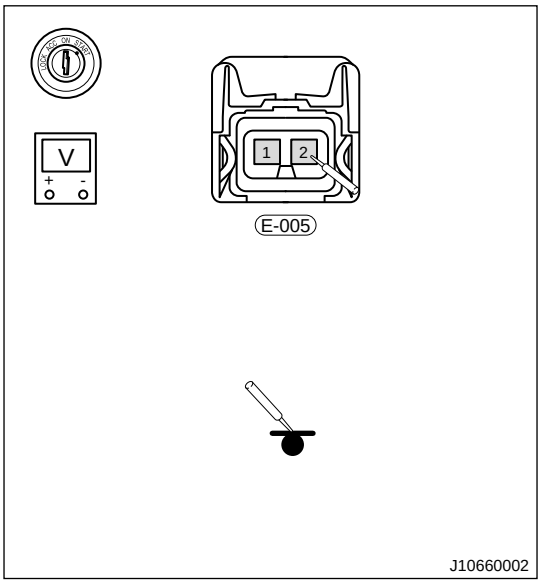
(a) Check coolant temperature sensor 1 connector.

(b) Start the engine.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of coolant temperature sensor 1 E-005 (1, 2) with red probe.

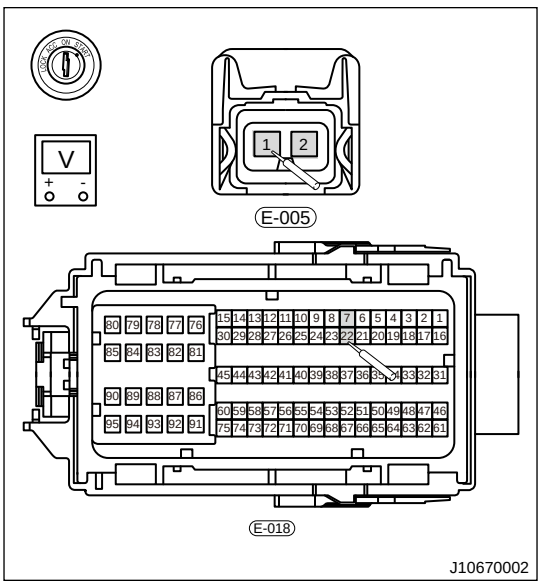
Signal terminal: Voltage signal should vary in accordance with temperature.

Ground terminal: Voltage < 0.2 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B22, B7), measure voltages of coolant temperature sensor E-005 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Thermostat Performance Unreasonable**

DTC	P012800	Coolant Thermostat (Coolant Temperature Below Thermostat Regulating Temperature)

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electronic thermostat

(a) Check if electronic thermostat is normally open or damaged

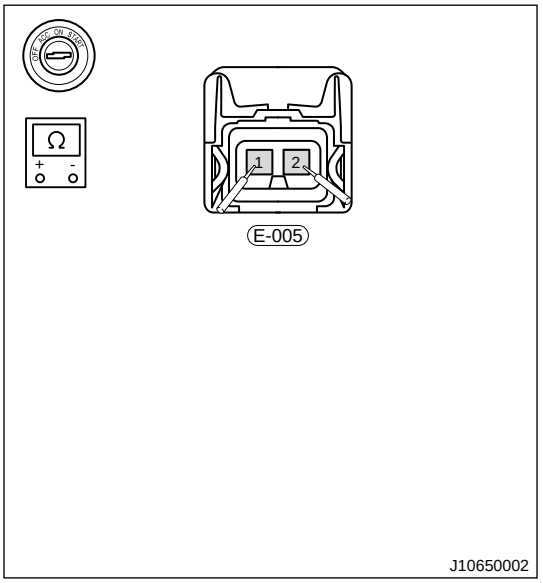
NG → **Replace electronic thermostat assembly.**

OK

2	Check coolant temperature sensor 1 resistance

(a) Using ohm band of multimeter, measure if internal resistances of coolant temperature sensor 1 E-005 (2-1) are normal with red and black probes respectively. They should vary in accordance with coolant temperature.

Rated resistance at 20℃: 2.5 KΩ ± 10%



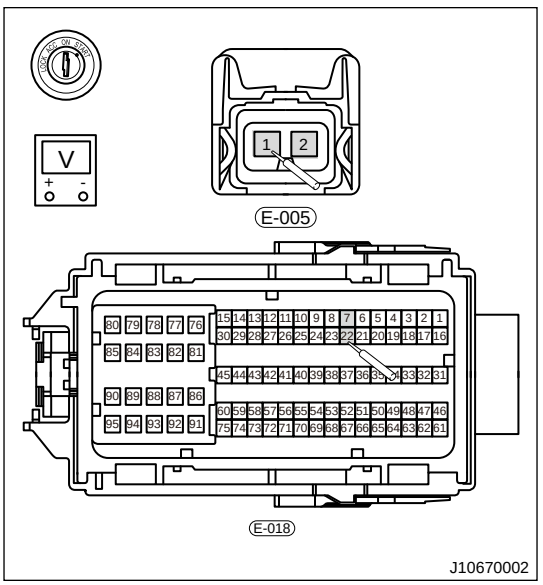
NG → **Replace coolant temperature sensor 1 assembly.**

OK

3	Check coolant temperature sensor 1 connecting wire voltage drop value

(a) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B22, B7), measure voltages of coolant temperature sensor E-005 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Upstream Oxygen Sensor Signal Circuit Voltage Low/High (APE IPE RE Line Short to Ground/ Power Supply)

DTC	P013100	O2 Sensor Circuit Low Voltage Bank 1 Sensor 1
DTC	P013200	O2 Sensor Circuit High Voltage Bank 1 Sensor 1
DTC	P223700	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (-Close to ECM)
DTC	P223713	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check upstream oxygen sensor connector

(a) Disconnect the negative battery.
(b) Unplug upstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

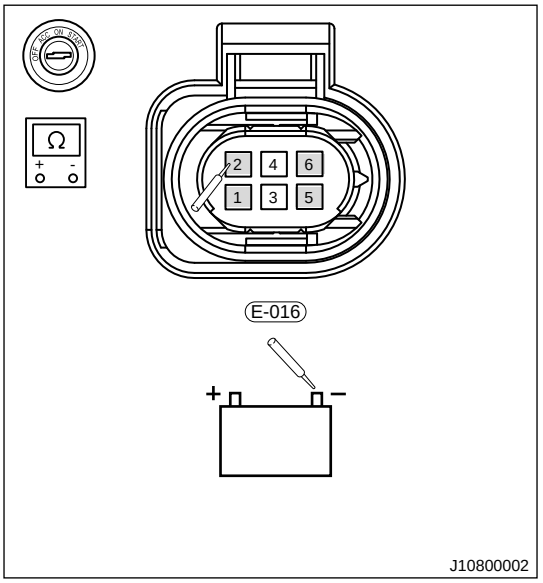
OK

2	Check for short circuit to ground / power supply in upstream oxygen sensor circuit

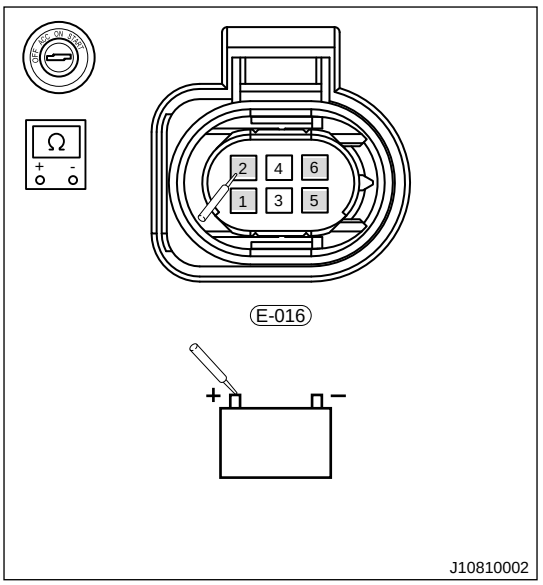
(a) Disconnect the upstream oxygen sensor connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of upstream oxygen sensor E-016 (2, 6, 1, 5) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of upstream oxygen sensor E-016 (2, 6, 1, 5) with red probe respectively. Check if circuit is short to power supply.

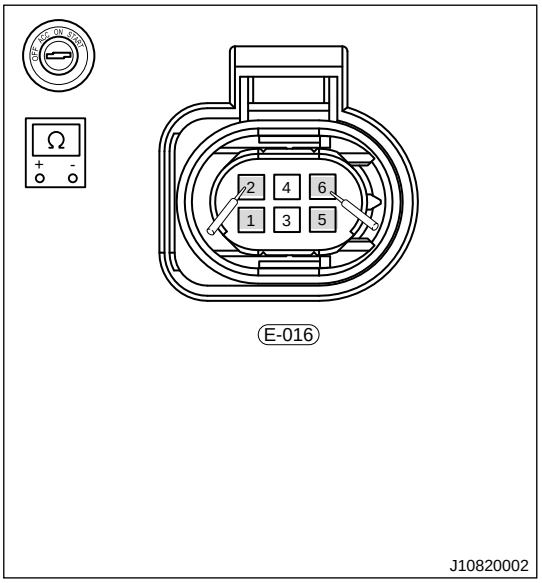


NG → **Repair or replace wire harness.**

OK

3	**Check if circuits of upstream oxygen sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of upstream oxygen sensor E-016 (2, 6, 1, 5) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace upstream oxygen sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ O2 Sensor Circuit Slow Response Bank 1 Sensor 1

DTC	P013300	O2 Sensor Circuit Slow Response Bank 1 Sensor 1

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check intake/exhaust air for leakage**

(a) Check intake system for air leakage.
(b) Check exhaust system for air leakage.

NG → **Repair and handle parts related to air leakage.**

OK ↓

2	**Check the upstream oxygen sensor.**

(a) Check if upstream oxygen sensor is deteriorated; Check if response speed is slow.

NG → **Replace upstream oxygen sensor assembly.**

OK ↓

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Downstream Oxygen Sensor Signal Improper/Signal Wire Short to Ground/Power Supply

DTC	**P013600**	**O2 Sensor Circuit Bank 1 Sensor 2**
DTC	**P013700**	**O2 Sensor Circuit Low Voltage Bank 1 Sensor 2**
DTC	**P013800**	**O2 Sensor Circuit High Voltage Bank 1 Sensor 2**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).

- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check downstream oxygen sensor connector**

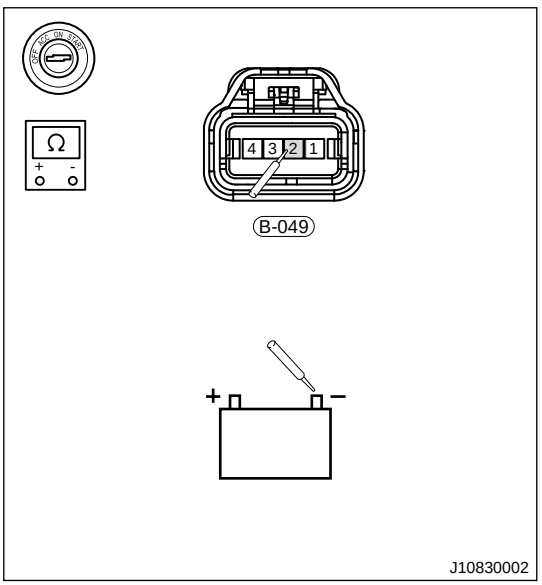
(a) Disconnect the negative battery.
(b) Unplug downstream oxygen sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

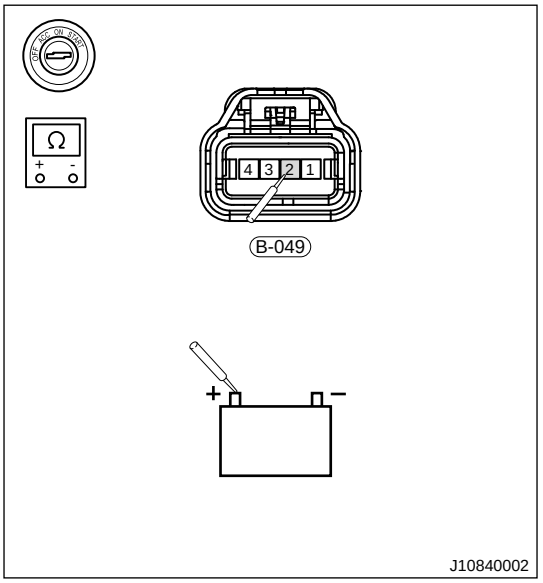
OK

2	**Check for short circuit to ground / power supply in downstream oxygen sensor signal**

(a) Disconnect the downstream oxygen sensor connector.
(b) Disconnect the ECM connector (B-003).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of downstream oxygen sensor B-049 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of downstream oxygen sensor E-049 (2) with red probe respectively. Check if circuit is short to power supply.

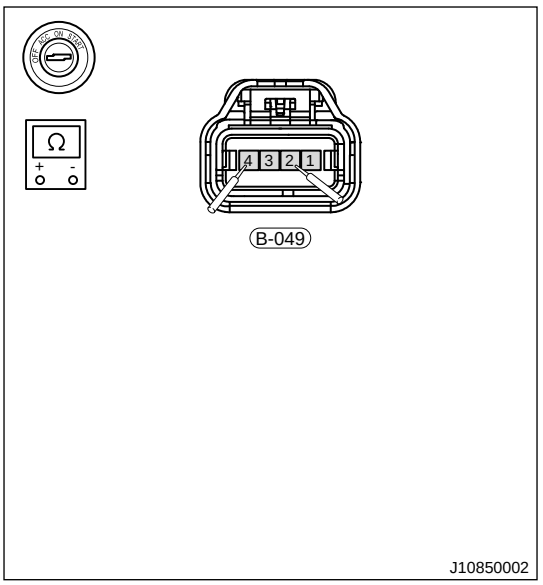


NG → **Repair or replace wire harness.**

OK

3	**Check if downstream oxygen sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of upstream oxygen sensor E-049 (1, 2, 3, 4) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace downstream oxygen sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Fuel Rail Pressure Sensor Circuit Short to Ground/Power Supply/Signal Stuck/Signal Non-plausible

DTC	P019200	Fuel Rail Pressure Sensor Circuit Short to Ground
DTC	P019300	Fuel Rail Pressure Sensor Circuit Short to Power Supply
DTC	P019400	Fuel Rail Pressure Sensor Circuit Intermittent/Erratic Bank 1
DTC	P019128	Fuel Rail Pressure Sensor Circuit Bank 1-Negative Offset
DTC	P019129	Fuel Rail Pressure Sensor Circuit Bank 1-Positive Offset
DTC	P019000	Fuel Rail Pressure Sensor Circuit Bank 1
DTC	P254200	DECOS Oil Passage Pressure Sensor Circuit High Voltage
DTC	P254100	DECOS Oil Passage Pressure Sensor Circuit Low Voltage

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuel rail pressure sensor connector

(a) Disconnect the negative battery.
(b) Unplug fuel rail pressure sensor connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

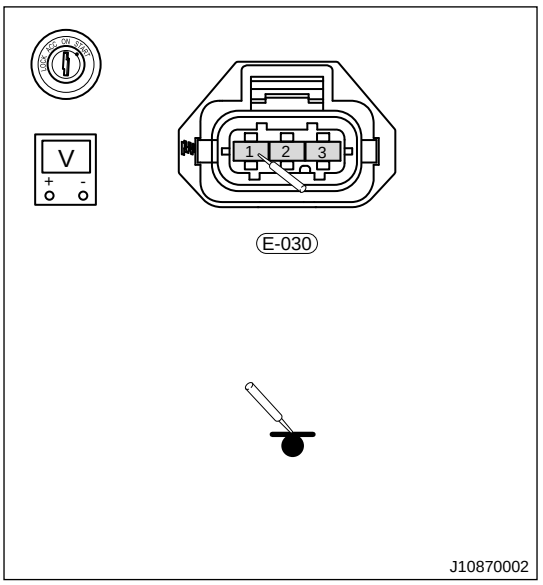
2	**Check fuel rail pressure sensor circuit**

(a) Connect the fuel rail pressure sensor connector.
(b) Ignition switch ON.
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of fuel rail pressure sensor E-030 (1, 2, 3) with red probe respectively.

Power supply: 5 V

Ground: < 0.2 V

Signal: Under atmospheric pressure (100 Kpa), signal output is 0.500 ± 0.048 V



NG → **Check and repair wire harness, or replace fuel rail pressure sensor.**

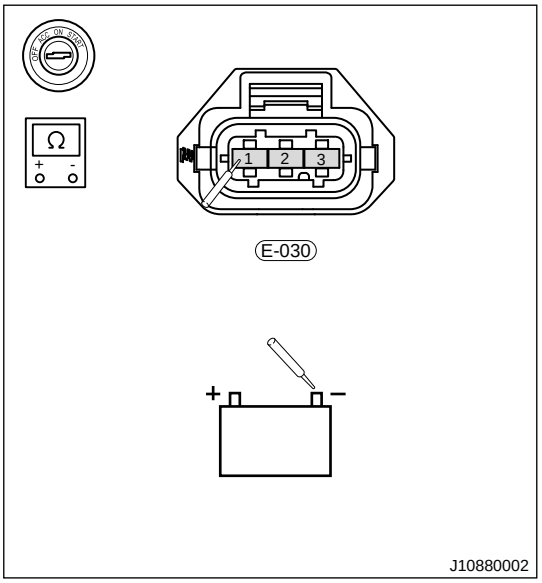
OK

3	**Check for short circuit to ground / power supply in fuel rail pressure sensor**

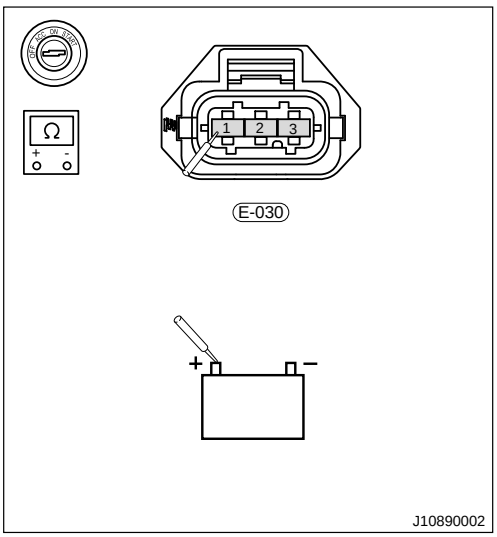
(a) Disconnect the fuel rail pressure sensor connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel rail pressure sensor E-030 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel rail pressure sensor E-030 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.

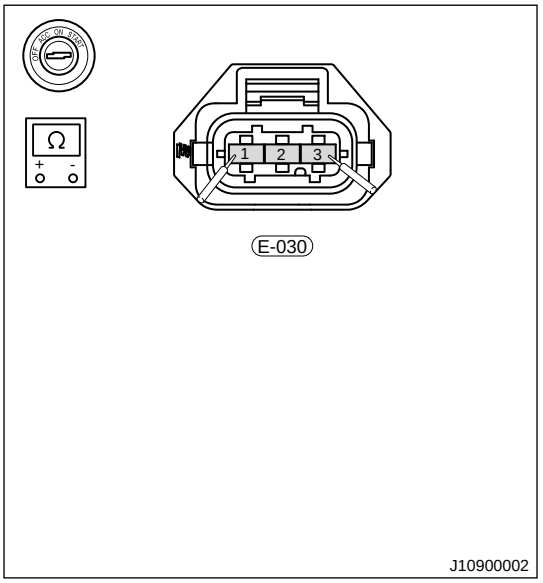


NG	**Check and repair wire harness.**

OK

4	**Check if circuits of fuel rail pressure sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of fuel rail pressure sensor E-030 (1, 2, 3) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace fuel rail pressure sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Fuel Injector Control Circuit Open**

DTC	P020113	Cylinder 1 Fuel Injector Control Circuit Open
DTC	P020213	Cylinder 2 Fuel Injector Control Circuit Open

DTC	P020313	Cylinder 3 Fuel Injector Control Circuit Open
DTC	P020413	Cylinder 4 Fuel Injector Control Circuit Open

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 fuel injector as an example.

1	**Check injector connector**

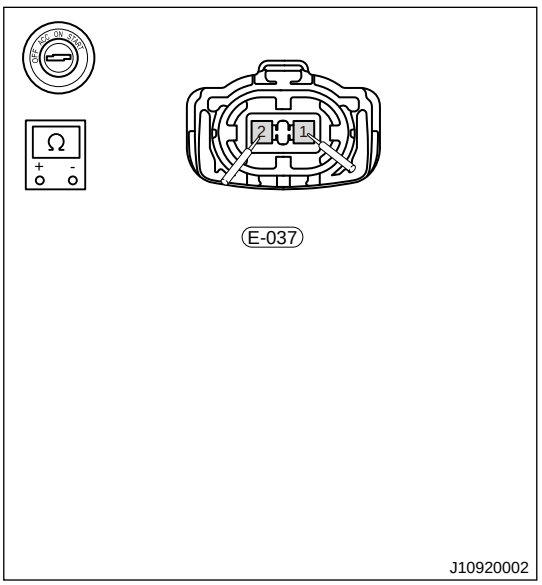
(a) Disconnect the negative battery.
(b) Check if fuel injector connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check internal resistance of fuel injector**

(a) Disconnect the injector connector.
(b) Using ohm band of multimeter, measure resistances of fuel injector E-037 (1, 2) with red and black probes respectively.



NG → **Replace cylinder 1 fuel injector assembly.**

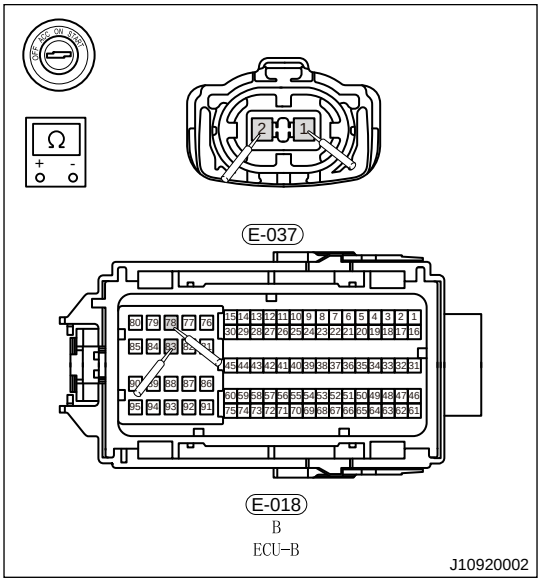
OK

3	Check fuel injector control circuit

(a) Disconnect the injector connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to ECM E-018 (B83, B78), measure for continuity between fuel injector E-037 (1, 2) with red probe respectively.



NG

Check and repair circuit.

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK

Repair or replace new module.

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK

Conduct test and confirm malfunction has been repaired.

■ **Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Ignition Coil Control Circuit Voltage High/Low**

DTC	**P230112**	**Ignition Coil “A” Primary Control Circuit High**
DTC	**P230412**	**Ignition Coil “B” Primary Control Circuit High**
DTC	**P230712**	**Ignition Coil “C” Primary Control Circuit High**
DTC	**P231012**	**Ignition Coil “D” Primary Control Circuit High**
DTC	**P230011**	**Ignition Coil “A” Primary Control Circuit Low**
DTC	**P230311**	**Ignition Coil “B” Primary Control Circuit Low**
DTC	**P230611**	**Ignition Coil “C” Primary Control Circuit Low**
DTC	**P230911**	**Ignition Coil “D” Primary Control Circuit Low**
DTC	**P035113**	**Ignition Coil "A" Primary Control Circuit Failure**
DTC	**P035213**	**Ignition Coil "B" Primary Control Circuit Failure**
DTC	**P035313**	**Ignition Coil "C" Primary Control Circuit Failure**
DTC	**P035413**	**Ignition Coil "D" Primary Control Circuit Failure**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 ignition coil as an example.

1	**Check ignition coil connector**

(a) Disconnect the negative battery.
(b) Unplug ignition coil connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check ignition coil power supply fuse**

(a) Check if fuse EF19 15A of engine compartment fuse and relay box is blown.

NG → **There is short circuit in circuit or ignition coil.**

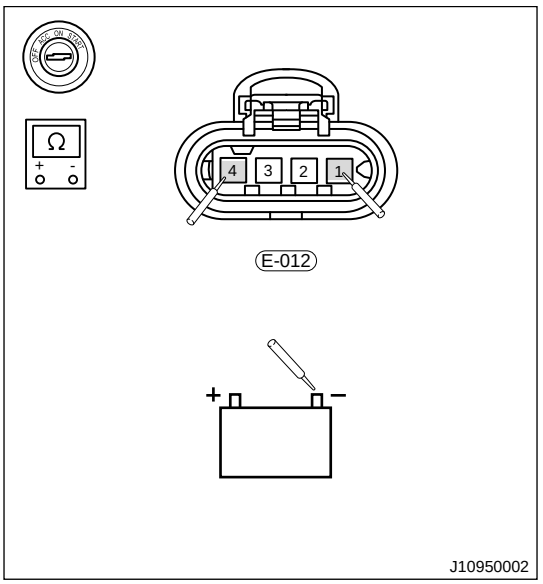
OK

3	Check for short circuit to ground / power supply in ignition coil circuit

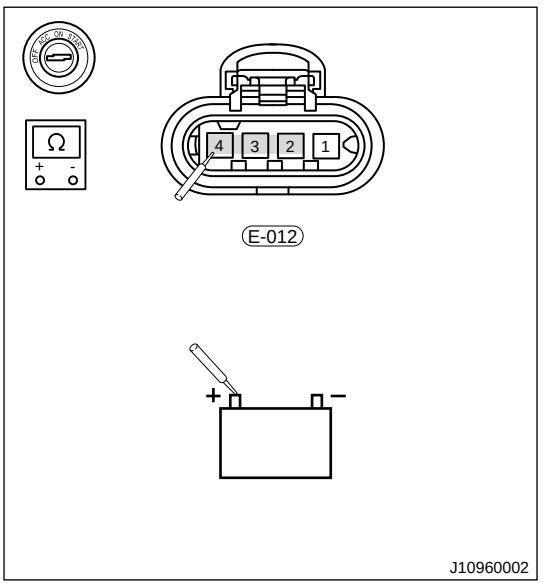
(a) Disconnect the ignition coil connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of ignition coil E-012 (1, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of ignition coil E-012 (2, 3, 4) with red probe respectively. Check if circuit is short to power supply.



NG → Check and repair wire harness.

OK

4	Check ignition coil control circuit

(a) Connect the ignition coil connector.

(b) Ignition switch ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of ignition coil E-012 (1, 2, 3) with red probe respectively.

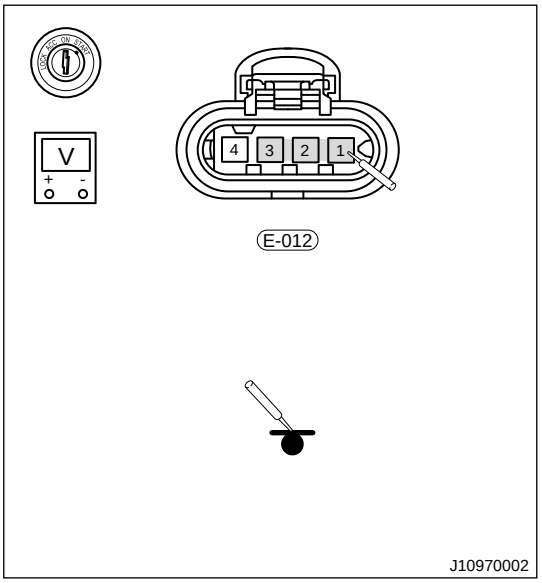
Power supply: 12 V

Ground: < 0.2 V

(d) Start the engine.

(e) Using the LED test light, connect clip to battery negative terminal, measure ignition coil E-012 (4) with another end.

Under normal conditions, test light should flash.

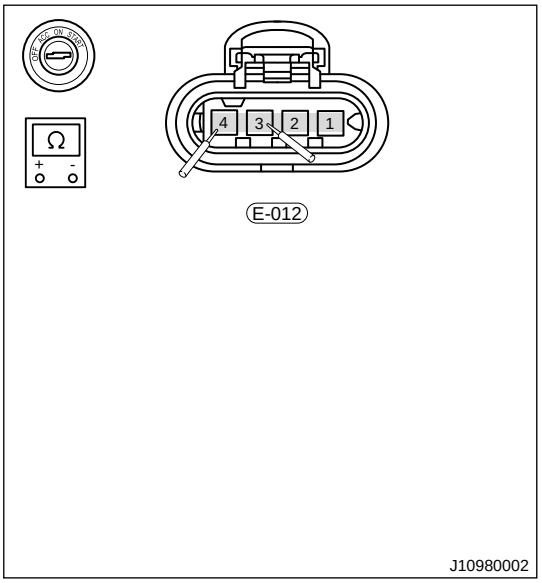


NG → **Check and repair wire harness**

OK

5	Check if circuits of ignition coil themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of ignition coil E-012 (1, 2, 3, 4) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace ignition coil assembly.**

OK

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK	**Repair or replace new module.**

NG

7	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired.**

■ Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Fuel Injector Control Circuit Short to Power Supply

DTC	**P026200**	**Cylinder 1 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P026800**	**Cylinder 3 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P027100**	**Cylinder 4 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P026500**	**Cylinder 2 Fuel Injector Control Circuit Short to Power Supply**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 fuel injector as an example.

1	**Check injector connector**

(a) Disconnect the negative battery.
(b) Check if fuel injector connector is loose, and contact between male and female terminals is in good condition.

NG	**Repair and adjust connector, or replace it.**

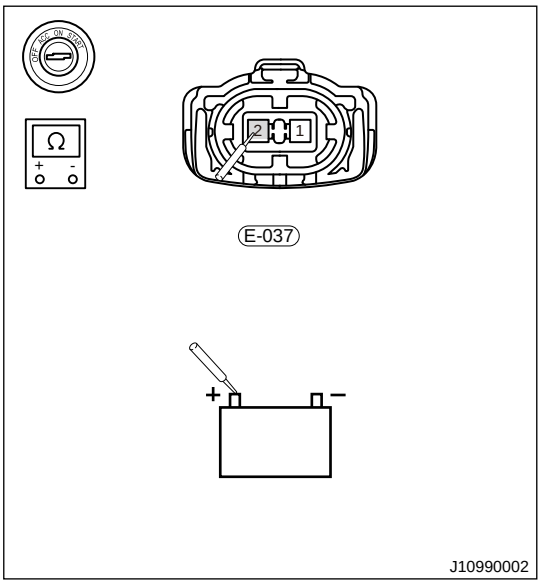
OK

2	Check if fuel injector control terminal is short to power supply

(a) Disconnect the injector connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of fuel injector E-037 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

3	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Flow Control Valve Control Circuit Open/Too High/Too Low**

DTC	**P025100**	**Flow Control Valve Positive or Negative Control Circuit Open**
DTC	**P025400**	**Flow Control Valve High Side Control Circuit Voltage Too High or Too Low**
DTC	**P025900**	**Injection Pump Fuel Metering Control "A" Low (Cam/Rotor/Injector)**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check high pressure fuel pump connector**

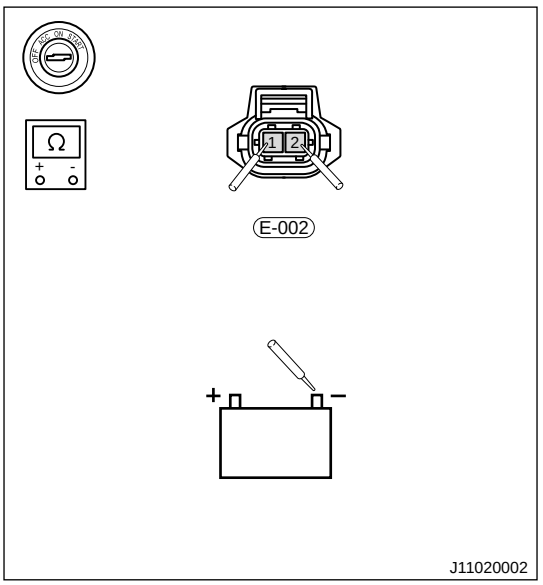
(a) Disconnect the negative battery.
(b) Unplug high pressure fuel pump connector, check if this connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

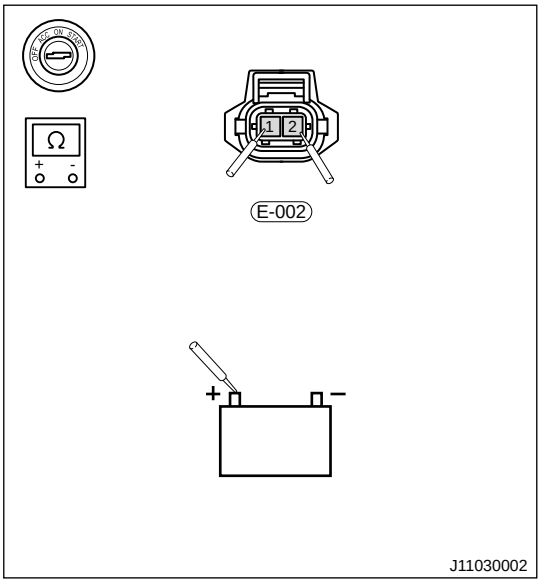
OK

2	**Check for short circuit to ground / power supply in high pressure fuel pump circuit**

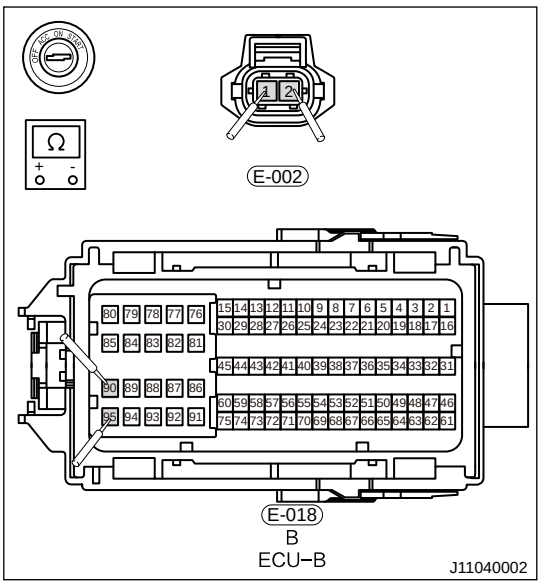
(a) Disconnect the high pressure fuel pump connector.
(b) Disconnect the ECM connector (E-018).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of high pressure fuel pump E-002 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of high pressure fuel pump E-002 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, connect black probe to ECM E-018 (B95, B90), measure for continuity between high pressure fuel pump E-002 (1, 2) with red probe respectively; Check for open circuit.

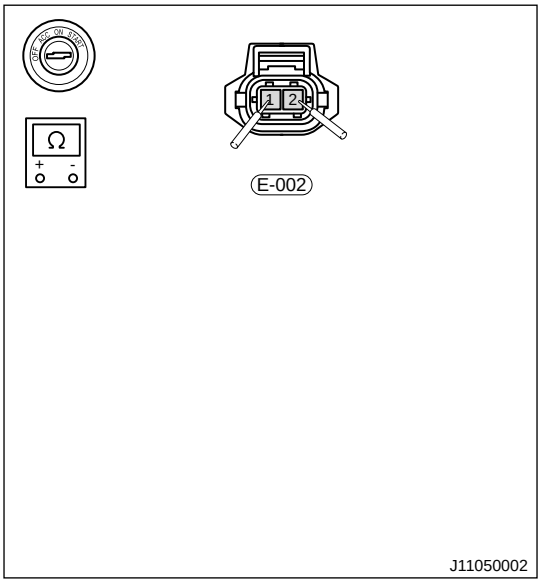


NG → **Check and repair wire harness.**

OK

3	**Check if circuits of flow control valve themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of high pressure fuel pump E-002 (1, 2) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace high pressure fuel pump assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Multiple Cylinder Misfire Detected**

DTC	**P030000**	**Random/Multiple Cylinder Misfire Detected**
DTC	**P030100**	**Cylinder 1 Misfire Detected**

DTC	P030200	Cylinder 2 Misfire Detected
DTC	P030300	Cylinder 3 Misfire Detected
DTC	P030400	Cylinder 4 Misfire Detected
DTC	P036300	Cylinder Selective Fuel Cutoff Active due to Catalyst Damaging Misfire

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check fuel injector, ignition coil connector**

(a) Disconnect the negative battery.
(b) Check if fuel injector, ignition coil connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check if ignition coil control circuit is abnormal**

(a) Check if ignition coil control circuit is abnormal.
(b) Under normal conditions of control circuit, replace ignition coil and perform test.

NG → **Check and repair circuit, or replace ignition coil assembly.**

OK

3	**Check spark plug**

(a) Check spark plug insulating ceramic for cracks;
(b) Check spark plug head electrode for corrosion, damage;
(c) Check if clearance between spark plug head side electrode and center electrode is normal.

NG → **Replace spark plug assembly.**

OK

4	Check if fuel injector control circuit is abnormal

(a) Check if fuel injector control circuit is abnormal.
(b) Under normal conditions of control circuit, replace fuel injector and perform test.

NG → **Check and repair circuit, or replace fuel injector assembly.**

OK

5	Check fuel quality

(a) Check if fuel quality is abnormal.

NG → **Replace fuel.**

OK

6	Check engine system for serious carbon deposition

(a) Check if fuel injector is dirty or blocked.
(b) Check if electronic throttle is dirty.
(c) Check intake valve for serious carbon deposition.

NG → **Clean engine system.**

OK

7	Test engine cylinder pressure

(a) Test if cylinder pressure of each cylinder is met standard with the cylinder pressure gauge.

NG → **Repair the engine.**

OK

8	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **Crankshaft Position Sensor Signal Improper/Missing**

DTC	P033900	Crankshaft Position Sensor “A” Circuit Intermittent
DTC	P261700	Crankshaft Position Signal Output Circuit Open

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check speed sensor connector

(a) Disconnect the negative battery.
(b) Check if speed sensor connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

OK

2	Check speed sensor and signal gear ring condition

(a) Remove the speed sensor.
(b) Check head of speed sensor for a large amount of iron chips.
(c) Check signal gear ring for tooth missing, damage or iron chips adhesion.

NG	Clean up iron chips or replace damaged flywheel.

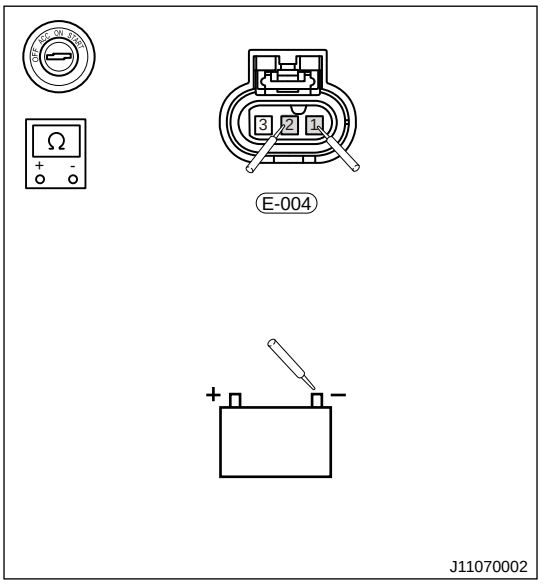
OK

3	Check for short circuit to ground / power supply in speed sensor circuit

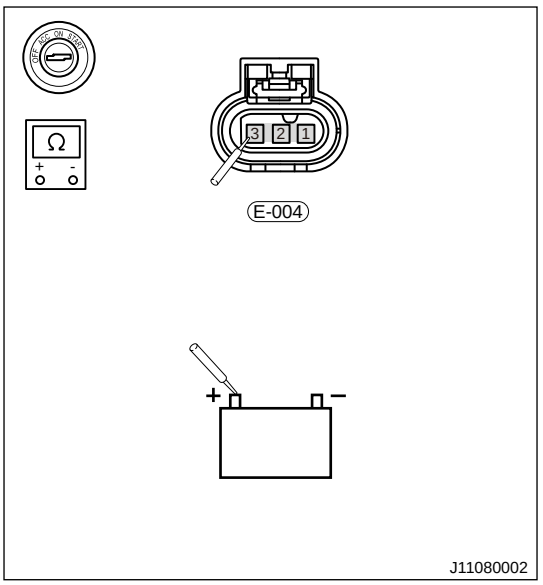
(a) Disconnect the speed sensor connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of speed sensor E-004 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of speed sensor E-004 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness.**

OK

4	Check speed sensor signal circuit

(a) Connect the speed sensor connector.

(b) Ignition switch ON.

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure voltage of speed sensor E-004 (1, 3) with red probe respectively.

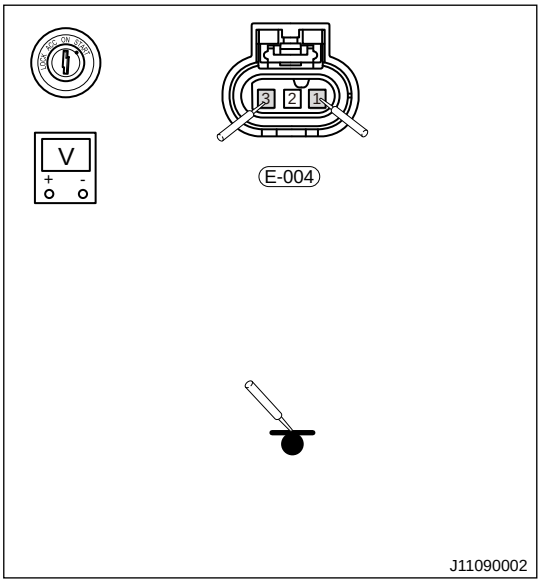
Power supply: 5 V

Ground: < 0.2 V

(d) Start the engine.

(e) Using the LED test light, connect clip to battery negative terminal, measure speed sensor E-004 (2) with another end.

Under normal conditions, test light should flash.

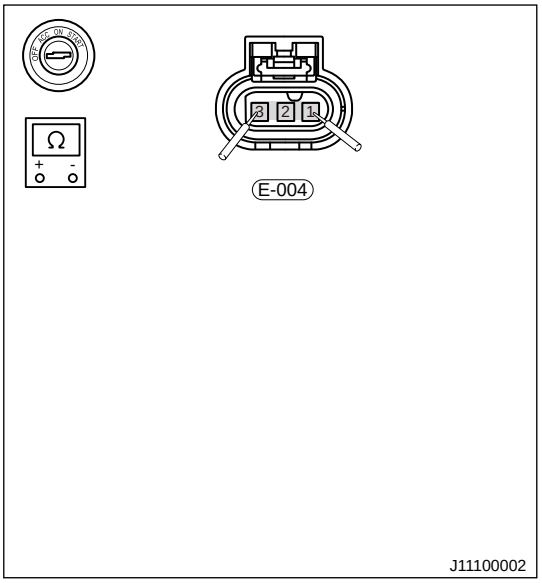


NG → **Check and repair wire harness**

OK

5	**Check if circuits of speed sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of speed sensor E-004 (1, 2, 3) with red and black probes respectively. Check if internal circuits are shorted to each other.



NG → **Replace speed sensor assembly.**

OK

6	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK	Repair or replace new module.

NG

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ Knock Sensor (Terminal A/B) Signal Short to Ground/Power Supply/Voltage Too High/Too Low

DTC	P032700	Knock Sensor Signal Short to Ground (A)
DTC	P032714	Knock Sensor Signal Short to Ground (B)
DTC	P032800	Knock Sensor Signal Short to Power Supply (A)
DTC	P032815	Knock Sensor Signal Short to Power Supply (B)
DTC	P032500	Knock Sensor Signal Circuit Voltage Too Low
DTC	P151000	Knock Control System Failure
DTC	P032600	Knock/Combustion Vibration Sensor 1 Circuit Bank 1 or Single Sensor

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check knock sensor connector

(a) Disconnect the negative battery.
(b) Check if knock sensor connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

OK

2	Check knock sensor condition

(a) Check if knock sensor is exposed to oil, coolant, water, etc. for a long time; Avoid corrosion to sensor.

(b) Check knock sensor fixing bolts for looseness.

Tightening torque: 20 ± 5 N·m

NG → **Clean and tighten fixing bolts to specified torque.**

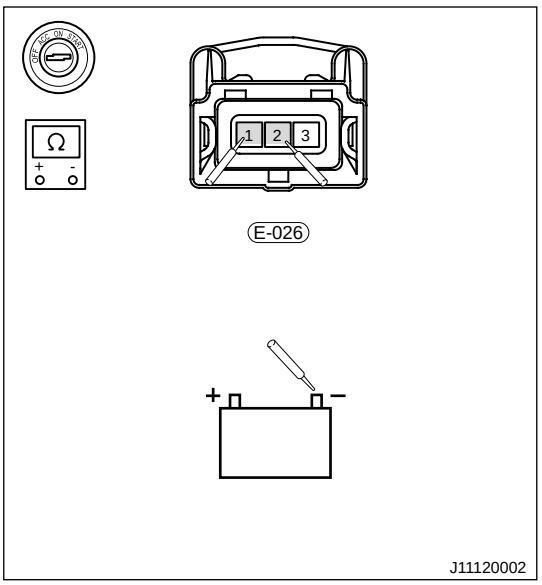
OK

3	Check for short circuit to ground / power supply in knock sensor circuit

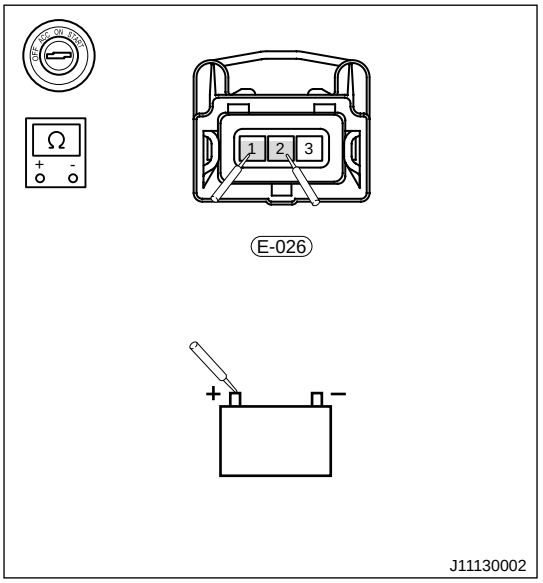
(a) Disconnect the knock sensor connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of knock sensor E-026 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of knock sensor E-026 (1, 2) with red probe respectively. Check if circuit is short to power supply.



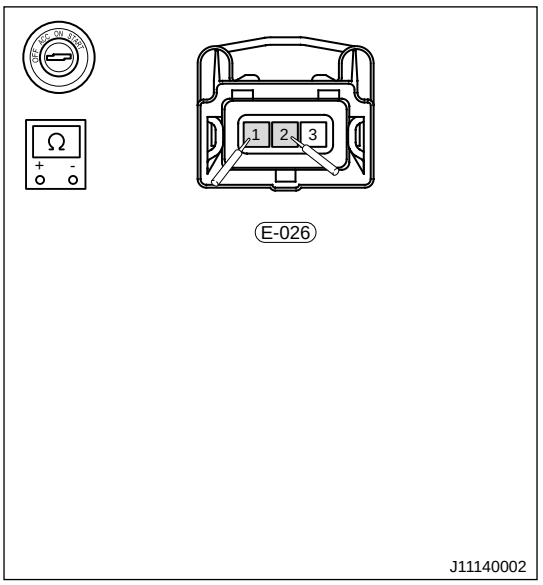
NG → **Check and repair wire harness.**

OK

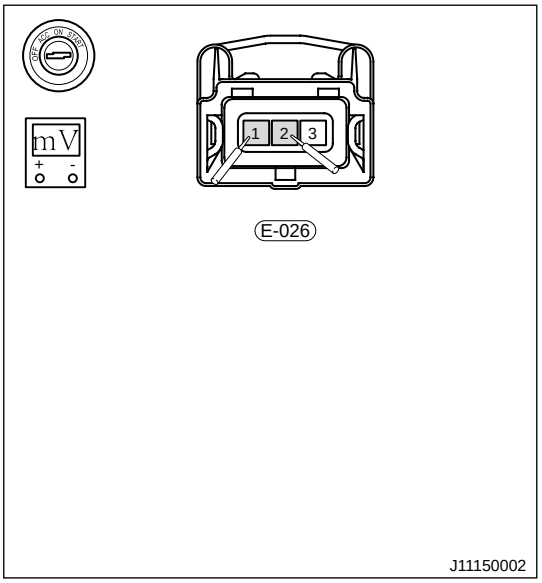
4	**Check knock sensor itself**

(a) Using ohm band of multimeter, measure resistances of knock sensor E-026 (1, 2) with red and black probes respectively.

Resistance at ambient temperature should be 4.9 MΩ ± 20%



(b) Using mV band of multimeter, measure voltages of knock sensor E-026 (1, 2) with red and black probes respectively. Using a small hammer to tap near knock sensor, there should be a voltage signal output at this time.



NG → **Replace knock sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Intake/Exhaust Camshaft Phaser Sensor Signal Improper**

DTC	**P034100**	**Intake Camshaft Phaser Sensor Signal Improper**
DTC	**P036600**	**Exhaust Camshaft Phaser Sensor Signal Improper**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check phaser solenoid valve, valve body bolt components state**

(a) Disconnect the negative battery cable.
(b) Remove intake/exhaust phaser solenoid valve; Check for blockage or dirty.
(c) Remove intake/exhaust phaser valve body bolts; Check for blockage or dirt.

NG → **Clean or replace phaser solenoid valve and valve body bolts.**

OK

2	**Check engine maintenance condition**

(a) Check if engine oil level is normal, and check for oil leakage and oil seepage.
(b) Remove valve trim cover, and check engine lubrication and cleaning conditions, and check for wear or sludge dirty

NG → **Clean and maintain the engine, replace the damaged components.**

OK

3	**Check valve mechanism timing**

(a) Check if valve mechanism timing is normal, and check timing chain for teeth skipping, misalignment, elongation, etc.
(b) Check camshaft signal plate for misalignment, looseness, etc.

NG → **Replace timing chain or camshaft assembly.**

OK

4	**Check intake/exhaust phaser assembly**

(a) Check if operating condition of cam phase regulator is normal (dirt blocked, oil leaked, stuck, etc.).

NG → **Replace intake/exhaust phaser assembly.**

OK

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Exhaust Camshaft Phase Signal Circuit Voltage Low/High**

DTC	P034200	Camshaft Position Sensor “A" Circuit Low Bank 1 or Single Sensor
DTC	P034300	Camshaft Position Sensor “A" Circuit High Bank 1 or Single Sensor

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check intake camshaft phaser sensor connector

(a) Disconnect the negative battery.
(b) Check if intake camshaft phaser sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

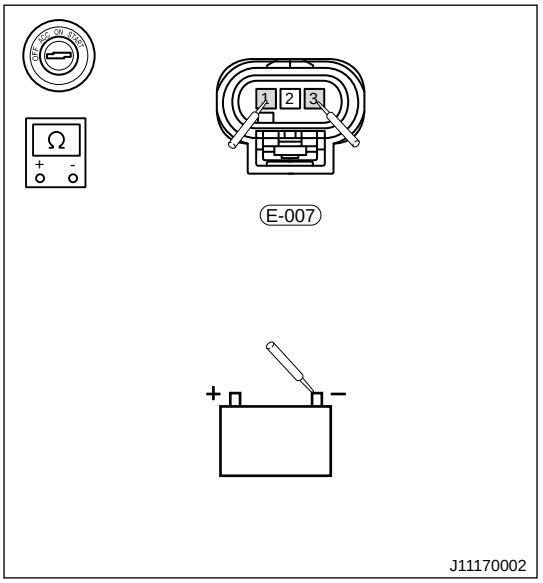
OK

2	Check for short circuit to ground / power supply in intake camshaft phaser sensor circuit

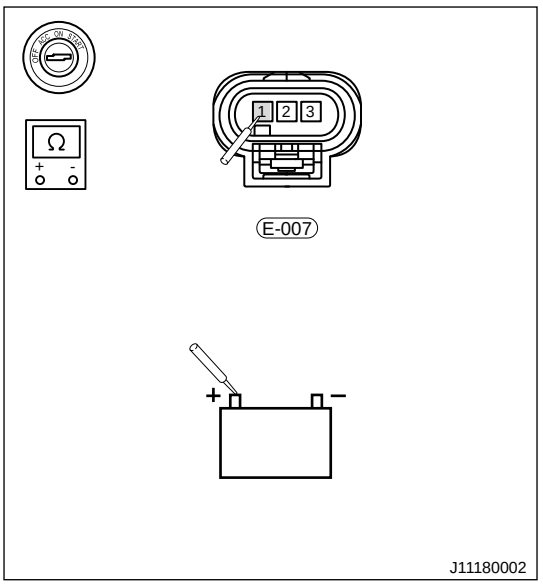
(a) Disconnect the intake camshaft phaser sensor connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of intake camshaft phaser sensor E-007 (1, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure intake camshaft phaser sensor E-007 (1) with red probe respectively. Check if circuit is short to power supply.



NG	**Check and repair wire harness.**

OK

3	**Check intake camshaft phaser sensor circuit**

(a) Connect the intake camshaft phaser sensor connector.

(b) Start the engine.

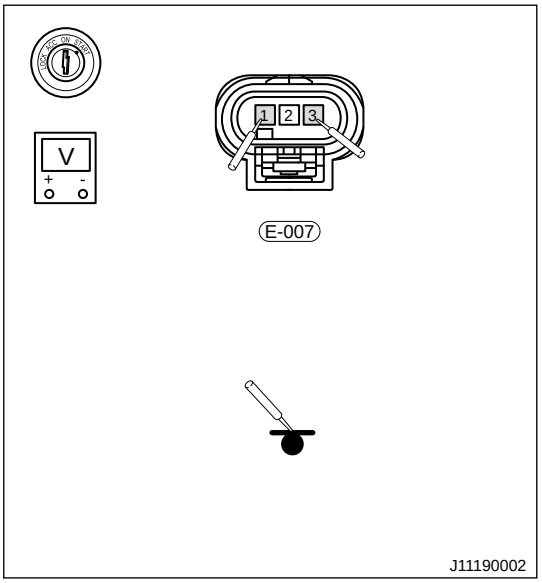
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of intake camshaft phaser sensor E-007 (1, 3) with red probe respectively.

Power supply: 12 V

Ground: < 0.2 V

(d) Using the LED test light, connect clip to battery negative terminal, measure intake camshaft phaser sensor E-007 (1) with another end.

Under normal conditions, test light should flash.



NG → **Check wire harness or replace intake camshaft phaser sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Exhaust Camshaft Phaser Signal Circuit Voltage Low/High

DTC	**P036700**	**Camshaft Position Sensor “B” Circuit Low (Bank1)**
DTC	**P036800**	**Camshaft Position Sensor "B" Circuit High (Bank1)**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check exhaust camshaft phaser sensor connector**

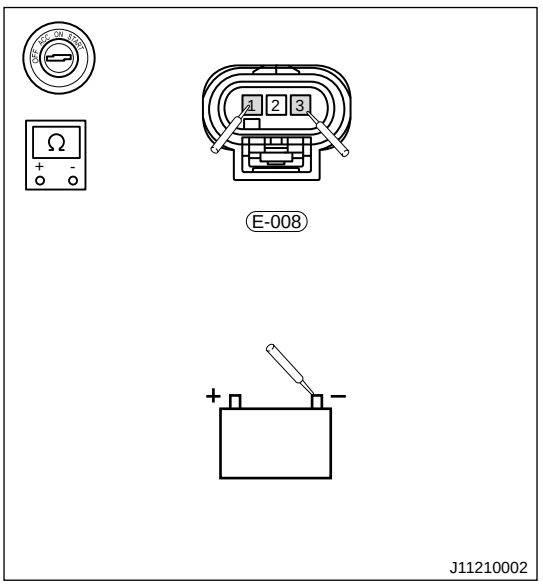
(a) Disconnect the negative battery.
(b) Check if exhaust camshaft phaser sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

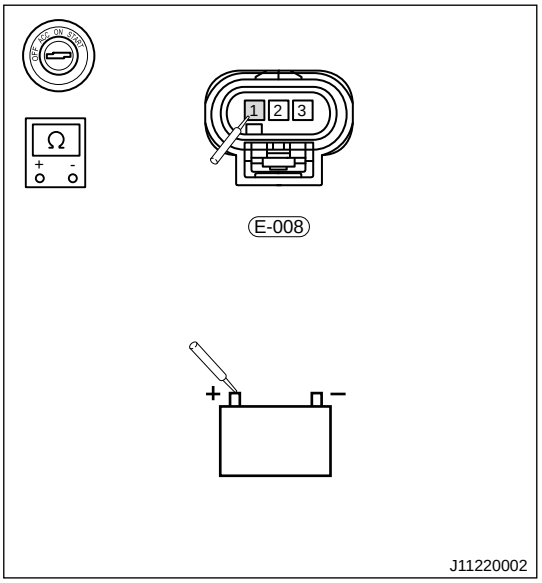
OK

2	**Check for short circuit to ground / power supply in exhaust camshaft phaser sensor circuit**

(a) Disconnect the exhaust camshaft phaser sensor connector.
(b) Disconnect the ECM connector (E-018).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of exhaust camshaft phaser sensor E-008 (1, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure exhaust camshaft phaser sensor E-008 (1) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness circuit.**

OK

3	**Check exhaust camshaft phaser sensor circuit**

(a) Connect the exhaust camshaft phaser sensor connector.

(b) Start the engine.

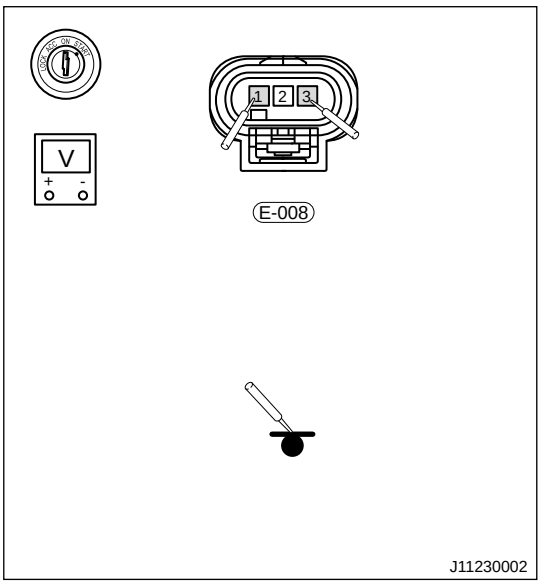
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of exhaust camshaft phaser sensor E-008 (1, 3) with red probe respectively.

Power supply: 12 V

Ground: < 0.2 V

(d) Using the LED test light, connect clip to battery negative terminal, measure exhaust camshaft phaser sensor E-008 (1) with another end.

Under normal conditions, test light should flash.



NG → **Check wire harness or replace exhaust camshaft phaser sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Secondary Oil Pump Drive Circuit Open/Short to Ground/Power Supply

DTC	P06DA13	Secondary Oil Pump Drive Circuit Open
DTC	P06DB11	Secondary Oil Pump Drive Circuit Short to Ground
DTC	P06DC12	Secondary Oil Pump Drive Circuit Short to Power Supply

■ Description

Control schematic diagram

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check variable oil pump connector

(a) Disconnect the negative battery.
(b) Check if variable oil pump connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check variable oil pump power supply fuse

(a) Check if engine compartment fuse and relay box fuse EF21 15A is damaged.

NG → **Check and repair short circuit malfunction of circuit.**

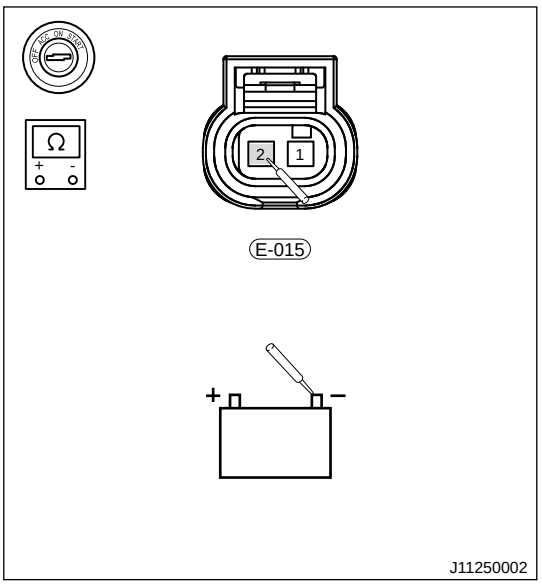
OK

3	Check for short circuit to ground / power supply in variable oil pump circuit

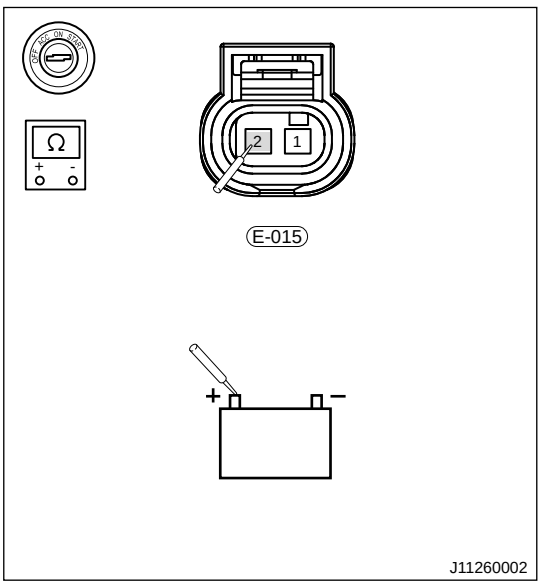
(a) Disconnect the variable oil pump connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of variable oil pump E-015 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure variable oil pump E-015 (2) with red probe respectively. Check if circuit is short to power supply.

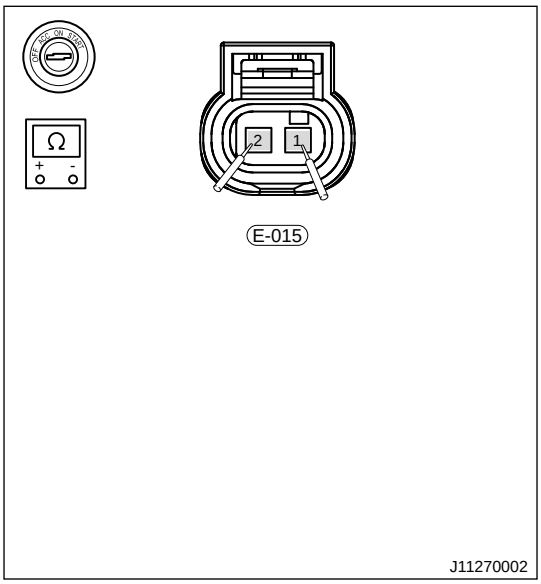


NG → **Check and repair control circuit.**

OK

4	Check if circuits of variable oil pump themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of variable oil pump E-015 (1, 2) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace variable oil pump assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Catalyst System Efficiency Below Threshold Bank 1**

DTC	**P042000**	**Catalyst System Efficiency Below Threshold Bank 1**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check pre-catalytic converter**

(a) Check pre-catalytic converter for mechanical damage.
(b) Check pre-catalytic converter for lead intoxication.

NG → **Replace pre-catalytic converter assembly.**

OK

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Canister Control Valve Control Circuit Open/Low/High**

DTC	**P044413**	**Evaporative Emission System Purge Control Valve Circuit Open**
DTC	**P045811**	**Evaporative Emission System Purge Control Valve Circuit Low**
DTC	**P045912**	**Evaporative Emission System Purge Control Valve Circuit High**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check canister solenoid valve connector

(a) Disconnect the negative battery.
(b) Check if canister solenoid valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check canister solenoid valve power supply fuse

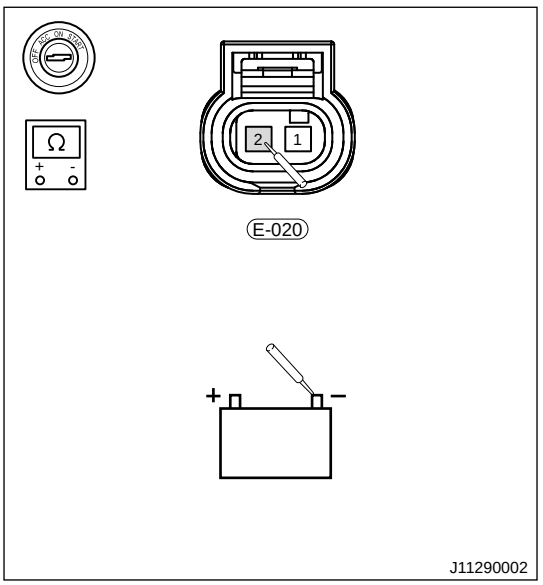
(a) Check if engine compartment fuse and relay box fuse EF21 15A is damaged.

NG → **Check and repair short circuit malfunction of circuit.**

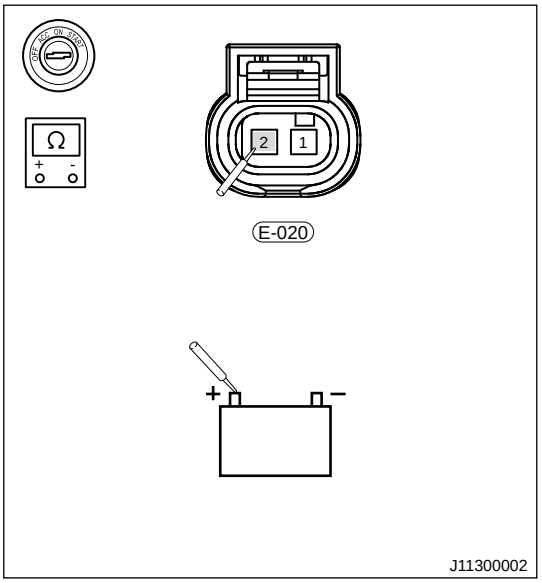
OK

3	Check for short circuit to ground / power supply in canister solenoid valve circuit

(a) Disconnect the variable oil pump connector.
(b) Disconnect the ECM connector (B-003).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of canister solenoid valve E-020 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure canister solenoid valve E-020 (2) with red probe respectively. Check if circuit is short to power supply.

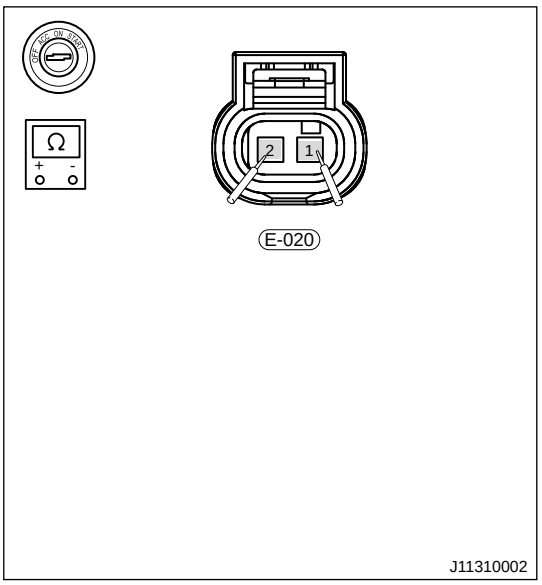


NG → **Check and repair control circuit.**

OK →

4	**Check if circuits of canister solenoid valve themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of canister solenoid valve E-020 (1, 2) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace canister solenoid valve assembly.**

OK →

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK	Repair or replace new module.

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ Idling Too High/Too Low

DTC	P050600	Idle Control System RPM Lower Than Expected
DTC	P050A21	Cold Start Idle Control System Performance
DTC	P050700	Idle Control System RPM Higher than Expected
DTC	P050500	Unreasonable Engine Idling-large Fluctuation
DTC	P050A22	Cold Start Idle Control System Performance
DTC	P050D00	Cold Start Rough Idle

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electronic throttle connector

(a) Disconnect the negative battery.
(b) Check if electronic throttle connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

OK

2	Check electronic throttle condition

(a) Check if electronic throttle is stuck.
(b) Check if electronic throttle is dirty.

NG → **Clean or replace electronic throttle.**

OK ↓

3	Check intake manifold for air leakage

(a) Check intake manifold or connecting lines for air leakage.

NG → **Replace parts related to air leakage.**

OK ↓

4	Check if fuel pressure too low

(a) Check if low/high pressure fuel pressure is too low.

NG → **Replace parts that cause low fuel pressure**

OK ↓

5	Check injector for blockage

(a) Check fuel injector for blockage or leakage.

NG → **Clean or replace fuel injector assembly.**

OK ↓

6	Check if exhaust back pressure is too high

(a) Check pre-catalytic converter for blockage.
(b) Check GPF converter for blockage.

NG → **Replace blocked parts or perform regeneration function.**

OK

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Battery Voltage Low Malfunction**

DTC	P056200	System Voltage Low

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery voltage

(a) Check that battery voltage should not be lower than 12 V.

NG → **It is necessary to recharge or replace the battery assembly.**

OK

2	Check generating capacity of alternator

(a) Check if generating capacity of alternator is normal.
Alternator output voltage: 13.5 V - 15 V

NG → **Replace alternator assembly.**

OK

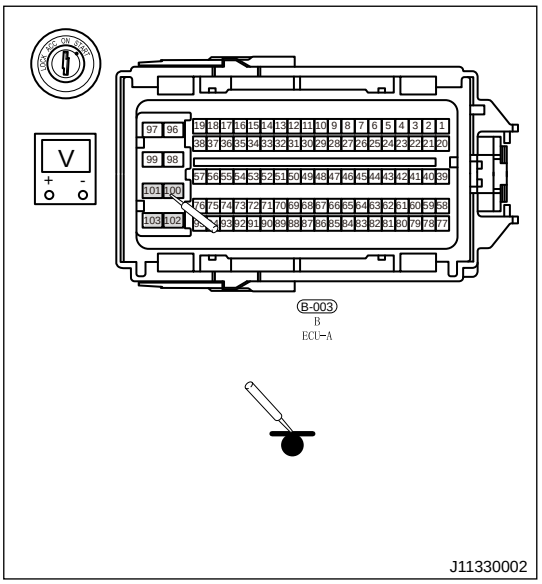
3	Check ECM power supply circuit

(a) Disconnect the ECM connector (B-003).

(b) Short the main relay switch side with wire harness.

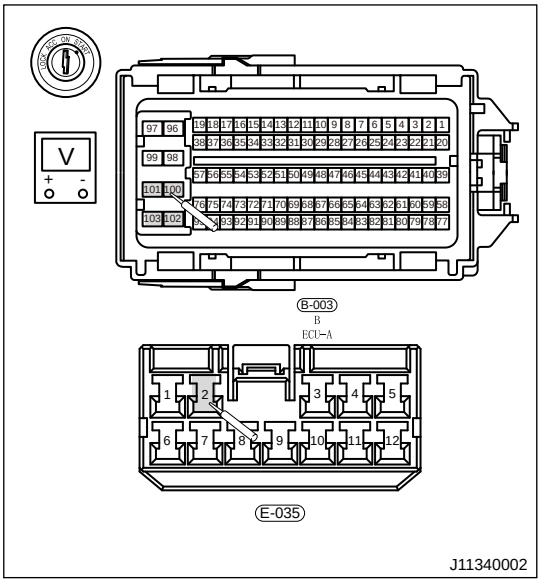
(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of ECM B-003 (A100, A101, A102, A103) with red probe respectively.

(d) Or use test light to measure ECM B-003 (A100, A101, A102, A103); Test light should be bright.



(e) Connect the ECM connector (B-003).

(f) Using voltage band of multimeter, connect black probe to engine compartment fuse and relay box B-035 (D2), measure ECM B-003 (A100, A101, A102, A103) with red probe respectively. Check if circuit voltage drop value is too large.



NG → **Check and repair control circuit.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **System Battery Voltage High**

DTC	P056300	System Battery Voltage High

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check generating capacity of alternator

(a) Check if generating capacity of alternator is normal.

Alternator output voltage: 13.5 V - 15 V

NG → **Replace alternator assembly.**

OK

2	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **Starter Relay Control Terminal Circuit Low/High**

DTC	P061513	Starter Relay Control Circuit Error
DTC	P061611	Starter Relay “A” High Circuit Low
DTC	P061712	Starter Relay “A” Circuit High

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check starter relay coil terminal power supply fuse

(a) Check if engine compartment fuse and relay box fuse EF22 5A is blown.

NG	Check and repair short circuit malfunction of circuit.

OK

2	Check starter relay

(a) Replace starter relay.

NG	Replace starter relay.

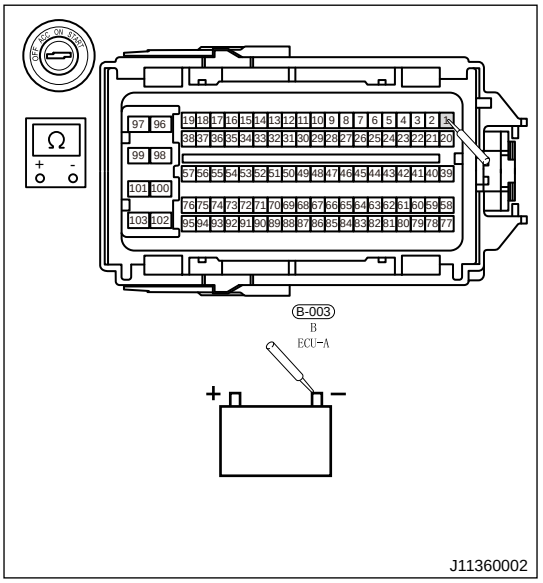
OK

3	Check for short circuit to ground / power supply in ECM control circuit

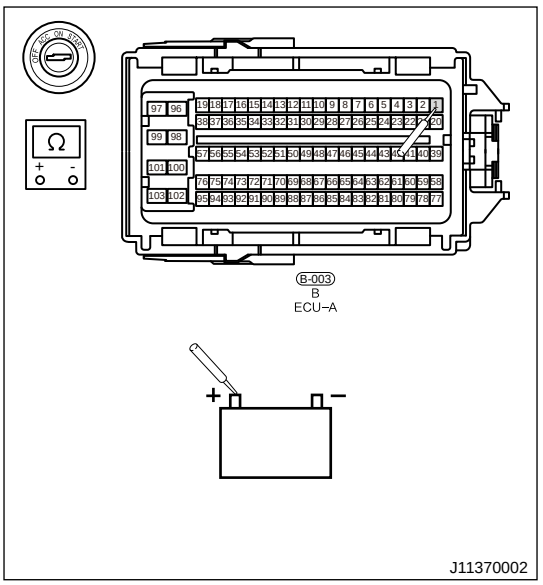
(a) Disconnect the engine compartment fuse and relay box connector (B-043).

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure ECM B-003 (A1) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

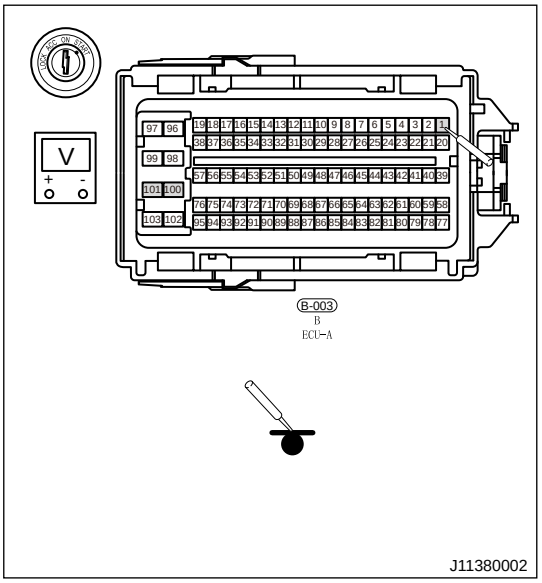
4	**Check ECM control circuit**

(a) Connect the engine compartment fuse and relay box connector (B-043).

(b) Short the main relay switch side with wire harness.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of ECM B-003 (A1) with red probe respectively.

(d) Or use test light to measure ECM B-003 (A1); Test light should be bright.



NG → **Check and repair control circuit.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Brake Chamber Vacuum Pressure Sensor Voltage High/Low**

DTC	**P055800**	**Brake Booster Pressure Sensor Circuit High**
DTC	**P055700**	**Brake Booster Pressure Sensor Circuit Low**

DTC	P145000	Brake Booster Pressure Sensor Circuit Range/Performance (High)
DTC	P145100	Brake Booster Pressure Sensor Circuit Range/Performance (Low)

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check vacuum pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if vacuum pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check brake vacuum booster system for damage or air leakage**

(a) Check brake vacuum booster system each line for damage, or connecting pipe port for air leakage, vacuum pump for abnormal operation, etc.

NG → **Repair or replace the damaged parts related to brake booster system.**

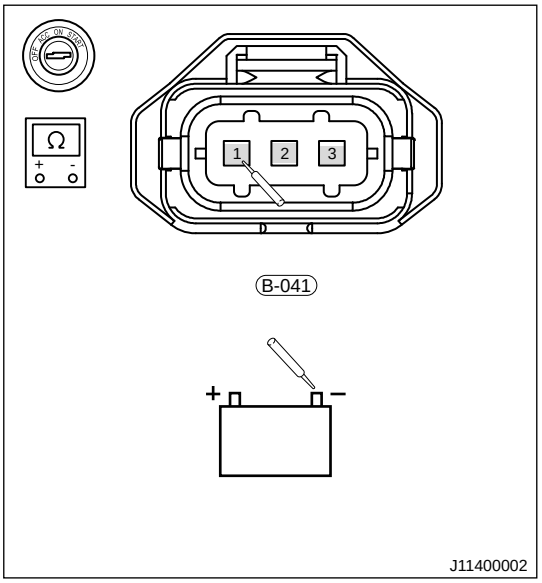
OK

3	**Check for short circuit to ground / power supply in vacuum pressure sensor**

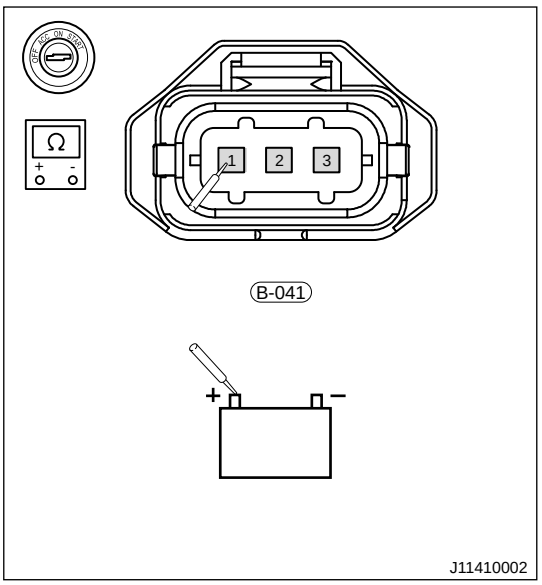
(a) Disconnect the vacuum pressure sensor connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of vacuum pressure sensor B-041 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of vacuum pressure sensor B-041 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair wire harness.**

OK

4	**Check vacuum pressure sensor voltage signal**

(a) Connect vacuum pressure sensor and ECM connectors.

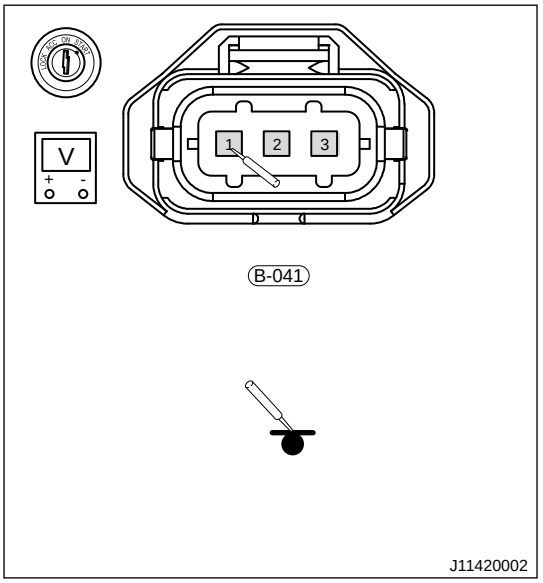
(b) Ignition switch ON.

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure voltage of vacuum pressure sensor B-041 (1, 2, 3) with red probe respectively.

Power supply: 5 V

Ground: < 0.2 V

Depress brake pedal consecutively; Signal voltage should vary in accordance with pressure.



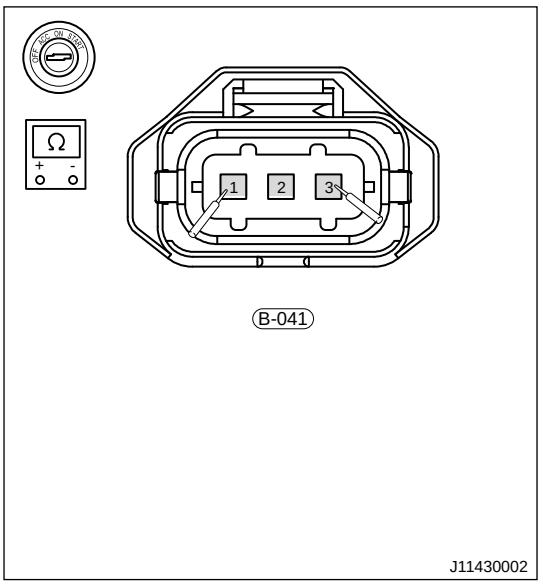
NG → **Check and repair wire harness, or replace vacuum pressure sensor.**

OK

5	**Check vacuum pressure sensor itself**

(a) Using ohm band of multimeter, measure resistance between vacuum pressure sensor B-041 (1, 3), and resistance between (1, 2) with red and black probes respectively. Check if internal circuits are shorted to each other.

Resistance at ambient temperature: 1 KΩ ~ 2 KΩ



NG → **Replace vacuum pressure sensor assembly.**

OK

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ A/C Compressor Circuit Voltage Too Low/Too High

DTC	P064513	A/C Clutch Relay Circuit Open
DTC	P064611	A/C Compressor Relay Circuit Low
DTC	P064712	A/C Compressor Relay Control Circuit High

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check A/C compressor relay coil terminal power supply fuse

(a) Check if engine compartment fuse and relay box fuse EF22 5A is blown.

NG → **Check and repair short circuit malfunction of circuit.**

OK

2	Check A/C compressor relay

(a) Replace A/C compressor relay.

NG → **Replace A/C compressor relay.**

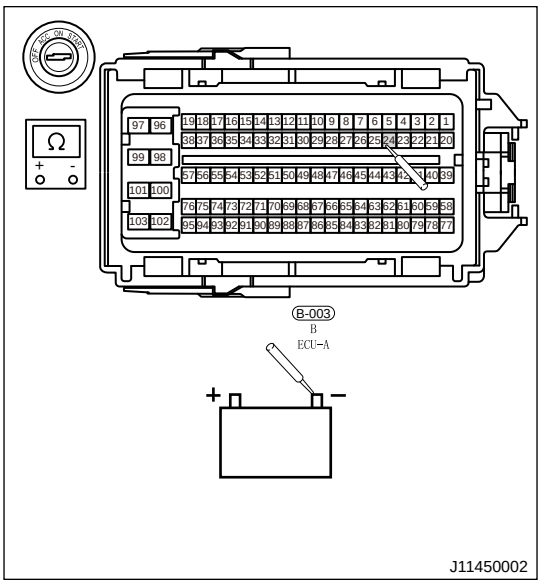
OK

3	Check for short circuit to ground / power supply in ECM control circuit

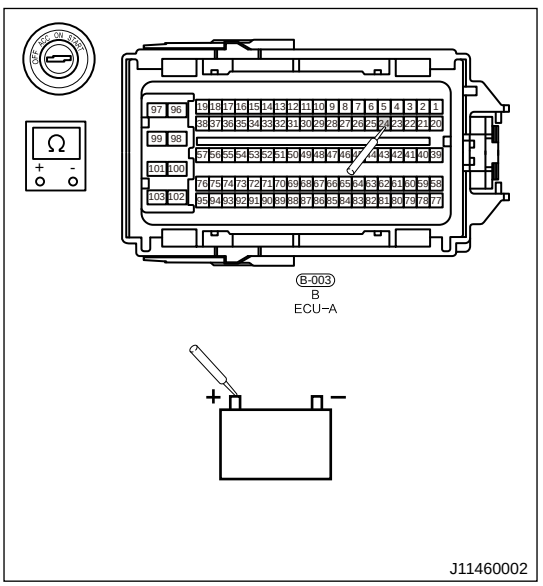
(a) Unplug the A/C compressor relay.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A24) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure ECM B-003 (A24) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

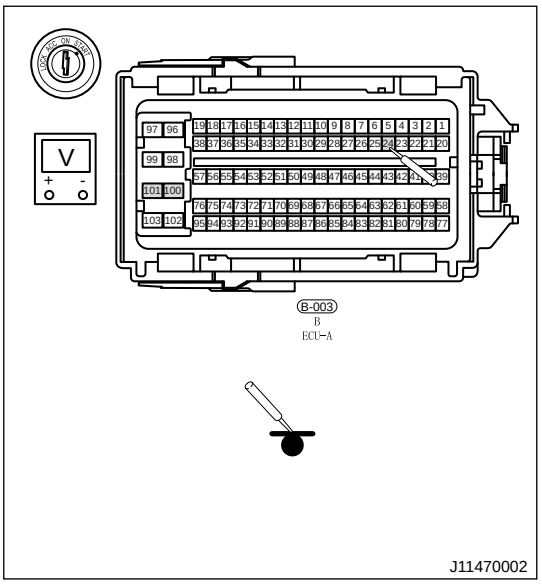
4	Check ECM control circuit

(a) Connect A/C compressor relay.

(b) Short the main relay switch side with wire harness.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of ECM B-003 (A24) with red probe respectively.

(d) Or use test light to measure ECM B-003 (A24); Test light should be bright.



NG → **Check and repair control circuit.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Intake VVT Control Circuit Voltage Too Low/Too High**

DTC	**P208800**	**“A" Camshaft Position Actuator Control Circuit Low Bank 1**
DTC	**P208900**	**“A" Camshaft Position Actuator Control Circuit High Bank 1**

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check intake phaser solenoid valve connector**

(a) Disconnect the negative battery.
(b) Check if intake phaser solenoid valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check intake phaser solenoid valve power supply fuse**

(a) Check if engine compartment fuse and relay box fuse EF21 15A is blown.

NG → **Check and repair short circuit malfunction of circuit.**

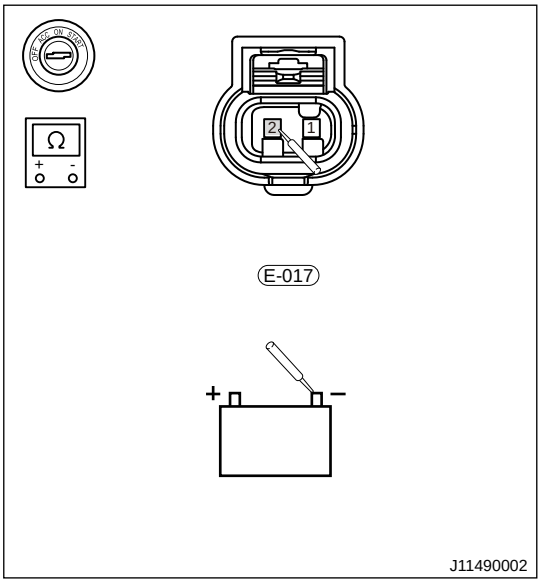
OK

3	**Check for short circuit to ground / power supply in intake phaser solenoid valve circuit**

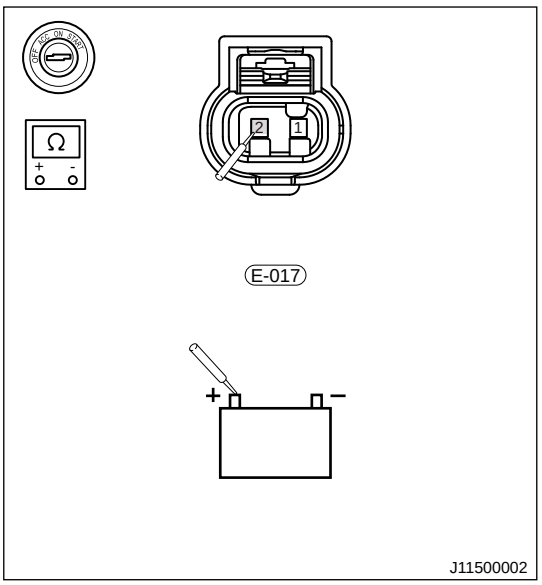
(a) Disconnect the intake phaser solenoid valve connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of intake phaser solenoid valve E-017 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of intake phaser solenoid valve E-017 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

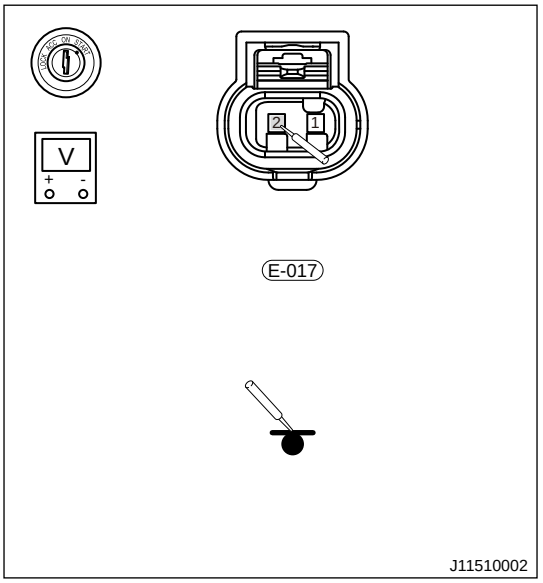
4	**Check intake phaser solenoid valve control circuit**

(a) Connect the intake phaser solenoid valve connector.

(b) Turn the ignition switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of intake phaser solenoid valve E-017 (2) with red probe.

(d) Or use test light to measure intake phaser solenoid valve E-017 (2); Test light should be bright.

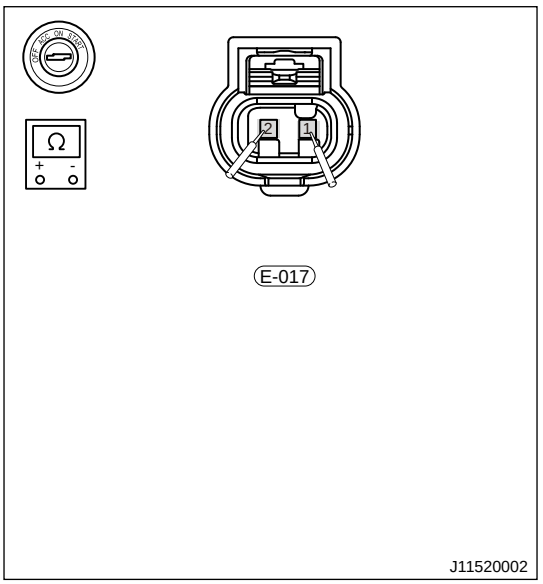


NG → **Check and repair control circuit.**

OK →

5	**Check if circuits of intake phaser solenoid valve themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of intake phaser solenoid valve E-017 (1, 2) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace intake phaser solenoid valve assembly.**

OK →

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Exhaust VVT Control Circuit Voltage Too Low/Too High**

DTC	P209000	“B" Camshaft Position Actuator Control Circuit Low Bank 1
DTC	P209100	“B" Camshaft Position Actuator Control Circuit High Bank 1

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check exhaust phaser solenoid valve connector

(a) Disconnect the negative battery.
(b) Check if exhaust phaser solenoid valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check exhaust phaser solenoid valve power supply fuse

(a) Check if engine compartment fuse and relay box fuse EF21 15A is blown.

NG → **Check and repair short circuit malfunction of circuit.**

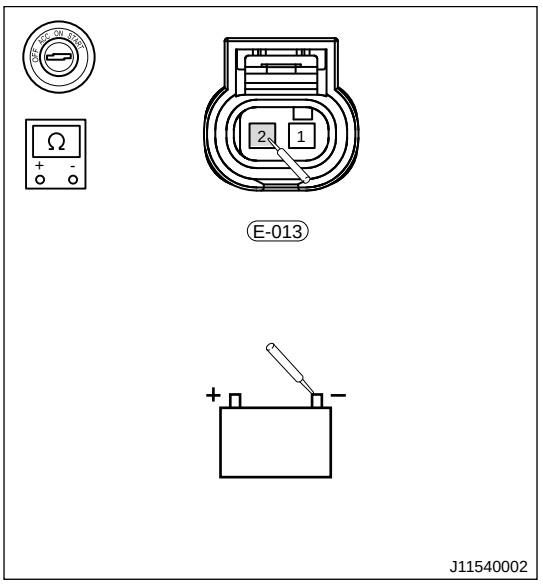
OK →

3	Check for short circuit to ground / power supply in exhaust phaser solenoid valve circuit

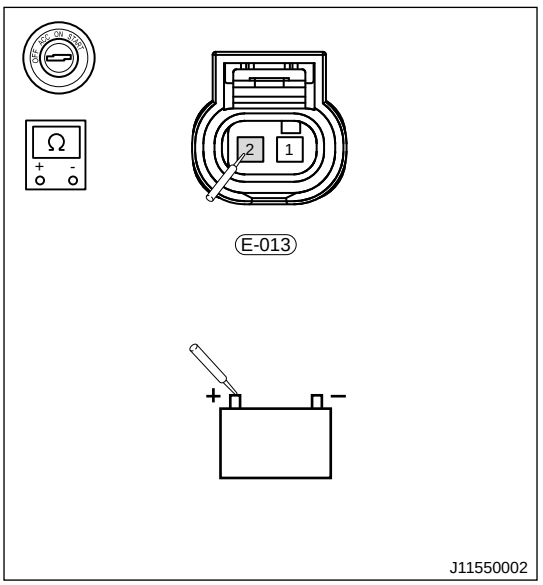
(a) Disconnect the exhaust phaser solenoid valve connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of exhaust phaser solenoid valve E-013 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistance of exhaust phaser solenoid valve E-013 (2) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

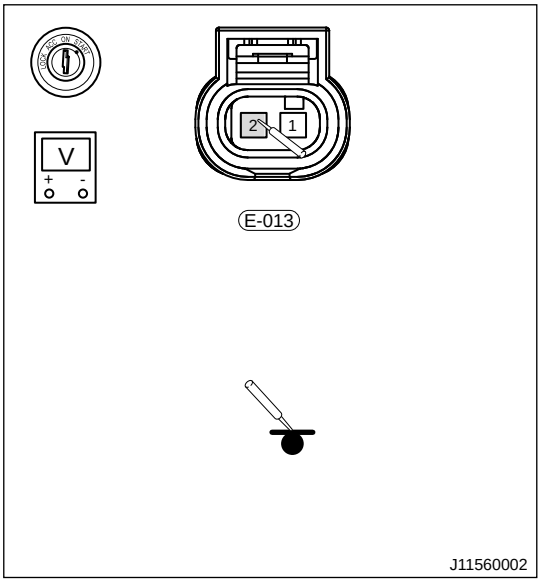
4	Check exhaust phaser solenoid valve control circuit

(a) Connect exhaust phaser solenoid valve connector.

(b) Turn the ignition switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of exhaust phaser solenoid valve E-013 (2) with red probe.

(d) Or use test light to measure exhaust phaser solenoid valve E-013 (2); Test light should be bright.

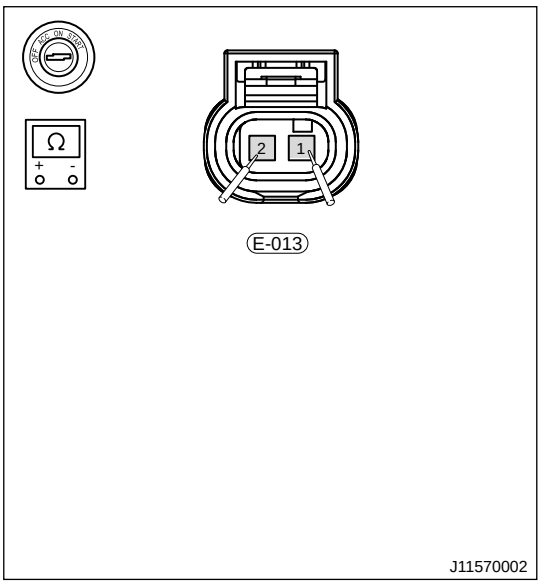


NG → **Check and repair control circuit.**

OK

5	Check if circuits of exhaust phaser solenoid valve themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of exhaust phaser solenoid valve E-013 (1, 2) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace exhaust phaser solenoid valve assembly.**

OK

6	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Air-fuel Ratio Closed Loop Control Correction**

DTC	**P217700**	**System Too Lean Off Idle Bank 1**
DTC	**P217800**	**System Too Rich Off Idle Bank 1**
DTC	**P218700**	**System Too Lean at Idle Bank 1**
DTC	**P218800**	**System Too Lean at Idle Bank 1**
DTC	**P219500**	**O2 Sensor Signal Biased/Stuck Lean Bank 1 Sensor 1**
DTC	**P219600**	**O2 Sensor Signal Biased/Stuck Rich Bank 1 Sensor 1**
DTC	**P241400**	**O2 Sensor Exhaust Sample Error Bank 1 Sensor 1**
DTC	**P209700**	**Post Catalyst Fuel Trim System Too Rich Bank 1**
DTC	**P209600**	**Post Catalyst Fuel Trim System Too Lean Bank 1**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check upstream oxygen sensor

(a) Depress the accelerator pedal sharply under idling condition, oxygen pump control voltage of oxygen sensor should be lower than 2.5 V at this time.
(b) Oxygen pump control voltage of oxygen sensor should be higher than 2.5 V when releasing the accelerator pedal quickly.

NG → **Replace upstream oxygen sensor assembly.**

OK →

2	Check intake pressure/temperature sensor

(a) Check intake pressure/temperature sensor (pressure signal).

Under idling state: Approximately 1 V

When the vehicle accelerates rapidly, voltage can instantly reach 4 V, and then drop to approximately 1.7 V

NG → **Replace intake pressure/temperature sensor.**

OK →

3	Check fuel system

(a) Check if low/high pressure fuel pressure is within the proper range.
(b) Check if fuel injector is dirty.

NG → **Replace fuel system damaged parts or clean fuel injector.**

OK →

4	Check intake system

(a) Check intake manifold, etc. to determine each line for air leakage.

NG → **Replace the leaked or damaged parts.**

OK

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Downstream Oxygen Sensor Deteriorated**

DTC	**P227000**	**O2 Sensor Signal Biased&Stuck Lean Bank 1 Sensor 2**
DTC	**P227100**	**O2 Sensor Signal Biased&Stuck Rich Bank 1 Sensor 2**
DTC	**P013A00**	**O2 Sensor Slow Response - Rich to Lean Bank 1 Sensor 2**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check downstream oxygen sensor

(a) Check if downstream oxygen sensor heating resistance is normal.

Resistance at ambient temperature: 7 ~ 11 Ω

(b) Check if downstream oxygen sensor signal voltage is normal.

It is normal when signal voltage fluctuates slightly from 0.55 to 0.65 V

NG → **Replace downstream oxygen sensor assembly.**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired.**

■ **Turbocharger Boost Pressure Too High**

DTC	**P023400**	**Turbocharger Boost Pressure Too High**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check turbocharger relief valve**

(a) Check turbocharger relief valve connector for looseness or poor contact.
(b) Check if turbocharger relief valve stuck.

NG	**Replace turbocharger relief valve assembly.**

OK

2	**Check exhaust gas by-pass valve**

(a) Pull exhaust gas by-pass valve pulling rod with hand to check that it can move smoothly and there is no stuck.

NG	**Replace turbocharger assembly.**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **Turbocharger Pressure Sensor Short to Ground/Power Supply**

DTC	**P023700**	**Turbocharger/Supercharger Boost Sensor "A" Circuit Low**
DTC	**P023800**	**Turbocharger/Supercharger Boost Sensor "A" Circuit High**

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check boost pressure/temperature sensor connector**

(a) Disconnect the negative battery.

(b) Check if boost pressure/temperature sensor connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

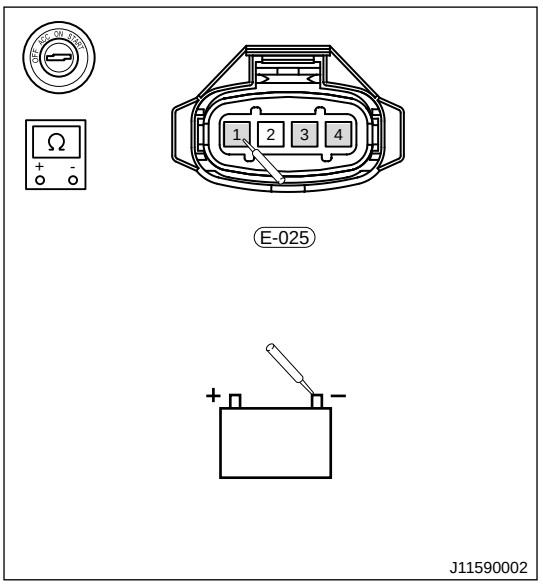
OK

2	**Check for short circuit to ground / power supply in boost pressure/temperature sensor circuit**

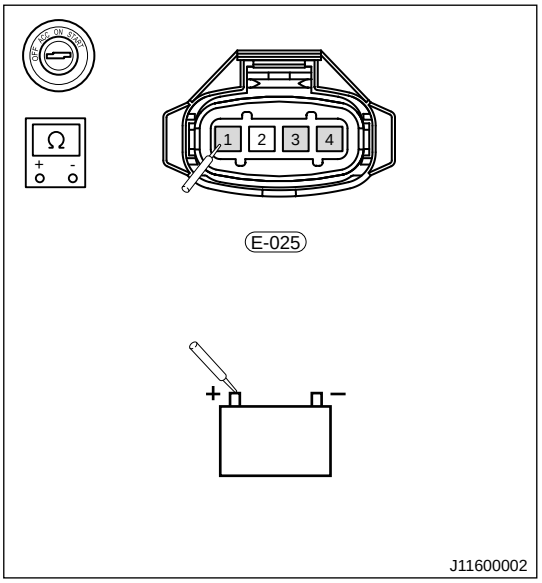
(a) Disconnect the boost pressure/temperature sensor connector.

(b) Disconnect the ECM connector (E-018).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of boost pressure/ temperature sensor E-025 (1, 3, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of boost pressure/ temperature sensor E-025 (1, 3, 4) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

3	**Check boost pressure/temperature sensor control circuit**

(a) Connect boost pressure/temperature sensor connector.

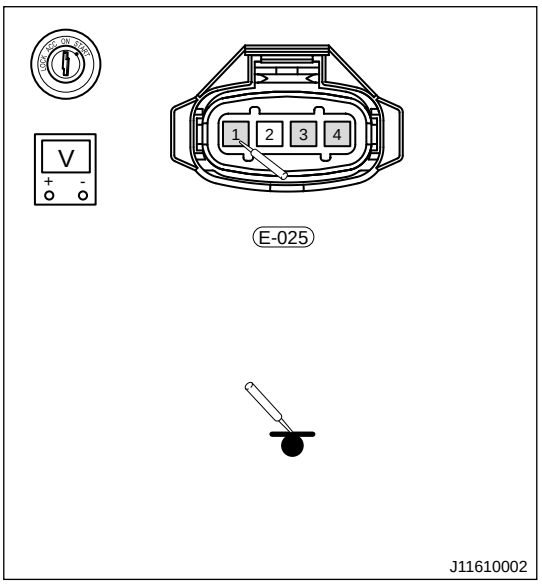
(b) Turn the ignition switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of boost pressure/temperature sensor E-025 (1, 3, 4) with red probe respectively.

Power supply terminal: 5 V

Ground terminal: < 0.2 V

Signal voltage varies in accordance with turbocharger line pressure

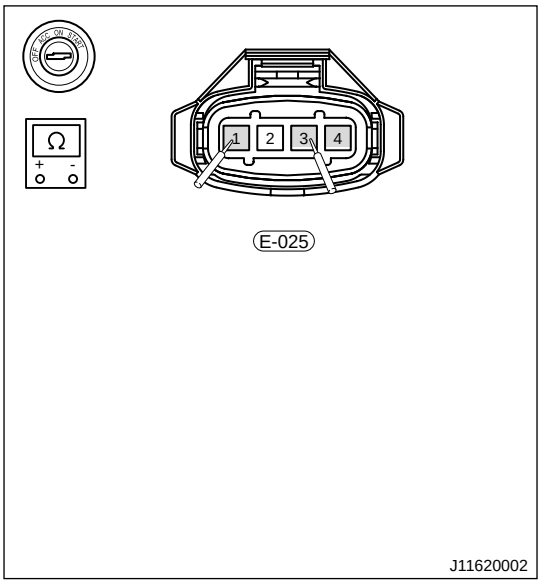


NG → **Check and repair control circuit, or replace boost pressure/temperature sensor.**

OK

4	Check if circuits of boost pressure/temperature sensor themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of boost pressure/temperature sensor E-013 (1, 3, 4) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace boost pressure/temperature sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Booster Exhaust Gas Control Circuit Open, Voltage Too High or Too Low

DTC	P024300	Booster Exhaust Gas Control Circuit Open
DTC	P024600	Booster Exhaust Gas Control Circuit Voltage Too High or Too Low

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check exhaust gas bypass actuator connector**

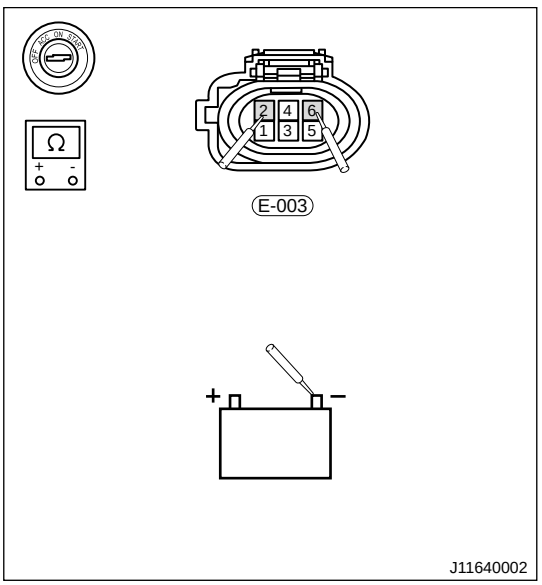
(a) Disconnect the negative battery.
(b) Check if exhaust gas bypass actuator connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

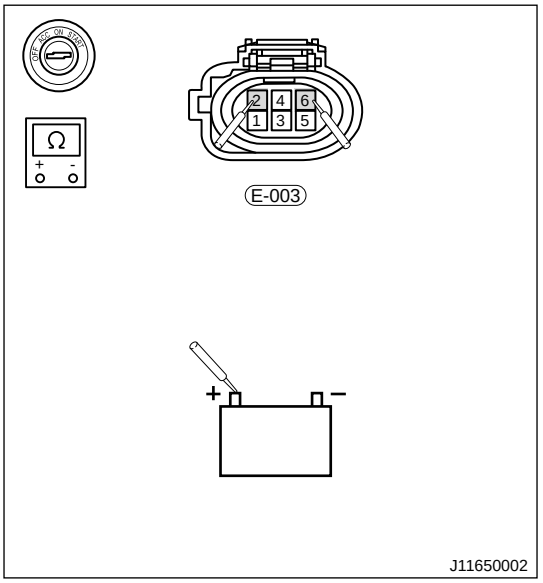
OK

2	**Check whether the exhaust gas bypass actuator circuit is short to ground or power supply**

(a) Disconnect the exhaust gas bypass actuator connector.
(b) Disconnect the ECM connector (E-018).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of exhaust gas bypass actuator E-003 (2, 6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of exhaust gas bypass actuator E-003 (2, 6) with red probe respectively. Check if circuit is short to power supply.

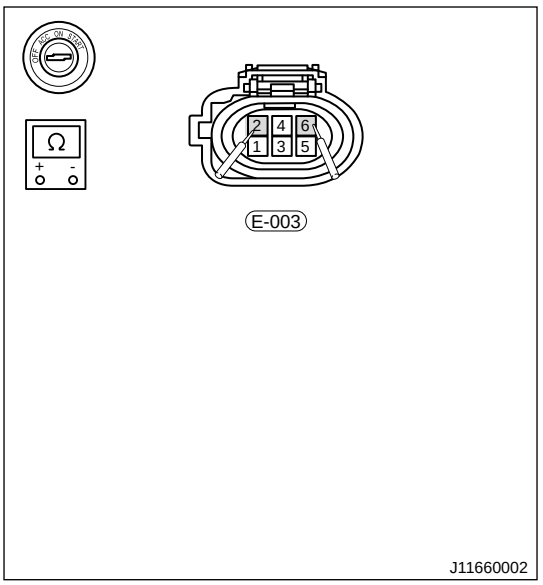


NG → **Check and repair control circuit.**

OK

3	**Check whether the exhaust gas bypass actuator is short to each other**

(a) Using ohm band of multimeter, measure resistances of exhaust gas bypass actuator E-003 (2, 6) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace the exhaust gas bypass actuator assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Turbocharger Boost Pressure Too Low**

DTC	P029900	Turbocharger Boost Pressure Too Low

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check air filter

(a) Check if air filter is dirty, blocked, etc.

NG → **Replace the air filter assembly.**

OK

2	Check each connecting line of turbocharger

(a) Check each connecting line of turbocharger for falling off, damage or air leakage, etc.

NG → **Replace the damaged line.**

OK

3	Check exhaust gas by-pass valve

(a) Pull exhaust gas by-pass valve pulling rod with hand, there should be no stuck.

NG → **Replace turbocharger assembly.**

OK

4	Check relief solenoid valve

(a) Check that relief solenoid valve connector is not loose or does not fall off.
(b) Check if relief solenoid valve is stuck at normally open position.

NG → **Replace relief solenoid valve assembly.**

OK

5	Check turbocharger

(a) Check operation parts such as turbine, impeller for damage or blade missing.

NG → **Replace turbocharger assembly.**

OK

6	Check if exhaust back pressure is too high

(a) Check pre-catalytic converter for blockage.
(b) Check GPF particulate filter for blockage.

NG → **Replace pre-catalytic converter assembly or perform GPF regeneration.**

OK

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **Turbocharger/Supercharger Bypass Valve "A" - Mechanical**

DTC	P226100	Turbocharger/Supercharger Bypass Valve "A" - Mechanical

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check relief solenoid valve

(a) Check that relief solenoid valve connector is not loose or does not fall off.
(b) Check if relief solenoid valve is not stuck.

NG	Replace relief solenoid valve assembly.

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **Upstream Oxygen Sensor RE Line, IPE Line Open**

DTC	P224300	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1
DTC	P225100	O2 Sensor Negative Current Control Circuit Open Bank 1 Sensor 1

DTC	P013000	Upstream Oxygen Sensor Compensating Circuit Open
DTC	P223700	O2 Sensor Positive Current Control Circuit Open Bank 1 Sensor 1 (-Close to ECM)

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check upstream oxygen sensor connector**

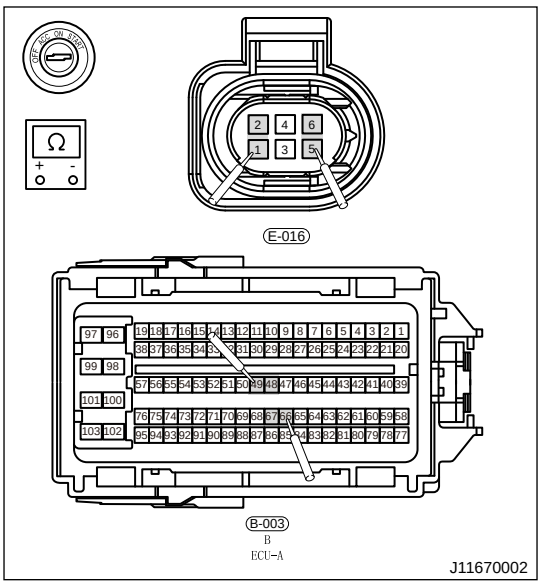
(a) Disconnect the negative battery.
(b) Check if upstream oxygen sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check upstream oxygen sensor circuit for open**

(a) Disconnect the upstream oxygen sensor connector.
(b) Disconnect the ECM connector (B-003).
(c) Using ohm band of multimeter, connect black probe to ECM B-003 (A48, A49, A66, A67), measure resistances of upstream oxygen sensor E-016 (1, 2, 5, 6) with red probe respectively. Check the circuit for open.



NG → **Check and repair control circuit.**

OK

3	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Network Malfunction**

DTC	U012287	Lost Communication With ESP (Electronic Stability Program)
DTC	U014687	Lost Communication With GW (Gateway)
DTC	U012687	Lost Communication With SAS (Steering Angle)
DTC	U010187	Lost Communication With TCM (Transmission Controller)
DTC	U110017	CAN Module Input Power Voltage High
DTC	P1388 24	Ambient Temperature Sensor Cold Start Test Positive Deviation Unreasonable
DTC	P1388 23	Ambient Temperature Sensor Cold Start Test Negative Deviation Unreasonable
DTC	P0070	Ambient Air Temperature Sensor Circuit "A"
DTC	U0128	Lost Communication With EPB Module
DTC	U0131	Lost Communication With EPS (HS CAN)
DTC	U0151	Lost Communication With Airbag Module (SDM) (HS CAN)
DTC	U0073	Control Module Communication Bus 1 Off (CAN1 Bus off)
DTC	P150100	Airbag Communicate Message Unplausible
DTC	P150000	EMS Received Crash Signal
DTC	U015187	Lose Communication With ABM/EGS/EPB/MFS/PEPS/SAM/EBS/ DECOS or Signal Abnormal

DTC	U010387	
DTC	U012887	
DTC	U118787	
DTC	U024887	
DTC	U021287	
DTC	U01B000	
DTC	U010987	
DTC	U041681	Data Received by ECM from ESP/TCM/ABM/BCM/CLM/EGS/EPB/FPC/ICM/MFS/PEPS/SAM Module not Reliable
DTC	U040281	
DTC	U045281	
DTC	U042281	
DTC	U042481	
DTC	U040481	
DTC	U041781	
DTC	U041081	
DTC	U042381	
DTC	U059B81	
DTC	U042681	
DTC	U042981	
DTC	U007388	CAN1 Bus OFF (Communication Closed)
DTC	U010187	Lost Communication With TCM (Transmission Controller)
DTC	U012287	Lost Communication With ESP (Electronic Stability Program)
DTC	U015587	Lost Communication With IP (Instrument Cluster)
DTC	U016487	Communication between ECM and AC Control Module Failure
DTC	U014087	Lost Communication With BCM (Body Control Module)

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Refer to diagnosis in CAN network section.

■ **Response Reception Time Out/Error of LIN Bus (Contact Between EMS and Intellectual Generator)**

DTC	P141500	Response Reception Time Out Error of LIN Bus (Contact Between EMS and Intellectual Generator)
DTC	P141700	Checksum Error of LIN Bus (Contact Between EMS and Intellectual Generator)

DTC	**P144200**	**Communication Fault of Generator**
DTC	**P144100**	**Mechanical Fault of Generator**
DTC	**P144000**	**Generator Circuit Error**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check alternator connector**

(a) Disconnect the negative battery.
(b) Check if alternator connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check LIN line voltage**

(a) Disconnect the alternator connector.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of alternator LIN line with red probe respectively.

Equivalent voltage: Approximately 10 V

OK → **Replace alternator.**

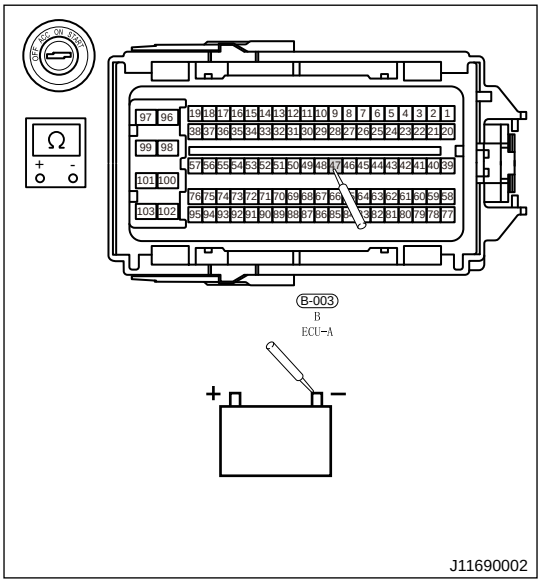
NG

3	**Check for short circuit to ground / power supply in LIN line**

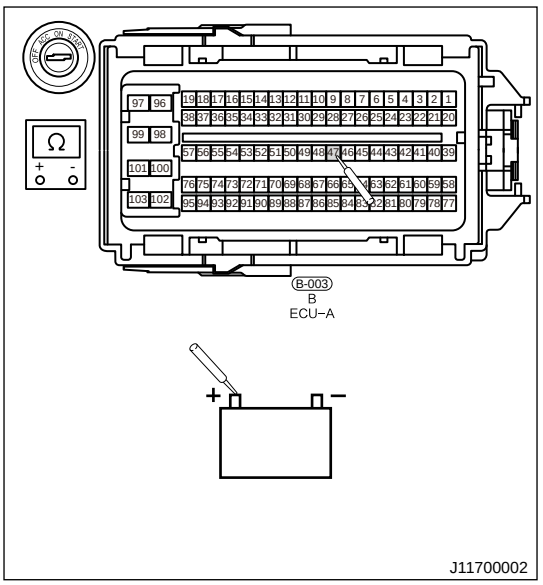
(a) Disconnect the alternator connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A47) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-003 (A47) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair control circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Immobilizer Malfunction**

DTC	P051300	Immobilizer Malfunction
DTC	P063300	
DTC	P161000	
DTC	P161400	
DTC	P161200	
DTC	P161300	
DTC	P161100	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Refer to diagnosis in immobilizer system section.

■ **Canister Vent Valve Stuck Normally Closed**

DTC	P242200	Canister Vent Valve Stuck Normally Closed

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check canister vent valve

(a) Check if line or charcoal canister filter at canister vent valve is blocked.
(b) Check if canister vent valve is stuck closed position.

NG → **Replace charcoal canister filter or canister vent valve.**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Fuel Tank Pressure Sensor Malfunction**

DTC	P045300	Fuel Tank Pressure Sensor Signal Short to Power Supply
DTC	P045200	Fuel Tank Pressure Sensor Signal Short to Ground
DTC	P128200	EVAP System Pressure Sensor/Switch Circuit Range Performance
DTC	P128300	EVAP System Pressure Sensor/Switch Circuit Range Performance
DTC	P04512A	EVAP System Pressure Sensor&Switch Circuit Range Performance
DTC	P045125	EVAP System Pressure Sensor&Switch Circuit Range Performance
DTC	P045128	EVAP System Pressure Sensor&Switch Circuit Range Performance

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuel tank pressure sensor connector

(a) Disconnect the negative battery.
(b) Check if fuel tank pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check canister vent valve**

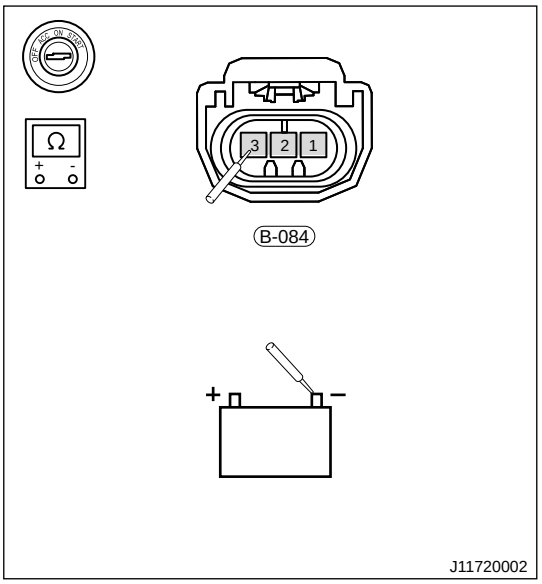
(a) Check if line or charcoal canister filter at canister vent valve is blocked.
(b) Check if canister vent valve is stuck closed or normally open position.

NG → **Replace charcoal canister filter or canister vent valve.**

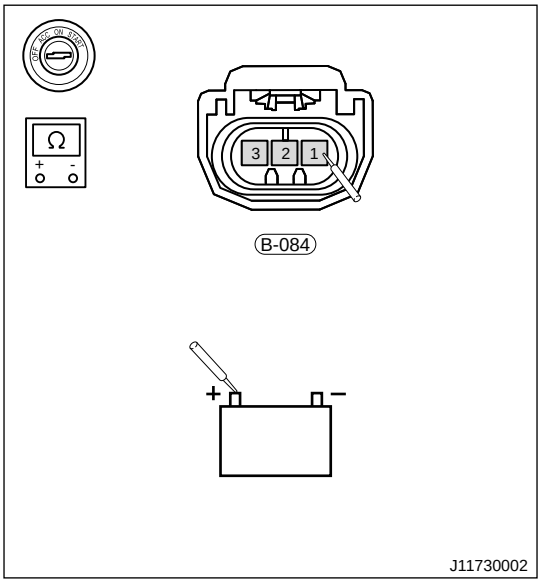
OK

3	**Check for short circuit to ground / power supply in fuel tank pressure sensor circuit**

(a) Disconnect fuel tank pressure sensor connector.
(b) Disconnect the ECM connector (E-018).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel tank pressure sensor B-084 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel tank pressure sensor B-084 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.

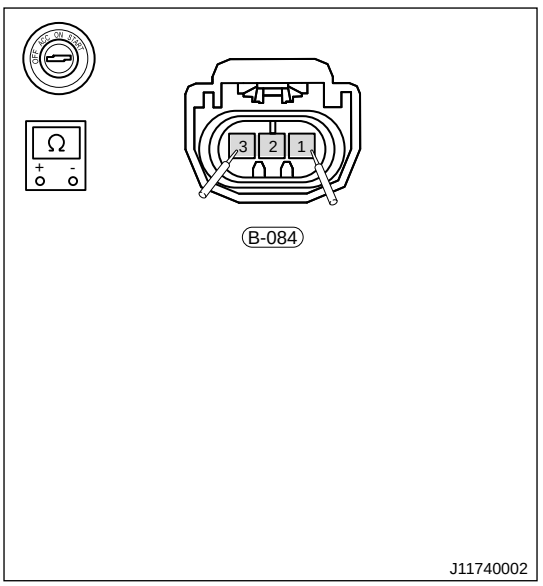


NG → **Check and repair control circuit.**

OK

4	**Check if circuits of fuel tank pressure sensor themselves are shorted to each other**

(a) Using ohm band of multimeter, measure resistances of fuel tank pressure sensor B-084 (1, 2, 3) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace fuel tank pressure sensor assembly.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK	**Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	**Conduct test and confirm malfunction has been repaired.**

■ Fuel Level Sensor Malfunction

DTC	**P046300**	**Fuel Level Sensor "A" Circuit High**
DTC	**P046200**	**Fuel Level Sensor “A” Circuit Low**
DTC	**P25B000**	**Fuel Level Sensor "A" Stuck**
DTC	**P046129**	**Fuel Level Sensor Unreasonable**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check fuel pump connector**

(a) Disconnect the negative battery.
(b) Check if fuel pump connector is loose, and contact between male and female terminals is in good condition.

NG	**Repair and adjust connector, or replace it.**

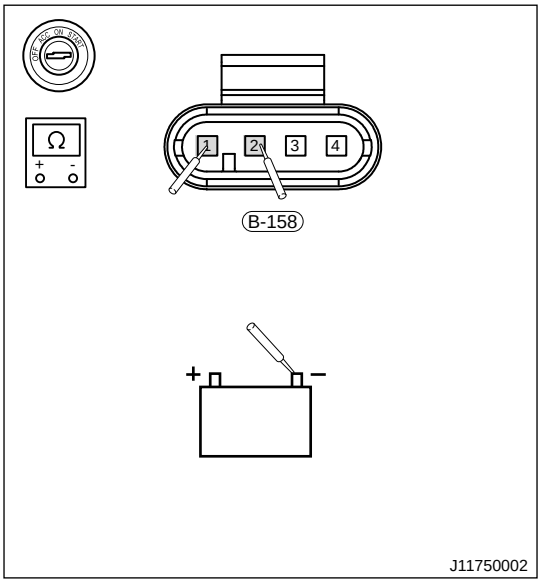
OK

2	**Check for short circuit to ground / power supply in fuel level sensor circuit**

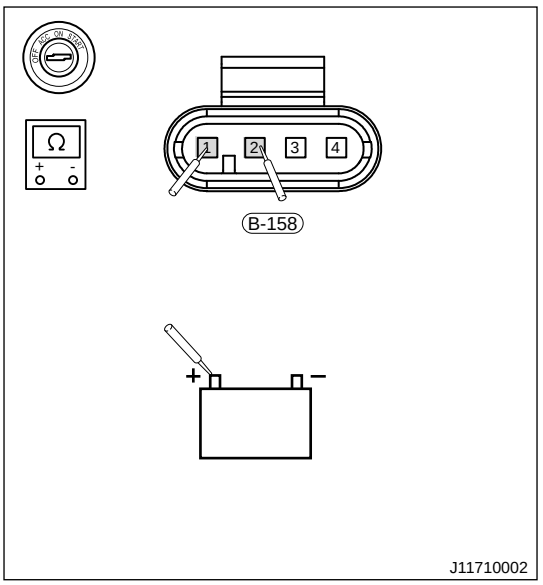
(a) Disconnect the fuel level sensor connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel level sensor B-158 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel level sensor B-158 (1, 2) with red probe respectively. Check if circuit is short to power supply.

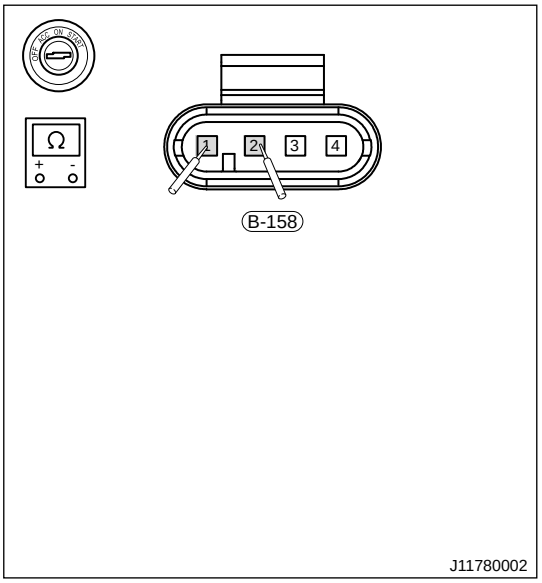


NG	**Check and repair control circuit.**

OK

3	**Check if circuits of fuel level sensor themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of fuel level sensor B-158 (1, 2) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace fuel level sensor assembly.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Evaporation System Leakage Malfunction**

DTC	**P044200**	**EVAP System Leak Detected (Small Leak)**
DTC	**P045500**	**EVAP System Leak Detected (Large Leak)**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check fuel tank cap**

(a) Check if fuel tank cap is tightened, and check if internal seal ring is deformed.
(b) Check fuel tank cap for damage or leaked port.

NG → **Repair and adjust or replace fuel tank assembly.**

OK

2	**Check evaporation system connecting line**

(a) Check each line for damage or small hole, etc.
(b) Check each line joint is clamped into place and check if worm clamp is tightened.

NG → **Repair and adjust or replace the damaged parts.**

OK

3	**Check charcoal canister**

(a) Check charcoal canister for damage or small hole, etc.
(b) Check if connecting pipe joint is clamped into place.

NG → **Repair and adjust or replace charcoal canister assembly.**

OK

4	**Check canister vent valve**

(a) Check if canister vent valve is not closed tightly or stuck.

NG → **Replace canister vent valve assembly.**

OK

5	Check canister solenoid valve

(a) Check if canister solenoid valve is not closed tightly or stuck.

NG → **Replace canister solenoid valve assembly.**

OK

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **High/Low Load Desorption Pipeline Malfunction - Canister Solenoid Valve**

DTC	P049700	EVAP System Low Purge Flow
DTC	P04F000	EVAP System High Pressure Purge

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check low/high load desorption pipeline

(a) Check each connecting line for breakage, damage or small hole, etc.
(b) Check if line check valve is damaged or inoperative.
(c) Check connection position between intake hose and desorption pipeline for blockage.

NG → **Repair and adjust or replace the damaged parts.**

OK

2	Check canister vent valve

(a) Check if canister vent valve is stuck closed position.

NG → Replace canister vent valve assembly.

OK

3	Check canister solenoid valve

(a) Check if canister solenoid valve is stuck closed position.

NG → Replace canister solenoid valve assembly.

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → Conduct test and confirm malfunction has been repaired.

■ **Desorption pressure sensor malfunction**

DTC	P046800	EVAP Purge Flow Sensor Circuit High
DTC	P046700	EVAP Purge Flow Sensor Circuit Low
DTC	P128500	EVAP Purge Flow Sensor Circuit Range Performance
DTC	P128600	EVAP Purge Flow Sensor Circuit Range Performance

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check desorption pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if desorption pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check high load desorption pipeline**

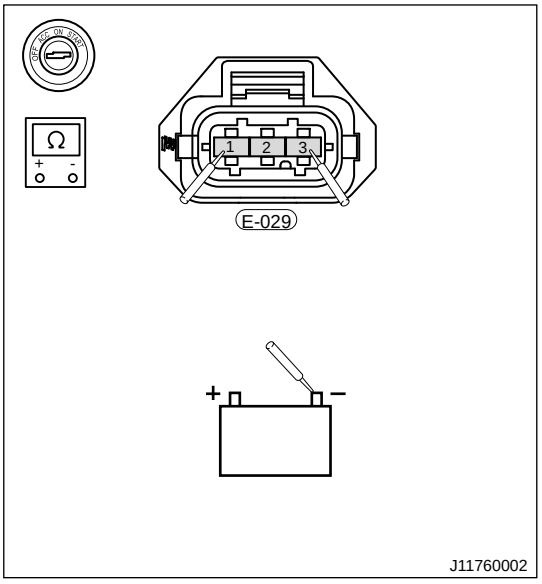
(a) Check each connecting line for breakage, damage or small hole, etc.
(b) Check if line check valve is damaged or inoperative.
(c) Check connection position between intake hose and desorption pipeline for blockage.

NG → **Repair and adjust or replace the damaged parts.**

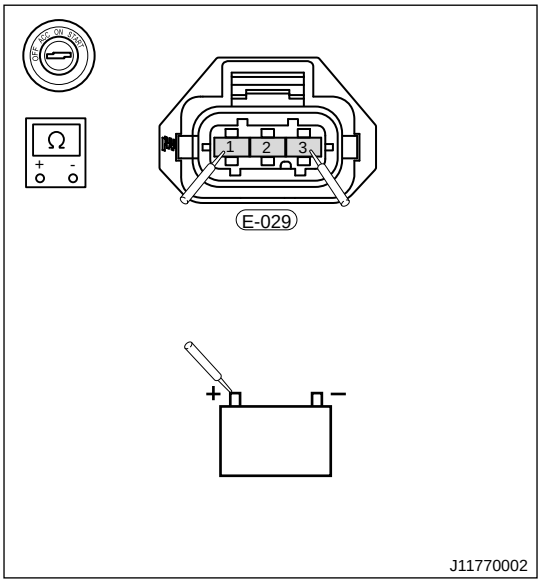
OK

3	**Check for short circuit to ground / power supply in desorption pressure sensor circuit**

(a) Disconnect the desorption pressure sensor connector.
(b) Disconnect the ECM connector (E-018).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of desorption pressure sensor E-029 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of desorption pressure sensor E-029 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.

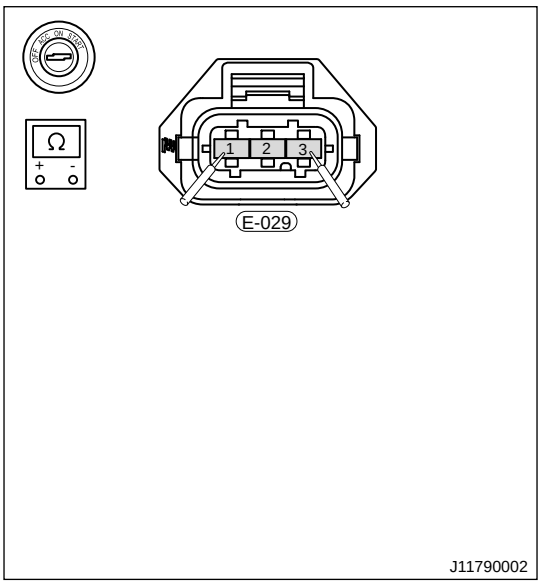


NG → **Check and repair control circuit.**

OK

4	Check if circuits of desorption pressure sensor themselves are shorted to each other or opened

(a) Using ohm band of multimeter, measure resistances of desorption pressure sensor E-029 (1, 2, 3) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace desorption pressure sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 CVO Self-learning Adjustment Reach Upper Limit/ Lower Limit Malfunction

DTC	P02CD00	Cylinder 1 Fuel Injector Offset Learning At Max Limit
DTC	P02D100	Cylinder 3 Fuel Injector Offset Learning At Max Limit
DTC	P02D300	Cylinder 4 Fuel Injector Offset Learning At Max Limit
DTC	P02CF00	Cylinder 2 Fuel Injector Offset Learning At Max Limit
DTC	P02CC00	Cylinder 1 Fuel Injector Offset Learning At Min Limit
DTC	P02D000	Cylinder 3 Fuel Injector Offset Learning At Min Limit
DTC	P02D200	Cylinder 4 Fuel Injector Offset Learning At Min Limit
DTC	P02CE00	Cylinder 2 Fuel Injector Offset Learning At Min Limit
DTC	P062B9A	Internal Control Module Fuel Injector Control Performance - Component Internal Failure
DTC	P062B64	
DTC	P062B96	
DTC	P126100	Cylinder 1 Injector Circuit Range/Performance - Signal Plausibility Failure
DTC	P126300	Cylinder 3 Injector Circuit Range/Performance - Signal Plausibility Failure
DTC	P126400	Cylinder 4 Injector Circuit Range/Performance - Signal Plausibility Failure
DTC	P126200	Cylinder 2 Injector Circuit Range/Performance - Signal Plausibility Failure

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check injector connector**

(a) Disconnect the negative battery.
(b) Check fuel injector connector for looseness or poor contact, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check injector**

(a) Remove the fuel injector assembly.
(b) Check fuel injector for blockage or leakage.

NG → **Clean or replace fuel injector assembly.**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Cylinder 1 / Cylinder 2 / Cylinder 3 / Cylinder 4 Fuel Injector Control Circuit Short**

DTC	**P02EE00**	**Cylinder 1 Fuel Injector Control Circuit Short**
DTC	**P02EF00**	**Cylinder 2 Fuel Injector Control Circuit Short**
DTC	**P02F000**	**Cylinder 3 Fuel Injector Control Circuit Short**
DTC	**P02F100**	**Cylinder 4 Fuel Injector Control Circuit Short**

DTC	**P214800**	**Cylinder 1 or Cylinder 4 Fuel Injector Control Circuit Short to Power Supply**
DTC	**P215100**	**Cylinder 2 or Cylinder 3 Fuel Injector Control Circuit Short to Power Supply**

■ Description

Control schematic diagram

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Take troubleshooting of cylinder 1 fuel injector as an example.

1	**Check injector connector**

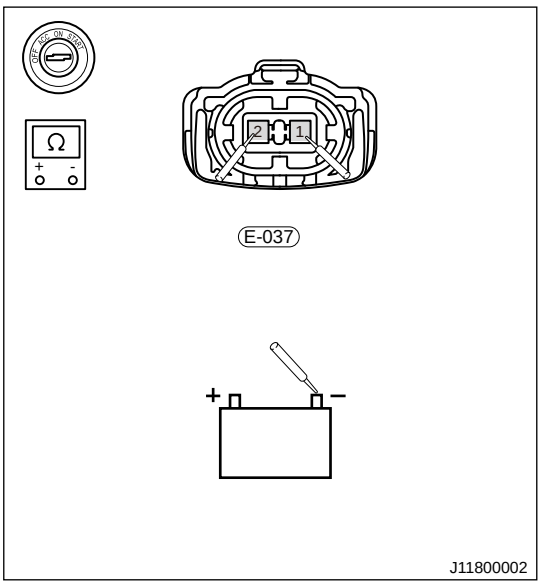
(a) Disconnect the negative battery.
(b) Check if fuel injector connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

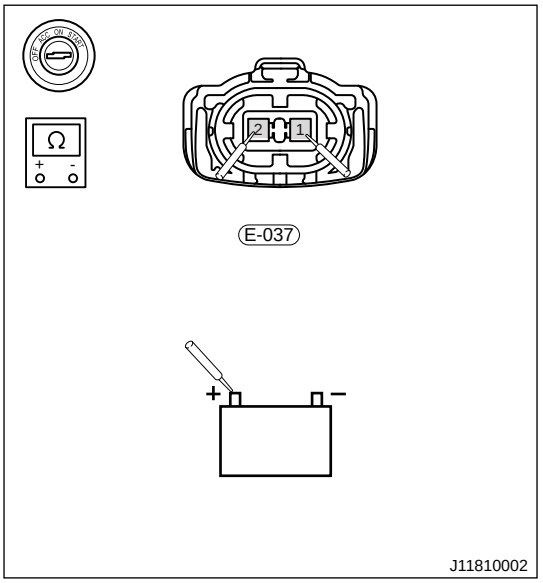
OK

2	**Check if fuel injector control terminal is short to ground/power supply or short to each other**

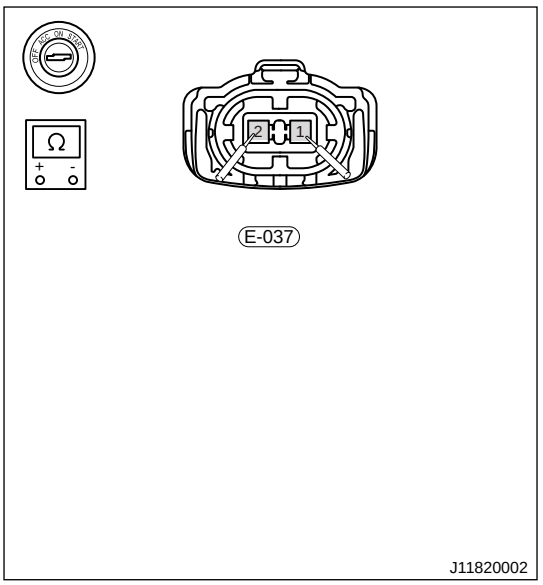
(a) Disconnect the injector connector.
(b) Disconnect the ECM connector (E-018).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of fuel injector E-037 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of fuel injector E-037 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of fuel injector E-037 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG	**Check and repair circuit.**

OK

3	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK	**Repair or replace new module.**

NG

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Electronic Throttle 1st Path / 2nd Path Signal Voltage Minimum / Maximum / Improper**

DTC	P012200	Electronic Throttle 1st Path / 2nd Path Signal Voltage Minimum
DTC	P022200	
DTC	P012300	Electronic Throttle 1st Path / 2nd Path Signal Voltage Maximum
DTC	P022300	
DTC	P012100	Electronic Throttle 1st Path / 2nd Path Signal Voltage Improper
DTC	P022100	

■ **Description**

Control schematic diagram

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electronic throttle connector

(a) Disconnect the negative battery.
(b) Check if electronic throttle connector is loose, and contact between male and female terminals is in good condition.

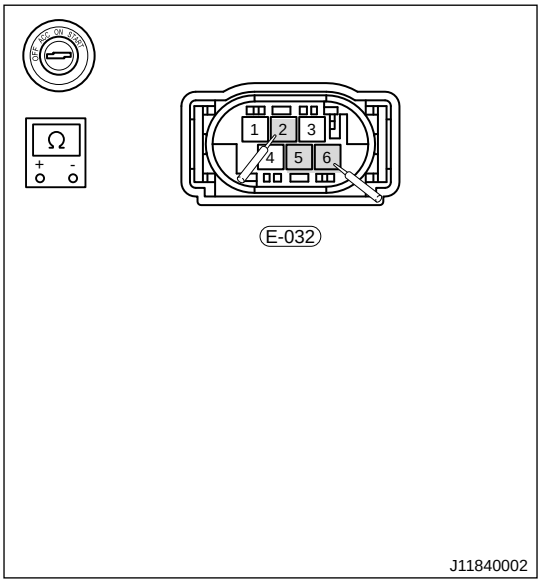
NG → **Repair and adjust connector, or replace it.**

OK

2	Check electronic throttle internal resistance

(a) Using ohm band of multimeter, measure if resistances of electronic throttle E-032 (2 - 6) and (2 - 5) are normal with red and black probes respectively.

Resistance values should change continuously when the valve plate is toggled by hand



NG → **Replace electronic throttle assembly.**

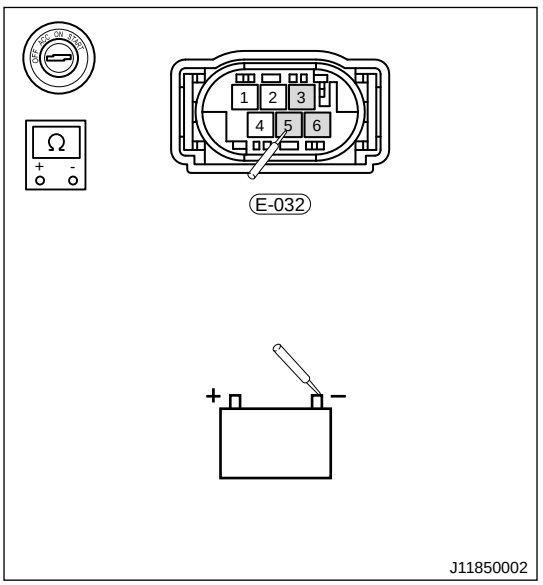
OK

3	**Check for short circuit to ground / power supply or short to each other in electronic throttle line**

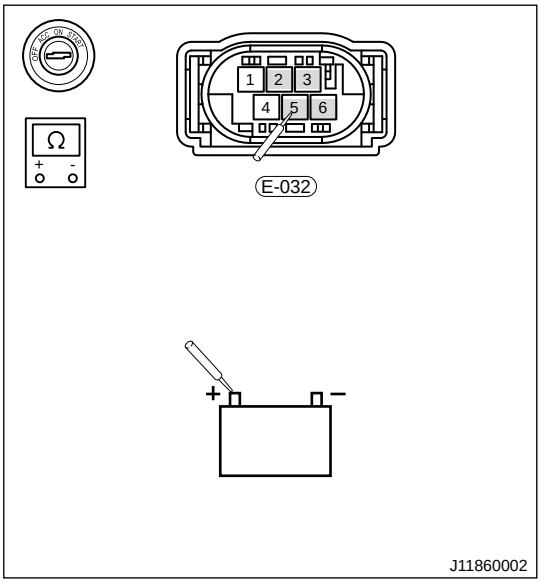
(a) Disconnect the electronic throttle connector.

(b) Disconnect the ECM connector (E-018).

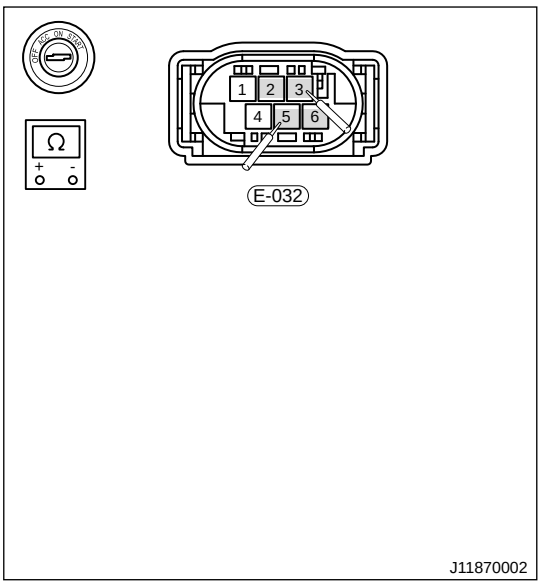
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of electronic throttle E-032 (3, 5, 6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of electronic throttle E-032 (2, 3, 5, 6) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of electronic throttle E-032 (2, 3, 5, 6) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK →

4	**Check electronic throttle position sensor power supply / ground / signal**

(a) Connect electronic throttle and ECM connector (E-018)

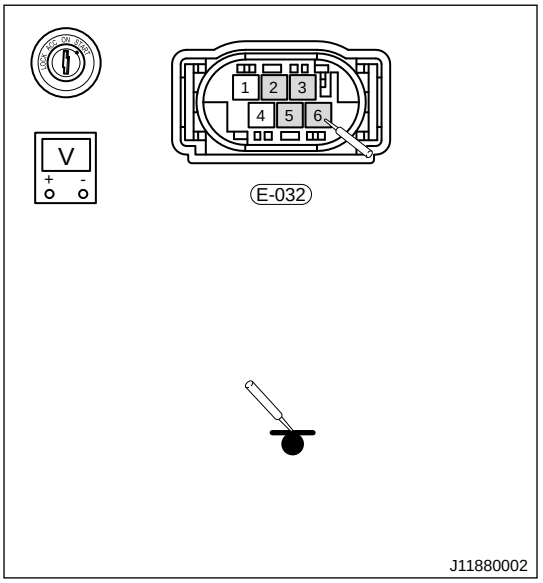
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, and measure voltages of electronic throttle E-032 (2, 3, 5, 6) with red probe respectively.

Power supply terminal: 5 V

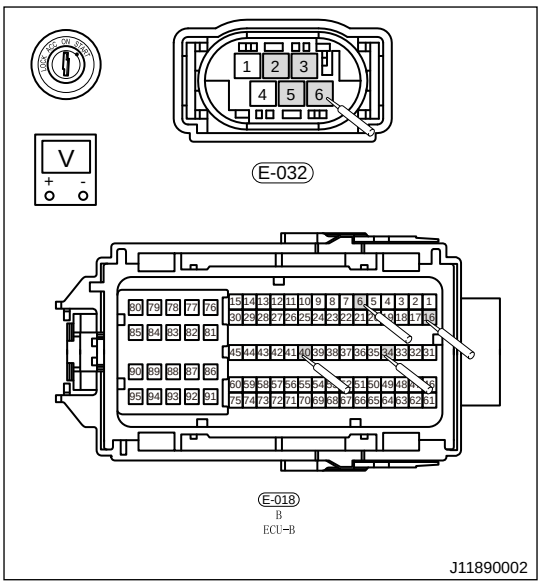
Ground terminal: < 0.2 V

The sum of signal 1 voltage and signal 2 voltage is approximately 5 V



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B40, B16, B34, B6), measure electronic throttle E-032 (2, 3, 5, 6) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Electronic Throttle Spring Inspection Malfunction Minimum, Maximum / Deviation Between Throttle Target Opening Angle and Actual Opening Angle / Adjustment / Drive Level Malfunction

DTC	P155400	Max Error of DV-E Return Spring Check Failure
DTC	P155500	
DTC	P156100	
DTC	P156000	Electronic Throttle PID Adjustment Malfunction
DTC	P210000	Electronic Throttle Drive Level Malfunction
DTC	P210300	
DTC	P210600	
DTC	P211800	

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electronic throttle connector

(a) Disconnect the negative battery.
(b) Check if electronic throttle connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check electronic throttle condition

(a) Electronic throttle body valve plate is dirty or there are foreign matters, so that the valve plate resistance is large or valve plate is stuck.

NG → **Clean or replace electronic throttle assembly.**

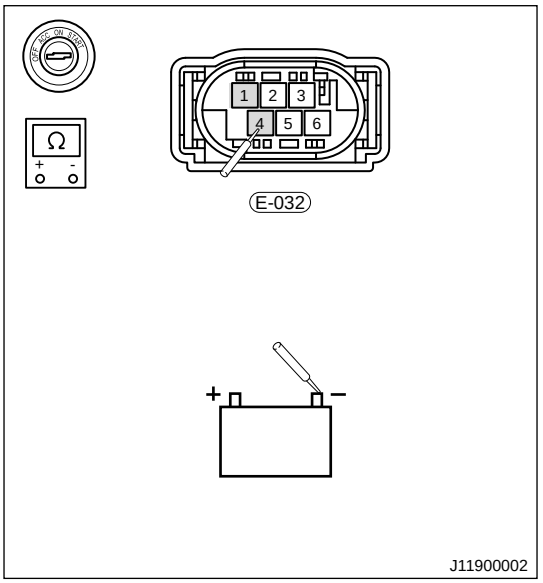
OK

3	**Check for short circuit to ground / power supply or short to each other in electronic throttle line**

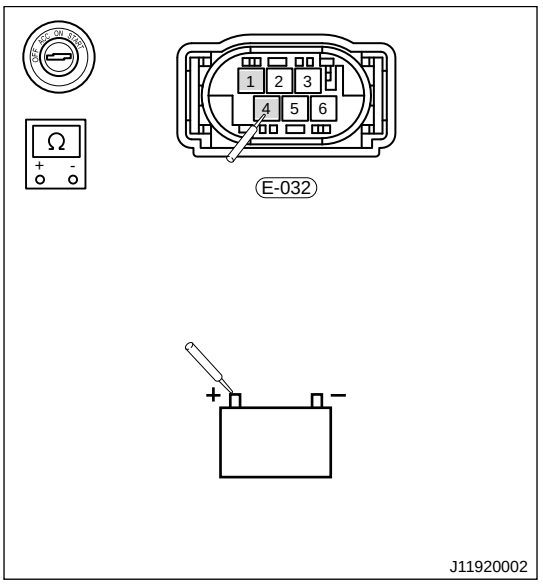
(a) Disconnect the electronic throttle connector.

(b) Disconnect the ECM connector (E-018).

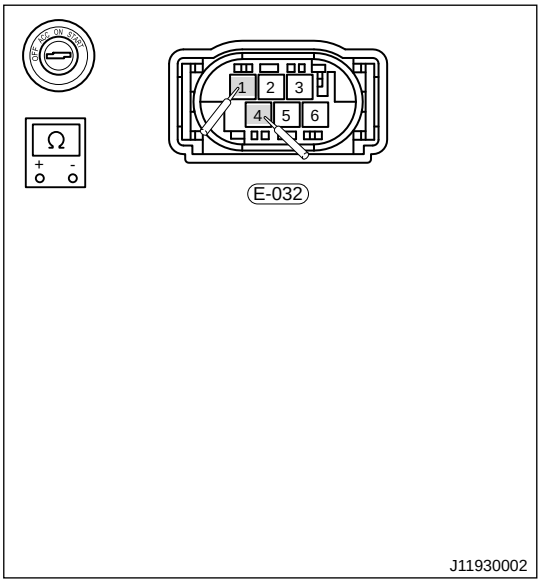
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of electronic throttle E-032 (4, 1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of electronic throttle E-032 (4, 1) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of electronic throttle E-032 (4, 1) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Electronic Throttle Self-learning Unable to Complete / Throttle Initial Self-learning Unable to Complete

DTC	P155000	Electronic Throttle Self-learning Unable to Complete / Throttle Initial Self-learning Unable to Complete
DTC	P155100	

DTC	P155800	Not Plausible Error of DV-E Limphome Learning Position
DTC	P155900	
DTC	P155A00	
DTC	P155B00	
DTC	P155600	Electronic Throttle Lower Mechanic Stop Re-learning Error
DTC	P155700	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check if electronic throttle self-learning condition is met**

(a) No malfunctions related to DVE or monitoring;
(b) Rotation speed is 0;
(c) Vehicle speed is 0;
(d) Pedal opening angle is 0;
(e) Battery voltage is higher than 10 V;
(f) Engine coolant temperature is higher than 5°C;
(g) Intake temperature is higher than 5°C

NG → **Handle the malfunctions that do not meet the self-learning conditions.**

OK ↓

2	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG ↓

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **ECM Internal Malfunction**

DTC	**P15A000**	**CPU0: MPU Error (Memory, DSPR, PSPR)**
DTC	**P15A100**	**CPU0: DCACHE/DSPR ECC Uncorrectable Error**
DTC	**P15A200**	**CPU0: DCACHE/DSPR Address Error**
DTC	**P15A300**	**CPU0:DCACHE TAG SRAM ECC Uncorrectable Error**
DTC	**P15A400**	**CPU0:DCACHE TAG SRAM Address Error**
DTC	**P15A500**	**CPU0:PCACHE TAGRAM ECC Uncorrectable Error**
DTC	**P15A600**	**CPU0:PCACHE TAGRAM Address Error**
DTC	**P15A700**	**CPU0: PCACHE/PSPR ECC Uncorrectable Error**
DTC	**P15A800**	**CPU0:PCACHE/PSPR Address Error**
DTC	**P15A900**	**CPU1:Lockstep Comparator Error**
DTC	**P15AA00**	**CPU1:MPU Error (Memory, DSPR, PSPR)**
DTC	**P15AB00**	**CPU1:DCACHE/DSPR ECC Uncorrectable Error**
DTC	**P15AC00**	**CPU1:DCACHE/DSPR Address Error**
DTC	**P15AD00**	**CPU1:DCACHE TAGRAM ECC Uncorrectable Error**
DTC	**P15AE00**	**CPU1:DCACHE TAGRAM Address Error**
DTC	**P15AF00**	**CPU1:PCACHE TAGRAM ECC Uncorrectable Error**
DTC	**P15B000**	**CPU1:PCACHE TAGRAM Address Error**
DTC	**P15B100**	**CPU1:PCACHE/PSPR ECC Uncorrectable Error**
DTC	**P15B200**	**CPU1:PCACHE/PSPR Address Error**
DTC	**P15B300**	**LMU:SRAM ECC Monitoring Error**
DTC	**P15B400**	**LMU:SRAM ECC Uncorrectable Error**
DTC	**P15B500**	**LMU:SRAM Address Error**
DTC	**P15B600**	**SMU: Recover Timer 0 Timeout Error**
DTC	**P15B700**	**SMU: Recover Timer 1 Timeout Error**
DTC	**P15B800**	**PMU:PFLASH ECC Uncorrectable Multi-bit Error**
DTC	**P15B900**	**PMU:PFLASH Address Error**
DTC	**P15BA00**	**PMU: PFLASH ECC Monitoring Error (Cover All ECC Module)**
DTC	**P15BB00**	**PMU: PFLASH EDC Comparator Error (Cover All PFLASH Instances)**
DTC	**P15BC00**	**SCU/CGU: System PLL OSC_WDT: Input Clock Exceeds Limit Error**

DTC	P15BD00	SCU/CGU: System PLL VCO Clock Event Loss Error
DTC	P15BE00	SCU/EVR: EVR 1.3V Digital Undervoltage Error
DTC	P15BF00	SCU/EVR: EVR 3.3V Overvoltage Error
DTC	P15C000	SCU/EVR: External Power Supply Overvoltage Error
DTC	P15C100	SCU/WDTS: Safety Watchdog Timeout Error
DTC	P15C200	SCU/WDTCPU0: Watchdog CPU0 Timeout Error
DTC	P15C300	SCU/WDTCPU1: Watchdog CPU1 Timeout Error
DTC	P15C400	SCU/CGU: PLL_ERAY VCO Clock Event Loss Error
DTC	P15C500	SCU/WDTCPU2: Watchdog CPU2 Timeout Error
DTC	P15C600	SCU/DTS: Temperature Sensor Overflow Error
DTC	P15C700	Registers: Register Monitor Detects Error
DTC	P15C800	SCU/LSCU: SCU Configuration Error: Monitor Dual-track Properties (-Inverted Signal) Alarm from Lockstep Comparator (LSCU)
DTC	P15C900	SCU/CGU: Clock Monitoring: STM Exceed Frequency Range Error
DTC	P15CA00	SCU/CGU: Clock Monitoring: PLL_ERAY Exceed Frequency Range Error
DTC	P15CB00	SCU/CGU: Clock Monitoring: PLL Exceed Frequency Range Error
DTC	P15CC00	SCU/CGU: Clock Monitoring: SRI Exceed Frequency Range Error
DTC	P15CD00	SCU/CGU: Clock Monitoring: SPB Exceed Frequency Range Error
DTC	P15CE00	SCU/CGU: Clock Monitoring: GTM Exceed Frequency Range Error
DTC	P15CF00	SCU/CGU: Clock Monitoring: ADC Exceed Frequency Range Error
DTC	P15D000	GTM: SRAMs Uncorrectable Error
DTC	P15D100	FLEXRAY:SRAM Address Error
DTC	P15D200	Misc SRAMs:SRAM ECC Uncorrectable Error
DTC	P15D300	Misc SRAMs:SRAM Address Error
DTC	P15D400	GTM: SRAMs Address Error
DTC	P15D500	CAN: SRAM Uncorrectable Error
DTC	P15D600	CAN: SRAM Address Error
DTC	P15D700	FLEXRAY:SRAM ECC Uncorrectable Error
DTC	P15D800	CPU2:MPU Error (Memory, DSPR, PSPR)
DTC	P15D900	CPU2: DCACHE/DSPR ECC Uncorrectable Error
DTC	P15DA00	CPU2: DCACHE/DSPR Address Error
DTC	P15DB00	CPU2: DCACHE TAG SRAM ECC Uncorrectable Error
DTC	P15DC00	CPU2:DCACHE TAG SRAM Address Error
DTC	P15DD00	CPU2:121 PCACHE TAGRAM ECC Uncorrectable Error
DTC	P15DE00	CPU2:PCACHE TAGRAM Address Failure

DTC	P15DF00	CPU2: PCACHE/PSPR ECC Uncorrectable Error
DTC	P15E000	CPU2: PCACHE/PSPR Address Error
DTC	P061A00	Safely Monitor Torque Exceeds Limit
DTC	P060D00	Accelerator Pedal 2nd Layer Monitoring Error
DTC	P152000	Function Monitoring: Check of Predicted Air Mass Failed
DTC	P152100	Function Monitoring: Fault of ECM Check of Injection Cut-off
DTC	P152200	Function Monitoring: Fault of ECM in Check of Cylinder Individual Fuel Corrections
DTC	P153900	Synchronization process rationality check (based on speed and synchronization count)
DTC	P153700	Function Monitoring: Fault of ECM or Sensor in rl-Comparison
DTC	P153500	Function Monitoring: Fault of ECM or Sensor in Mixture Check
DTC	P153600	Function Monitoring: Fault of ECM Comparison of Lambda and Operation Mode
DTC	P153800	Electronic Throttle Safety Monitoring Function Error (Ignition Angle Signal, Wire Harness or ECM Error)
DTC	P152700	Function Monitoring: Monitoring of ICO From Level1
DTC	P152800	Function Monitoring: Monitoring of ICO From Level2
DTC	P061C00	Safety Monitoring Function Error (2nd Layer Engine Speed Monitoring Error)
DTC	P152900	Function Monitoring: Fault of Starter Control
DTC	P153000	Function Monitoring: Fault of ECM ADC - Null Load Test Pulse
DTC	P153100	Function Monitoring: Fault of ECM ADC - Test Voltage
DTC	P157100	Closed Path Checking, Driver Level Check Error Or Communication Error
DTC	P157200	Under Normal Voltage, ABE Activated
DTC	P157300	Diagnostic Fault Check to Report "WDA active" Due to Errors in Query/Response Communication
DTC	P157400	Errorpin Activated and Monitoring Communication Normal
DTC	P157500	Diagnostic Fault Check to Report "WDA active" Due to Overvoltage Detection
DTC	P142000	CAN Hardware Memory Response Timeout
DTC	P142100	LIN Hardware Memory Response Timeout
DTC	P064100	5 V Power Supply Module 1 Fail
DTC	P065100	5 V Power Supply Module 2 Fail
DTC	P069700	5 V Power Supply Module 3 Fail
DTC	P261000	Unreasonable Shutdown Timing
DTC	P06B842	Error when Reading/Writing Flash Block

DTC	P06B843	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Deviation Between Both Paths Signal of Accelerator Pedal Out of Limit/Voltage Too High/Too Low**

DTC	P213800	Deviation Between Both Paths Signal of Accelerator Pedal Out of Limit
DTC	P212300	Accelerator Pedal 1st Path / 2nd Path Signal Voltage High
DTC	P212800	
DTC	P212200	Accelerator Pedal 1st Path / 2nd Path Signal Voltage Low
DTC	P212700	

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check electronic accelerator pedal connector**

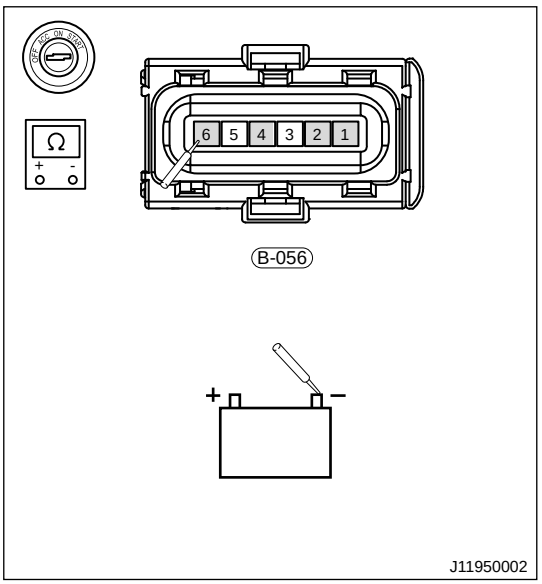
(a) Disconnect the negative battery.
(b) Check if electronic accelerator pedal connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

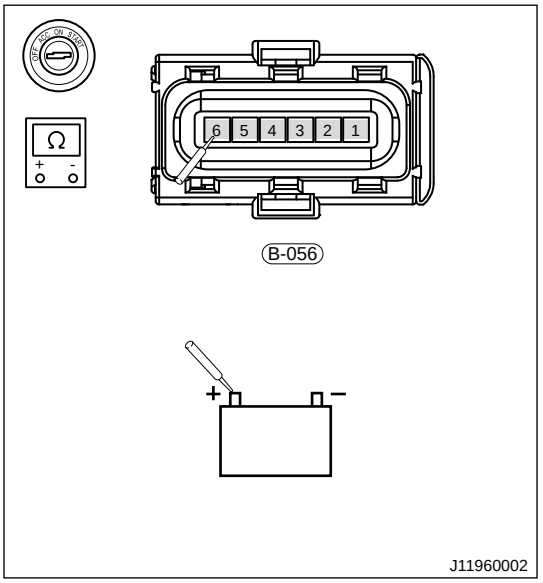
OK

2	**Check for short circuit to ground / power supply or short to each other in electronic accelerator pedal line**

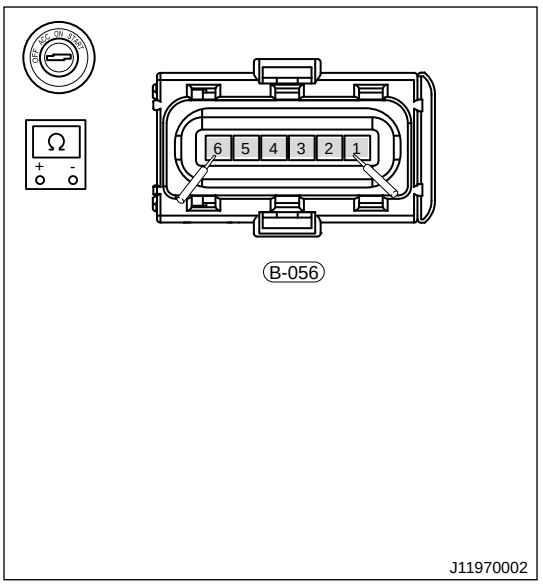
(a) Disconnect the electronic accelerator pedal connector.
(b) Disconnect the ECM connector (B-003).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of electronic accelerator pedal B-056 (1, 2, 4, 6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of electronic accelerator pedal B-056 (1, 2, 3, 4, 5, 6) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of electronic accelerator pedal B-056 (1, 2, 3, 4, 5, 6) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

3	**Check electronic accelerator pedal position sensor power supply / ground / signal**

(a) Connect electronic accelerator pedal and ECM connector (B-003)

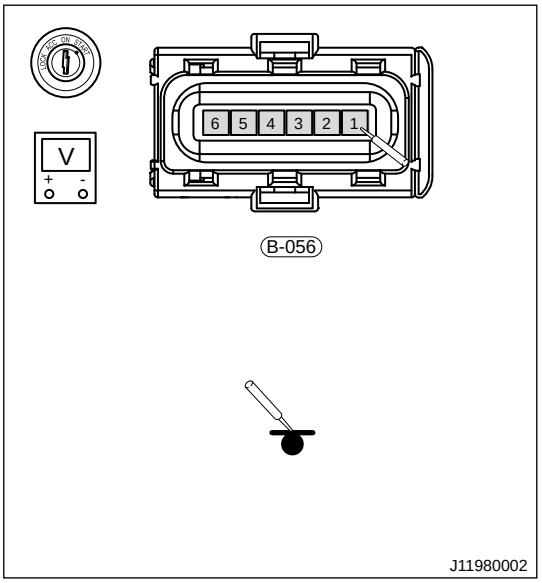
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, and measure voltages of electronic accelerator pedal B-056 (1, 2, 3, 4, 5, 6) with red probe respectively.

Power supply terminal: 5 V

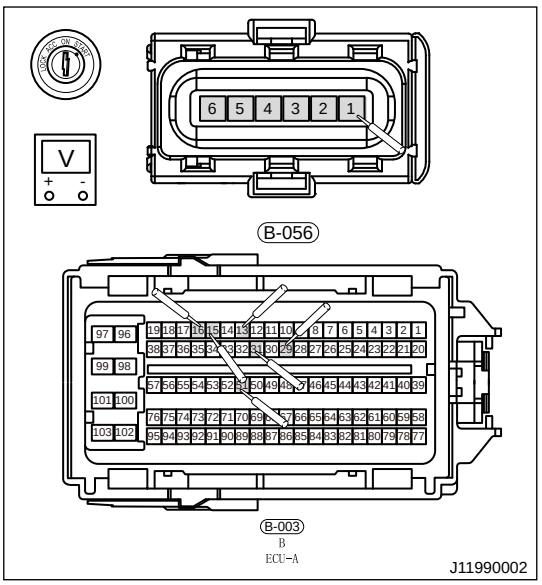
Ground terminal: < 0.2 V

Signal 1 voltage value and signal 2 voltage value maintain a voltage multiplying relationship



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-003 (A15, A31, A13, A16, A51, A29), measure electronic accelerator pedal B-056 (1, 2, 3, 4, 5, 6) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **EVAP System Vent Control Circuit Short to Ground or Power Supply**

DTC	P049900	EVAP System Vent Control Circuit Short to Power Supply
DTC	P049800	EVAP System Vent Control Circuit Short to Ground
DTC	P044700	EVAP System Vent Control Circuit Short to Ground

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check canister vent valve connector

(a) Disconnect the negative battery.
(b) Check if canister vent valve connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

OK

2	Check canister vent valve power supply fuse

(a) Check if engine compartment fuse and relay box fuse EF22 5A is blown.

NG	Check and repair short circuit malfunction and replace fuse.

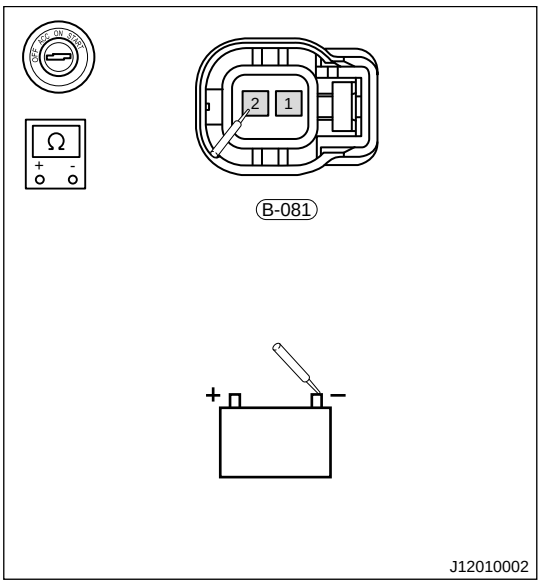
OK

3	Check for short circuit to ground / power supply or short to each other in canister vent valve line

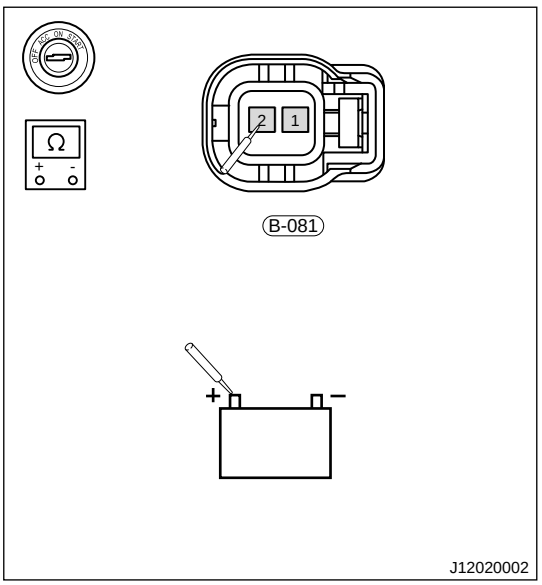
(a) Disconnect the canister vent valve connector.

(b) Disconnect the ECM connector (B-003).

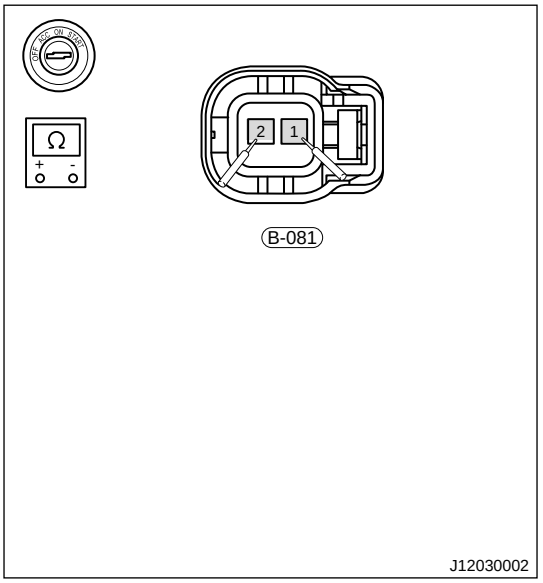
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of canister vent valve B-081 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of canister vent valve B-081 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of canister vent valve B-081 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Cooling Fan Control Circuit Voltage Too Low/Too High**

DTC	**P069100**	**Fan Control Circuit Low**
DTC	**P069200**	**Fan Control Circuit High**

DTC	P048000	Cooling Fan Control Circuit Error
DTC	P063400	Cooling Fan Drive Chip Overheating
DTC	P048371	Fan Rationality Check Error (Type 1)
DTC	P048372	Fan Rationality Check Error (Type 2)
DTC	P048373	Fan Rationality Check Error (Type 3)
DTC	P048374	Fan Rationality Check Error (Type 4)

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check cooling fan connector**

(a) Disconnect the negative battery.
(b) Check if cooling fan connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check cooling fan power supply fuse**

(a) Check if engine compartment fuse and relay box fuse EF25 5A is blown.

NG → **Check and repair short circuit malfunction of circuit.**

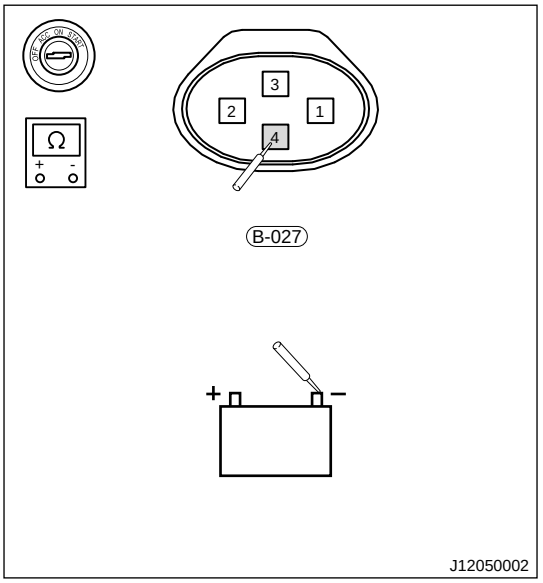
OK

3	**Check for short circuit to ground / power supply in cooling fan control circuit**

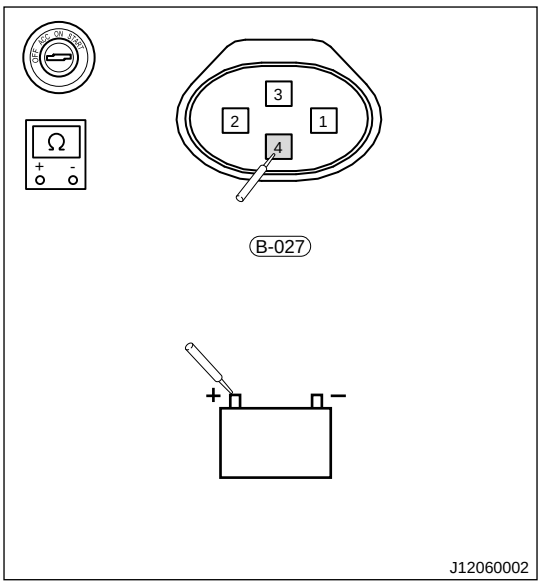
(a) Disconnect the cooling fan connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of cooling fan B-027 (4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of cooling fan B-027 (4) with red probe respectively. Check if circuit is short to power supply.



NG	**Check and repair circuit.**

OK

4	**Check cooling fan power supply / ground / control signal**

(a) Connect cooling fan and ECM connector (B-003)

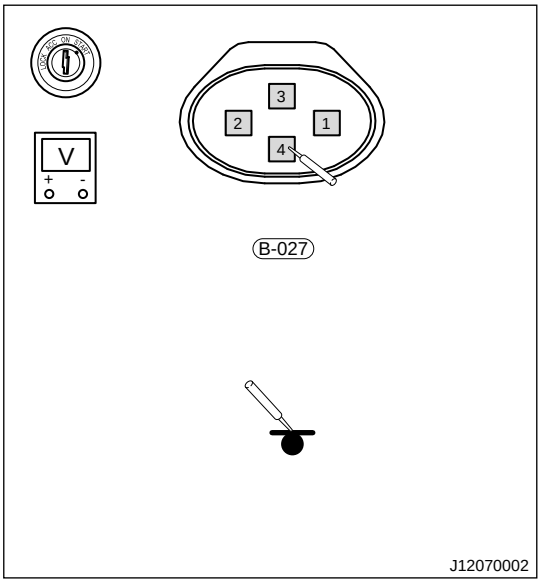
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, and measure voltages of cooling fan B-027 (1, 2, 3, 4) with red probe.

Power supply terminal: 12 V

Ground terminal: < 0.2 V

The control signal adopts duty ratio control (high level is effective)



NG → **Repair or replace wire harness.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ TCU Requests to Illuminate MIL Light

DTC	P070000	TCU Requests to Illuminate MIL Light

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read transmission system DTCs and refer to transmission system diagnosis.

■ Vehicle Speed Sensor Performance / Improper / Input Signal Fault

DTC	**P121200**	**Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Maximum Range)**
DTC	**P050184**	**Vehicle Speed Sensor Performance Failure (Vehicle Speed Exceed Minimum Range)**
DTC	**P050165**	**Vehicle speed sensor performance failure (vehicle speed is too low when oil cut-off during coasting)**
DTC	**P050166**	**Vehicle Speed Sensor "A" Circuit Range/Performance**
DTC	**P050000**	**Vehicle Speed Sensor Input Signal Fault**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read brake control system DTCs and refer to brake control system diagnosis.

■ Ignition Angle Efficiency Monitoring During Catalytic Converter Heating

DTC	**P050B00**	**Cold Start Ignition Timing Performance**
DTC	**P050B20**	**Cold Start Ignition Timing Performance**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check electronic throttle condition**

(a) Check if electronic throttle is dirty or is stuck at position with a small opening angle.

NG → **Clean or replace electronic throttle assembly.**

OK

2	Check ignition system

(a) Check engine for DTCs related to ignition.
(b) Check ignition coil and spark plug for damage.

NG → **Replace the damaged parts.**

OK

3	Check intake system

(a) Check intake manifold or each connecting line for air leakage.

NG → **Replace the leaked or damaged parts.**

OK

4	Check fuel system

(a) Check if low/high pressure fuel pressure is too low.

NG → **Replace the damaged parts.**

OK

5	Check if exhaust back pressure is too high

(a) Check pre-catalytic converter for blockage.
(b) Check GPF particulate filter for blockage.

NG → **Replace pre-catalytic converter assembly or perform GPF regeneration.**

OK

6	Check boost system

(a) Check each connecting line of boost system for falling off.
(b) Check if turbocharger can boost normally and each actuator can operate normally.

NG → **Replace turbocharger assembly.**

OK

7	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

8	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Brake Pedal Signal Synchronization Malfunction

DTC	P012200	Brake Pedal Signal Synchronization Malfunction

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check brake switch connector

(a) Disconnect the negative battery.
(b) Check if brake switch connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check brake switch power supply fuse

(a) Check if fuse RF37 5A and fuse RF15 5A in instrument panel fuse and relay box are blown.

NG → **Check and repair short circuit malfunction of circuit.**

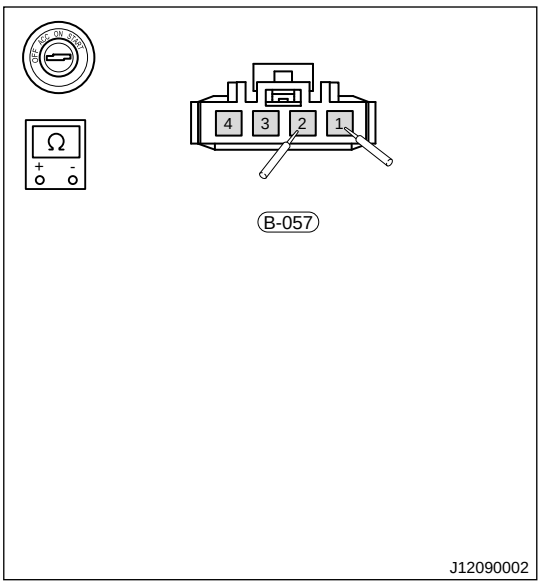
OK

3	Check brake switch condition

(a) Unplug the brake switch connector.

(b) Using ohm band of multimeter, measure brake switch B-057 (1, 2) with red and black probes; There should be continuity without brake pedal depressed and no continuity with brake pedal depressed.

(c) Using ohm band of multimeter, measure brake switch B-057 (3, 4) with red and black probes; There should be no continuity without brake pedal depressed and there should be continuity with brake pedal depressed.



NG → **Replace brake switch assembly.**

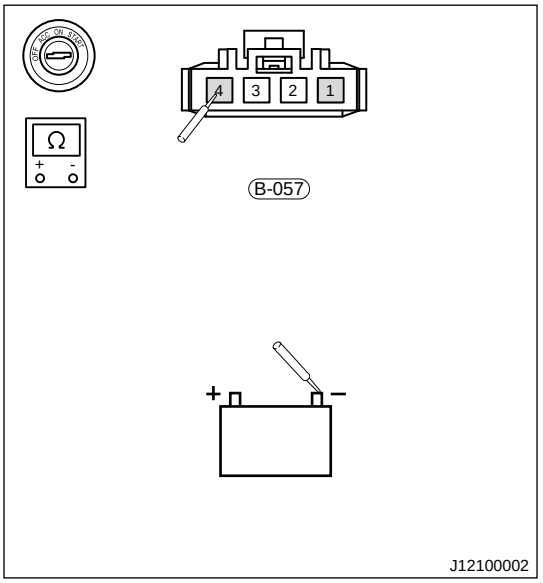
OK

4	Check for short circuit to ground / power supply or short to each other in brake switch line

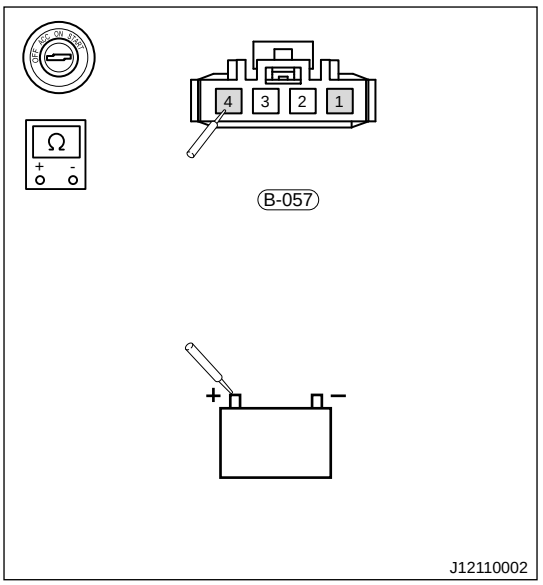
(a) Disconnect the brake switch connector.

(b) Disconnect the ECM connector (B-003).

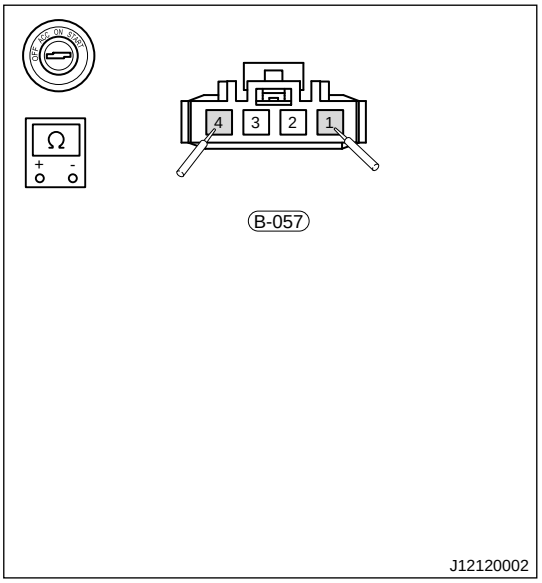
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistances of brake switch B-057 (1, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of brake switch B-057 (1, 4) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of brake switch B-057 (1, 4) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

5	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Main Relay Open / Short to Ground / Power Supply**

DTC	**P068500**	**Main Relay Open Circuit Error**
DTC	**P068700**	**Main Relay Short to Power Supply**

DTC	P068600	Main Relay Short to Ground
DTC	P06869E	ECM/PCM Power Relay Control Circuit Low

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check main relay**

(a) Replace the main relay in engine compartment fuse and relay box.

NG → **Replace main relay.**

OK ↓

2	**Check main relay coil terminal power supply fuse**

(a) Check if fuse MF04 175A in engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

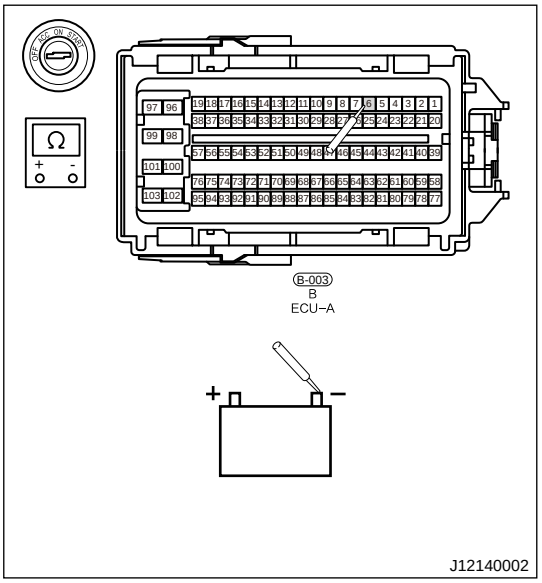
OK ↓

3	**Check for short circuit to ground / power supply in main relay control circuit**

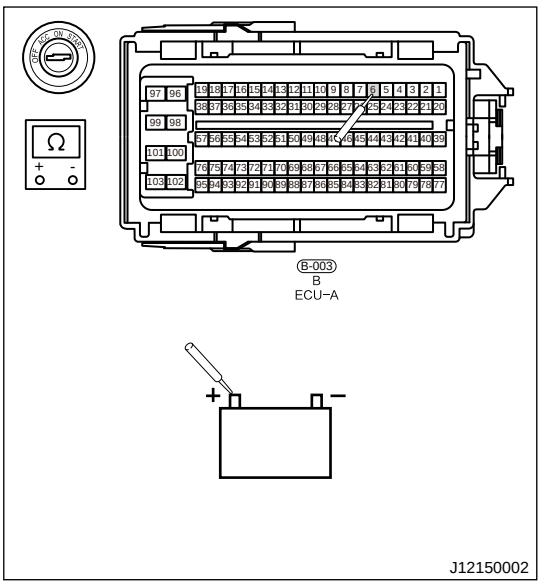
(a) Disconnect the engine compartment fuse and relay box connector (B-043).

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A6) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-003 (A6) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Response Reception Time Out/Error of LIN Bus (Contact Between EMS and Intellectual Generator)**

DTC	P143000	Battery Has Been Changed and Long Time No Tester Confirmation
DTC	P143100	EBS or Battery Error
DTC	P143200	EBS Temporary Error

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery model

(a) Check if battery model is in agreement with genuine battery.

Type: Sail AGM

Specification: 12 V 70 AH

NG → **Use genuine battery to replace.**

OK

2	Check battery sensor connector

(a) Disconnect the negative battery.
(b) Check if battery sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

3	**Check LIN line voltage**

(a) Disconnect the battery sensor connector.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltage of battery sensor LIN line with red probe respectively.

Equivalent voltage: Approximately 10 V

NG → **Check and repair LIN line.**

OK

4	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Starter Relay / Drive Chain State Relay Fault

DTC	**P26F100**	**Starter Relay R1 (Crank Relay) or Starter (Drive Chain) Relay R2 (Pt State Relay) Cannot Be Combined**
DTC	**P26F200**	**Starter (Drive Chain) Status Relay R2 (PT State Relay) Cannot Be Disconnected**
DTC	**P26F000**	**Starter Relay R1 (Crank relay) Cannot Be Disconnected**
DTC	**P14AD00**	**Engine Block or Starter is not Engaged**
DTC	**P14AF00**	**KL50r Wire Short Circuit to Ground**
DTC	**P14AE00**	**KL50r Wire Short Circuit to Battery**
DTC	**P14AC00**	**Starter Damaged or Wire Dropped**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.

- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check drive chain state relay**

(a) Replace the drive chain state relay in engine compartment fuse and relay box.

NG → **Replace drive chain state relay.**

OK

2	**Check drive chain state relay feedback terminal power supply fuse**

(a) Check if fuse EF15 10A in engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

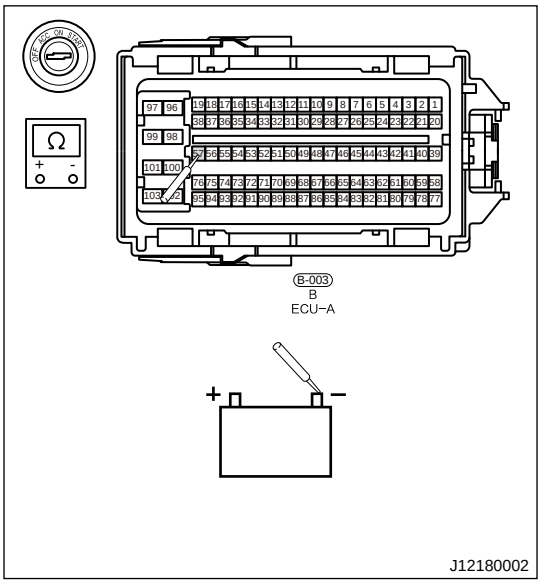
OK

3	**Check for short circuit to ground / power supply in drive chain state relay feedback circuit**

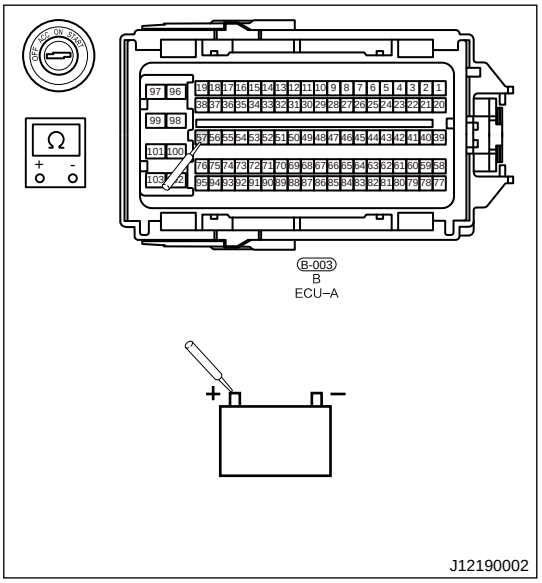
(a) Disconnect the engine compartment fuse and relay box connector (B-043).

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A57) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-003 (A57) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

4	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **A/C Pressure Sensor Circuit Voltage High/Low**

DTC	**P053300**	**A/C Refrigerant Pressure Sensor "A" Circuit High**
DTC	**P053200**	**A/C Refrigerant Pressure Sensor "A" Circuit Low**

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check A/C pressure sensor connector**

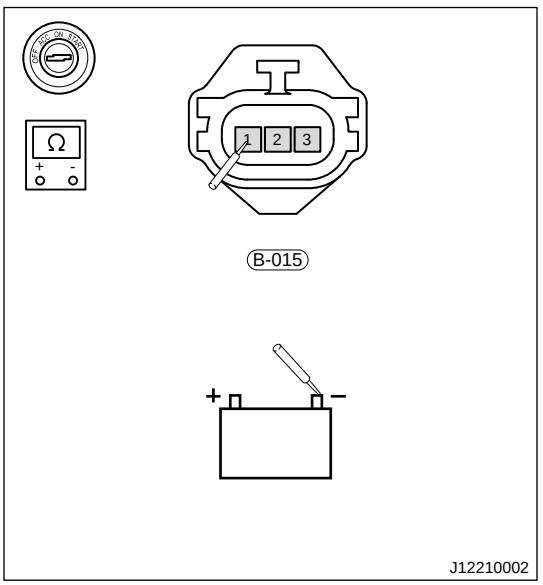
(a) Disconnect the negative battery.
(b) Check if A/C pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

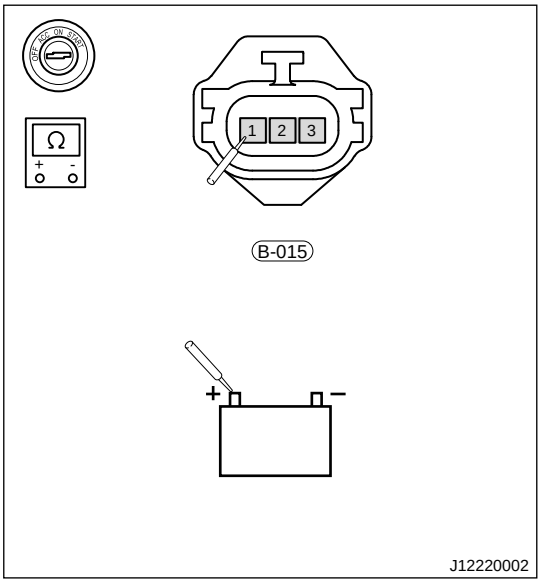
OK

2	**Check for short circuit to ground / power supply or short to each other in A/C pressure sensor circuit**

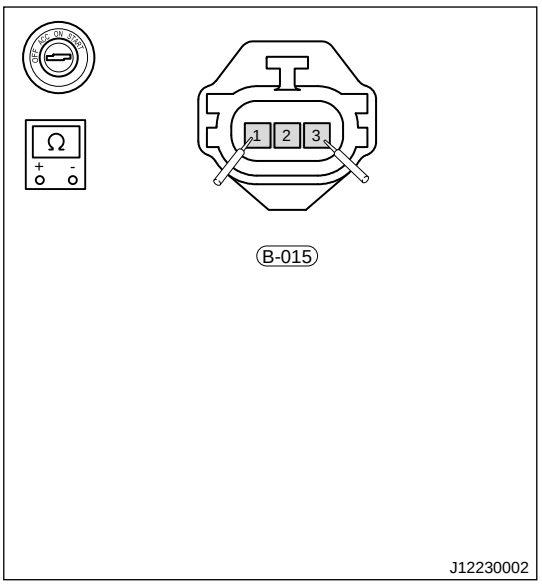
(a) Disconnect the A/C pressure sensor connector.
(b) Disconnect the ECM connector (B-003).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of A/C pressure sensor B-015 (1, 2, 3) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of A/C pressure sensor B-015 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of A/C pressure sensor B-015 (1, 2, 3) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

3	**Check A/C pressure sensor power supply / ground / signal**

(a) Connect A/C pressure sensor and ECM connector (B-003)

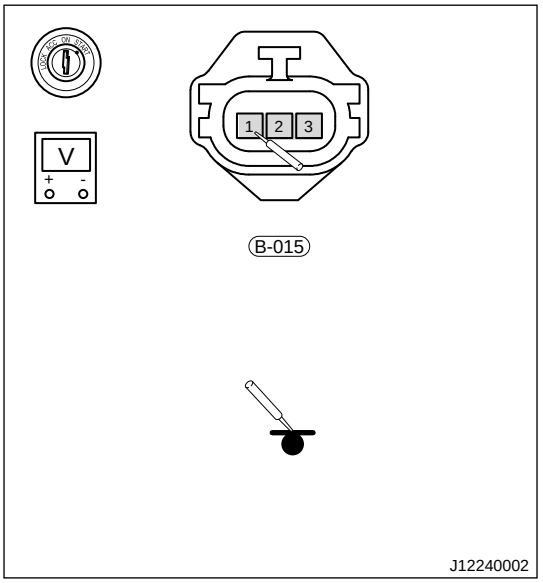
(b) Turn ENGINE START STOP switch to ON.

(c) Using voltage band of multimeter, connect black probe to battery negative terminal, measure voltages of A/C pressure sensor B-015 (1, 2, 3) with red probe.

Power supply terminal: 5 V

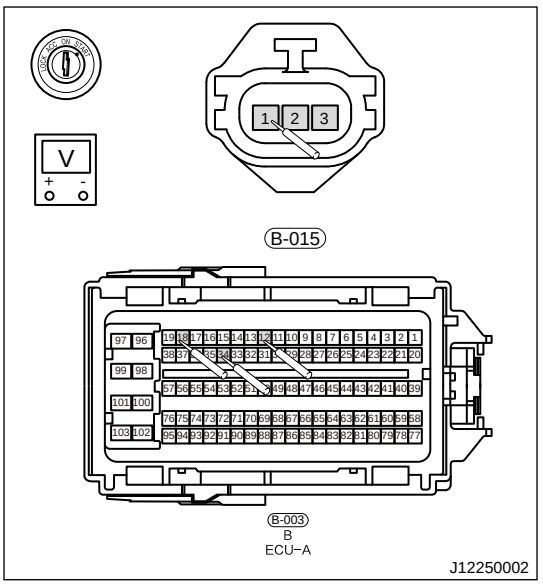
Ground terminal: < 0.2 V

Voltage of signal terminal should increase as the pressure rises



(d) Using voltage band of multimeter (voltage drop method), connect black probe to ECM B-003 (A12, A34, A18), measure A/C pressure sensor B-015 (1, 2, 3) with red probe.

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Brake Vacuum Pump Control Circuit Open / Voltage Too Low / Too High**

DTC	P050F00	Brake Assist Vacuum Too Low
DTC	P258A00	Vacuum Pump Control Circuit Open
DTC	P258C00	Vacuum Pump Control Circuit "A" Low
DTC	P258D00	Vacuum Pump Control Circuit "A" High
DTC	P063449	Brake Vacuum Pump Drive Chip Overheat

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check electric vacuum pump connector

(a) Disconnect the negative battery.
(b) Check if electric vacuum pump connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check electric vacuum pump relay

(a) Replace the electric vacuum pump relay in engine compartment fuse and relay box.

NG → **Replace electric vacuum pump relay.**

OK

3	Check electric vacuum pump relay coil terminal power supply fuse

(a) Check if engine compartment fuse and relay box fuse EF22 5A is blown.

NG → **Check and repair short circuit malfunction of circuit.**

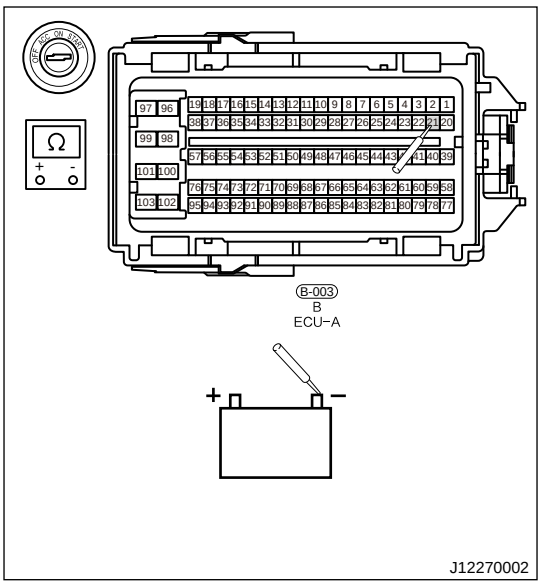
OK

4	Check for short circuit to ground / power supply in electric vacuum pump relay control circuit

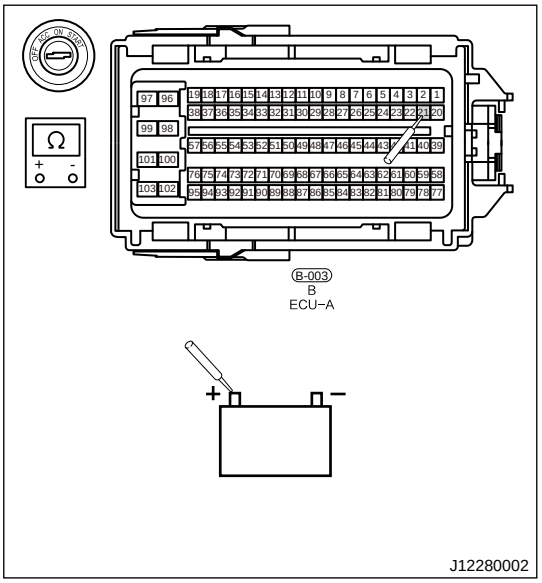
(a) Unplug the electric vacuum pump relay.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A21) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-003 (A21) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Electronic Thermostat Control Circuit Open / Voltage Too Low / Too High**

DTC	**P059700**	**Thermostat Heater Control Circuit Open**
DTC	**P059800**	**Thermostat Heater Control Circuit Low**
DTC	**P059900**	**Thermostat Heater Control Circuit High**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check electronic thermostat connector**

(a) Disconnect the negative battery.
(b) Check if electronic thermostat connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check electronic thermostat power supply fuse**

(a) Check if fuse EF21 15A in engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

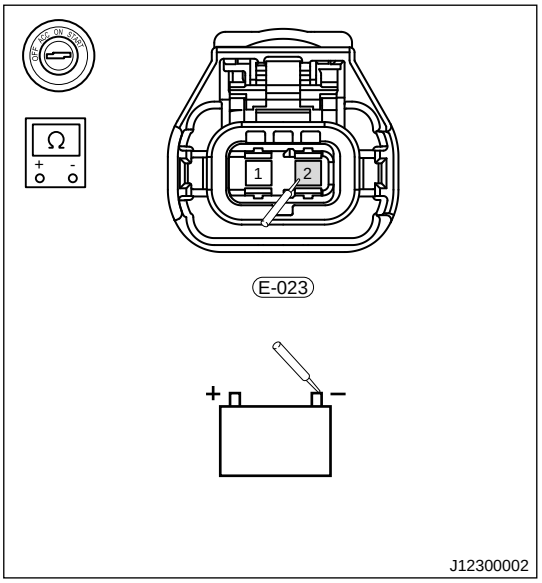
OK

3	**Check for short circuit to ground / power supply in electronic thermostat control circuit**

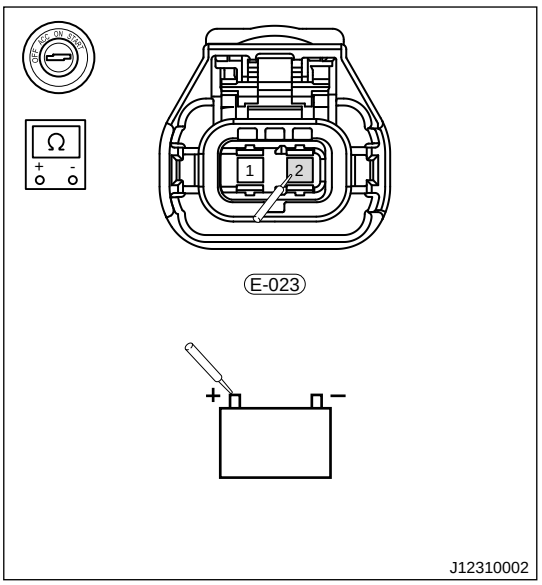
(a) Disconnect the electronic thermostat connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of electronic thermostat E-023 (2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of electronic thermostat E-023 (2) with red probe respectively. Check if circuit is short to power supply.

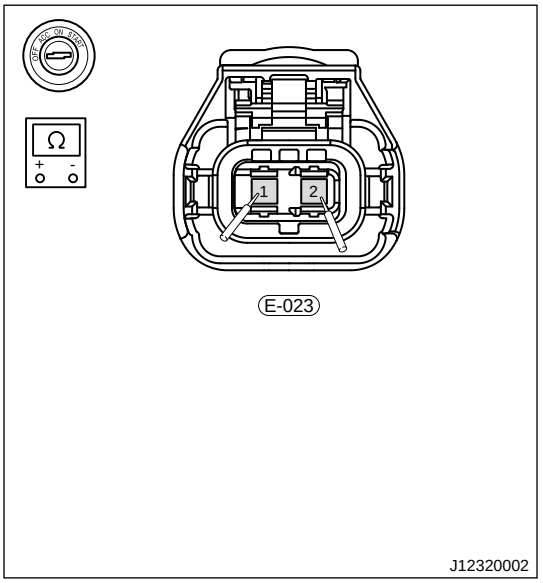


NG	**Check and repair circuit.**

OK

4	**Check if circuits of electronic thermostat themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of electronic thermostat E-023 (1, 2) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace electronic thermostat assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Ambient Temperature Sensor Circuit Voltage Too Low / Too High**

DTC	P007200	Ambient Air Temperature Sensor Circuit "A" Low
DTC	P007300	Ambient Air Temperature Sensor Circuit "A" High

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read A/C system DTCs and refer to A/C system diagnosis.

■ **Low Pressure Fuel Pressure Sensor Malfunction**

DTC	**P254029**	**DECOS Oil Passage Pressure Sensor Circuit Bank 1-Positive Offset**
DTC	**P254028**	**DECOS Oil Passage Pressure Sensor Circuit Bank 1-Negative Offset**
DTC	**P137000**	**DECOS Oil Passage Pressure Sensor Relative Pressure Too Low**
DTC	**P137100**	**DECOS Oil Passage Pressure Sensor Relative Pressure Too High**
DTC	**P008A00**	**DECOS Low Pressure Oil Passage Pressure Too Low**
DTC	**P008B00**	**Low Pressure Fuel System Pressure - Too High**
DTC	**P016F00**	**DECOS Low Pressure Oil Passage PWM Control Deviation Too Large**
DTC	**P016E00**	**Closed Loop Fuel Pressure Control At Limit - Pressure Too High**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check low pressure fuel pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if low pressure fuel pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check low pressure end fuel pressure**

(a) Using the fuel pressure gauge to test if low pressure end fuel pressure is met the standard.

NG → **Replace electric fuel pump assembly.**

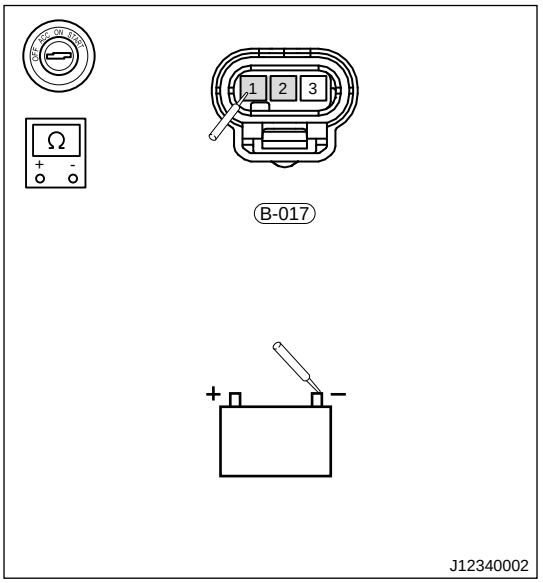
OK

3	**Check for short circuit to ground / power supply or short to each other in low pressure fuel pressure sensor**

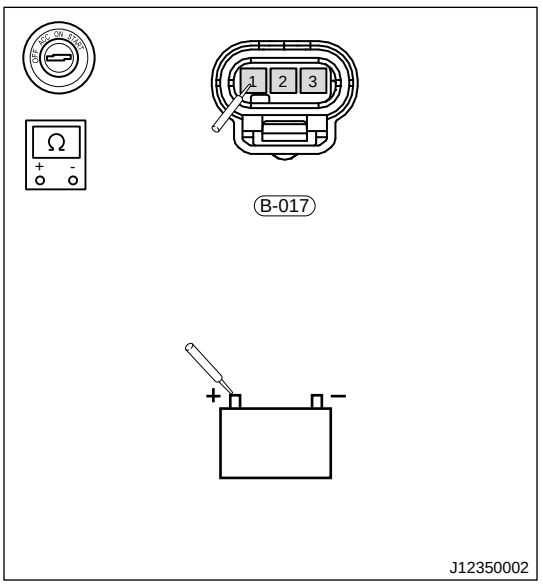
(a) Disconnect the low pressure fuel pressure sensor connector.

(b) Disconnect the ECM connector (E-018).

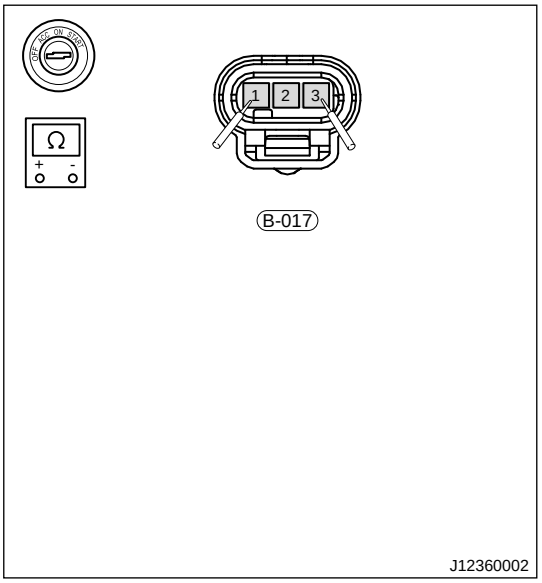
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of low pressure fuel pressure sensor B-017 (1, 2) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of low pressure fuel pressure sensor B-017 (1, 2, 3) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of low pressure fuel pressure sensor B-017 (1, 2, 3) with red and black probes respectively. Check if circuits are shorted to each other.

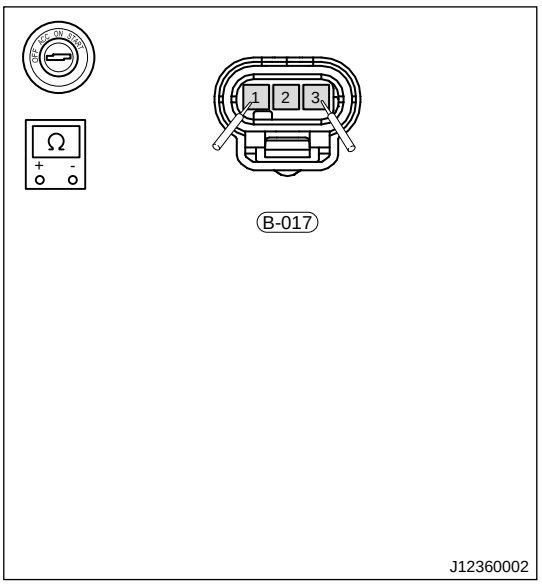


NG → **Check and repair circuit.**

OK

4	**Check if circuits of low pressure fuel pressure sensor themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of low pressure fuel pressure sensor B-017 (1, 2, 3) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace low pressure fuel pressure sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Particulate Filter Upstream Temperature Sensor Error**

DTC	**P208062**	**Particulate Filter Upstream Temperature Sensor Signal Measured Value Unreasonable**
DTC	**P20802A**	**Particulate Filter Upstream Temperature Sensor Signal Stuck**
DTC	**P054500**	**Particulate Filter Upstream Temperature Sensor Circuit Voltage Low**
DTC	**P054600**	**Particulate Filter Upstream Temperature Sensor Circuit Voltage High**
DTC	**P20E224**	**Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (Positive Deviation)**
DTC	**P20E223**	**Particulate Filter Upstream Temperature Sensor Cold Start Correction Improper (Negative Deviation)**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check GPF temperature sensor connector

(a) Disconnect the negative battery.
(b) Check if GPF temperature sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

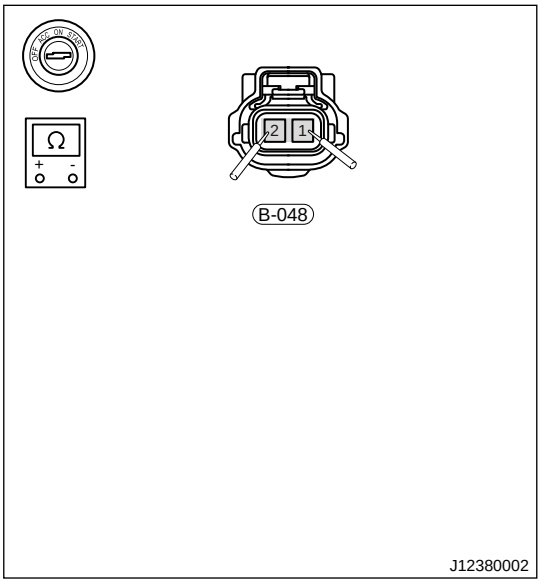
OK

2	**Check GPF temperature sensor internal resistance**

(a) Disconnect the GPF temperature sensor connector

(b) Using ohm band of multimeter, measure if resistances of GPF temperature sensor B-048 (1, 2) are normal with red and black probes respectively.

Normal resistance value at ambient temperature (10～30℃) should be: 200 ~ 230Ω.



NG → **Replace GPF temperature sensor assembly.**

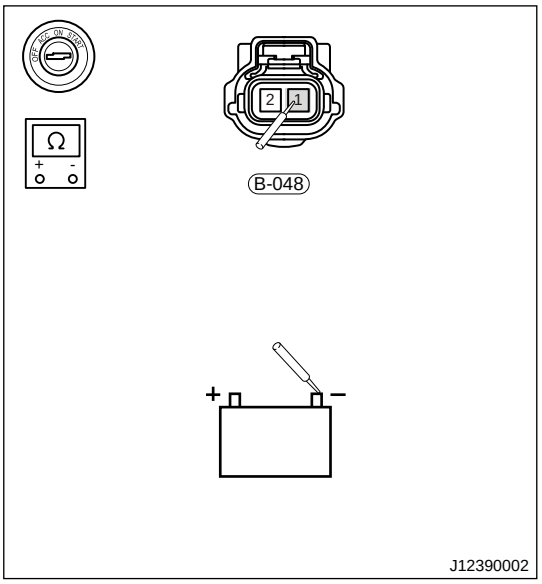
OK

3	**Check for short circuit to ground / power supply or short to each other in GPF temperature sensor circuit**

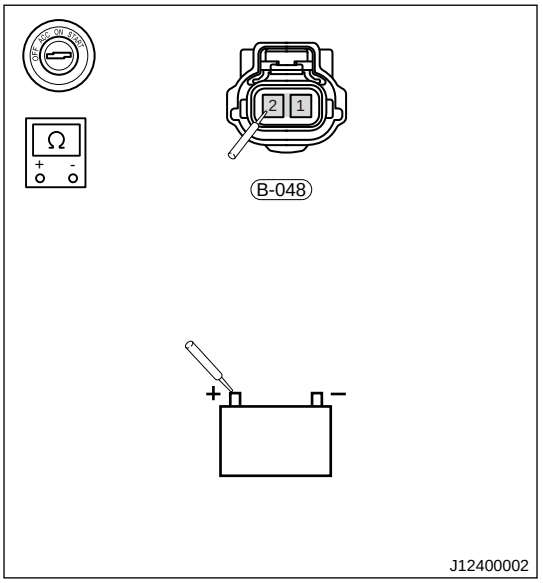
(a) Disconnect the GPF temperature sensor connector.

(b) Disconnect the ECM connector (B-048).

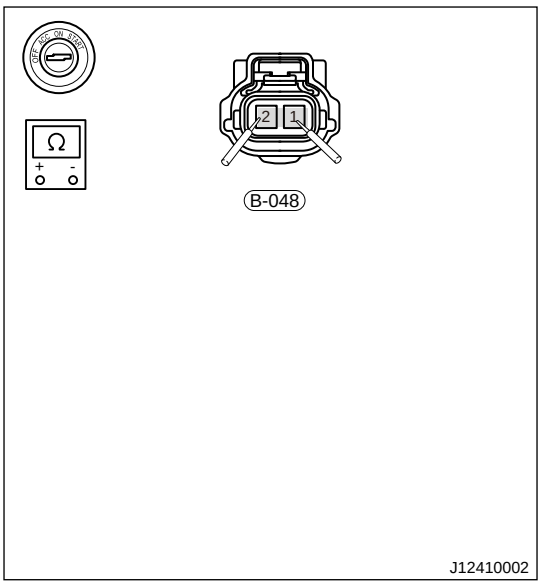
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistance of GPF temperature sensor B-048 (1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of GPF temperature sensor B-048 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of GPF temperature sensor B-048 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

OK

4	**Check Engine Control Module (ECM)**

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

5	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ Engine Coolant Temperature Sensor 2 Cold Start Calibration Unreasonable (Positive Deviation)/ (Negative Deviation)

DTC	P218324	Engine Coolant Temperature Sensor 2 Circuit Range/Performance
DTC	P218323	Engine Coolant Temperature Sensor 2 Circuit Range/Performance
DTC	P218400	Engine Coolant Temperature Sensor 2 Circuit Low
DTC	P218500	Engine Coolant Temperature Sensor 2 Circuit High

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check coolant temperature sensor 2 connector

(a) Disconnect the negative battery.
(b) Check if coolant temperature sensor 2 connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

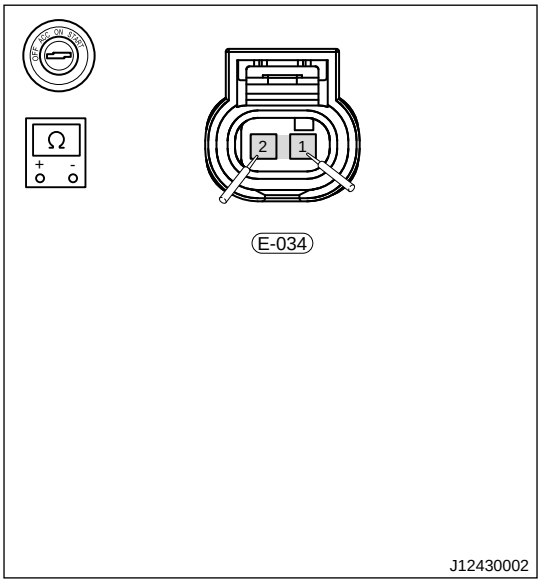
OK

2	Check coolant temperature sensor 2 internal resistance

(a) Disconnect the coolant temperature sensor 2 connector

(b) Using ohm band of multimeter, measure if resistances of coolant temperature sensor 2 E-034 (1, 2) are normal with red and black probes respectively.

Rated resistance at 20℃: 2.5 KΩ ± 5%



NG → **Replace coolant temperature sensor 2 assembly.**

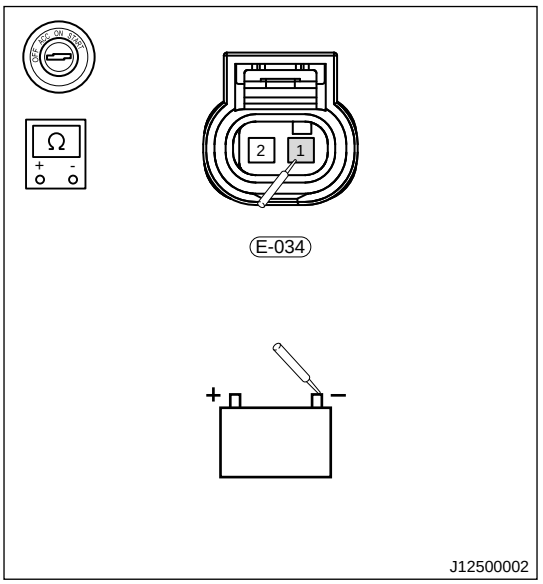
OK

3	**Check for short circuit to ground / power supply or short to each other in coolant temperature sensor 2 circuit**

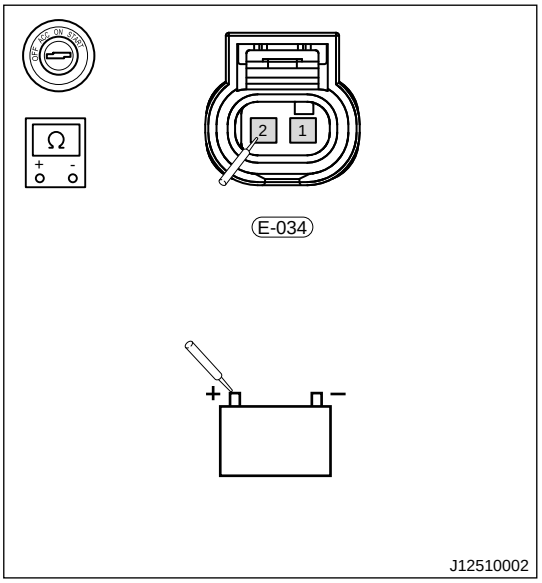
(a) Disconnect the coolant temperature sensor 2 connector.

(b) Disconnect the ECM connector (E-018).

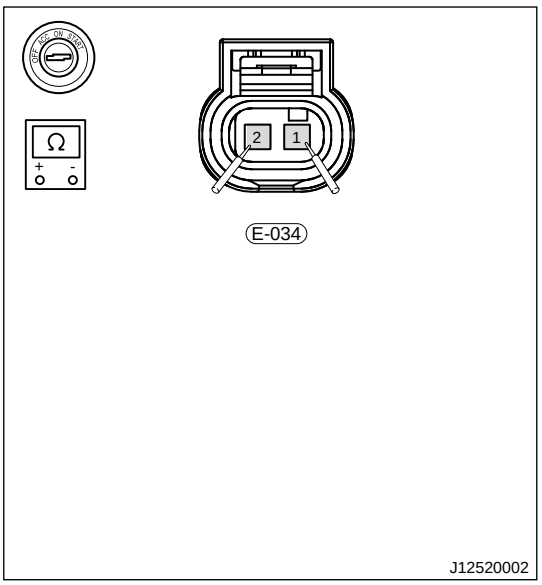
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of coolant temperature sensor 2 E-034 (1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of coolant temperature sensor 2 E-034 (1, 2) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure the resistances of coolant temperature sensor 2 E-034 (1, 2) with red and black probes respectively. Check if circuits are shorted to each other.



NG → **Check and repair circuit.**

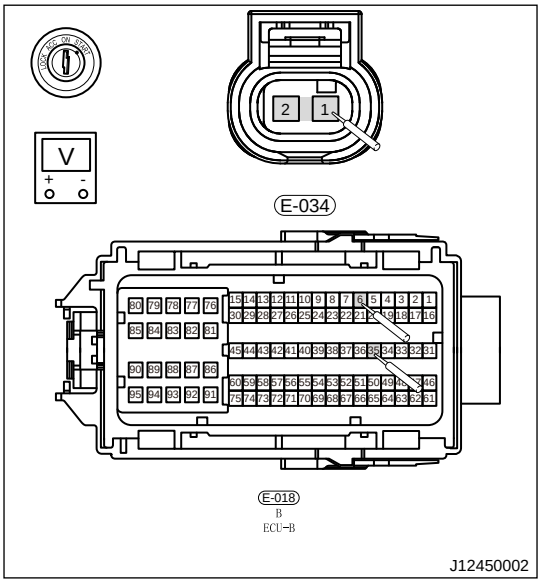
OK

4	**Check whether there is contact resistance in coolant sensor 2 circuit**

(a) Connect the coolant temperature sensor 2 and ECM connector (E-018).

(b) Using voltage band of multimeter (voltage drop method), connect black probe to ECM E-018 (B6, B35), measure voltages of coolant temperature sensor 2 E-034 (1, 2) with red probe

Test voltage drop value should be less than approximately 0.2 V



NG → **Repair or replace wire harness.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.

(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Particulate Filter Differential Pressure Sensor Malfunction**

DTC	**P12A300**	**Particulate Filter Differential Pressure Sensor Line Connection Error**
DTC	**U060100**	**Particulate Filter Differential Pressure Sensor Sent Communication Failure**

DTC	**U060141**	**Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible**
DTC	**P129300**	**Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (SENT Signal High or Low)**
DTC	**P245500**	**Particulate Filter Differential Pressure Sensor Circuit Voltage High**
DTC	**P245400**	**Particulate Filter Differential Pressure Sensor Circuit Voltage Low**
DTC	**P129100**	**Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible**
DTC	**P129000**	**Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable**
DTC	**P12E000**	**Offset Check Value After Running Particulate Filter Differential Pressure Sensor Unreasonable**
DTC	**P12E100**	**Dynamic Response Performance of Particulate Filter Differential Pressure Sensor Non-plausible**
DTC	**P12E300**	**Particulate Filter Differential Pressure Sensor Channel 1 Digital Signal Non-plausible (SENT Signal High or Low)**
DTC	**P12A200**	**Particulate Filter Differential Pressure Sensor Line Connection Error**
DTC	**P246100**	**Particulate Filter Differential Pressure Sensor Circuit Voltage High**
DTC	**P246000**	**Particulate Filter Differential Pressure Sensor Circuit Voltage Low**
DTC	**U060200**	**Particulate Filter Differential Pressure Sensor Sent Communication Failure**
DTC	**U060241**	**Particulate Filter Differential Pressure Sensor Data Inspection Non-plausible**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check GPF pressure sensor connector**

(a) Disconnect the negative battery.
(b) Check if GPF pressure sensor connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	Check GPF pressure sensor connecting line

(a) Check if GPF pressure sensor connecting line falls off or is connected incorrectly.

NG → **Adjust the connecting line.**

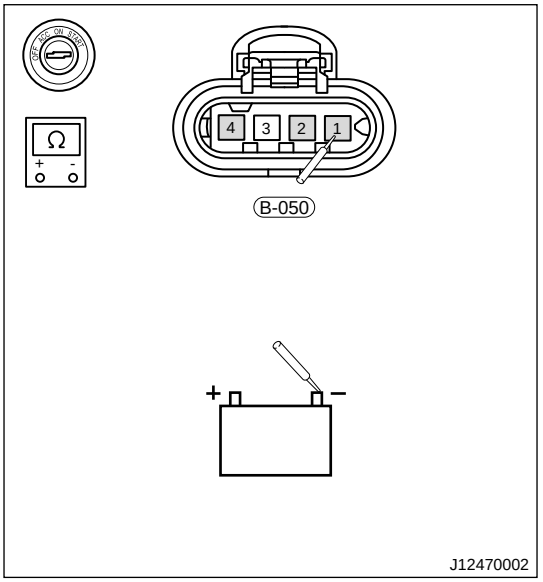
OK

3	Check for short circuit to ground / power supply or short to each other in GPF pressure sensor circuit

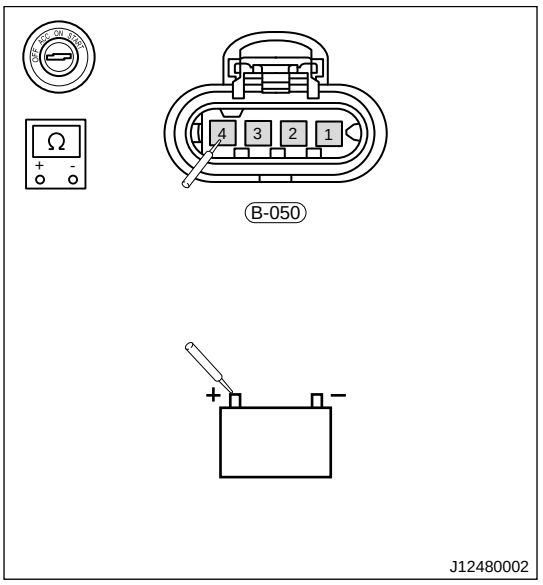
(a) Disconnect the GPF pressure sensor connector.

(b) Disconnect the ECM connector (E-018).

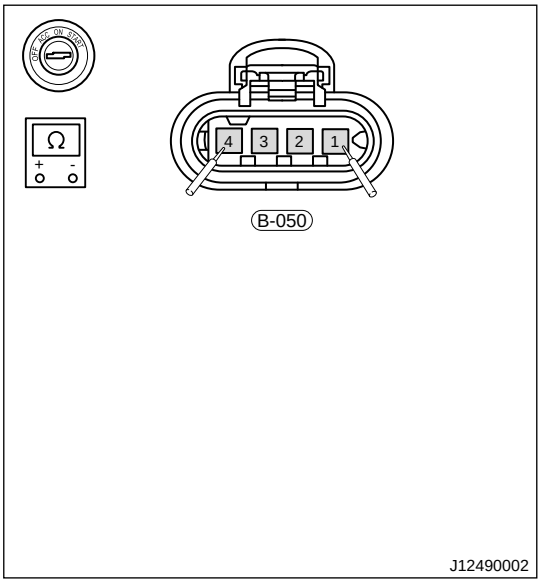
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, measure resistances of GPF pressure sensor B-050 (1, 2, 4) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, measure resistances of GPF pressure sensor B-050 (1, 2, 3, 4) with red probe respectively. Check if circuit is short to power supply.



(e) Using ohm band of multimeter, measure resistances of GPF pressure sensor B-050 (1, 2, 3, 4) with red and black probes respectively. Check if circuits are shorted to each other.

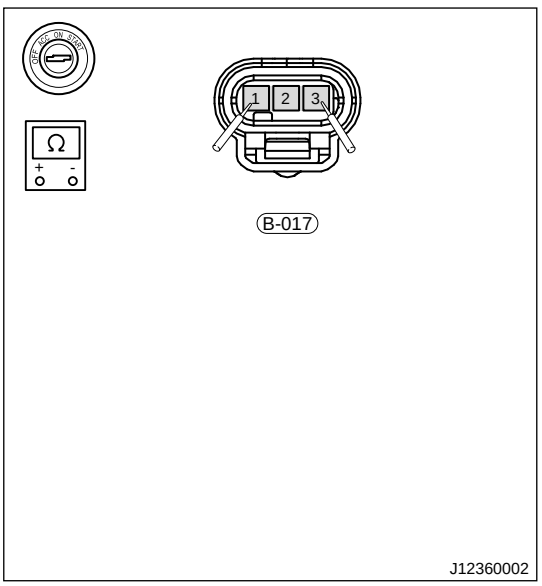


NG → **Check and repair circuit.**

OK

4	Check if circuits of GPF pressure sensor themselves are shorted to each other

(a) Using ohm band of multimeter, measure resistances of GPF pressure sensor B-050 (1, 2, 3, 4) with red and black probes respectively; Check if they are shorted to each other.



NG → **Replace GPF pressure sensor assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK	Repair or replace new module.

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ Particulate Filter is Removed

DTC	P226D00	Particulate Filter Removed

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check GPF particulate filter

(a) Check if GPF particulate filter is removed.
(b) Check if GPF particulate filter is melted.

NG	Replace GPF particulate filter.

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK	Conduct test and confirm malfunction has been repaired.

■ **Fuel Pump Enable Control Circuit is Open/Voltage Too High/Too Low**

DTC	**P025D00**	**Fuel Pump Module "A" Control Circuit High**
DTC	**P025A00**	**Fuel Pump Module "A" Control Circuit Open**
DTC	**P025C00**	**Fuel Pump Module "A" Control Circuit Low**

■ **Description**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check fuel pump controller connector**

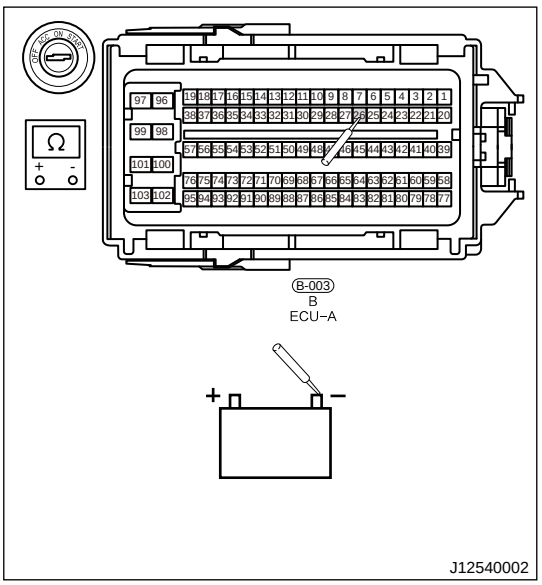
(a) Disconnect the negative battery.
(b) Check if fuel pump controller connector is loose, and contact between male and female terminals is in good condition.

NG	Repair and adjust connector, or replace it.

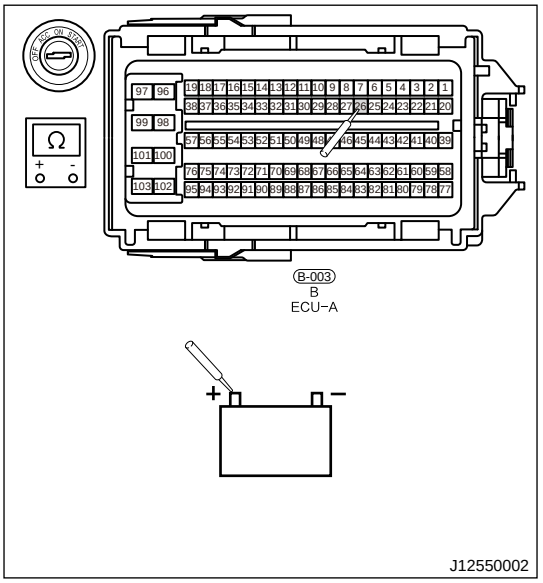
OK

2	**Check whether the fuel pump enable signal circuit is short to ground/power supply**

(a) Disconnect the fuel pump controller connector.
(b) Disconnect the ECM connector (B-003).
(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of ECM B-003 (A26) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistance of ECM B-003 (A26) with red probe respectively. Check if circuit is short to power supply.



NG → **Check and repair circuit.**

OK

3	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ Crankcase Heating Line Circuit Open / Voltage Too High / Too Low

DTC	P053A00	Crankcase Heating Line Circuit Open
DTC	P053C00	Crankcase Heating Line Circuit Voltage Too High
DTC	P053B00	Crankcase Heating Line Circuit Voltage Too Low

■ Description

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check crankshaft heating valve connector**

(a) Disconnect the negative battery.
(b) Check if crankshaft heating valve connector is loose, and contact between male and female terminals is in good condition.

NG → **Repair and adjust connector, or replace it.**

OK

2	**Check crankshaft heating valve power supply fuse**

(a) Check if fuse EF21 15A in engine compartment fuse and relay box is blown.

NG → **Check and repair short circuit malfunction of circuit.**

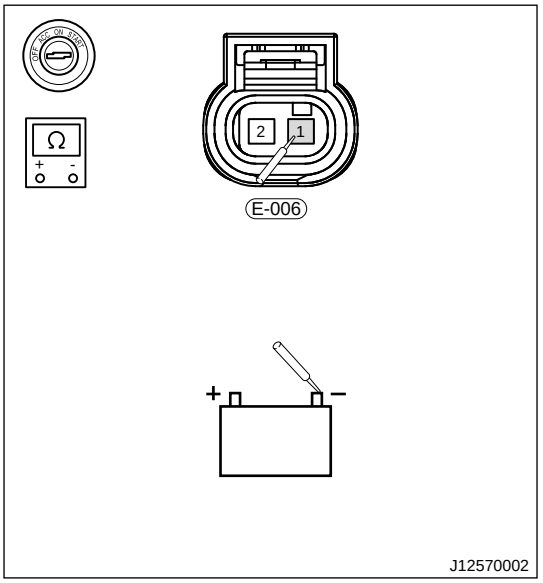
OK

3	**Check for short circuit to ground / power supply in crankshaft heating valve control circuit**

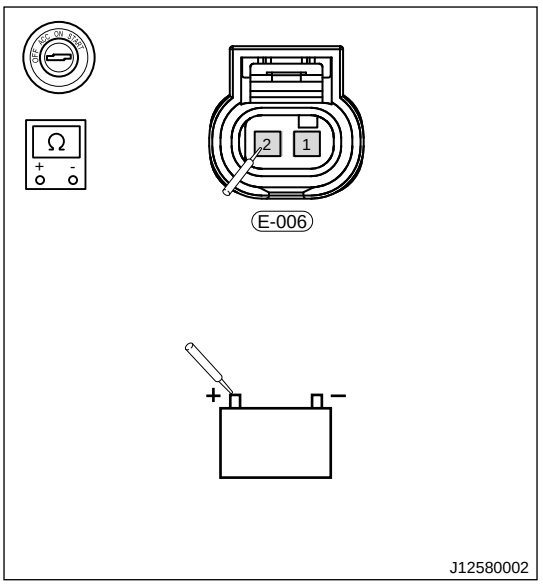
(a) Disconnect the crankshaft heating valve connector.

(b) Disconnect the ECM connector (B-003).

(c) Using ohm band of multimeter, connect black probe to battery negative terminal, and measure resistance of crankshaft heating valve E-006 (1) with red probe respectively. Check if circuit is short to ground.



(d) Using ohm band of multimeter, connect black probe to battery positive terminal, and measure resistances of crankshaft heating valve E-006 (1, 2) with red probe respectively. Check if circuit is short to power supply.

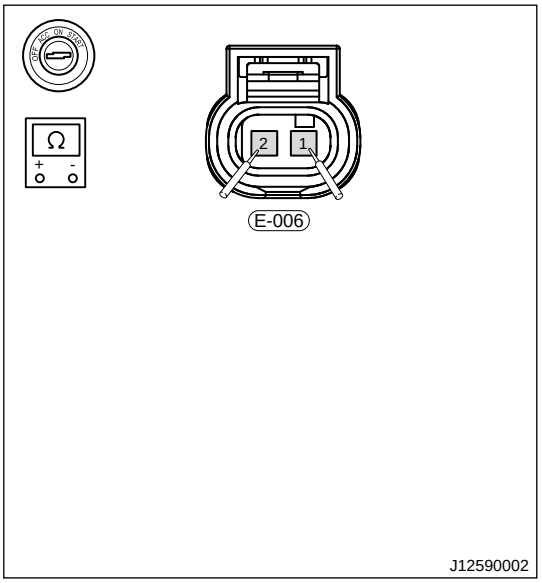


NG → **Check and repair circuit.**

OK

4	**Check if circuits of crankshaft heating valve themselves are shorted to each other or opened**

(a) Using ohm band of multimeter, measure resistances of crankshaft heating valve E-006 (1, 2) with red and black probes respectively; Check if they are shorted to each other or opened.



NG → **Replace crankshaft heating valve assembly.**

OK

5	Check Engine Control Module (ECM)

(a) Remove Engine Control Module (ECM) from malfunctioning vehicle.
(b) Install a new engine control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Ambient Temperature Sensor Circuit Voltage Too Low / Too High**

DTC	**P121B00**	**Front Left Wheel Speed Sensor Signal NG**
DTC	**P121C00**	**Front Right Wheel Speed Sensor Signal NG**

DTC	**P121D00**	**Rear Left Wheel Speed Sensor Signal NG**
DTC	**P121E00**	**Rear Right Wheel Speed Sensor Signal NG**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

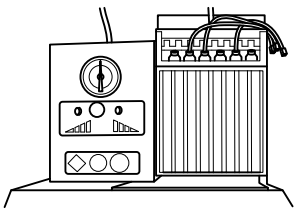
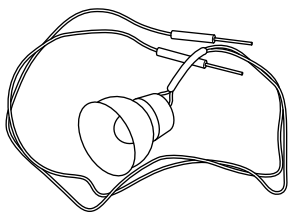
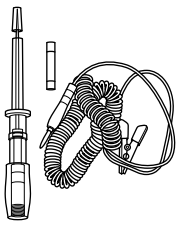
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

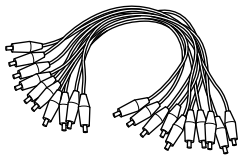
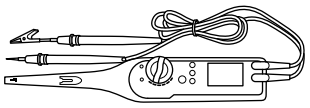
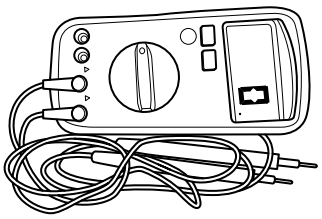
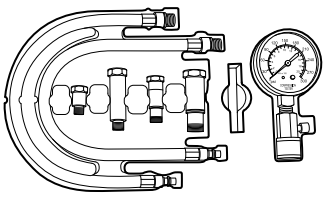
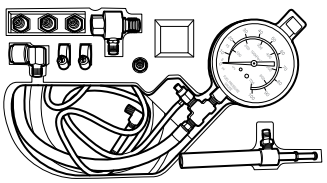
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
Read brake control system DTCs and refer to brake control system diagnosis.

5 On-Vehicle Service

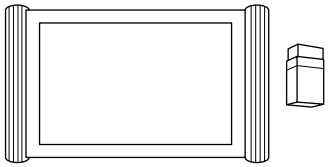
5.1 Tools

■ General Tools

Tool Name	Tool Drawing
Fuel Injector Cleaning Analyzer	 S00043
21 W Test Light	 S00061
LED Test Light	 S00077

Tool Name	Tool Drawing
Jumper Wire	 S00062
Diode Test Light	 S00078
Digital Multimeter	 S00002
Cylinder Pressure Gauge	 S00033
Fuel Pressure Gauge	 S00035

■ **Special Tool**

Tool Name	Tool Drawing
Diagnostic Tester	 S00001

5.2 Intake Pressure/Temperature Sensor

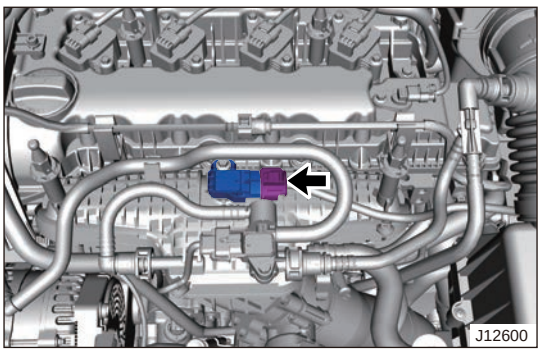
■ **Removal**

⚠ Warning

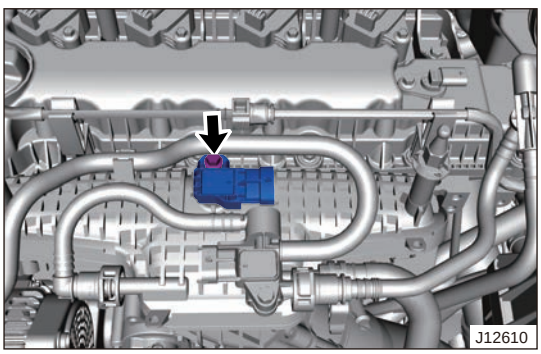
- **Be sure to wear necessary safety equipment to prevent accidents, when removing intake pressure/ temperature sensor.**
- **Appropriate force should be applied when removing intake pressure/temperature sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Disconnect the intake pressure/temperature sensor connector.



(5) Remove the intake pressure/temperature sensor fixing bolt and take it out carefully.



■ **Inspection**

(1) Temperature sensor part: (Remove the connector) Turn digital multimeter to ohm band, connect two probes to sensor pins 1# and 2# respectively, the rated resistance is 2.5 kΩ ± 5% at 20˚C. Measurement can also be performed by simulating. Specific operations are to send wind to the sensor with blow drier

(be careful that blow drier shouldn’ t be too close to the sensor) and observe the changes of sensor resistance. The resistance should reduce at the moment.

(2) Pressure sensor part: (Connect the connector) Turn digital multimeter to DC voltage band, ground the black probe, connect red probe to pins 3# and 4# respectively. Under idling status, there should be 5 V of reference voltage at pin 3#, and about 1 V of voltage at pin 4#; Under unloaded status, slowly open the throttle, the voltage of pin 4# has not changed too much; Quickly open the throttle, the voltage of pin 4# can reach about 4 V instantaneously (value changes with model), and then drops to about 1.7 V (value changes with model).

■ Installation

(1) Install the intake pressure/temperature sensor fixing bolt.

Torque: 6 ± 1 N m

(2) connector and intake pressure/temperature sensor connector.

5.3 Electronic Throttle

■ Removal

(1) For details about removal methods, refer to the removal steps of electronic throttle assembly in intake system.

■ Inspection

(1) Judgment methods for specific mechanical damage: Valve plate should be in NLP position with power off and can rotate smoothly when flipping it by hand. If stuck occurs, it indicates that internal components may be damaged.

(2) Simple measurement of internal sensors: (remove the connector) Turn digital multimeter to ohm band.

1) Connect two probes to pin IP1S and pin IPM respectively, flip valve plate by hand, and resistance should change continuously.

2) Connect two probes to pin IP2S and pin IPM respectively, flip valve plate by hand, and resistance should change continuously.

3) If there are conditions, you can fully close or fully open throttle body with constant current source [fully close throttle body with 3A current (UMA), fully open throttle body with 2A current (OMA)], connect 5 V constant voltage source to pins UIP and IPM simultaneously, measure the output voltage values of IP1S and IP2S at fully close and fully open positions.

■ Installation

(1) For details about installation methods, refer to the installation steps of electronic throttle assembly in intake system.

5.4 Knock Sensor

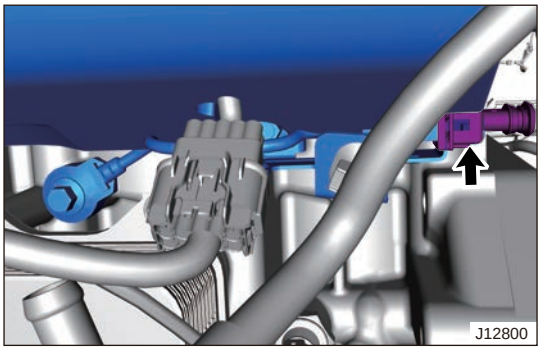
■ Removal

⚠ Warning

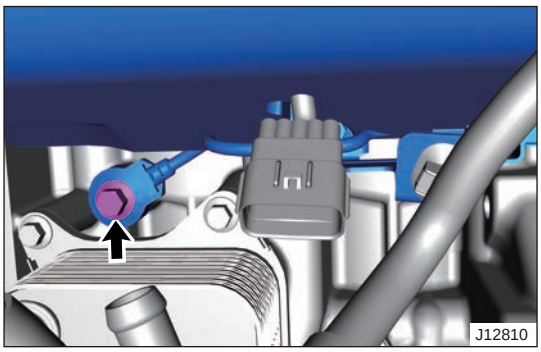
- **Be sure to wear necessary safety equipment to prevent accidents, when removing knock sensor.**
- **Appropriate force should be applied when removing knock sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the intake hose assembly.

(5) Disconnect the knock sensor connector.



(6) Remove the knock sensor fixing bolt and take it out carefully.



■ Inspection

(1) Simple measurement method:(Remove the connector) Turn digital multimeter to ohm band, connect two probes to the pins of sensor type knock sensor 1#, 2# or cable type knock sensor 1#, 2#, and their resistance value at normal temperature should be (4.9±20%) MW. Turn digital multimeter to mV band, use a small hammer to tap near knock sensor, there should be output a voltage signal.

■ Installation

⚠ Caution

- **Be careful not to allow liquids such as oil, coolant, brake fluid and water to contact the sensor for a long periods of time.**
- **Do not use any type of gasket during installation. The sensor must be pressed against the cylinder block with its metal surface.**
- **When wiring the sensor signal cable, you should pay attention not to make the signal cable resonate, so as not to break.**

(1) Install the knock sensor fixing bolt.

Torque: 20 ± 5 N m

(2) Connect the knock sensor connector.

5.5 Coolant Temperature Sensor

■ Removal

(1) For details about removal methods, refer to removal steps of coolant temperature sensor assembly in cooling system.

■ **Inspection**

Step	Operation	Test Value	Test Result	Subsequent Step
1	Remove coolant temperature sensor wire harness connector, use a multimeter to measure if resistance between two terminals of sensor is normal.	Rated resistance is 2.5 kΩ ± 10% at 20˚C. Measurement can also be performed by simulating. Specifically, the working area of sensor is placed in 100˚C of boiled water (note that the soaking time must be sufficient), and observe the changes of sensor resistance. At this time, the resistance should drop to 170 Ω~200Ω.	Yes	Next
			No	Replace coolant temperature sensor
2	Connect coolant temperature sensor wire harness connector, turn ignition switch to ON, measure the voltage between two pins of coolant temperature sensor wire harness.	5 ± 0.5 V	Yes	Diagnostic Help
				Check for continuity and ground of wire harness

■ **Installation**

(1) For details about installation methods, refer to installation steps of coolant temperature sensor assembly in cooling system.

5.6 Speed Sensor

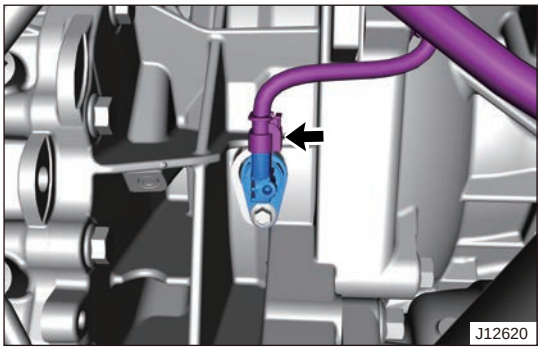
■ **Removal**

⚠ Warning

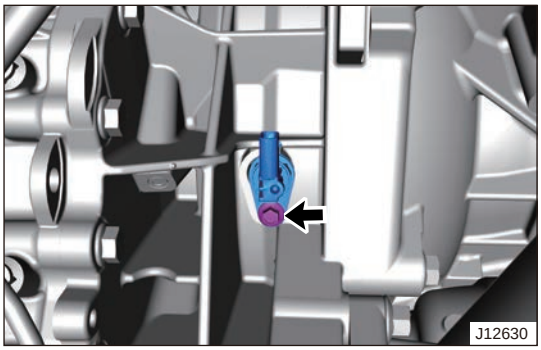
- **Be sure to wear necessary safety equipment to prevent accidents, when removing speed sensor.**
- **Appropriate force should be applied when removing speed sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Disconnect the speed sensor connector.



(5) Remove the speed sensor fixing bolt and take it out carefully.



■ **Inspection**

(1) Simple measurement method: (Remove the connector) Turn LCR meter to ohm band (in-line mode, test frequency is 10 kHz), connect two probes to sensor connector terminals 1 and 3, rated resistance is 33 Ω ± 20%; Turn LCR meter to capacitance band (in-parallel mode, est frequency is 1 kHz), connect two probes to sensor connector terminals 1 and 3, rated capacitance is 100 nF ± 20%;Turn LCR meter to capacitance band (in-parallel mode, est frequency is 1 kHz), connect two probes to sensor connector terminals 2 and 3, rated capacitance is 4.7 nF ± 20%.

■ **Installation**

⚠ Caution

- **Ensure that the sensor is clean and the sensor is allowed to be removed from the package before it is installed in the engine or test bench. Users with cardiac pacemakers should take precautions before operation.**
- **The sensor is only allowed to be pressed into installation hole by press-in. It is not allowed to install the sensor with a tapping tool (such as hammer).**

(1) Install the speed sensor fixing bolt.

Torque: 7 ± 1 N m

(2) Connect the speed sensor connector.

5.7 Camshaft Position Sensor

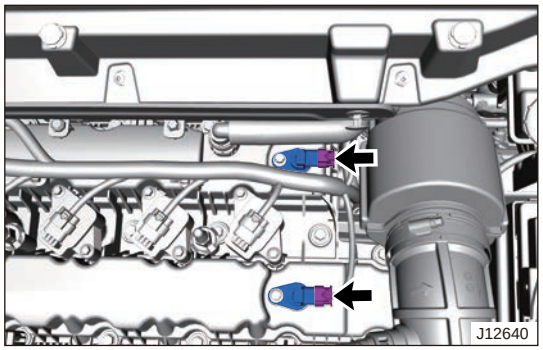
■ **Removal**

⚠ Warning

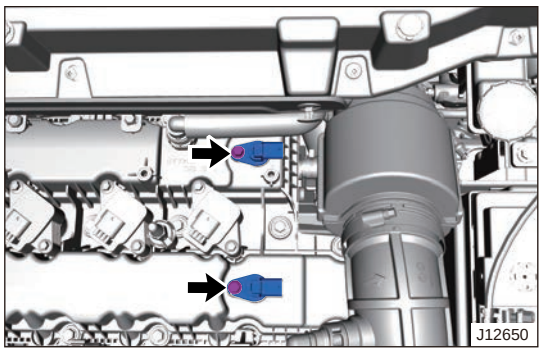
- **Be sure to wear necessary safety equipment to prevent accidents, when removing camshaft position sensor.**
- **Appropriate force should be applied when removing camshaft position sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Disconnect the intake/exhaust phaser sensor connector.



(5) Remove the intake/exhaust phaser sensor and take it out carefully.



■ **Installation**

⚠ Caution

- **The sensor is only allowed to be pressed into installation hole by press-in. It is not allowed to install the sensor with a tapping tool (such as hammer).**

(1) Install the intake/exhaust phaser sensor fixing bolts.
Torque: 8 ± 3 N m

(2) Connect the phaser sensor connector.

5.8 Boost pressure/temperature sensor

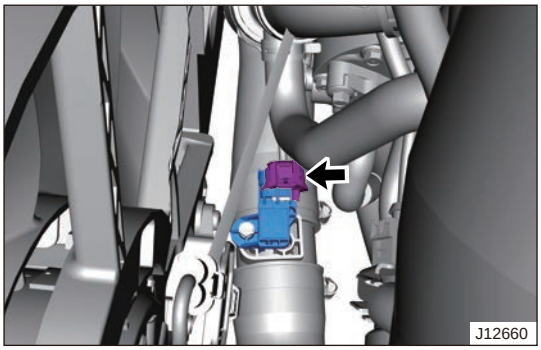
■ **Removal**

⚠ Warning

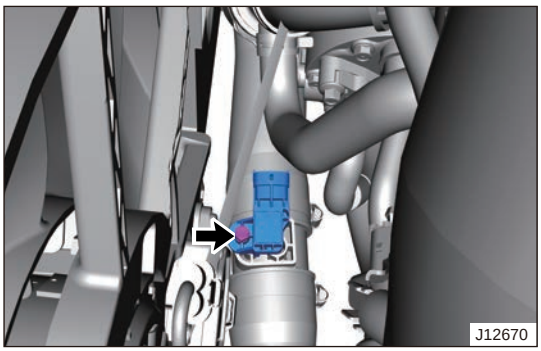
- **Be sure to wear necessary safety equipment to prevent accidents, when removing boost pressure/ temperature sensor.**
- **Appropriate force should be applied when removing boost pressure/temperature sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Disconnect the boost pressure/temperature sensor connector.



(5) Remove the boost pressure/temperature sensor fixing bolt and take it out carefully.



■ Installation

(1) Install the boost pressure/temperature sensor fixing bolt.

Torque: 9 ± 1.5 N m

(2) Connect the boost pressure/temperature sensor connector.

5.9 VVT Control Valve

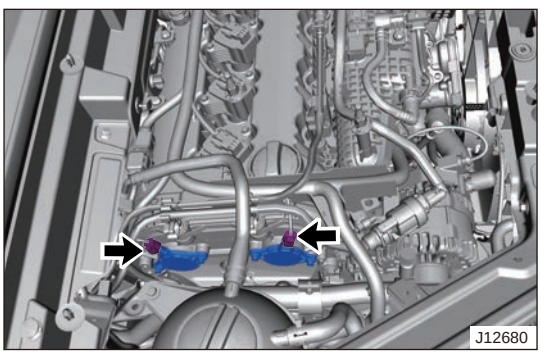
■ Removal

⚠ Warning

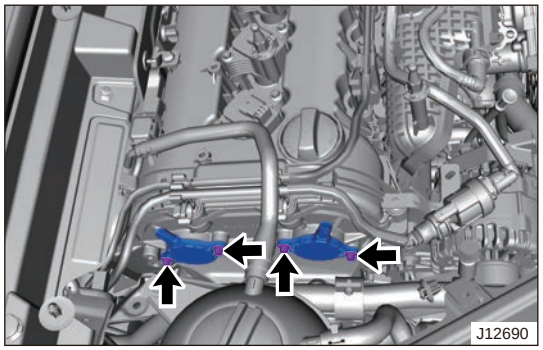
- **Be sure to wear safety equipment to prevent accidents, when removing VVT control valve.**
- **Appropriate force should be applied, when removing VVT control valve. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Disconnect the intake/exhaust VVT control valve connector.



(5) Remove the intake/exhaust VVT control valve fixing bolt respectively and take them out carefully.



■ **Inspection**

Step	Operation	Test Value	Test Result	Subsequent Step
1	Remove VVT control valve wire harness connector, use a multimeter to measure if resistance between two terminals of sensor is normal.	Resistance at ambient temperature: 6 Ω	Yes	Next
			No	Replace VVT control valve
2	Remove VVT control valve, and check for foreign matter stuck or internal leakage.		Yes	Replace VVT control valve
			No	Diagnostic Help

■ **Installation**

⚠ **Caution**
• **Control valve is only allowed to be pressed into installation hole by press-in. It is not allowed to install the sensor with a tapping tool (such as hammer).**

(1) Install the intake/exhaust VVT control valve fixing bolt.
(2) Connect the intake/exhaust VVT control valve connector.

5.10 Fuel Rail Injector

■ **Removal**

(1) For details about removal methods, refer to removal steps of fuel rail injector assembly in fuel system.

■ **Inspection**

(1) Simple measurement method: (Remove the connector) Turn digital multimeter to ohm band, connect two probes to two terminals of fuel injector respectively, the rated resistance is 1.83 Ω at 20℃.

■ **Installation**

(1) For details about installation methods, refer to installation steps of fuel rail injector assembly in fuel system.

5.11 High Pressure Fuel Rail Pressure Sensor

■ **Removal**

(1) For details about removal methods, refer to removal steps of high pressure fuel rail pressure sensor assembly in fuel system.

■ **Inspection**

(1) Simple measurement method: Remove the sensor, connect 5 V power supply at normal temperature and atmospheric pressure, pressure signal output is 0.500 ± 0.048 V at this time.

■ **Installation**

(1) For details about installation methods, refer to installation steps of high pressure fuel rail pressure sensor in fuel system.

5.12 Canister Control Valve

■ **Removal**

(1) For details about removal methods, refer to removal steps of canister control valve assembly in fuel system.

■ **Inspection**

(1) Simple measurement method: (Remove the connector) Turn digital multimeter to ohm band, connect two probes to two terminals of canister control valve respectively, resistance is 14~ 18 Ω at 20℃. Replace it if the resistance does not meet the specification.

■ **Installation**

(1) For details about installation methods, refer to installation steps of canister control valve assembly in fuel system.

5.13 Brake Vacuum Pressure Sensor

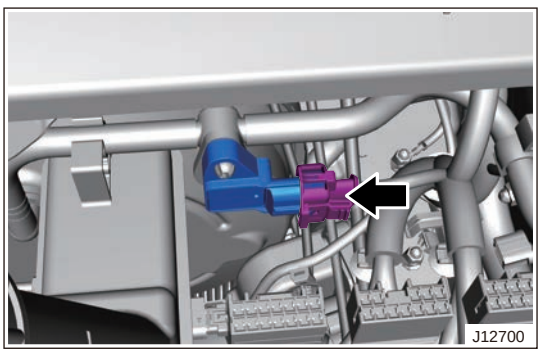
■ **Removal**

⚠ Warning

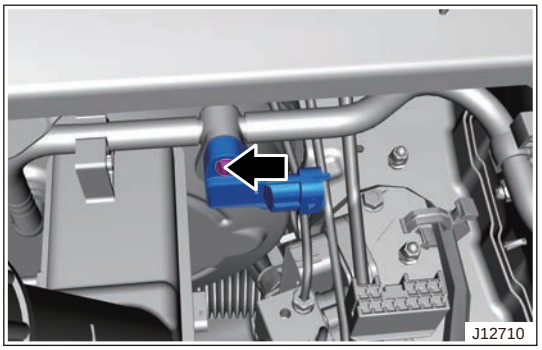
- **Be sure to wear necessary safety equipment to prevent accidents, when removing brake vacuum pressure sensor.**
- **Appropriate force should be applied when removing brake vacuum pressure sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the engine compartment fuse and relay box main body.

(5) Disconnect the brake vacuum pressure sensor connector.



(6) Press brake vacuum pressure sensor fixed clamping area and take out sensor carefully.



■ **Inspection**

(1) Simple measurement method: (Remove the connector) Turn digital multimeter to ohm band, you can perform the following simple measurements respectively:

1) Connect two probes to sensor pins 1# and 2# respectively, the resistance is 1 kΩ ~ 2 kΩ at normal temperature. There may be short or open circuit in power supply circuit if the resistance is abnormal;

2) Connect two probes to sensor pins 1# and 3# respectively, the resistance is 1 kΩ ~ 2 kΩ at normal temperature. There may be short or open circuit in output circuit if the resistance is abnormal.

■ **Installation**

⚠ Caution

- **Always make sure the O-ring is not damaged during installation. Apply a light coat of oil (such as 5W20) to O-ring surface before installation, and do not use silicon grease.**
- **Press sensor detecting sleeve into installation hole manually during installation, and do not install sensor with striking tool.**

(1) Insert the brake vacuum pressure sensor into installation hole carefully, and make sure that fixing clip has been fully clamped.
(2) Connect the brake vacuum pressure sensor connector.

5.14 Engine Control Unit (ECU)

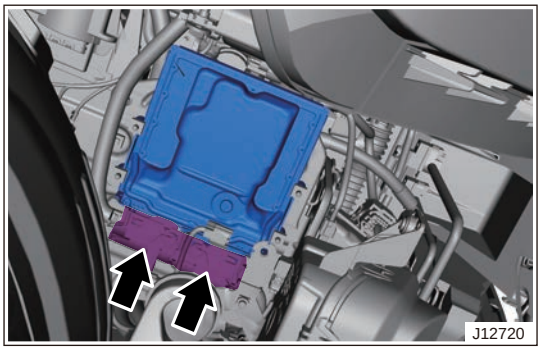
■ **Removal**

⚠ Warning

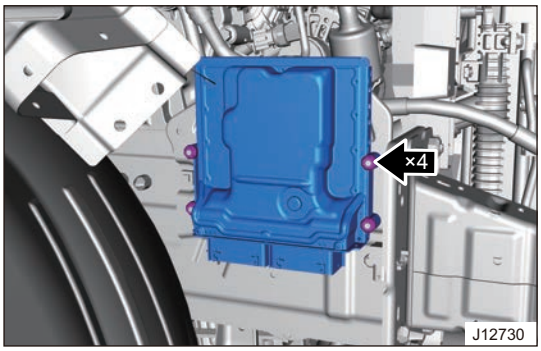
- **Be sure to wear safety equipment to prevent accidents, when removing engine control unit.**
- **Appropriate force should be applied, when removing engine control unit. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the front right wheel.
(5) Remove the front right wheel house protector.

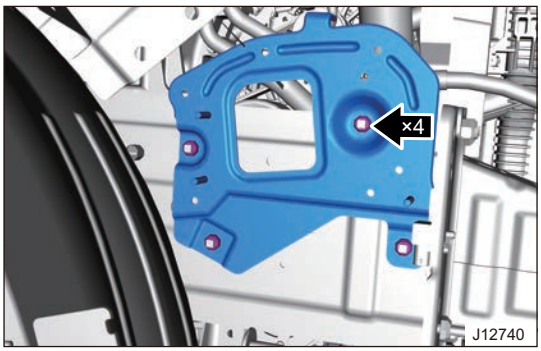
(6) Disconnect the engine control module connector.



(7) Remove 4 fixing bolts from engine control module, and take out engine control module assembly carefully.



(8) Remove 4 fixing bolts from engine control unit mounting bracket, and take out mounting bracket assembly.



■ Inspection

(1) Simple measurement method: 1. (Connect the connector) Use engine data CAN line to read engine trouble records; 2. (Remove the connector) Check if ECM connecting wire is in good condition, focusing on if ECM power supply and ground line are normal; 3. Check if the external sensor is operating properly, output signal is reliable and its circuit is in good condition; 4. Check if the actuator is operating properly and its circuit is in good condition; 5. Finally replace ECM and perform test.

■ Installation

⚠ Caution

- **Pay attention to static electricity protection during installation; Pay attention to the protection of the connector pin.**

(1) Install 4 fixing bolts to engine control unit mounting bracket.

Torque: 8 ± 2 N m

(2) Install 4 fixing bolts to engine control unit.

Torque: 8 ± 2 N m

(3) Connect the engine control unit connector.

5.15 Matching Learning

■ Matching Learning

Hint

- Before performing matching and learning of vehicle module, be sure to carefully read the related precautions and perform the operation strictly according to standard working procedures.

For details of matching and learning of engine management system (EMS) module performed under different situations, see table below:

Items	Applicable Situations	Actions Required by Diagnostic Tester	Note
Module replacement	• Module is damaged; • Module failure.	Write VIN Code	If it is a bare spare part (- module has no basic program and software), after writing the VIN code, the software must first enter the "Integrated Service" to refresh the control software, and write the control software into the module.
		Write configuration code	
		Read transmission storage data	
		CVO self-learning	
		VVT self-learning	
		Throttle Self-learning	
		Replace EMS (Engine Management System) - GPF (Gasoline Particulate Filter) Related	
		ESK Writing (PIN Is Required To Input)	
Software upgrading	• Low software version; • Software error.	Controller software refreshing	Refresh data can be requested from EXEED after-sales service department. The upgrade method is the same as 1.6T.
Calibration	/	/	/
Write VIN Code	Replace module	Write VIN Code	If configuration code cannot be read in the original module, try to get it from same configuration model or EXEED after-sales service department.
Learn	• Replace module; • Vehicle battery powered off.	Throttle Self-learning	/
	• Removal, installation or replacement of phaser sensor or speed sensor; • Removal/installation of camshaft/phaser sensor signal plate/phaser;	VVT self-learning	/

Items	Applicable Situations	Actions Required by Diagnostic Tester	Note
	• Removal/installation of crankshaft/flywheel; • Replace the timing chain; • Readjust the timing; • Replace ECM.		
	Replace GPF	Replace EMS (Engine Management System) - GPF (Gasoline Particulate Filter) Related	/
		Replace GPF(gasoline particulate filter) learning	
	Replace GPF pressure sensor	Replace GPF (gasoline particulate filter) pressure sensor learning	
		Replace EMS (Engine Management System) - GPF (Gasoline Particulate Filter) Related	/

■ **Self-diagnostic**

(1) Mainly include: read DTC, clear DTC; freeze frame, DTC extended information, DTC failure type (DTC low byte).

■ **System Parameter Display - Data Flow Collection Based On CAN UDS Protocol**

(1) Mainly include: Coolant temperature, intake temperature, intake pressure, boost, throttle opening, engine speed, ignition angle, air-fuel radio short term correct, air-fuel radio long term addition and multiplication correct, intake pressure, intake flow, oxygen sensor signal, system voltage, torque demand value, etc.

■ **System Condition**

(1) Mainly include: It displays 10 conditions such as program condition, cooling system, stable condition, dynamic condition, emission control, oxygen sensor, idle speed, malfunction indicator, emergency condition, A/C, etc.

■ **Actuator Test**

(1) Mainly include: Canister control valve control, fuel pump relay control, cooling fan control, electronic throttle control, PWM fan control, DVE self-learning, DVE first self-learning, conventional idle control, high speed idle control, CVO self-learning test.

■ **System Initialization Reset (Adaptive Reset)**

(1) After the engine stalling, initialization command is sent and system resets the previous self-adaption. The functions involved are: VVT learning, anti-theft learning after-sales, EBS battery data reading and writing, and command to replace GPF.

■ **Odometer**

(1) Mainly include: Display of vehicle driving distance and driving time.

■ **Edition Information**

(1) Mainly include: Display of vehicle identification number (VIN), ECM hardware number, ECM software number.

■ **Write VIN Code**

(1) After replacing ECM, rewrite the VIN.

■ **Refresh (Optional)**

5.16 Write Self-learning and GPF Information

■ **VVT Self-learning Guide**

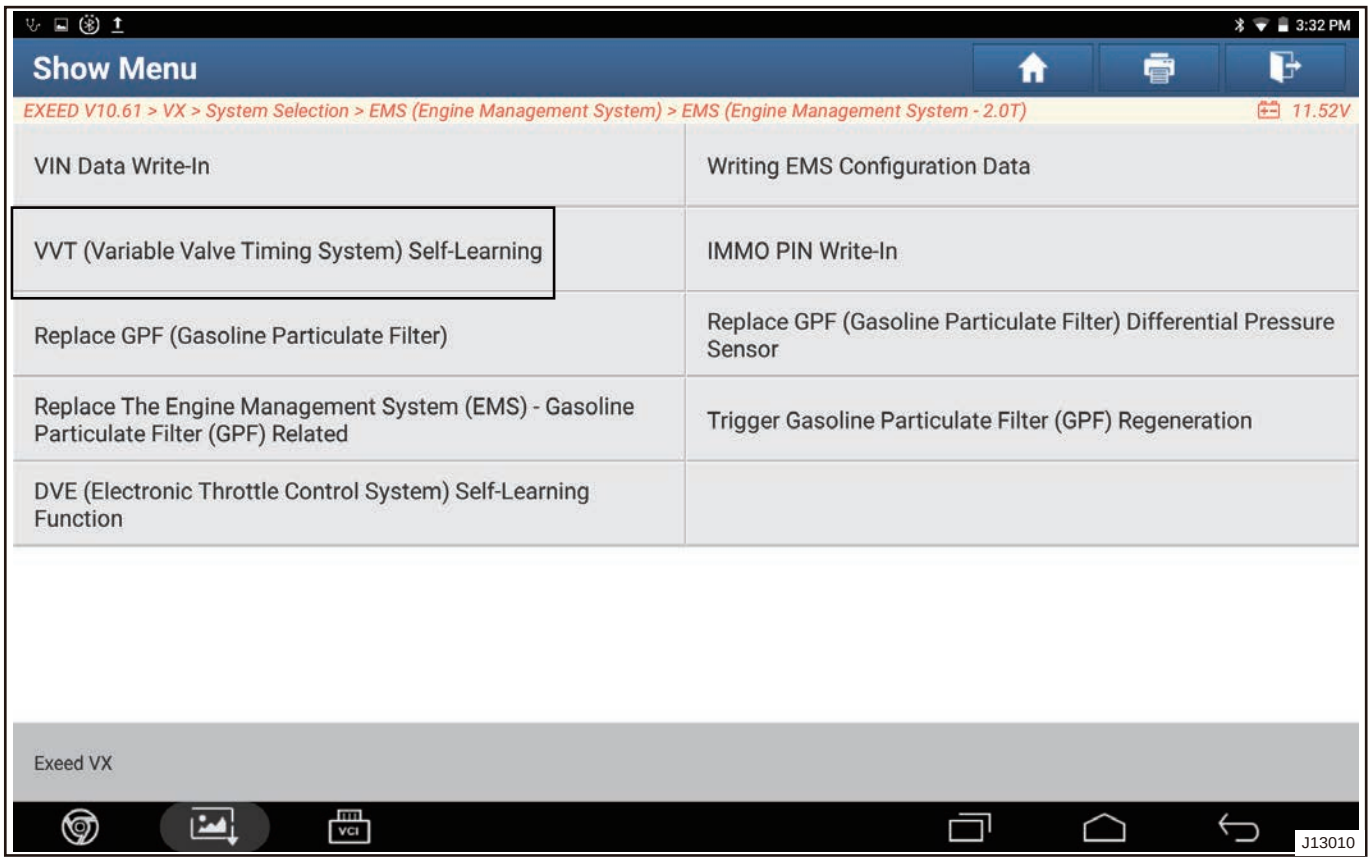
Working conditions and operating methods that need to be forced to trigger self-learningDuring offline or after-sales maintenance, any operation that may change the phase relationship between camshaft position sensor and crankshaft position sensor must perform the first VVT self-learning.

(1) The first self-learning of VVT includes the following situations:

1) Removal, installation or replacement of PG or DG sensor
2) Removal/installation of camshaft/PG signal plate/phaser
3) Removal/installation of DG signal plate
4) Removal/installation of crankshaft/flywheel
5) Replace the timing chain
6) Readjust the timing
7) Replace ECM

(2) Operation step:

1) When the ECM is powered on, the AE09 command is sent by UDS service of diagnostic tester without starting the engine, and the command lasts for more than 1 second;
2) Power off, waiting for 720 seconds;
3) Power on and start again, idling for 15 seconds;
4) Power off, waiting for 720 seconds.



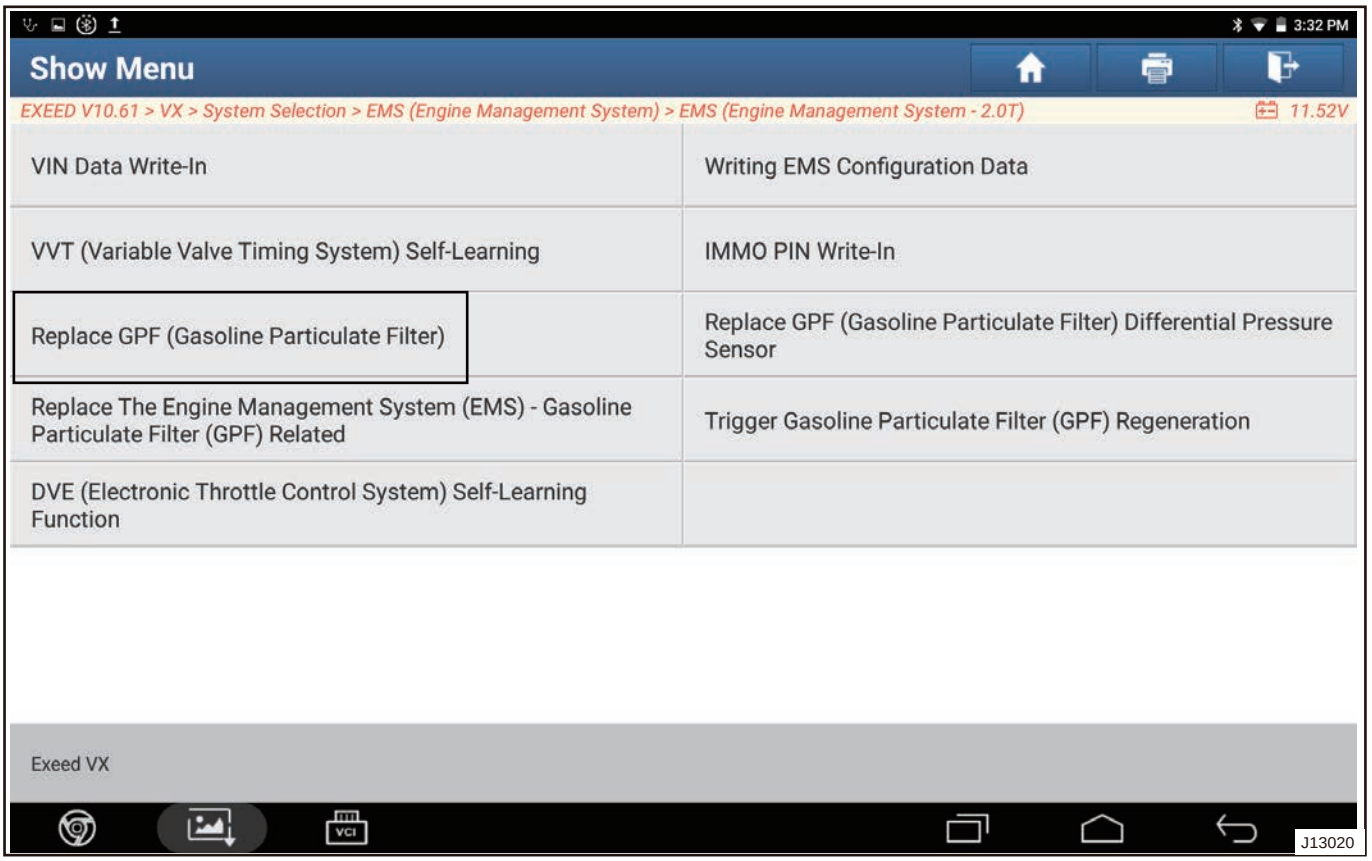
■ **Write GPF Information**

In the following cases, GPF information needs to be written

(1) Replace GPF

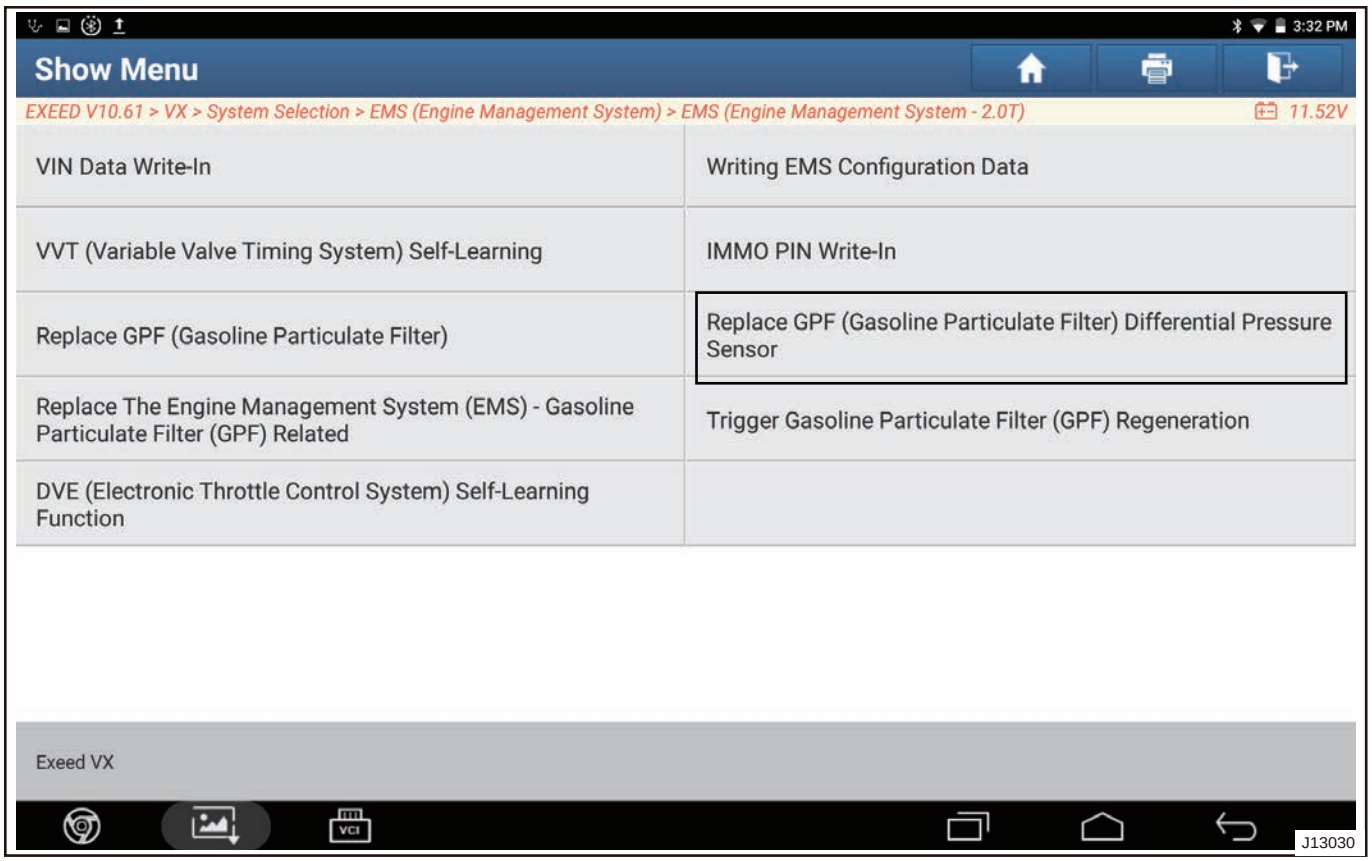
1) Stop the vehicle in a safe place;

2) The engine stops, after the GPF temperature has cooled to room temperature, replace GPF with a new one;
3) When the engine is powered on and not started, the command will be sent by UDS service of diagnostic tester;
4) Power off, wait for 720 seconds, power on again to read the current model carbon value ⩽ 0.6, the corresponding fuel cumulative value is 0, that is, write to EEPROM is successful;
5) Replacement of GPF is complete.



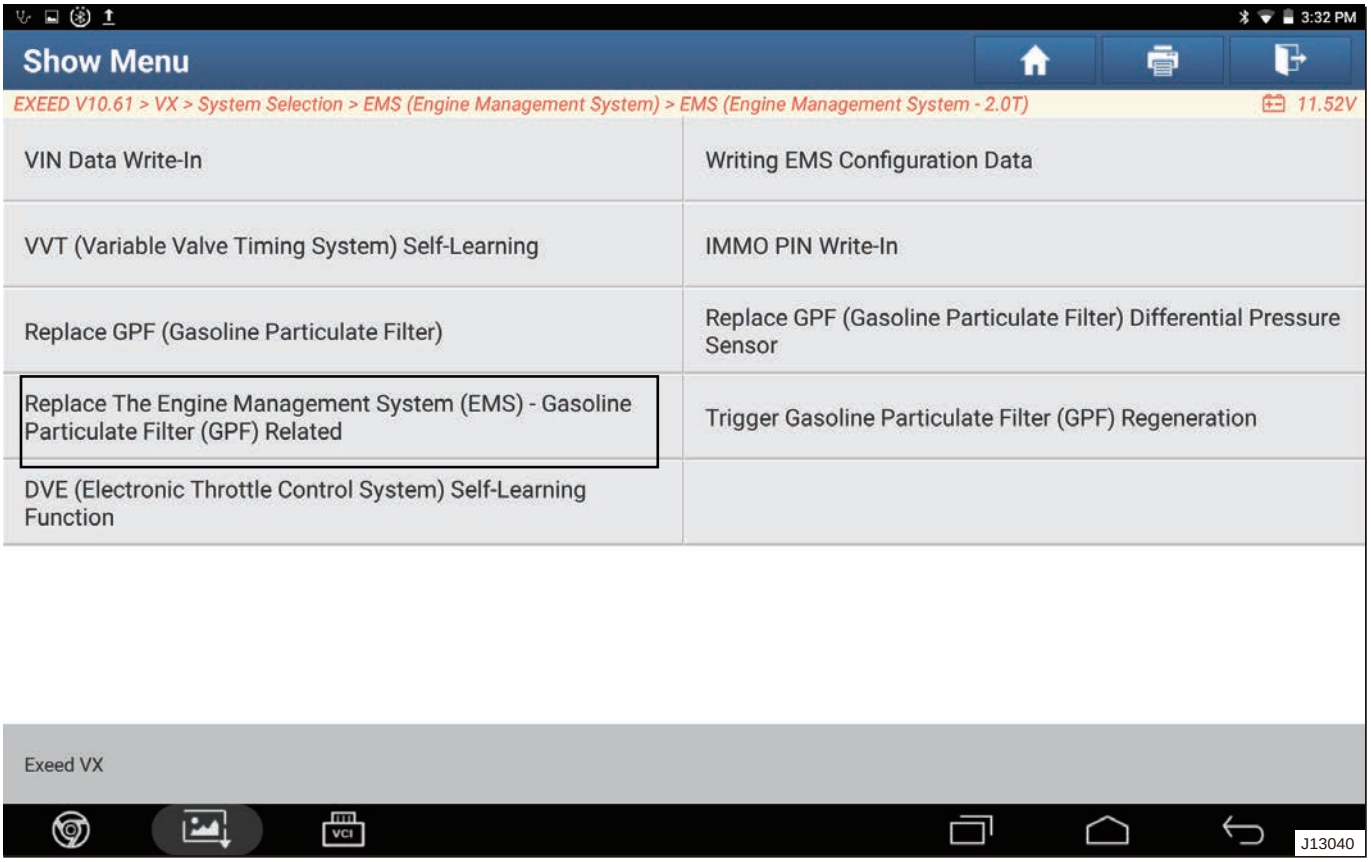
(2) Replace differential pressure sensor

1) Stop the vehicle in a safe place;
2) The engine stops, after the GPF temperature has cooled to room temperature, replace differential pressure sensor with a new one and ensure that the upstream and downstream lines are installed correctly;
3) When the engine is powered on and not started, the command will be sent by UDS service of diagnostic tester;
4) Power off, wait for 720 seconds, power on again to read the learning value of differential pressure sensor as 0, that is, write to EEPROM successfully;
5) Replacement of differential pressure sensor is complete.



(3) Replace ECM

1) Stop the vehicle in a safe place;
2) When the engine is stopped, power on and use the UDS service of diagnostic tester to read out the expected rewritten amount (if the diagnostic tester has a storage function, store it in the diagnostic tester; if not, you need to manually record each EEP value);
3) Power off the engine, after the ECM is cooled to room temperature, replace it with a new one;
4) When the engine is powered on and not started, send commands by UDS service, and send (flag bit + value) fields to new ECM one by one;
5) Power off, wait for 720 seconds, power on again to read the current model carbon value $\geqslant$ 0.6, the corresponding fuel cumulative value is not 0, that is, write to EEPROM is successful;
6) Replacement of ECM complete.



(4) Parking service regeneration

1) Stop the vehicle in a safe place, avoid exposure to the sun and around inflammables, do not open the hood, if there is a blower, it can be placed in front of the intake grille to blow;

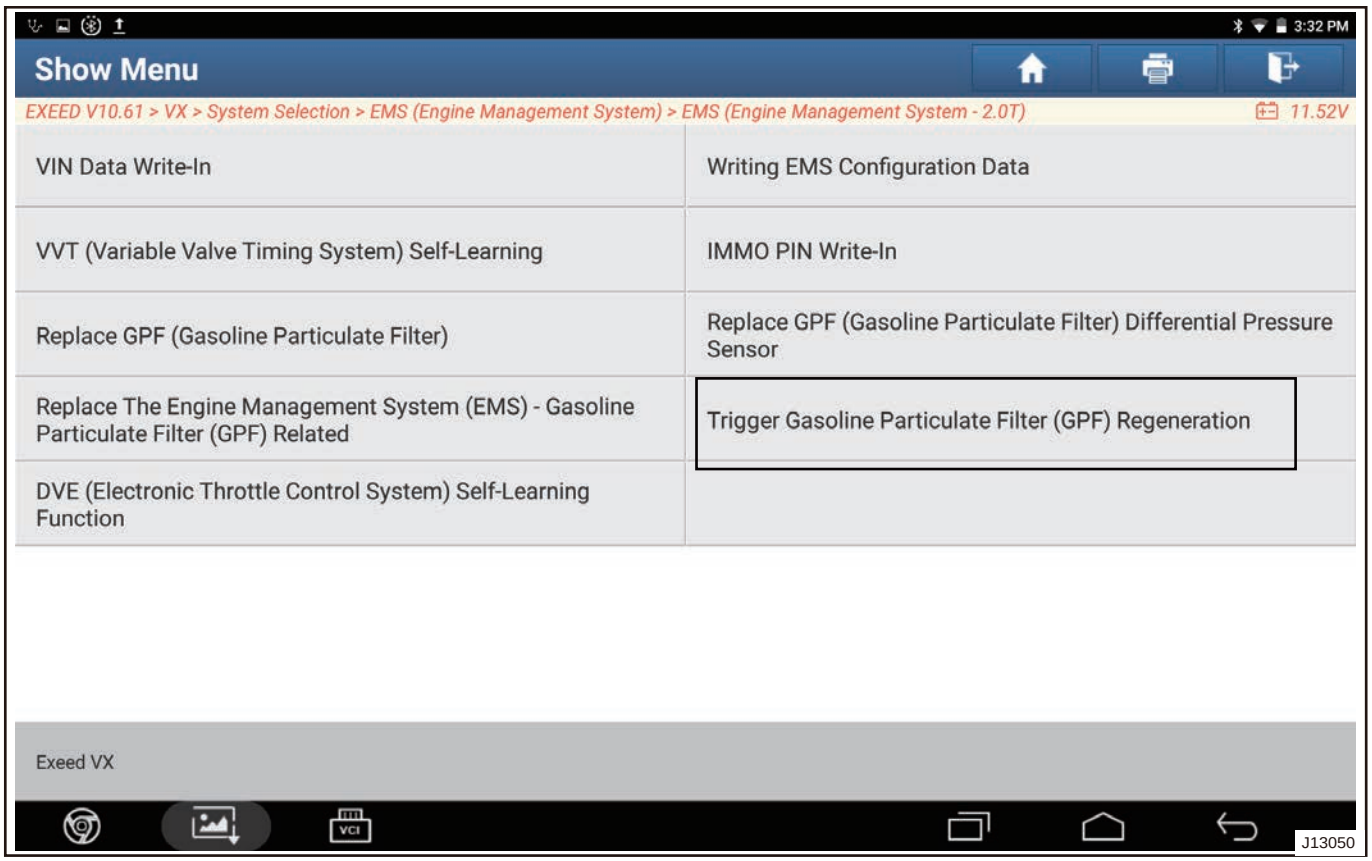
2) Power on and shift to P, start the engine, idle until the coolant temperature exceeds 60℃, turn off the air conditioning, turn on the vehicle heater, turn the target temperature to maximum, and make the wind speed to maximum;

3) Send the command by the UDS service of diagnostic tester, and the engine speed reaches 3900 rpm, then the parking regeneration is triggered successfully;

4) Within 1 hour after triggering regeneration, the engine returns to normal idle speed;

5) Use the diagnostic tester to read the current model carbon value ⩽ 1.5g, and the mileage value since the last fully successful regeneration is 0, the regeneration is successful, if not, turn the engine OFF and power off. Restart the engine and trigger the parking regeneration again according to the above steps.

6) Service regeneration is complete.



⚠ Caution

- **Before performing parking regeneration, all DTC of vehicle engine should be repaired according to the regulations.**
- **Non-related personnel should not approach the regenerative vehicle.**
- **During the regeneration process, there are the following possibilities to interrupt the process:**
  - **(1) GPF temperature is too high**
  - **(2) Regeneration time is too long**
  - **(3) The remaining gasoline is too low**
  - **(4) Vehicle movement**
  - **(5) Engine knock**
  - **(6) Enriched with air-fuel ratio**
  - **(7) Shifting**
  - **(8) Accelerator pedal depressed**
  - **(9) Brake pedal depressed**
  - **(10) Coolant temperature is too high or too low**
  - **(11) Misoperation of diagnostic tester**

4.2 ENGINE MECHANICAL

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.

2 System Overview

2.1 Description

SQRF4J20 engine has the following features

(1) DVVT

(2) In-line DOHC with 4 cylinders

(3) Four valves per cylinder

(4) Aluminum cylinder head

(5) Aluminum cylinder block

(6) Supercharged intercooler

(7) Equipped with balance shaft

2.2 System Principle

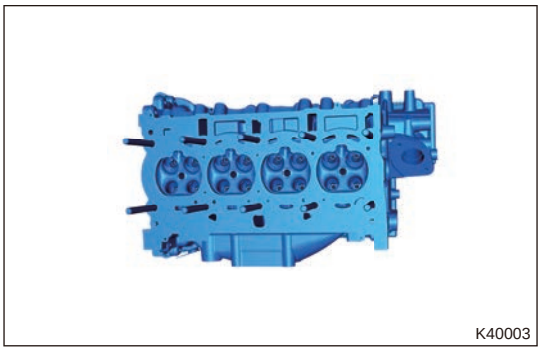
(1) SQRF4J20 engine adapts a design of transverse, direct injection, in-line 4-cylinder, 4-stroke, four valves per cylinder, DOHC, supercharged intercooler, VVT and electronic controlled multi-port fuel injection, the engine adapts independent ignition.

(2) SQRF4J20 engine adapts aluminum cylinder block. Aluminum oil pan is fixed to aluminum frame with bolts. The aluminum cylinder head is secured to the block with bolts. The camshaft is installed on cylinder head. Power output from crankshaft drives camshaft by crankshaft sprocket through timing belt to rotate, thus making camshaft interact with rocker arm lifter to open and close valve. Piston assembly is an aluminum piston with cast iron connecting rod. This engine has features of reliable structure and excellent performance.

2.3 System Components Description

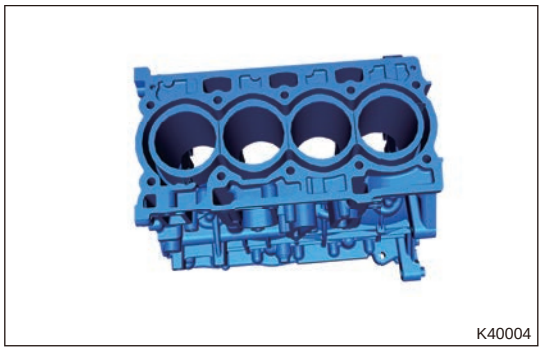
■ Cylinder Head

The upper part of the cylinder is closed to form a combustion chamber, and as the support of the camshaft, rocker arm, intake pipe and exhaust pipe. It mainly sucks air into the cylinder, the spark plug ignites the combustible gas mixture to drive the piston, and the exhaust gas is discharged from the exhaust pipe.



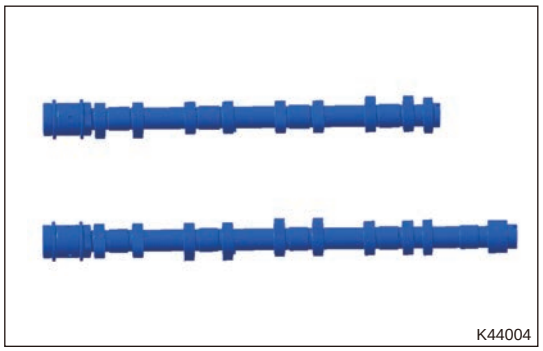
■ Cylinder Block

The main body of the engine, which connects each cylinder and crankcase into a whole, is the support frame for installing piston, crankshaft, other parts and accessories.


K40004

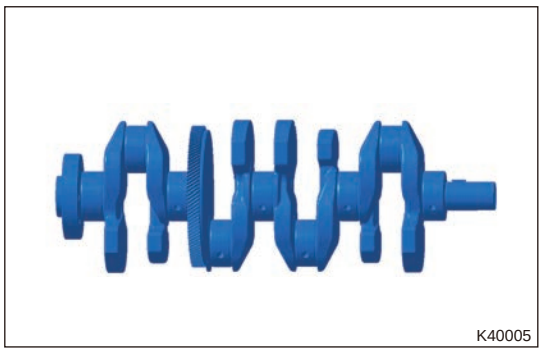
■ Camshaft

Camshaft is a component located inside engine, which is used to control valve opening and closing operations.


K44004

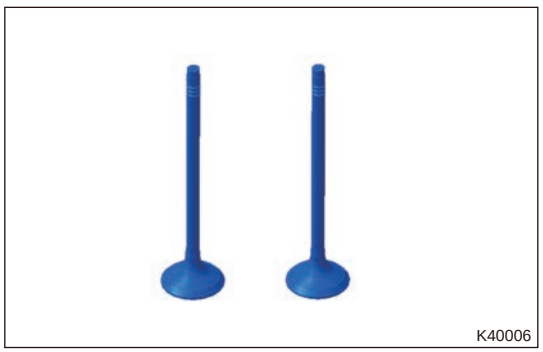
■ Crankshaft

Crankshaft is an important component in engine, which bears force from connecting rod and transfers it into rotation torque and outputs it through crankshaft to drives other accessories of engine.


K40005

■ Valve

Valve is used to allow air to flow in engine and bleed exhausted air after combustion; Intake valve is used to absorb air in engine and mix it with fuel for combustion; Exhaust valve is used to bleed exhausted air after combustion for radiation.


K40006

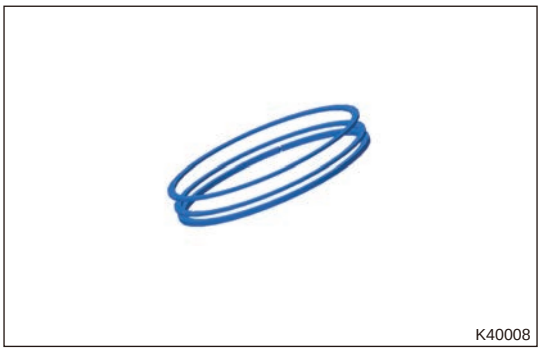
■ Piston

Piston is used to bear combustion compression from cylinder and transfer it to the crankshaft through piston pin and connecting rod.


K40007

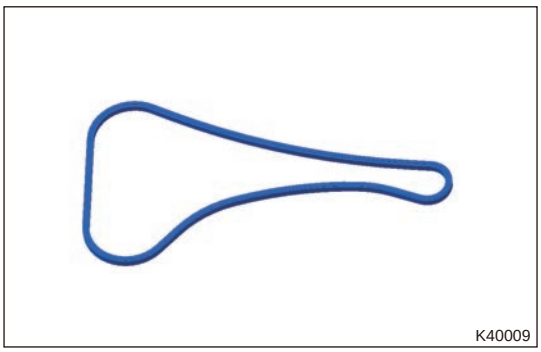
■ Piston Ring

Piston ring has two types of air ring and oil ring.
Air ring is used to keep air tightness between cylinder and piston to avoid air leakage. Also it transmits most heat to cylinder wall which is carried away by coolant; Oil ring is used to apply and scrape the oil. Excessive oil can be scraped when oil ring moves downward and a layer of even oil can be applied to cylinder wall when oil ring moves upward. It not only can prevent oil entering the cylinder for combustion and also can reduce friction resistance between piston and cylinder. Furthermore, oil ring helps in air tightness.


K40008

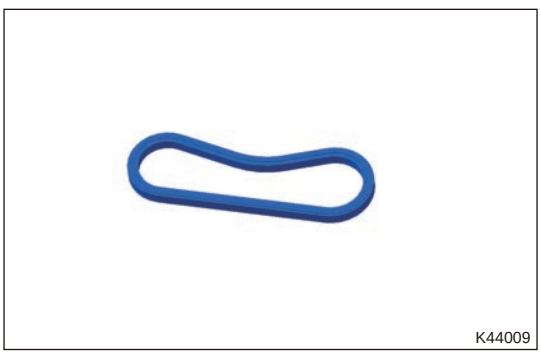
■ Engine Timing Chain

Engine timing chain is mainly used to drive valve mechanism, which allows intake valve and exhaust valve to open and close in proper time so that engine cylinder can absorb and exhaust air normally.


K40009

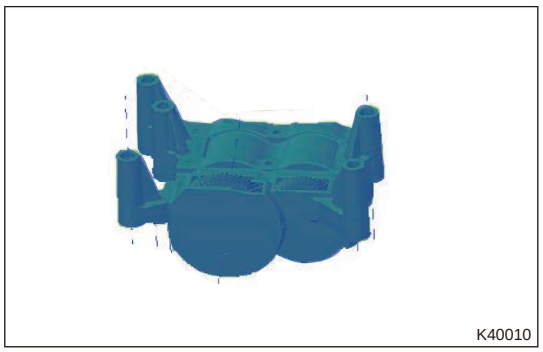
■ Engine Timing Chain

Engine timing chain is mainly used to drive valve mechanism, which allows intake valve and exhaust valve to open and close in proper time so that engine cylinder can absorb and exhaust air normally.


K44009

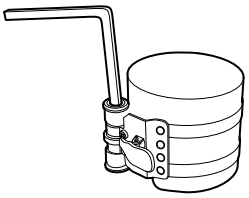
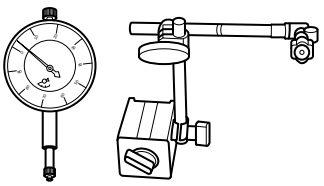
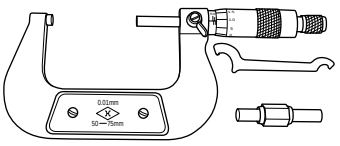
■ Balance Shaft Assembly

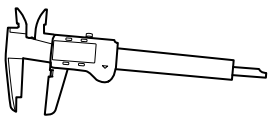
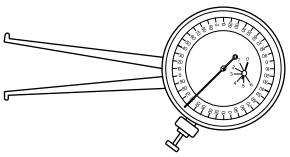
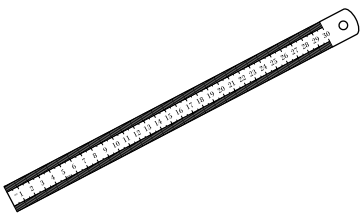
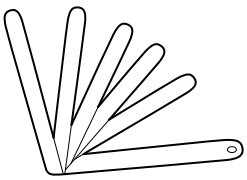
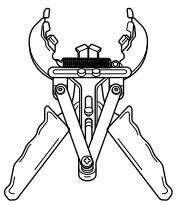
In order to balance the speed difference of piston at the top and bottom dead centers, the vibration of the engine is significantly improved, allowing engine to work more smoothly.

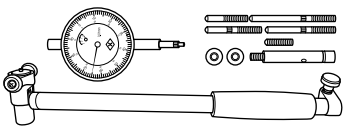
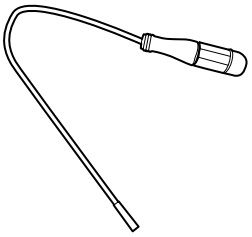
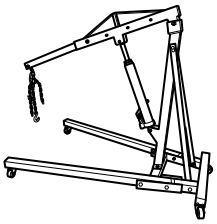
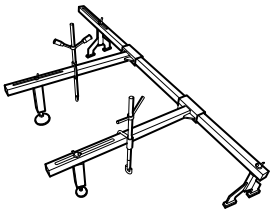
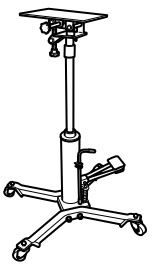

K40010

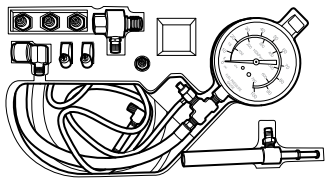
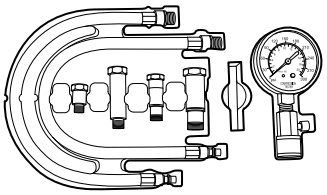
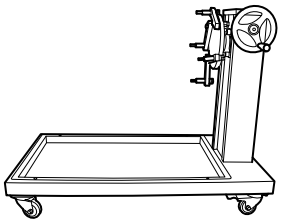
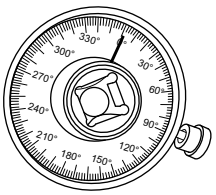
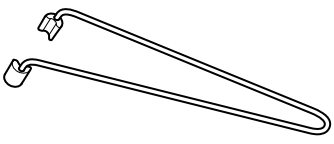
3 Special Tool and Equipment

3.1 General Tools

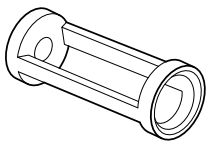
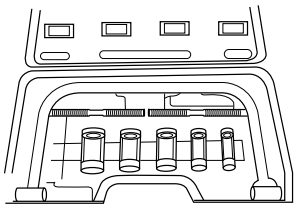
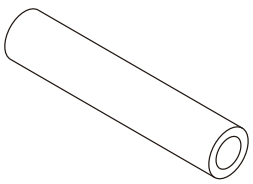
Tool Name	Tool Drawing
Piston Installer	 S00030
Dial Indicator and Magnetic Holder	 S00018
External Micrometer	 S00045

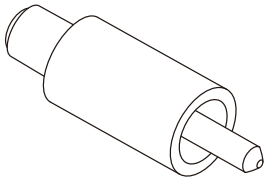
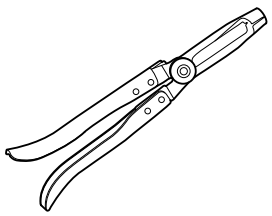
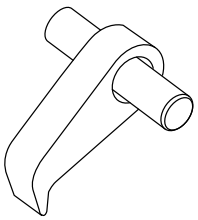
Tool Name	Tool Drawing
Vernier Caliper	 S00051
Inner Diameter Micrometer	 S00049
Precision Straightedge	 S00044
Feeler Gauge	 S00041
Piston Ring Remover	 S00047

Tool Name	Tool Drawing
Cylinder Gauge	 S00046
Flexional Magnetic Rod	 S00031
Engine Hoist	 S00032
Engine Equalizer	 S00021
Transmission Carrier	 S00004

Tool Name	Tool Drawing
Fuel System Pressure Tester	 S00035
Cylinder Pressure Gauge	 S00033
Engine Service Platform	 S00039
Angle Gauge	 S00065
Valve Cotter Installer	 S00024

3.2 Special Tools

Tool Name	Applicable (Model, Power, Chassis)	Part No.	Tool Drawing	Main Application
Crankshaft Front Oil Seal Guide Tool	F4J20 Engine	EPT-0021		Used in conjunction with the crankshaft front oil seal installer to install the crankshaft front oil seal
Crankshaft Front Oil Seal Installer	F4J20 Engine	EPT-0022		Used to install the crankshaft front oil seal
Crankshaft Rear Oil Seal Installer	F4J20 Engine	EPT-0023		Used to install the crankshaft rear oil seal
Crankshaft Rear Oil Seal Guide Tool	F4J20 Engine	EPT-0024		Used in conjunction with the crankshaft rear oil seal installer to guide the rear oil seal, so as to prevent damage to rear oil seal
Valve Spring Compression Adapter	F4J16 Engine/ F4J20 Engine	EPT-0001	 S00037	
Valve Spring Compressor	F4J16 Engine/ F4J20 Engine	EPT-0002	 S00087	
Valve Oil Seal Installer	F4J16 Engine/ F4J20 Engine	EPT-0010	 S00093	

Tool Name	Applicable (Model, Power, Chassis)	Part No.	Tool Drawing	Main Application
Valve Oil Seal Guide Sleeve	F4J16 Engine/ F4J20 Engine	EPT-0009	 S00092	
Valve Oil Seal Remover	F4J16 Engine/ F4J20 Engine	EPT-0003	 S00029	
Camshaft Timing Tool	F4J20 Engine	EPT-0025		Fix the intake/exhaust camshafts with special tools and perform engine camshaft timing calibration
Crankshaft Timing Tool	F4J20 Engine	EPT-0026		Fix the engine crankshaft and perform engine crankshaft timing calibration
Balance Shaft Locking Special Fixture	F4J20 Engine	EPT-0027		Used for balance shaft installation
Flywheel Holding Tool	F4J16 Engine/ F4J20 Engine	EPT-0008	 S00099	

4 Parameters

4.1 Engine Specifications

Items	Specifications
Engine Type	Vertical, direct injection, in-line 4-cylinder, water-cooled, 4-stroke, DOHC
Engine Model	SQRF4J20
Valve Number Per Cylinder	4

Items	Specifications
Cylinder Diameter (mm)	80.5
Piston Stroke (mm)	98
Displacement (ml)	1998
Compression Ratio	10.2:1
Ignition Type	Independent
Rated Power (kw)	187
Max. Torque (N·m)	390
Fuel Octane Number	Unleaded gasoline, octane number 92 or above
Oil Grade	C5 0W-20
Starting Type	Electric starting
Cooling Type	Forced circulation type antifreeze cooling
Lubrication Type	Compound type (pressure, splash lubrication)
Cylinder Compression Pressure (bar) (180 - 250) r/min	7 - 10

4.2 Tolerance Matching Between Engine Main Components

Series Number	Part Name	Size and Tolerance	Matching Clearance
1	Intake Side 1st Bearing Hole	Φ33 (0, +0.025)	0.050 - 0.91
	Intake Camshaft Assembly 1st Journal	Φ33 (-0.066, -0.050)	
	Intake Side 2nd-6th Bearing Holes	Φ24 (0, +0.021)	0.040 - 0.074
	Intake Camshaft Assembly 2nd-6th Journals	Φ24 (-0.053, -0.040)	
2	Exhaust Side 1st Bearing Hole	Φ33 (0, +0.025)	0.050 - 0.91
	Exhaust Camshaft Assembly 1st Journal	Φ33 (-0.066, -0.050)	
	Exhaust Side 2nd-5th Bearing Holes	Φ24 (0, +0.021)	0.040 - 0.074
	Exhaust Camshaft Assembly 2nd-5th Journals	Φ24 (-0.053, -0.040)	
3	Cylinder Head Intake Side Camshaft Thrust Gear Width	23.85 (-0.1, 0)	0.15 - 0.275
	Intake Camshaft Assembly Thrust Gear Width	24 (0, +0.025)	
4	Cylinder Head Exhaust Side Camshaft Thrust Gear Width	23.85 (-0.1, 0)	0.15 - 0.275
	Exhaust Camshaft Assembly Thrust Gear Width	24 (0, +0.025)	
5	Hydraulic Lifter Assembly Outer Diameter	Φ11.994 ± 0.006	0.006 - 0.036

Series Number	Part Name	Size and Tolerance	Matching Clearance
	Cylinder Head Hydraulic Lifter Hole Diameter	Φ12 (+0.006, +0.024)	
6	Valve Guide Hole Diameter	Φ6 (0, +0.015)	0.013 - 0.042
	Intake Valve Stem Diameter	Φ5.98 ± 0.007	
7	Valve Guide Hole Diameter	Φ6 (0, +0.015)	0.033 - 0.062
	Exhaust Valve Stem Diameter	Φ5.96 ± 0.007	
8	Valve Guide Mounting Hole	Φ11 (0, +0.018)	-0.051 - -0.022
	Valve Guide Outer Diameter	Φ11 (+0.040, +0.051)	
9	Intake Valve Retainer Mounting Hole	Φ31.9 (0, +0.016)	-0.1 - -0.068
	Intake Valve Retainer Outer Diameter	Φ32 (-0.016, 0)	
10	Exhaust Valve Retainer Mounting Hole	Φ27.2 (0, +0.013)	-0.1 - -0.071
	Exhaust Valve Retainer Outer Diameter	Φ27.3 (-0.016, 0)	
11	Cylinder Block Bore	Φ80.5 (+0.013/0)	0.04 - 0.063
	Piston Skirt	80.455 ± 0.005	
12	Piston Pin Hole	Φ22 (+0.009/+0.004)	0.004 -0.014
	Piston Pin	Φ22 (0/-0.005)	
13	Connecting Rod Small End Bore	Φ22 (+0.018/+0.010)	0.010 - 0.023
	Piston Pin	Φ22 (0/-0.005)	

4.3 Valve Timing

■ Intake (180.5° Wrapped Angle)

	Angle (°)	Valve Lift (mm)
Valve Opening 0 mm	346.5	0
Valve Opening 0.5 mm	377.5	0.49
Valve Opening 1 mm	385	0.99
Maximum Valve Lift	475.5	9.49
Valve Closed 1 mm	565.5	0.99
Valve Closed 0.5 mm	573.5	0.50
Valve Closed 0 mm	614.5	0

■ Exhaust (180.5° Wrapped Angle)

	Angle (°)	Valve Lift (mm)
Valve Opening 0 mm	107.5	0
Valve Opening 0.5 mm	137	0.49

	Angle (°)	Valve Lift (mm)
Valve Opening 1 mm	144.5	0.99
Maximum Valve Lift	234	8.5
Valve Closed 1 mm	325	0.99
Valve Closed 0.5 mm	333	0.50
Valve Closed 0 mm	370	0

4.4 Lubrication Area

Lubrication Area	Type
Valve Guide Bottom Hole	Use same type of lubricant as engine
Intake Valve Retainer Bottom Hole	Use same type of lubricant as engine
Exhaust Valve Retainer Bottom Hole	Use same type of lubricant as engine
Valve Stem and Valve Guide Hole	Use same type of lubricant as engine
Valve Oil Seal Lip	Use same type of lubricant as engine
Hydraulic Lifter Assembly External Circular Surface and Hydraulic Lifter Hole	Use same type of lubricant as engine
Camshaft Assembly Journal and Bearing Seat Hole	Use same type of lubricant as engine
Roller Rocker Arm Assembly Bearing	Use same type of lubricant as engine
Phaser Solenoid Valve Seal Ring (O-ring)	Use same type of lubricant as engine
Upper and Lower Connecting Rod Bearing Shell and Connecting Rod Journal	Use same type of lubricant as engine
Upper and Lower Main Bearing Shell and Main Journal	Use same type of lubricant as engine
Thrust Washer (Oil Rail Side) and Crankshaft Thrust Surface	Use same type of lubricant as engine
Front and Rear Oil Seal Inner Lip and Crankshaft Oil Seal Journal	Use same type of lubricant as engine
Piston Pin Hole	Use same type of lubricant as engine
Piston Ring Groove	Use same type of lubricant as engine
Cylinder Bore Inner Wall	Use same type of lubricant as engine
Crankshaft Front and Rear Oil Seal External Circular Surface	Use same type of lubricant as engine
Timing System	Use same type of lubricant as engine

4.5 Seal Gum Application Area

Seal Gum Application Area	Seal Gum Type
Bowl Plug - Front and Rear End	Loctite 11747
Bowl Plug - Exhaust Side	Loctite 121078
Top and Bottom Sides of Cylinder Head Front End (T-shaped Area)	Loctite 5900H

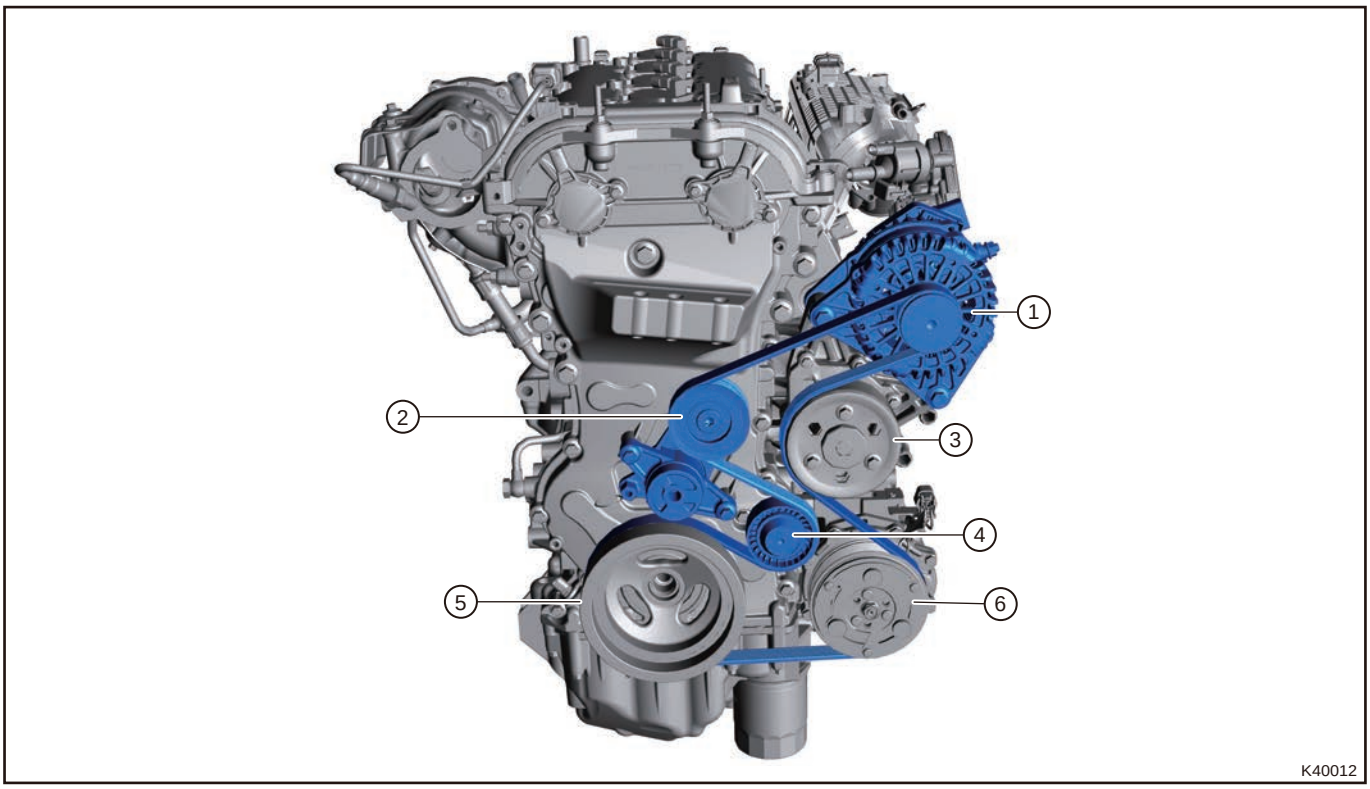
Seal Gum Application Area	Seal Gum Type
"T" Shaped Area Between Timing Chain Cover and Cylinder Head	Loctite 5900H
Timing Chain Cover Frame Bottom Arc Part	Loctite 5900H
Timing Chain Cover Seal Surface	Loctite 5900H/Loctite 5900HA
Upper Guide Rail Assembly Bolt	Loctite 243

4.6 Non-reusable Part

Non-reusable Part	
Cylinder Head Fixing Bolt	Replace it
Valve Oil Seal	Replace it
Crankshaft Front Oil Seal	Replace it
Crankshaft Rear Oil Seal	Replace it
Cylinder Head Gasket	Replace it
Connecting Rod Bearing Cap Fixing Bolt	Replace it
Flywheel Fixing Bolt	Replace it
Main Bearing Cap Fixing Bolt	Replace it

5 ON-VEHICLE SERVICE

5.1 Accessory Gear Train



1	Alternator Assembly	4	Idler Pulley Assembly
2	Tensioner Assembly	5	Torsion Shock Absorber Assembly
3	Water Pump Pulley	6	Compressor Assembly

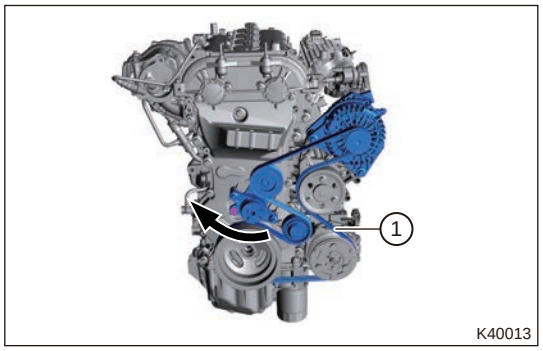
■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing accessory drive belt.**
- **Appropriate force should be applied when removing accessory drive belt. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover assembly.

(4) Insert tool into tensioner and pull it upward in direction of arrow as shown in illustration, then remove accessory drive belt assembly (1).



⚠ Warning

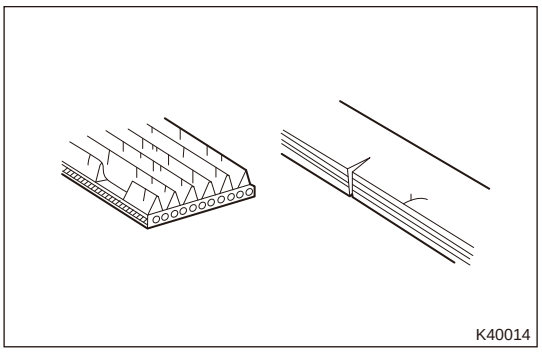
Prevent hand from contacting belt tensioner when raising it upward, so as to avoid damage.

■ Inspection

(1) Visually check accessory drive belt for excessive wear and cords for wear, etc. If any of these defects is found, replace accessory drive belt.

Hint:

- If accessory drive belt has chunks missing from ribs, it should be replaced.
- After installing accessory drive belt, check that it fits properly in the ribbed grooves. Check that belt has not slipped out of grooves on bottom of the crankshaft pulley by hand.



■ Installation

⚠ Caution

- **Before installation, remove the dirt from accessory drive belt.**
- **After installation, check if scale on tensioner arm is almost corresponding to the middle scale of tensioner base.**
- **Check that belt fits well to grooves on bottom of pulley properly. Avoid improper installation and misalignment.**

(1) Install the accessory drive belt properly according to its moving direction.
(2) Install drive belt on each pulley to operate tensioner freely.

■ **Adjustment**

(1) Rotate crankshaft pulley 2 turns, so that belt tension between each pulley is even.
(2) Apply 100 N of force to center part of the belt between alternator and tensioner pulley with your thumb. Check that displacement of belt is within 5 - 6 mm. If displacement is too large or too small, adjust, check or repair.

5.2 Idler Pulley Assembly

■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing idler pulley assembly.**
- **Appropriate force should be applied, when removing idler pulley assembly. Be careful not to operate roughly.**

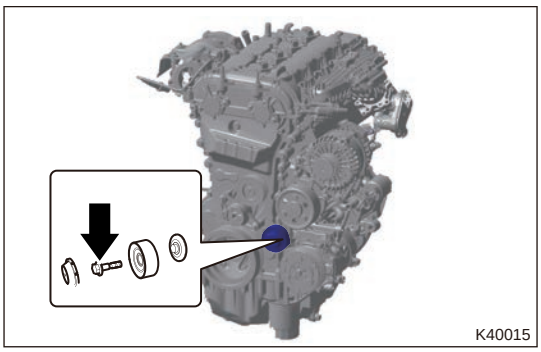
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Remove the engine compartment trim cover assembly.

(3) Remove the engine trim cover assembly.

(4) Remove the accessory drive belt.

(5) Remove the idler pulley assembly dust boot.
(6) Remove fixing bolt and idler pulley assembly.



■ **Inspection**

(1) Rotate idler pulley by hands and check if rotation is smooth and if abnormal noise occurs.
(2) Wiggle idler pulley in axial and radial directions to check bearing for looseness.
(3) Check if there is damage on idler pulley assembly operating surface.

■ **Installation**

⚠ Caution

- **Pretighten it by 2 to 3 threads first.**
- **After installation, turn crankshaft to run accessory drive belt by several turns, and check if crankshaft turns smoothly and belt runs well. If it cannot turn smoothly, reinstall accessory drive belt.**
- **Make sure to correctly install accessory drive belt, and it does not interfere with other components.**

(1) Install the idler pulley assembly fixing bolt.

Torque: 47 ± 5 N•m

(2) Install the idler pulley assembly dust boot.
(3) Install the accessory drive belt.
(4) Install the engine trim cover.
(5) Install the engine compartment trim cover.

5.3 Tensioner Assembly

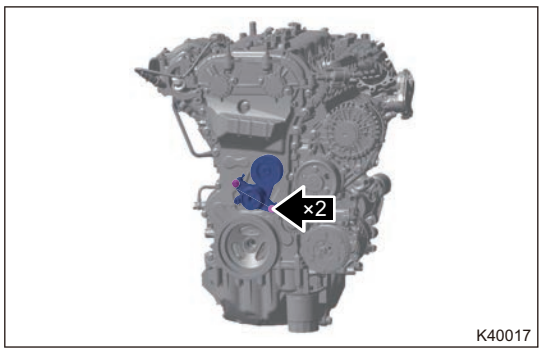
■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing tensioner assembly.**
- **Appropriate force should be applied, when removing the tensioner assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover assembly.
(4) Remove the accessory drive belt.

(5) Remove 2 fixing bolts from tensioner assembly.



(6) Remove the tensioner assembly.

■ Inspection

(1) Rotate tensioner pulley assembly by hands and check if rotation is smooth and if abnormal noise occurs.
(2) Wiggle tensioner pulley assembly in axial and radial directions to check for looseness.
(3) Check if there is damage on tensioner pulley operating surface.

■ Installation

(1) Install 2 tensioner assembly fixing bolts.

Torque: 20 ＋ 5 N·m

(2) Install the accessory drive belt.
(3) Install the engine trim cover.
(4) Install the engine compartment trim cover.

5.4 Cylinder Head Cover

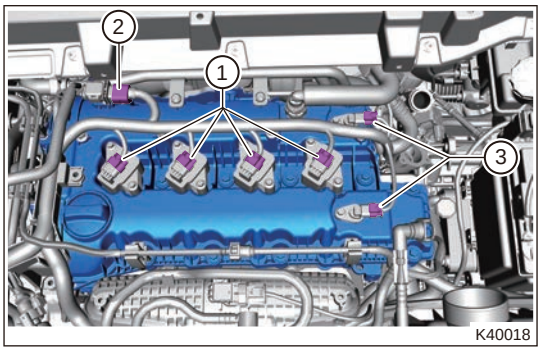
■ Removal

⚠ Warning

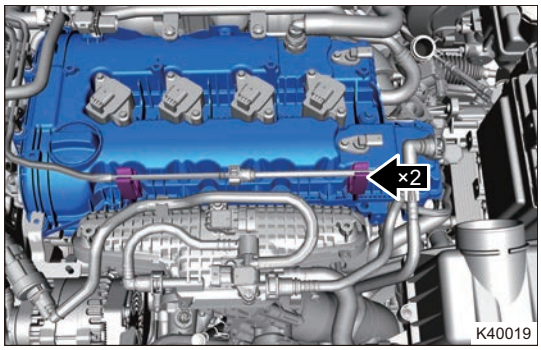
- **Blow dirt and debris away from surface of cylinder head cover with compressed air.**
- **Be sure to wear safety equipment to prevent accidents, when removing cylinder head cover.**
- **Appropriate force should be applied when removing cylinder head cover. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover.
(4) Remove the intake hose.

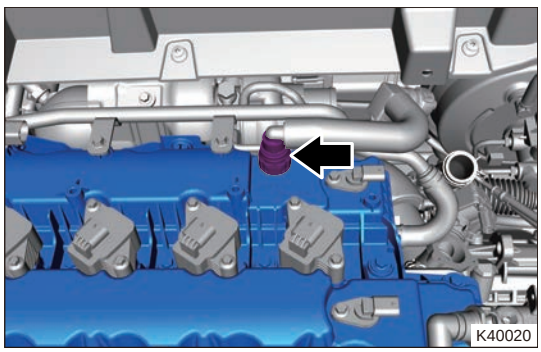
(5) Disconnect ignition coil connector (1), upstream oxygen sensor connector (2), and camshaft position sensor connector (3).



(6) Remove 2 oil inlet pipe single tube clamps from cylinder head cover.

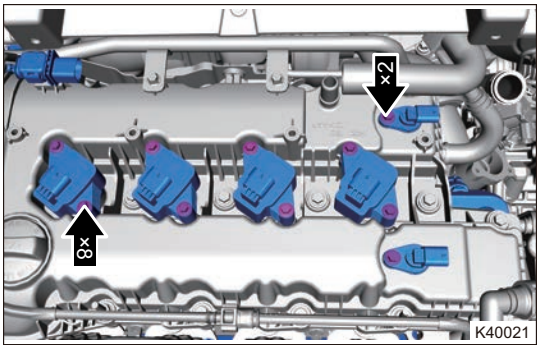


(7) Disconnect the hose - intake hose from cylinder head cover.

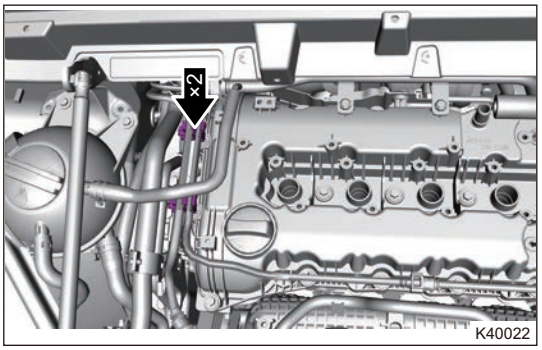


(8) Remove 8 fixing bolts and ignition coil.

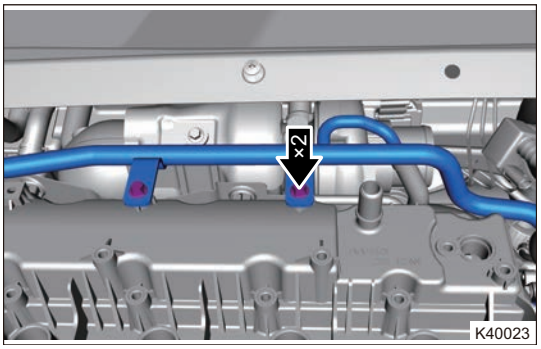
(9) Remove 2 fixing bolts and camshaft position sensor.



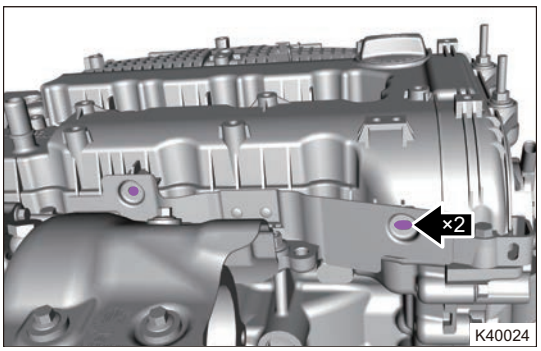
(10) Remove 2 three-tube clamps from cylinder head cover.



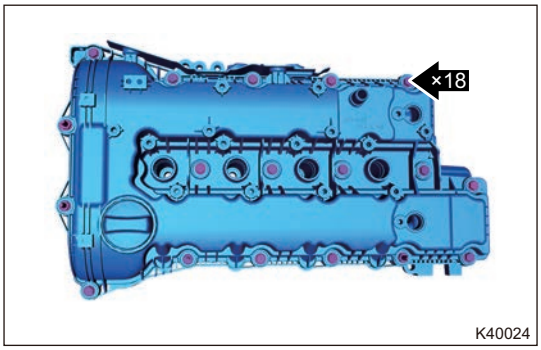
(11) Remove 2 fixing bolts from cooling pipe assembly.



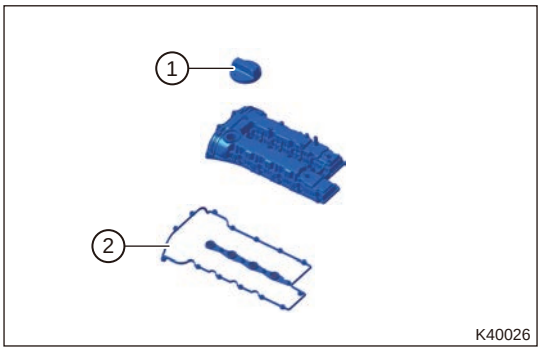
(12) Remove 2 fixing bolt from heat insulator.



(13) Remove 18 fixing bolts cylinder and cylinder head cover.



(14) Remove fuel filler cap (1) and gasket (2) from cylinder head cover assembly.



■ Inspection

(1) Check the appearance of the cylinder head cover for cracks, and replace the assembly if necessary.

■ Installation

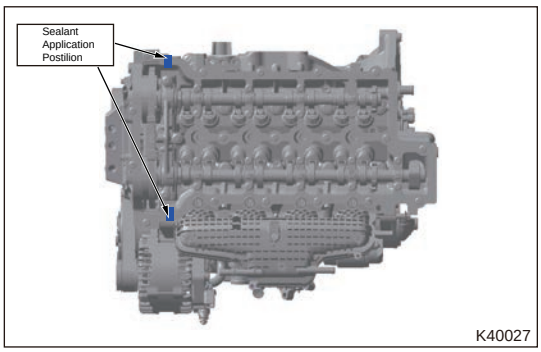
⚠ Caution

- **Remove oil dirt and sealant on cylinder head cover and cylinder head before installation.**
- **Check if gasket is damaged or loses elasticity. If so, replace gasket.**

(1) As shown in illustration, apply seal gum (Loctite 5900H) to "T" position of junction area between timing chain cover and cylinder head.

Hint:

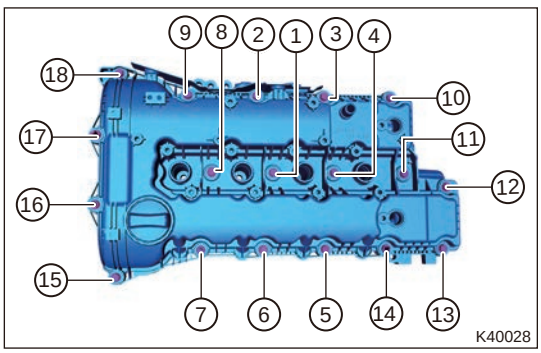
- Note that the sealant should not be too thick, to prevent excess sealant into the engine when the valve chamber cover is pressed.
- Install the cylinder head cover assembly and wait for 15 minutes to apply seal gum.



(2) Install cylinder head cover and first manually install fixing bolts by 1 to 2 threads.

(3) Tighten 18 cylinder head cover fixing bolts in order shown in illustration.

Torque: 10.5 - 12.5 N·m



(4) Install fuel filler door.
(5) Install 2 fixing bolts to heat insulator.

Torque: 8 + 3 N·m

(6) Install the cooling pipe assembly.
(7) Install the camshaft position sensor.
(8) Install the ignition coil.
(9) Install hose - intake hose.
(10) Connect the wire harness connector.
(11) Install the oil inlet pipe tube clamp.
(12) Install the engine trim cover.

5.5 Crankshaft Front Oil Seal

■ Removal

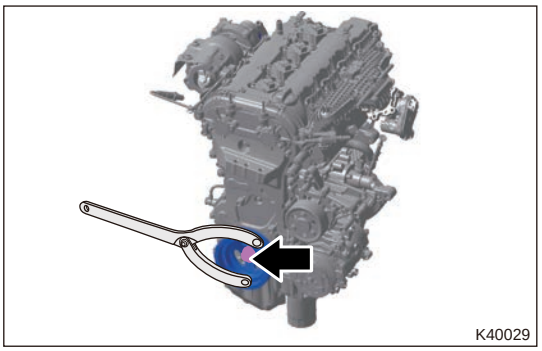
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing crankshaft front oil seal.**
- **Appropriate force should be applied when removing crankshaft front oil seal. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover.
(3) Disconnect the negative battery cable.
(4) Remove the accessory drive belt.

(5) Remove fixing bolt from torsion absorber assembly.

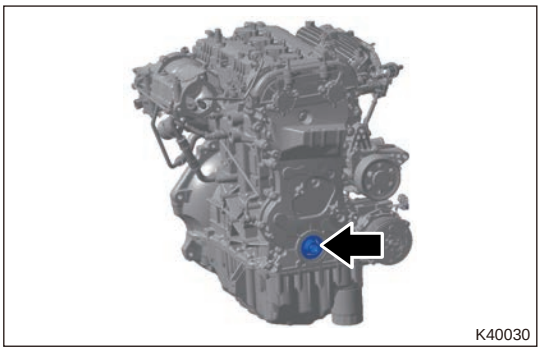
Hint:
Use tool to lock torsion absorber assembly and fixing bolt.


K40029

(6) Remove the torsion shock absorber assembly.

(7) Carefully remove the crankshaft front oil seal with proper tool.

Hint:
Be careful not to scratch junction surface, when removing crankshaft front oil seal.


K40030

■ **Installation**

⚠ Caution

- **Apply a small amount of engine oil to the crankshaft front oil seal guide tool before installing a new oil seal.**
- **Remove dirt on junction surface and apply a small amount of engine oil to oil seal external circular surface and oil seal guide tool (except the oil seal with surface applied wax) before assembly.**
- **Be sure to prevent the lip of crankshaft front oil seal from being scratched during installation; If it is damaged, replace it immediately.**

(1) Install crankshaft front oil seal to crankshaft front oil seal installer, then install crankshaft front oil seal in place with crankshaft front oil seal guide tool.

Hint:
- Make sure oil seal surface is 0 to 0.5 mm lower than end surface of timing chain cover oil seal hole.
- Never allow tilting it by more than 5°, oil seal external rubber breakage or flanges during oil seal press fitting.

(2) Install fixing bolt of torsion shock absorber assembly.

Torque: 1st step: 35 ± 5 N·m, 2nd step: 30 ± 5°

(3) Install the accessory drive belt.
(4) Install the engine compartment trim cover assembly.

5.6 Crankshaft Rear Oil Seal

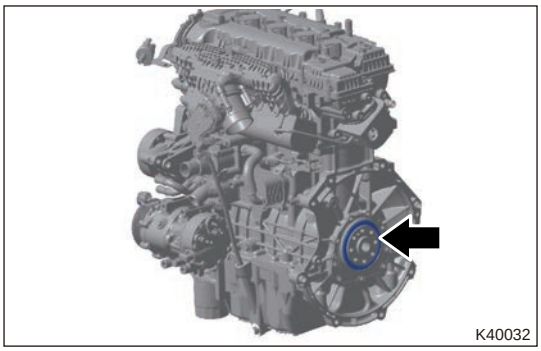
■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing crankshaft rear oil seal.**
- **Appropriate force should be applied when removing crankshaft rear oil seal. Be careful not to operate roughly.**

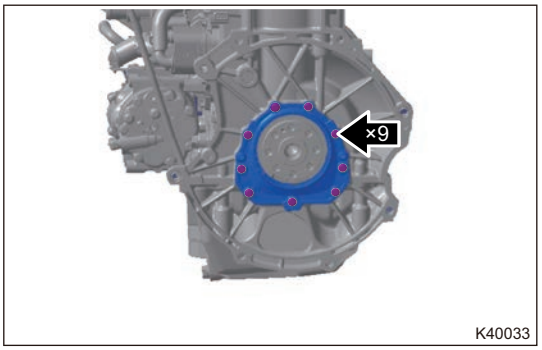
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover.
(3) Disconnect the negative battery cable.
(4) Remove the transmission assembly.
(5) Remove the flywheel assembly.

(6) Remove the crankshaft rear oil seal with proper tool carefully.



(7) Remove the crankshaft rear oil seal.

(8) Remove 9 fixing bolts from rear oil seal bracket.



(9) Remove the rear oil seal bracket.

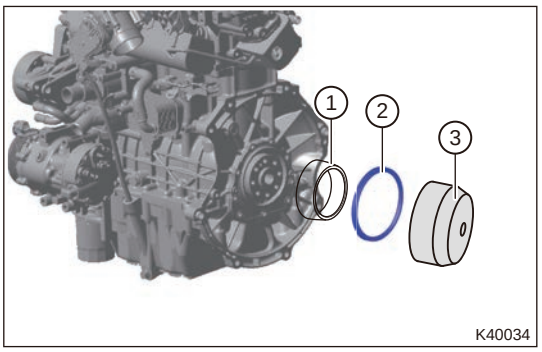
■ **Installation**

⚠ Caution

- **Be sure to clean dirt around oil seal retainer and on inside wall before installation.**
- **Check oil seal for damage before installation. If there is any damage, replace it.**
- **Be sure to prevent the lip of crankshaft rear oil seal from being scratched during installation.**
- **Be careful not to damage oil seal retainer during installation.**

(1) Install guide tool (1) to crankshaft.

(2) Install new oil seal (2) to crankshaft rear oil seal guide tool, then install new oil seal evenly and fully into oil seal retainer with a crankshaft rear oil seal installer (3).



⚠ Caution

- **Make sure oil seal surface is 0.5 to 1 mm lower than end surface of timing chain cover oil seal hole.**
- **Ensure that oil seal lip has no damage during assembly.**
- **Never allow tilting it by more than 5°, oil seal external rubber breakage or flanges during oil seal press fitting.**

(3) Install the flywheel assembly.

(4) Install the transmission assembly.

5.7 Flywheel Assembly

■ **Removal**

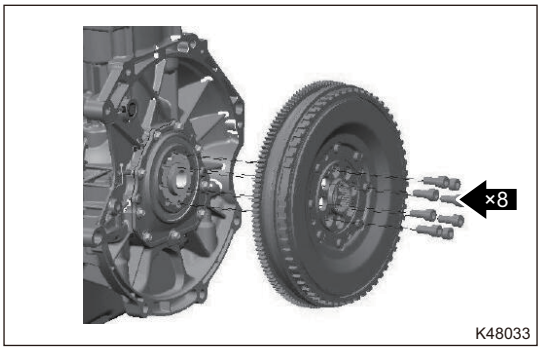
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when installing flywheel assembly.**
- **Appropriate force should be applied, when removing flywheel assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the transmission assembly.

(4) Remove 8 fixing bolts and flywheel assembly.

Hint:
Flywheel assembly fixing bolts must be disposed after removal. Never reuse them.



■ Inspection

(1) Check if crankshaft position signal gear is distorted or deformed. If damaged, replace flywheel. Clean signal gear before installation.

■ Installation

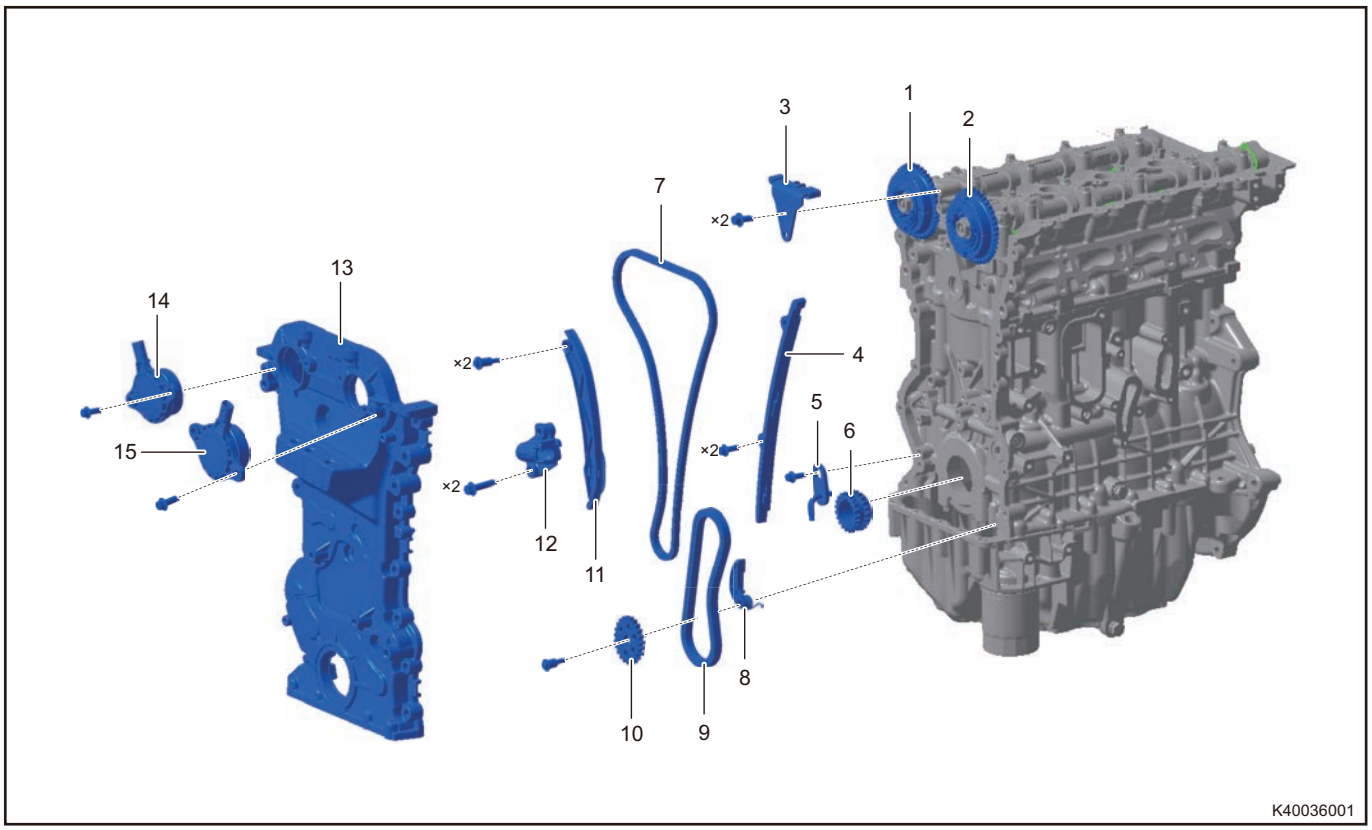
⚠ Caution

- **Lightly push flywheel after alignment during assembly. Do not tap flywheel with a hammer.**
- **Replace flywheel fixing bolts with new ones.**

(1) Install 8 fixing bolts to flywheel assembly, and pretighten the bolts.
(2) Installing flywheel holding tool, then tighten each flywheel bolt diagonally in order.

Torque: 1st step: 35 ± 5 N·m, 2nd step: 30 ± 5°

5.8 Engine Timing Chain



1	Exhaust Phaser Assembly	9	Oil Pump Chain Assembly
2	Intake Phaser Assembly	10	Oil Pump Sprocket
3	Upper Chain Guide Rail Assembly	11	Movable Guide Rail Assembly
4	Fixing Guide Rail Assembly	12	Hydraulic Tensioner Assembly
5	Nozzle - Timing Chain	13	Timing Chain Cover
6	Crankshaft Timing Sprocket	14	Exhaust Phaser Solenoid Valve
7	Timing Chain Assembly	15	Intake Phaser Solenoid Valve
8	Oil Pump Movable Rail Assembly		

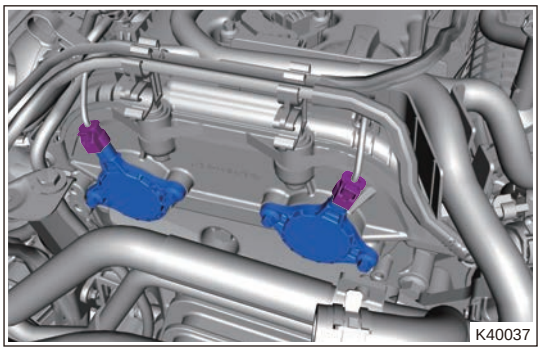
■ Removal

⚠ Warning

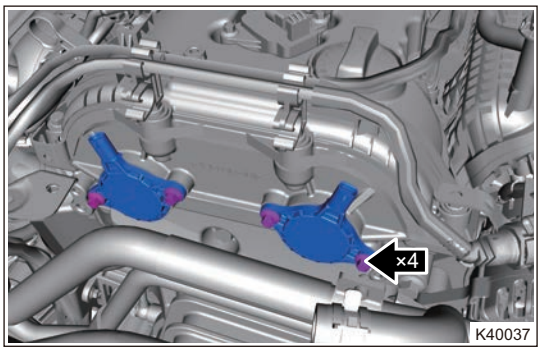
- **Be sure to wear necessary safety equipment to prevent accidents, when removing engine timing chain.**
- **Appropriate force should be applied when removing engine timing chain. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover assembly.
(4) Remove the cylinder head cover.
(5) Remove the engine lower protector assembly.
(6) Remove the accessory drive belt.
(7) Remove the accessory drive belt tensioner assembly.
(8) Remove the idler pulley assembly.
(9) Remove the torsion shock absorber assembly.
(10) Use an engine equalizer to hang engine assembly.
(11) Remove the engine right mounting cushion assembly.

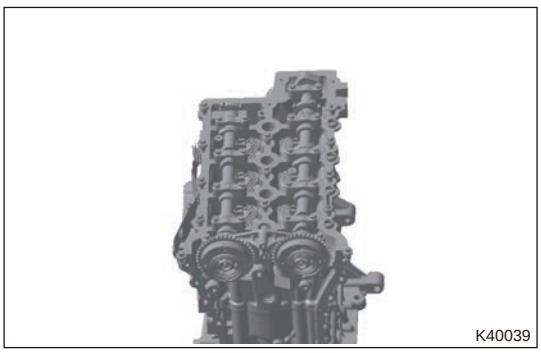
(12) Disconnect the intake/exhaust phaser solenoid valve connector.



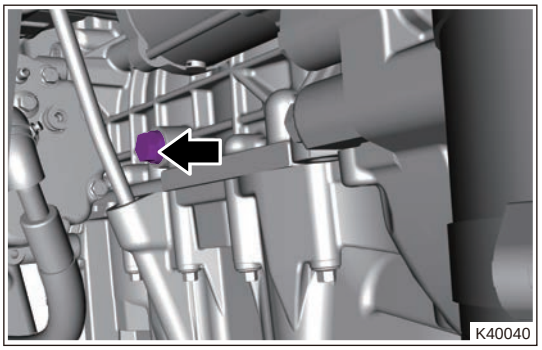
(13) Remove 4 fixing bolts and intake/exhaust phaser solenoid valve.



(14) Place camshaft timing positioning special tool on the back of cylinder head upper plane, rotate intake and exhaust camshafts separately in order to clamp the special tool into slots on rear end of both camshafts.

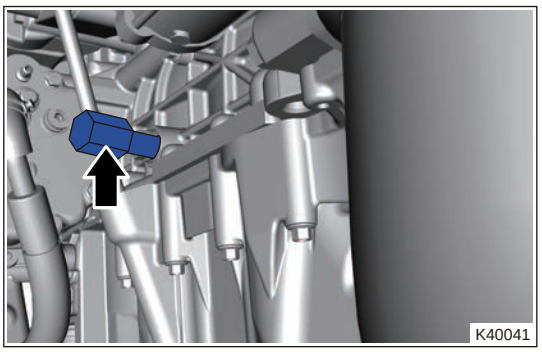


(15) Remove crankshaft balancer locating hole fixing bolt from engine block.

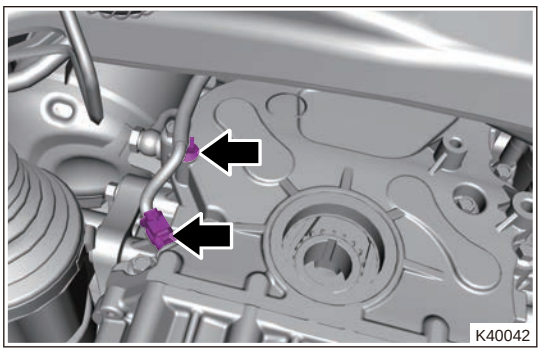


(16) Install crankshaft timing positioning pin to cylinder block through thread hole on intake side of cylinder block, and insert front end of positioning pin into positioning hole of crankshaft balancer (each cylinder piston should be in the same plane).

Hint:
It takes patience to perform this operation and pay more attention to avoid damage to crankshaft.



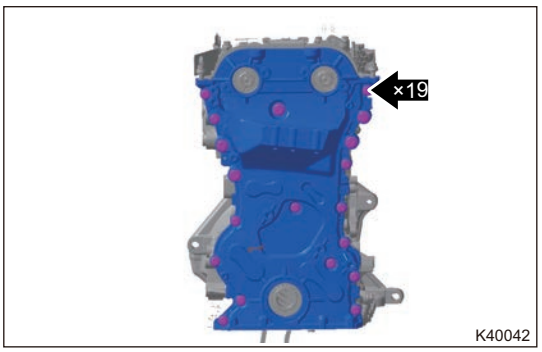
(17) Disconnect oil pump assembly connector and detach wire harness fixing clip.



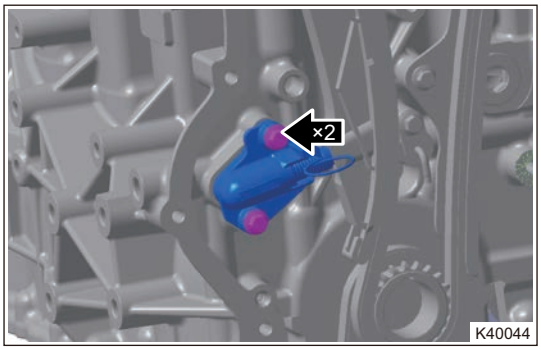
(18) Remove the oil pan assembly.

(19) Remove 19 fixing bolts and timing chain cover.

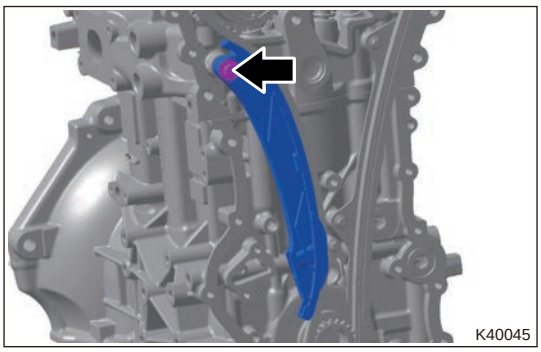
Hint:
Carefully observe timing chain cover for cracks or oil leakage; If exists, replace timing chain cover assembly.



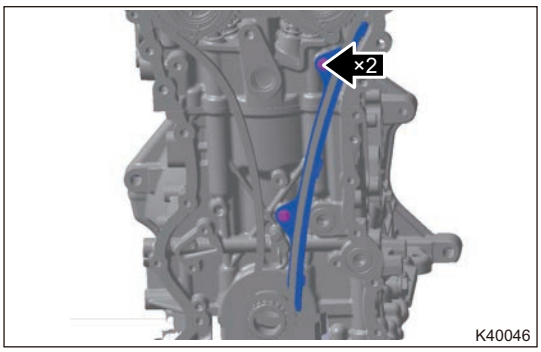
(20) Remove 2 fixing bolts and hydraulic tensioner assembly.



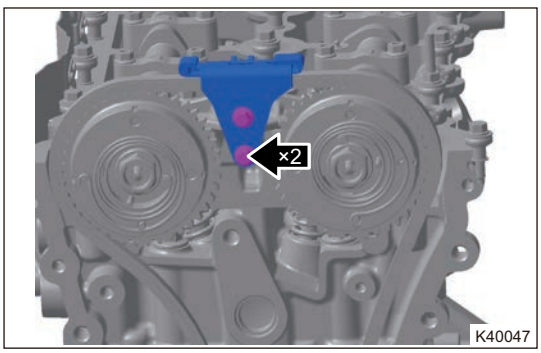
(21) Remove 1 fixing bolt and movable guide rail assembly.



(22) Remove 2 fixing bolts and fixing guide rail assembly.

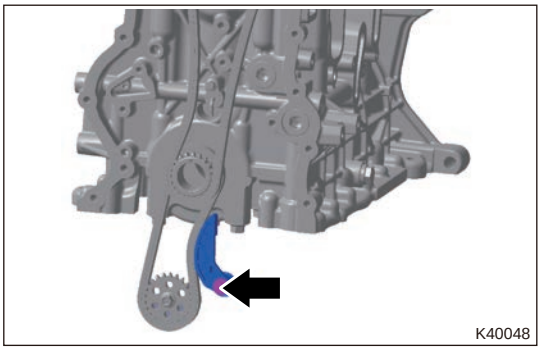


(23) Remove 2 fixing bolts and upper chain guide rail assembly.



(24) Remove the engine timing chain.

(25) Remove 1 fixing bolt from oil pump chain movable guide rail and remove oil pump chain.

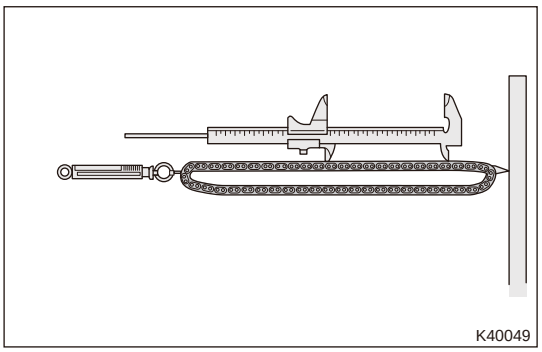


■ Inspection

(1) Carefully check if timing chain is seriously worn or cracked If exists, replace timing chain assembly.

(2) Use a force of 147 N to pull the chain. Take 15 links from chain and perform measurement with a vernier caliper. Max. elongation: 120.6 mm.

Hint:
Take 3 positions for measurement. If the average value is larger than max. elongation ratio, replace timing chain assembly. If it is not as specified, replace timing chain cover assembly.

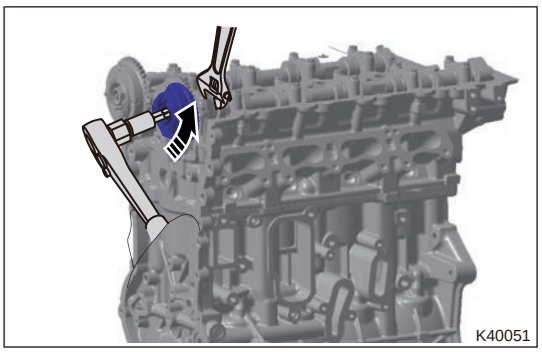


(3) Measure depth of movable guide rail with a vernier caliper.

Hint:
If wear limit is beyond 2 mm, replace movable guide rail assembly.

■ Installation

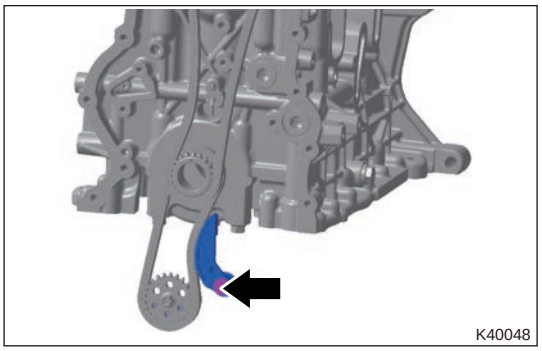
(1) Use a proper wrench to hold intake camshaft and loosen fixing bolt from intake phaser assembly.



(2) Install oil pump chain and 1 movable guide rail fixing bolt.

Torque: 9 + 3 N·m

Hint:
The movable guide rail should rotate smoothly around the bolt after assembling and either end of spring should hook the oil pump housing.



(3) Install 2 fixing bolts to upper chain guide rail assembly.

Torque: 8 + 3 N·m

(4) Install 2 fixing bolts from fixing guide rail assembly.

Torque: 8 + 3 N·m

(5) Install 1 fixing bolt to movable guide rail assembly.

Torque: 20 ＋ 5 N·m

Hint:
The movable guide rail should rotate smoothly around the bolt after installation.

(6) Install the timing chain.

Hint:
Ensure timing chain is set to intake and exhaust phasers and crankshaft sprocket. Make sure that timing chain and upper guide rail are in level.

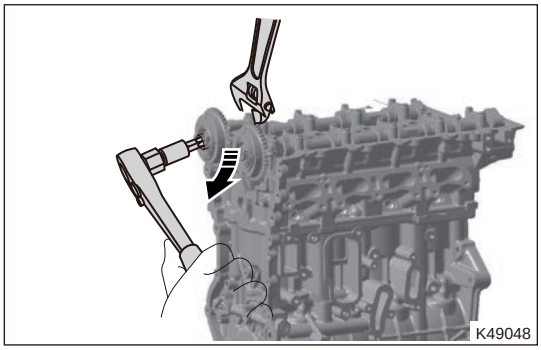
(7) Install hydraulic tensioner assembly, and tighten 2 fixing bolts.

Torque: 8 + 3 N·m

Hint:
Pull up hydraulic tensioner upper steal ring pin after installation and tightening.

(8) Use a proper wrench to hold intake camshaft and tighten fixing bolt of intake and exhaust phaser valve body.

Torque: 1st step: 30 ± 1.5 N·m 2nd step: clockwise rotation angle 34° ± 2°



Hint:
- Tighten exhaust phase valve body bolt first, and then tighten intake phaser valve body bolt. Failure to tighten in order may cause “tooth missing” phenomenon in timing chain.
- The accumulative tightening times of the phaser valve body bolts shall not exceed three times.

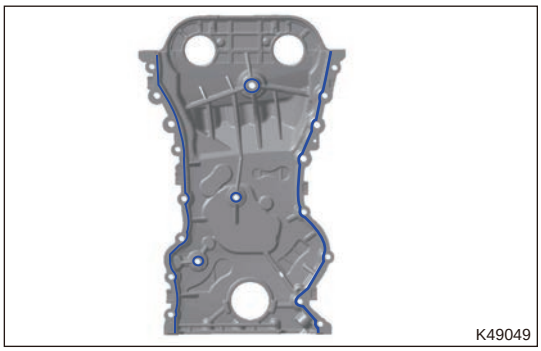
(9) Remove crankshaft timing tool and camshaft timing tool, then rotate crankshaft clockwise 2 turns at least to check if timing system can operate normally.

⚠ Caution

- **Never rotate crankshaft counterclockwise.**

(10) Apply seal gum to inside of timing chain cover mounting bolt hole.

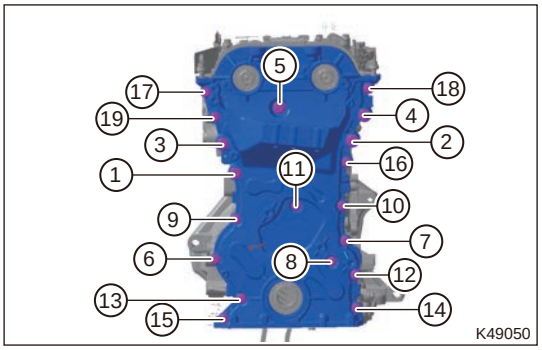
Seal gum: Loctite 5900H



(11) Install and tighten 19 cylinder head cover fixing bolts in order shown in illustration.

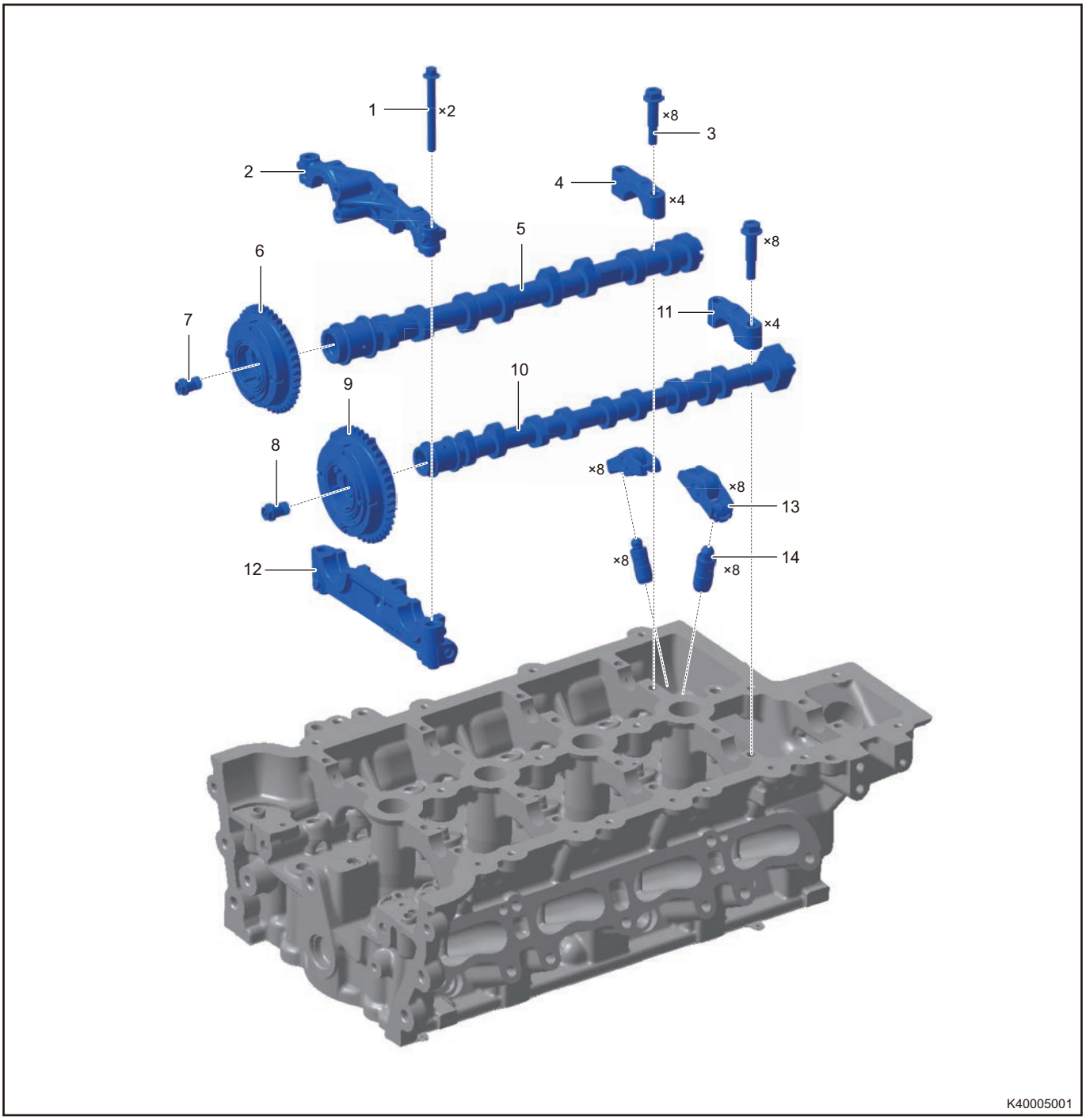
M8x35 Torque: 25 + 5 N·m

M10x45 Torque: 40 + 5 N·m



(12) Connect the oil pump assembly connector.
(13) Install the idler pulley assembly.
(14) Install the torsion shock absorber assembly.
(15) Install the accessory drive belt tensioner assembly.
(16) Install the accessory drive belt.
(17) Install the right mounting cushion assembly.
(18) Install the engine lower protector assembly.
(19) Install the phaser magnet.
(20) Install the cylinder head cover assembly.
(21) Install the engine trim cover assembly.
(22) Install the engine compartment trim cover assembly.

5.9 Camshaft & Rocker Arm



1	1st Bearing Cap Fixing Bolt	8	Intake Phaser Valve Body Bolt
2	1st Bearing Upper Cap	9	Intake Phaser Assembly
3	Exhaust Camshaft Bearing Cap Fixing Bolt	10	Intake Camshaft Assembly
4	Exhaust Camshaft Bearing Cap	11	Intake Camshaft Bearing Cap
5	Exhaust Camshaft Assembly	12	1st Bearing Lower Cap
6	Exhaust Phaser Assembly	13	Roller Rocker Arm Assembly
7	Exhaust Phaser Valve Body Bolt	14	Hydraulic Lifter Assembly

■ Removal

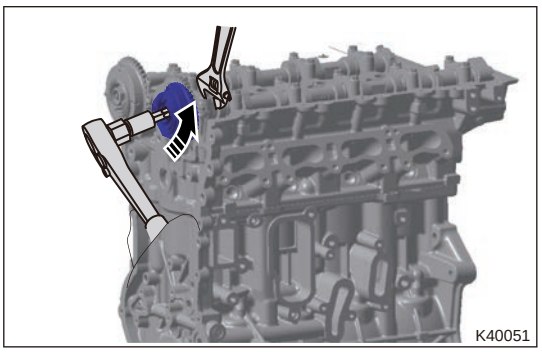
⚠ Warning

- **Blow dirt and debris away from surface of cylinder head cover with compressed air.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing camshaft and rocker arm.**
- **Appropriate force should be applied when removing camshaft and rocker arm. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover assembly.
(4) Remove the cylinder head cover.
(5) Remove the accessory drive belt.
(6) Remove the engine timing chain.

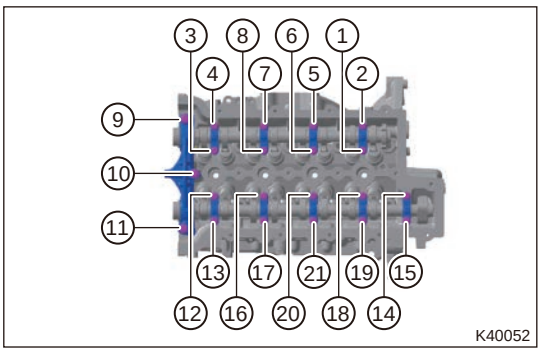
(7) Use a proper wrench to hold intake camshaft, and remove fixing bolt from intake phaser in direction of arrow, remove intake phaser.

Hint:
Removal method for exhaust phaser is the same as that of intake phaser.



(8) Remove intake and exhaust camshaft bearing cap fixing bolts.

Hint:
During removal, loosen fixing bolts in order shown in illustration first, and then remove bolts thoroughly in order.



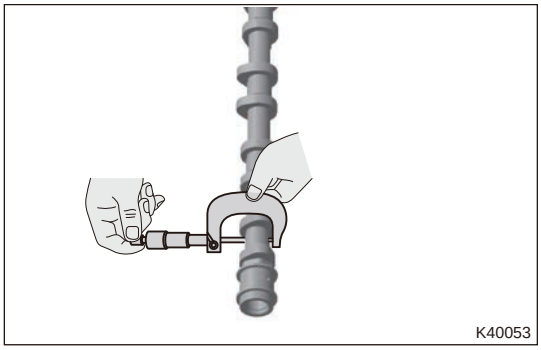
(9) Remove the camshaft bearing caps.
(10) Remove intake and exhaust camshaft.
(11) Remove rocker arm and hydraulic lifter component.

■ Camshaft Appearance Inspection

(1) Check if there are scratches on camshaft surface. If there are scratches, replace camshaft.
(2) Check if there are leaking holes and cracks on camshaft bearing caps. If so, replace camshaft.

■ Measure camshaft journal diameter with a micrometer

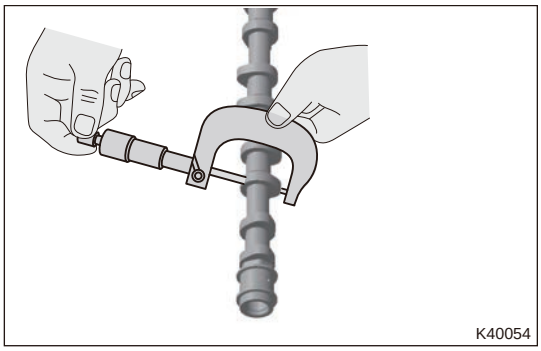
Measurement Item	Specification (mm)
1st journal diameter (same for intake and exhaust sides) (mm)	Φ30 (-0.066 - 0.050)
2nd - 5th journals (same for intake and exhaust sides)	Φ24 (-0.053 - 0.040)



Hint:
If camshaft journal diameter is not within specified range, replace intake/exhaust camshaft assembly.

■ Measure highest point of cam with a micrometer

Measurement Item	Specification (mm)
Cam Flange Height (Highest Point)	Intake: 37.07 - 37.31
	Exhaust: 36.94 - 37.18



Hint:
If cam height is not within specified range, replace intake/exhaust camshaft assembly.

■ Check camshaft axial clearance

(1) Perform measurement with roller rocker arm and intake and exhaust phasers not installed.
(2) Place dial indicator on cylinder head body. Press indicator tip on front end of camshaft, and push camshaft forward and backward. The difference between the two limit reading equals to camshaft axial clearance. It is normal if the difference is between 0.15 and 0.275 mm.

■ Check hydraulic lifter

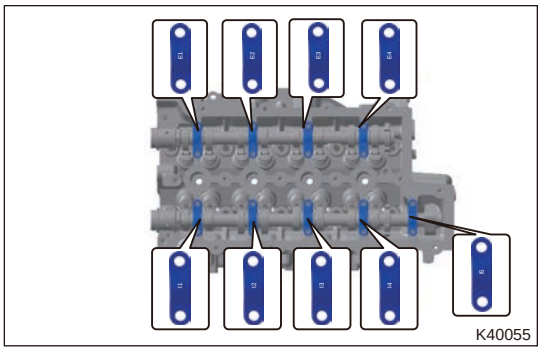
(1) Check if end surface and cylindrical operating surface of hydraulic lifter are normal.
(2) Check if hydraulic lifter slides smoothly in cylinder head guide hole.
(3) Check each hydraulic lifter for weakness. If exists, remove and soak it for 24 hours, then press the hydraulic lifter plunger. If the plunger can be clearly pushed, it means that the tappet is “soft” and the hydraulic tappet can be replaced.

■ Installation

(1) Clean intake and exhaust camshafts and camshaft bearing caps.
(2) Apply engine oil to camshaft cam surface and add a proper amount of engine oil to camshaft bearing hole.
(3) Install intake, exhaust camshaft assemblies and intake and exhaust camshaft bearing caps.

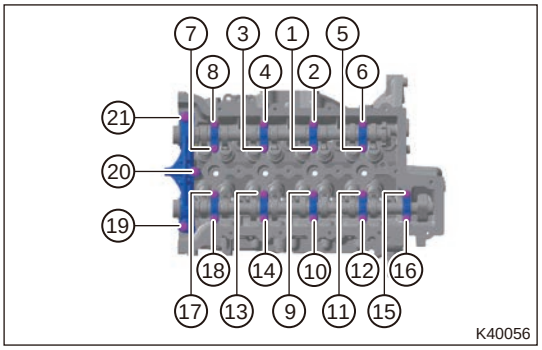
Hint:

- Install according to marks on bearing cap: “I” indicates intake camshaft bearing cap and “E” indicates exhaust camshaft bearing cap.



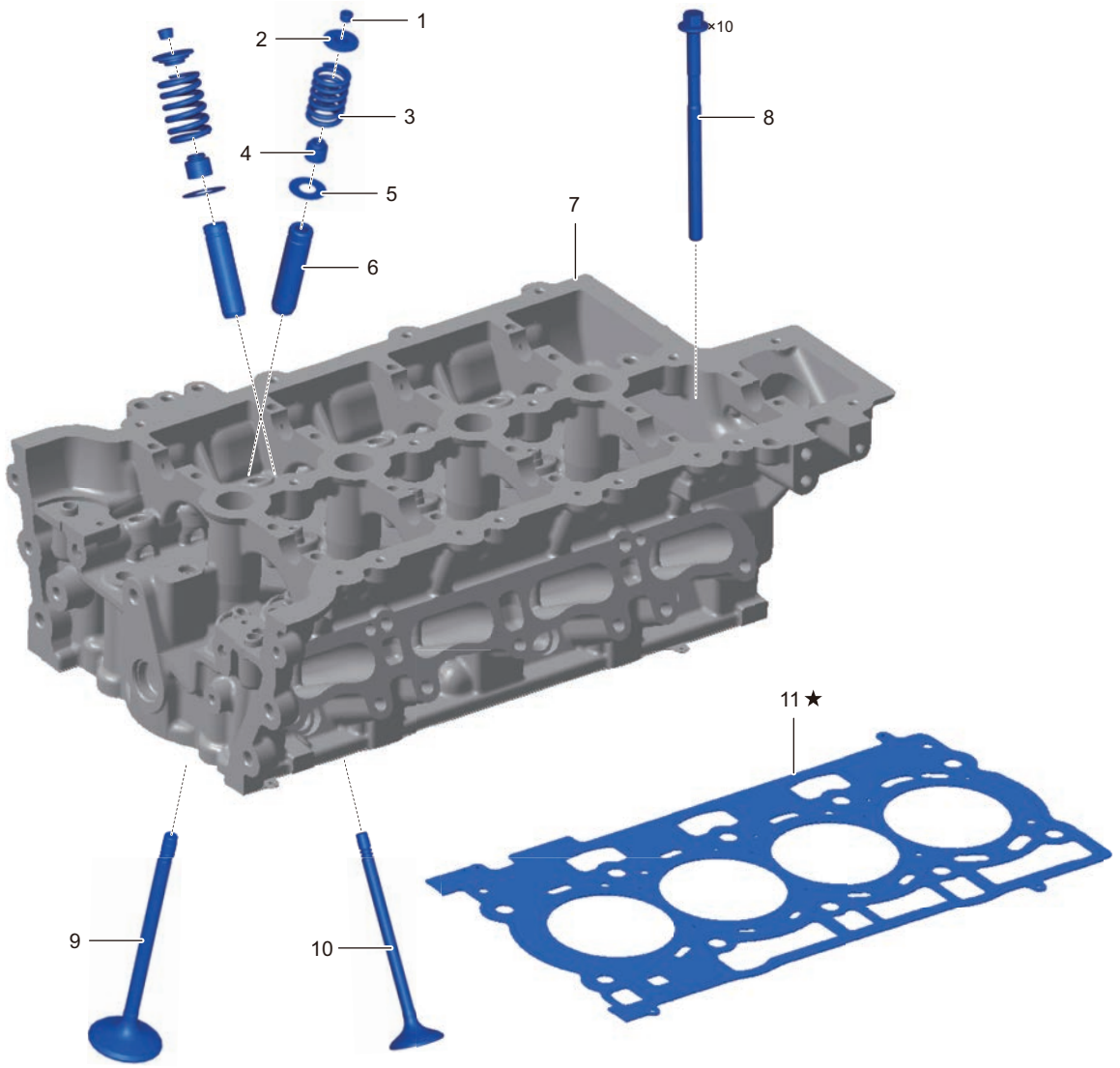
(4) Tighten the camshaft bearing cap fixing bolt manually then tighten camshaft bearing cap fixing bolt.

Torque: For the 1st bearing cap fixing bolt 20 + 3 N·m, for bearing cap bolt 8 + 3 N·m



(5) Install the engine timing chain.
(6) Install the accessory drive belt.
(7) Install the cylinder head cover.
(8) Install the engine trim cover assembly.
(9) Install the engine compartment trim cover assembly.

5.10 Cylinder Head



★ : Indicates that it is a non-reusable part

K40057

1	Valve Cotter	7	Cylinder Head
2	Valve Spring Upper Seat	8	Cylinder Head Bolt
3	Valve Spring	9	Exhaust Valve
4	Valve Oil Seal	10	Intake Valve
5	Valve Spring Lower Seat	11	Cylinder Gasket
6	Valve Guide	★	Non-reusable Part

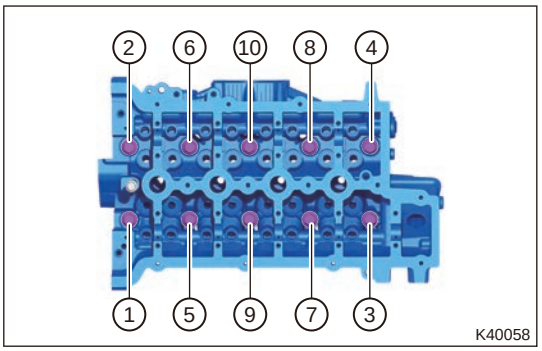
■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing cylinder cover.**
- **Appropriate force should be applied when removing cylinder cover. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover assembly.
(4) Drain the engine oil
(5) Drain the coolant.
(6) Remove the battery assembly.
(7) Remove the battery tray assembly.
(8) Remove the intake hose assembly.
(9) Remove the air filter assembly.
(10) Remove the cooling pipe assembly.
(11) Remove expansion tank inlet pipe assembly.
(12) Remove the intake manifold assembly.
(13) Remove the fuel rail injector assembly.
(14) Remove the precatalytic converter assembly.
(15) Remove the turbocharger assembly.
(16) Remove the accessory drive belt.
(17) Remove the tensioner assembly.
(18) Remove the idler pulley assembly.
(19) Remove the cylinder head cover.
(20) Remove the timing chain cover.
(21) Remove the engine timing chain.
(22) Remove camshaft and rocker arm.

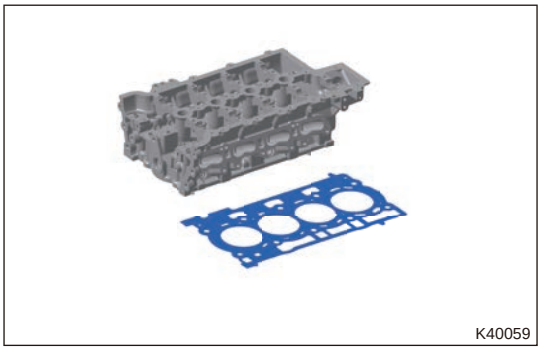
(23) Remove 10 fixing bolts from cylinder cover in order shown in illustration.



⚠ Caution

- **When engine is in high temperature, removal and installation may cause deformation to cylinder head, so perform removal and installation at normal temperature.**
- **Failure to remove cylinder head bolts in order may cause cylinder head deformation.**
- **Make scraping marks on removed cylinder head bolt, and they cannot be reused.**

(24) Remove cylinder head assembly and cylinder head gasket.

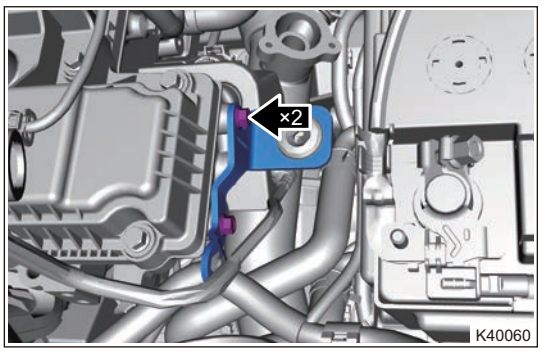


⚠ Caution

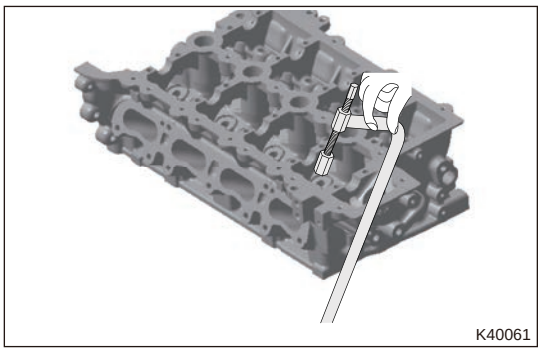
- **DO NOT reuse the removed cylinder head gasket, and it is necessary to replace with a new one.**
- **Be careful not to lose cylinder head mounting dowel pin during removal.**

■ Disassembly

(1) Remove 2 fixing bolts and bracket.

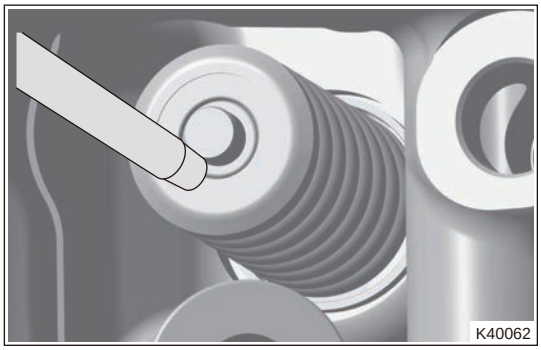


(2) Using a valve spring compressor, compress valve spring to a position so that valve cotter can be removed.

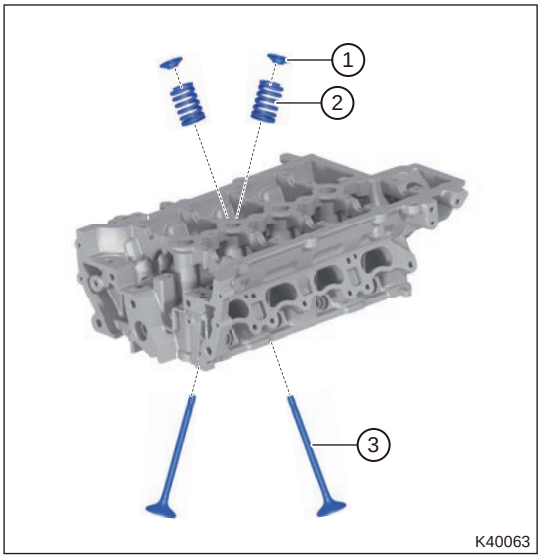


(3) Using a magnetic rod, remove valve cotter.

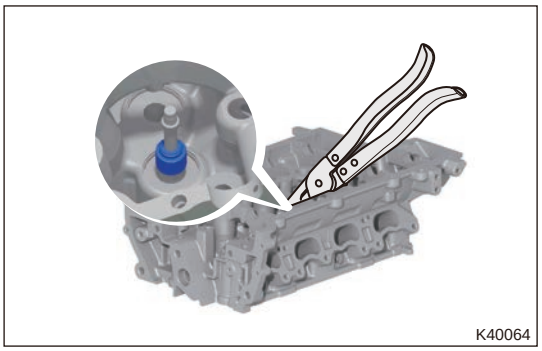
Hint:
Due to the valve cotter is small, please operate carefully when operating it, so as to avoid loss.



(4) Remove valve spring upper seat (1), valve spring (2) and intake and exhaust valve (3) from cylinder head.



(5) Using a valve oil seal remover, remove the valve oil seal.



(6) Using a magnetic rod, remove valve spring lower seat.

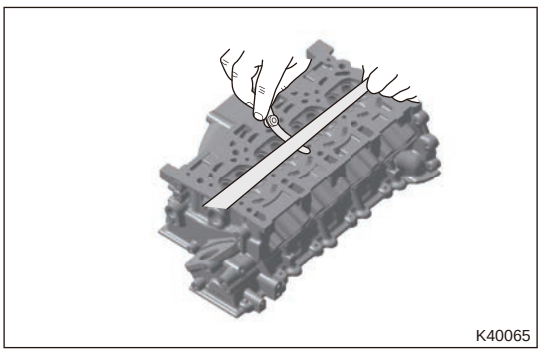
■ Check cylinder head

(1) Check the appearance.
   1) Remove carbon deposits inside valve guides with cleaner.
   2) Make sure valve stem can move and rotate freely in its mounting hole.

(2) Using a precision straightedge and feeler gauge, check cylinder head flatness.

Measurement Item	Specification (mm)
Cylinder Head Flatness	0.04

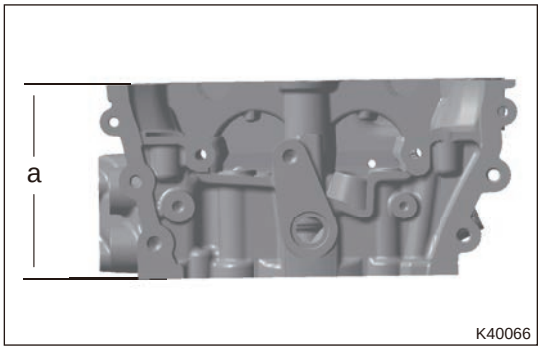
Hint:
If cylinder head flatness is not within specified range, replace cylinder head assembly.



(3) Using a precision straightedge, measure cylinder head height a.

Measurement Item	Specification (mm)
Cylinder Head Height	136.9

Hint:
If cylinder head height is not within specified range, replace cylinder head assembly.

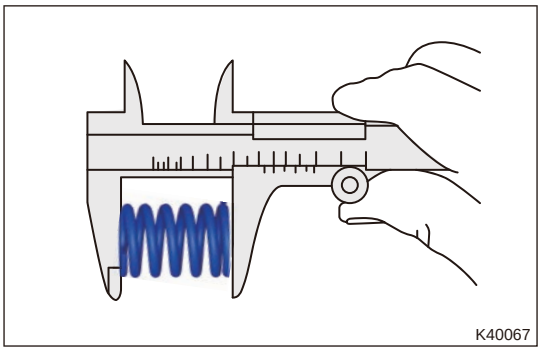


■ Check valve spring

(1) Using a vernier caliper, measure free length of valve spring and length of valve spring under the pre-pressure of (230 ± 11 N).

Measurement Item	Specification (mm)
Valve Spring Free Length	45.4 ± 2
Valve Spring Length Under Pre-pressure	Intake: 36.5
	Exhaust: 34.8

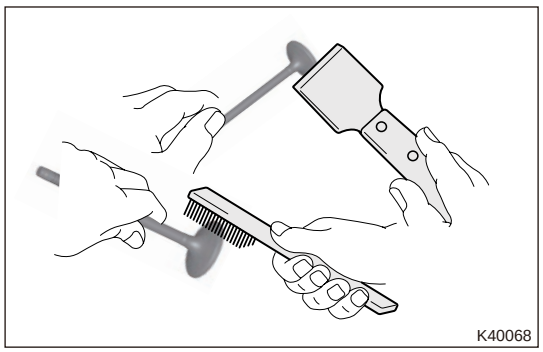
Hint:
If valve spring length is not within specified range, replace valve spring.



■ Check valve

(1) Clean the valve.

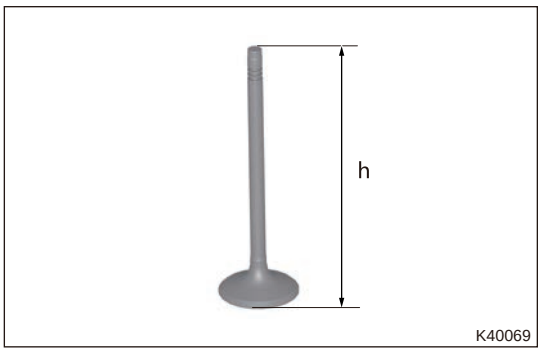
1) Using a scraper, remove carbon deposited on valve head.
2) Using a thin and soft wire brush, clean the valve thoroughly.



(2) Using a micrometer, measure the valve height h.

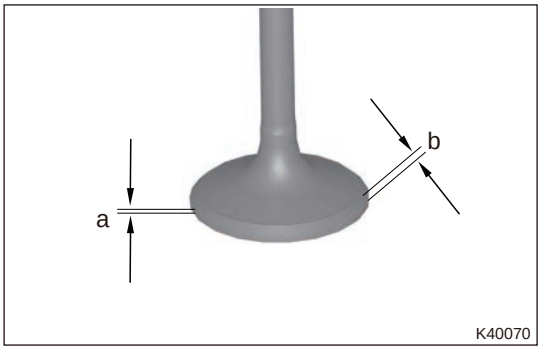
Measurement Item	Specification (mm)
Intake Valve	107.86 ± 0.25
Exhaust Valve	109.06 ± 0.25

Hint:
If valve height is less than specified value, replace valve.



(3) Check the valve head.

1) Measure margin thickness (a) of valve head.
2) Measure width (b) of valve face.

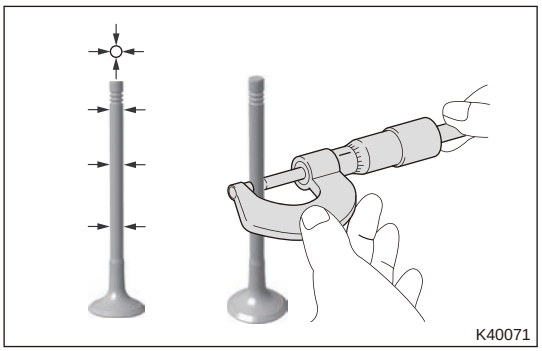


Measurement Item	Specification (mm)
Valve Head Margin Thickness (Intake)	1.3 ± 0.15
Valve Head Margin Thickness (Exhaust)	1.4 ± 0.15
Valve Face Width (Intake)	2.12
Valve Face Width (Exhaust)	3.12

Hint:
If valve head margin thickness and face width are not within specified range, replace valve.

(4) Using a micrometer, measure the valve stem diameter.

1) Measure margin thickness (a) of valve head.
2) Measure width (b) of valve face.

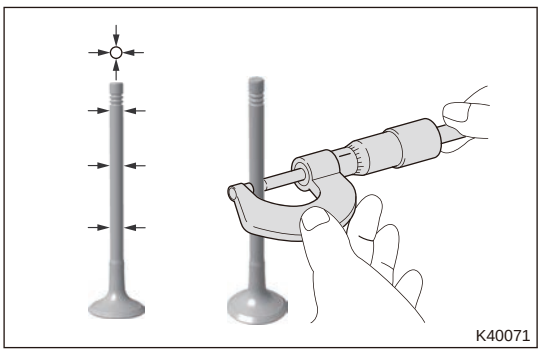


Measurement Item	Size and Tolerance (mm)
Valve Stem Diameter (Intake)	Φ5.98 ± 0.007
Exhaust Valve Stem Diameter (Exhaust)	Φ5.96 ± 0.007

Hint:
If valve stem diameter is not within specified range, check clearance between valve stem and valve guide.

(5) Check clearance between valve stem and valve guide.

1) Using a caliper gauge, measure inner diameter of valve guide.



Measurement Item	Size and Tolerance (mm)
Valve Guide Inner Diameter	Φ6 (0, +0.015)

2) Clearance between valve stem and valve guide = Valve guide inner diameter - Valve stem diameter.

Measurement Item	Specification (mm)
Clearance Between Intake Valve and Valve Guide	0.013 - 0.042
Clearance Between Exhaust Valve and Valve Guide	0.033 - 0.062

Hint:
If clearance between valve and valve guide is not within specified range, replace valve or valve guide.

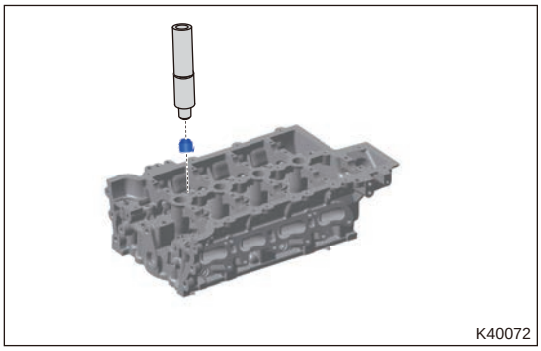
■ Assembly

⚠ Caution

- **Apply lubricant to valve oil seal lip before installing valve oil seal.**
- **Before installing valve spring, check valve spring lower seat for proper installation.**
- **Clean all components to be assembled thoroughly before assembly.**

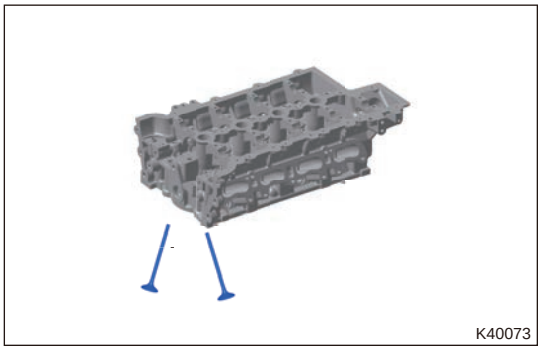
(1) Install valve spring lower seat to valve guide end to fit it with cylinder head.

(2) Install valve oil seal to valve oil seal special tool and press it on valve guide. Tap the tool end with a hammer to press in oil seal.

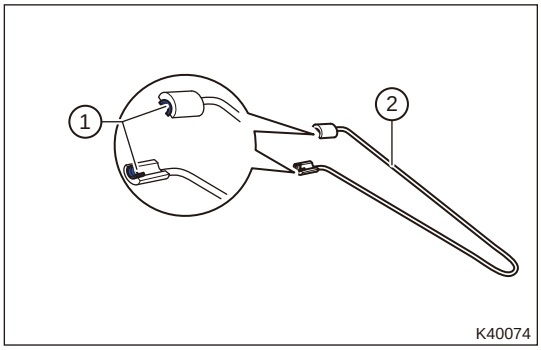

K40072

(3) Clean valve surface, install exhaust valve into cylinder head guide hole.

Hint:
Slightly rotate valve collar until valve conical face fully contacts retainer conical face.

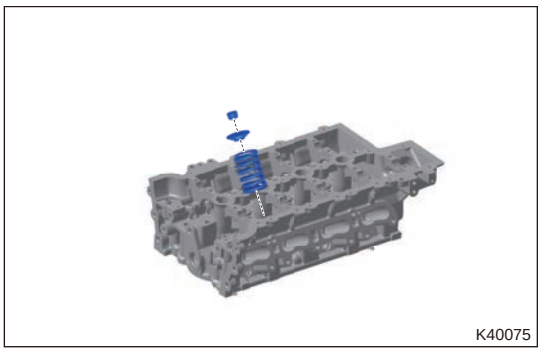

K40073

(4) Install valve cotter (1) to valve cotter installer (2).



K40074

(5) Install valve spring (1) and valve spring upper seat (2). Using a valve spring compressor, compress valve spring to a position so that valve cotter can be installed; Using a valve cotter installer, install valve cotter (3) in place.


K40075

(6) Tap tip of valve stem lightly with a rubber hammer to make sure valve cotter is installed in place after assembly.

■ Installation

⚠ Caution

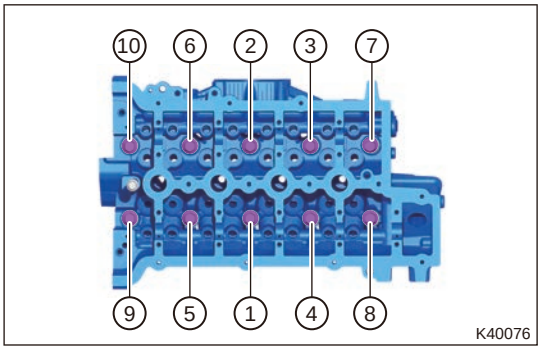
- **DO NOT damage or lose dowel pin on cylinder block.**
- **Remove residual oil on cylinder head and cylinder block.**
- **Replace cylinder head gasket with a new one.**
- **Check that cylinder head gasket is neat and clean without any chips and scratches.**
- **Clean junction surface between cylinder head and combustion chamber, and remove any accumulated oil at bottom of cylinder block thread.**
- **Replace cylinder head fixing bolt, and make scraping marks on removed cylinder head bolt.**

(1) Tighten bolts in place by hands.

(2) 1st step: Tighten bolts to 55 ± 5 N·m in order from (1) to (10) shown in illustration.

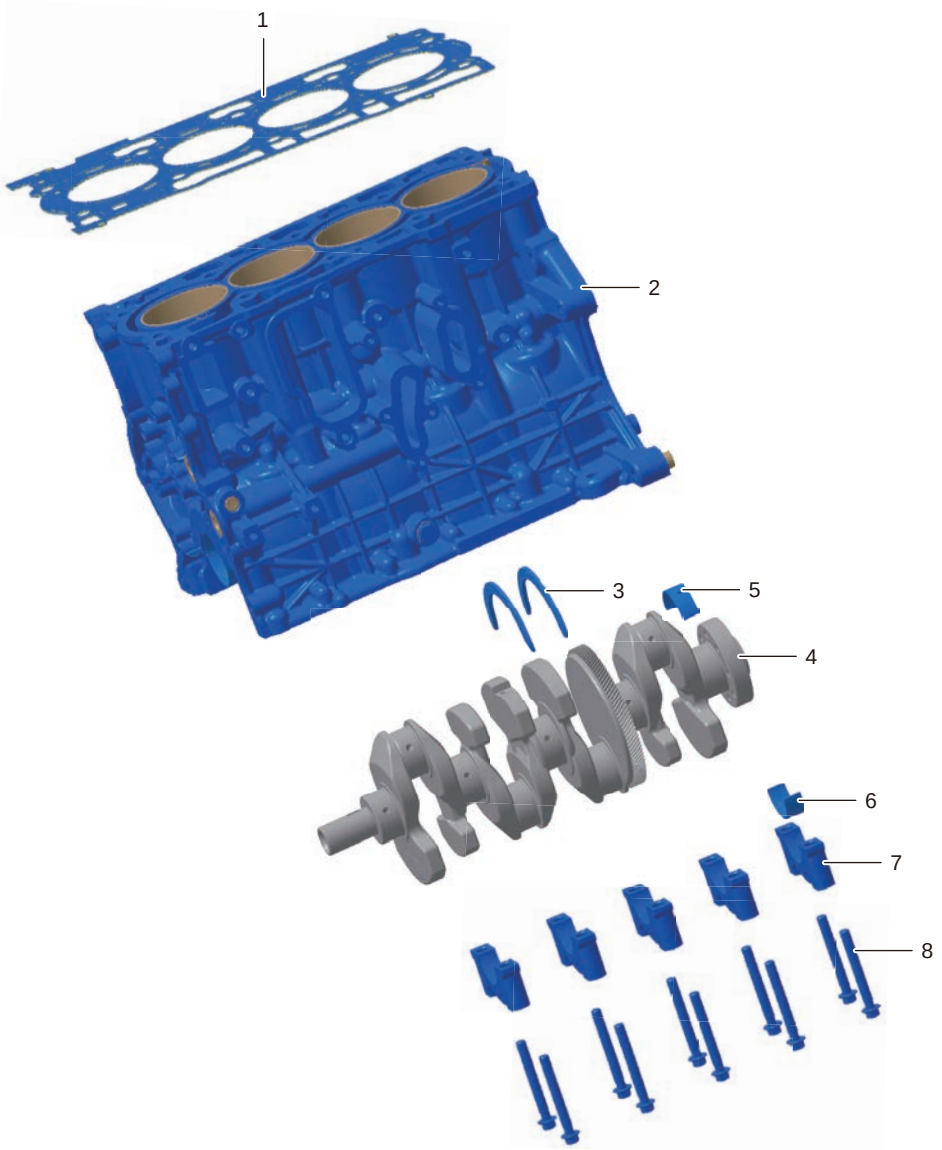
(3) 2nd step: Rotate bolts clockwise by 100° ± 5° in tightening order.

(4) 3rd step: Rotate bolts clockwise by 70° ± 5° in tightening order again.

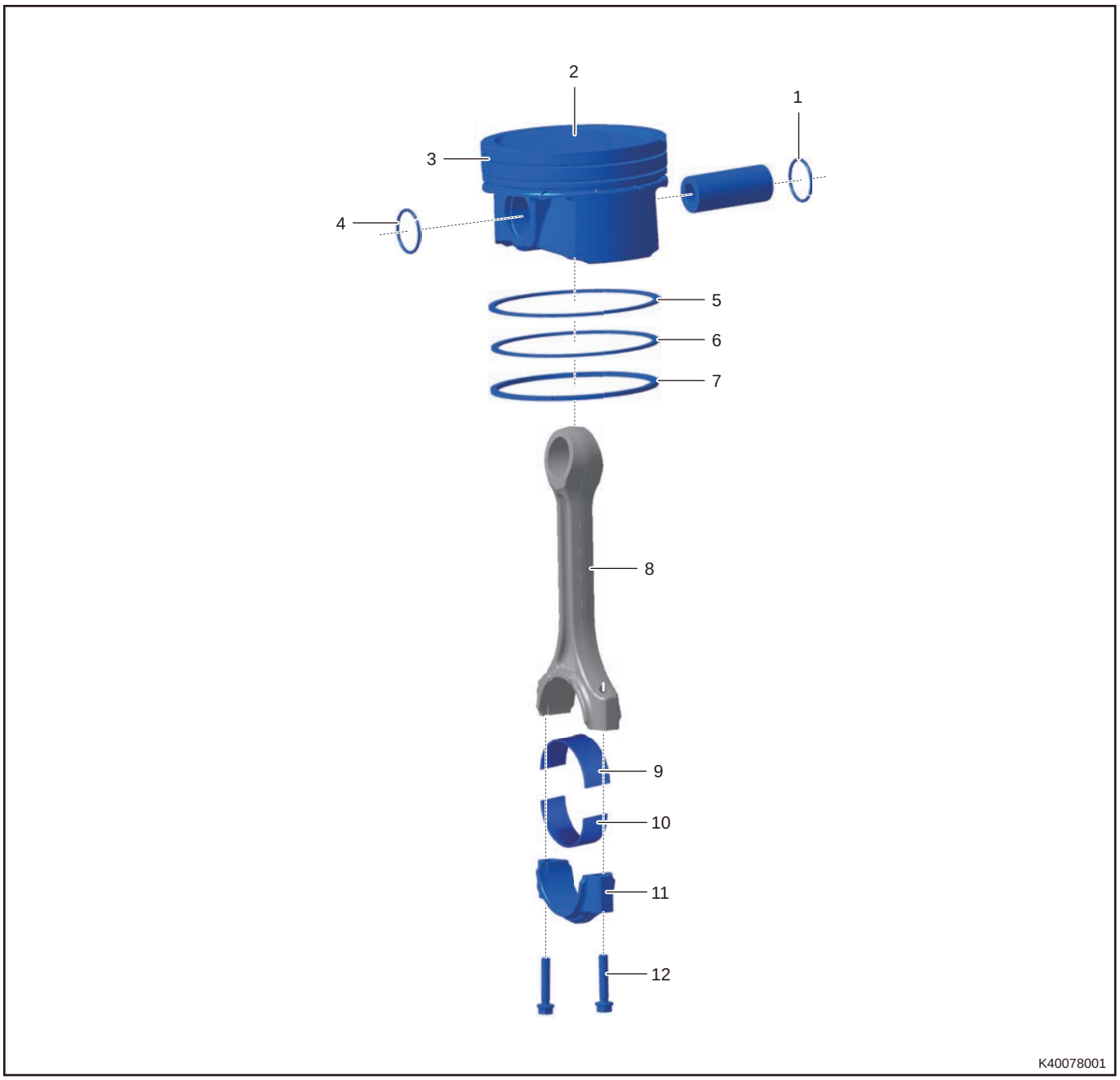


(5) Install the camshaft and rocker arm.
(6) Install the engine timing chain.
(7) Install the cylinder head cover.
(8) Install the idler pulley assembly.
(9) Install the tensioner assembly.
(10) Install the accessory drive belt.
(11) Install the turbocharger assembly.
(12) Install the precatalytic converter assembly.
(13) Install the fuel rail injector assembly.
(14) Install the intake manifold assembly.
(15) Install the cooling pipe assembly.
(16) Install the intake hose assembly.
(17) Install the battery tray.
(18) Install the battery assembly.
(19) Install the air filter assembly.
(20) Add the coolant as specified.
(21) Add the engine oil as specified.
(22) Install the engine trim cover assembly.
(23) Install the engine compartment trim cover assembly.

5.11 Cylinder Block



1	Cylinder Gasket	5	Crankshaft Main Bearing Upper Shell
2	Cylinder Block	6	Crankshaft Main Bearing Lower Shell
3	Thrust Washer	7	Main Bearing Cap
4	Crankshaft	8	Main Bearing Cap Fixing Bolt



1	Elastic Circlip	7	Oil Ring Assembly
2	Piston pin	8	Connecting Rod Assembly
3	Piston	9	Connecting Rod Bearing Upper Shell
4	Elastic Circlip	10	Connecting Rod Bearing Lower Shell
5	First Compression Ring - Piston	11	Connecting Rod Bearing Cap
6	Second Compression Ring - Piston	12	Connecting Rod Bearing Cap Fixing Bolt

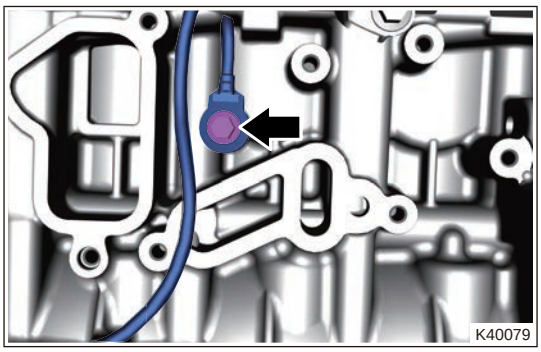
■ Removal

⚠ Warning

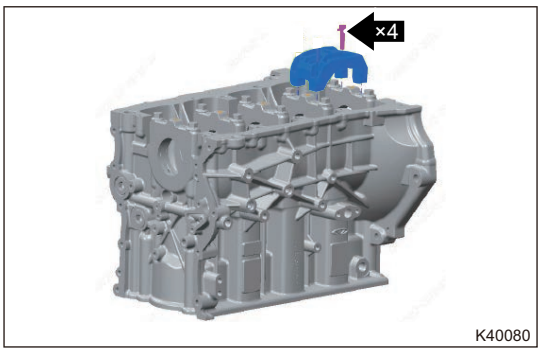
- **Be sure to wear necessary safety equipment to prevent accidents, when removing cylinder block.**
- **Appropriate force should be applied when removing cylinder block. Be careful not to operate roughly.**

(1) Remove engine assembly from vehicle.
(2) Separate transmission from engine.
(3) Remove the flywheel assembly.
(4) Remove the turbocharger assembly.
(5) Remove the turbocharger oil inlet pipe.
(6) Remove the turbocharger oil return pipe.
(7) Remove the intake manifold assembly.
(8) Remove the accessory drive belt.
(9) Remove the idler pulley assembly.
(10) Remove the tensioner assembly.
(11) Remove the torsion shock absorber.
(12) Remove the water pump module assembly.
(13) Remove the oil filter.
(14) Remove the A/C compressor bracket.
(15) Remove the oil pan assembly.
(16) Remove the engine timing chain.
(17) Remove the oil pump chain.
(18) Remove the cylinder head assembly.
(19) Remove the oil pump assembly.

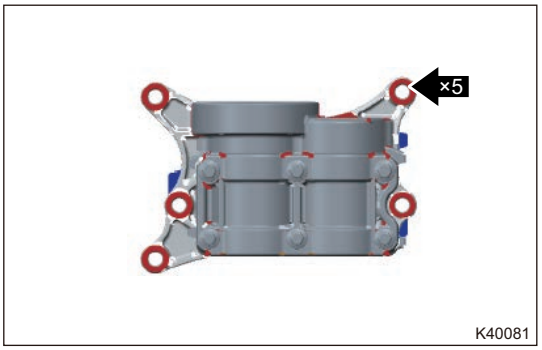
(20) Remove the knock sensor fixing bolt and remove the knock sensor.



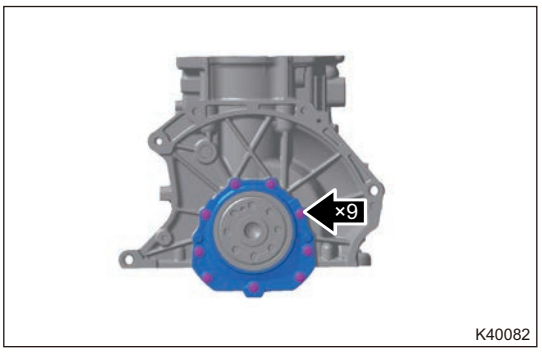
(21) Remove 4 fixing bolts and connecting bracket.



(22) Remove 5 fixing bolts and balance shaft with housing assembly.

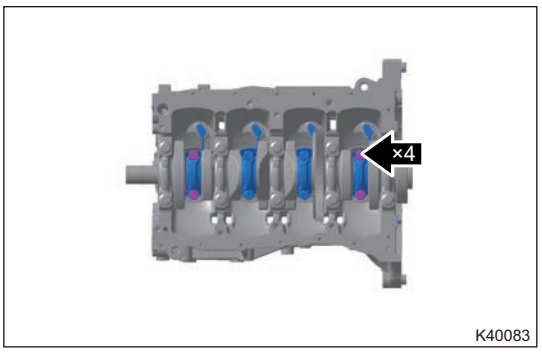


(23) Remove 9 fixing bolts and crankshaft rear oil seal bracket.



(24) Turn crankshaft, so that of cylinders 1 and 4 are at bottom dead center, remove fixing bolts from connecting rod bearing caps of cylinders 1 and 4, and remove connecting rod bearing caps of cylinders 1 and 4.

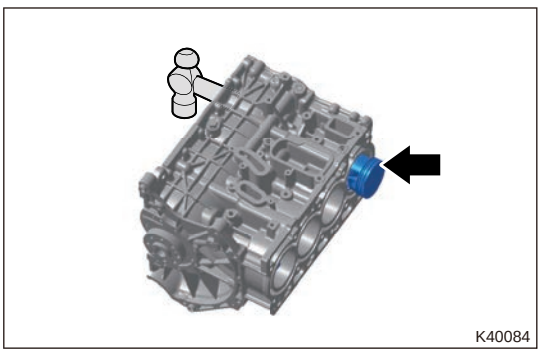
Hint:
Removal procedures of cylinders 2 and 3 are the same as cylinders 1 and 4.



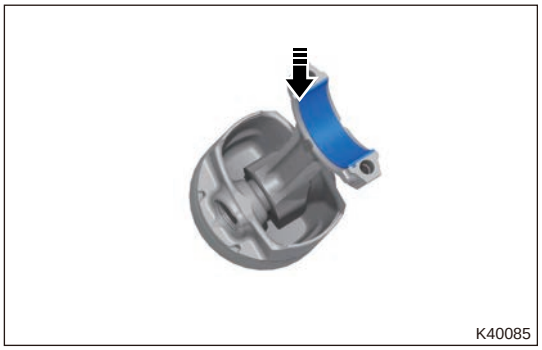
(25) Using a hammer handle, push out piston connecting rod assembly from cylinder block.

Hint:

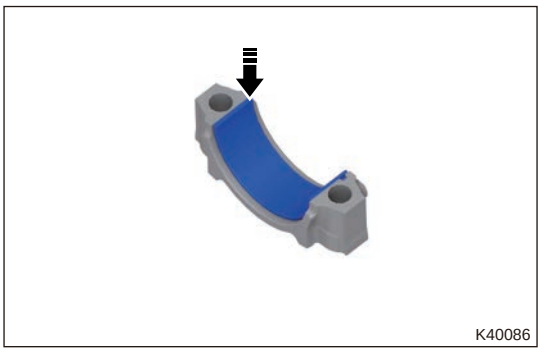
- Please operate carefully when pushing out piston, to avoid cylinder liner damage.
- Mark the removed piston connecting rod assemblies, so as to distinguish them.
- Replace with new connecting rod bearing cap bolts during assembly.



(26) Push out upper shell from connecting rod body slightly in direction of arrow to remove it.

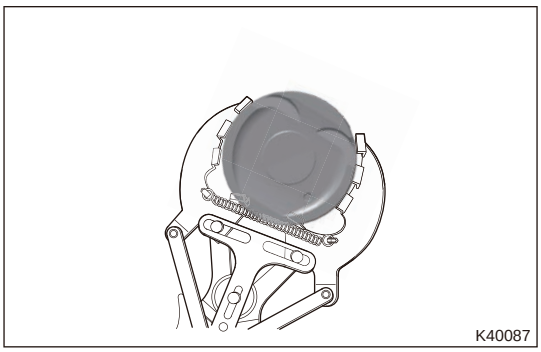


(27) Push out bearing lower shell slightly from connecting rod bearing cap in direction of arrow to remove it.



(28) Using a piston ring remover, remove first compression ring and second compression ring.

Hint:
Before removing piston ring, check piston ring side clearance; If it is necessary to be reused, be sure to mark piston ring position.

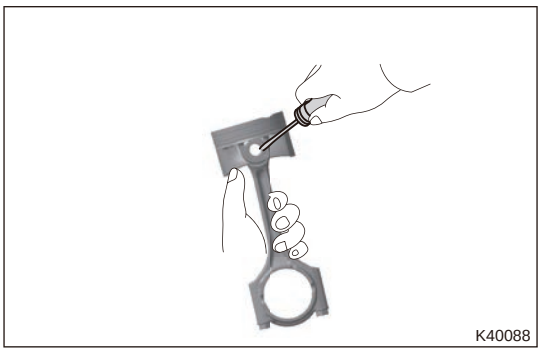


(29) Remove oil ring rail and expander.

(30) Using a flat tip screwdriver, pry out elastic circlips at both sides of piston pin carefully from notch.

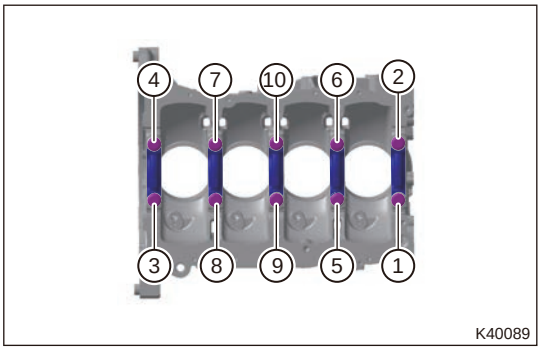
⚠ Caution

- **Elastic circlip has a large tensile force. Be careful during removal to prevent personal injury.**



(31) Remove the piston pin assembly.

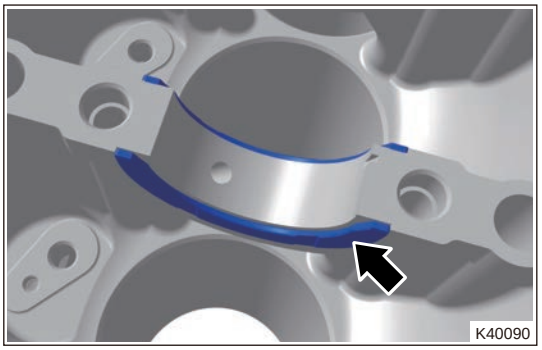
(32) Remove 10 fixing bolts from crankshaft main bearing cap in order as shown in illustration.



(33) Remove the crankshaft assembly.

Hint:
Take care when removing crankshaft, ask other operators to assist when necessary. Avoid scratching contact surfaces between crankshaft and bearing shell.

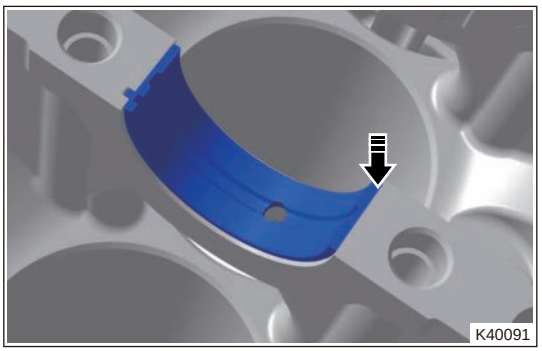
(34) Remove crankshaft thrust washers from cylinder block.



(35) Push out main bearing upper shell slightly from cylinder block in direction of arrow to remove it.

⚠ Caution

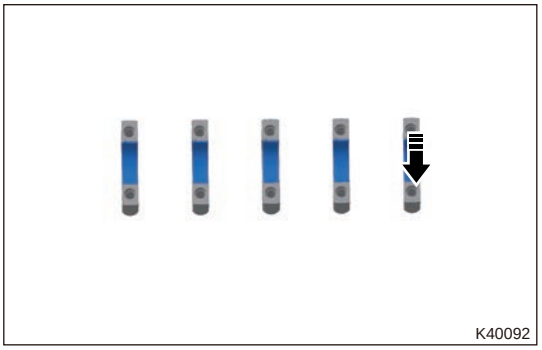
- **Pay attention to the notch position. Push out bearing shell carefully. It is difficult to push out bearing shell and parts may be damaged if pushing in opposite direction.**



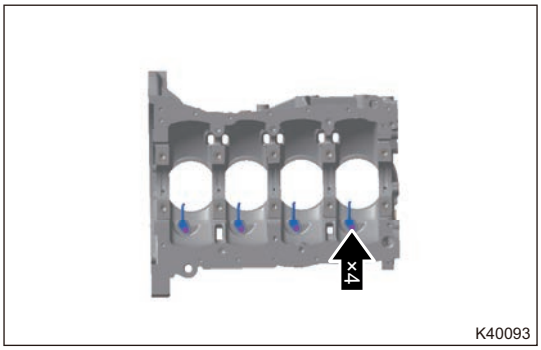
(36) Push out main bearing lower shell slightly from main bearing cap in direction of arrow to remove it.

⚠ Caution

- **Pay attention to the notch position. Push out bearing shell carefully. It is difficult to push out bearing shell and parts may be damaged if pushing in opposite direction.**



(37) Remove 4 fixing bolts and piston cooling nozzles.



■ Inspection

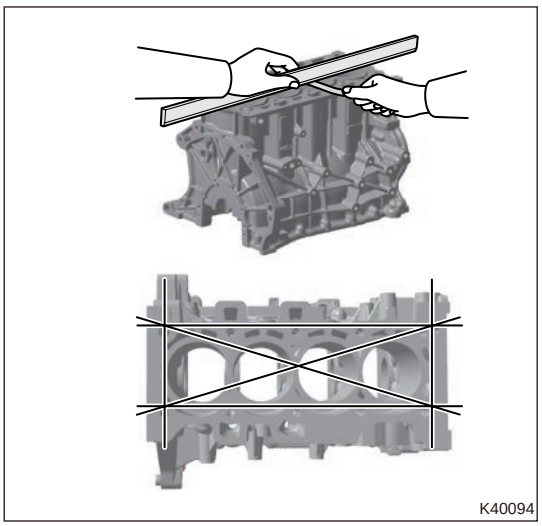
(1) Check the cylinder block appearance.

1) Clean engine block thoroughly and check all hole passages for leakage.
2) Check cylinder liner for cracks.
3) Check cylinder block for cracks.

Hint:
DO NOT wash cylinder at high temperature; otherwise, cylinder liner will stick out beyond cylinder block.

(2) Check the cylinder block upper surface flatness.

1) Clean the cylinder block upper surface, using precision straightedge and feeler gauge, measure cylinder block upper surface flatness.

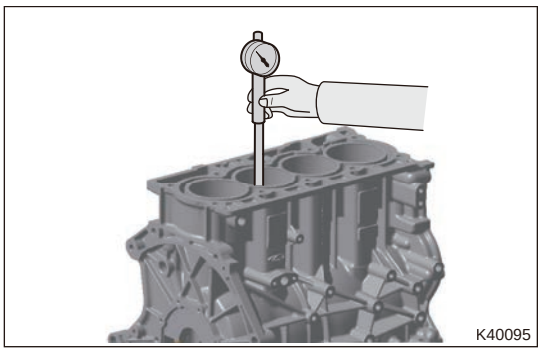


Measurement Item	Specification (mm)	Limit Value (mm)
Cylinder Block Upper Surface Flatness	0.04	0.1

Hint:
Never grind the cylinder block upper surface. If the engine block upper surface flatness is above the limit, replace the engine block.

(3) Check cylinder diameter and piston clearance.

1) Using a cylinder gauge, measure cylinder diameter and calculate the gap between cylinder and piston.

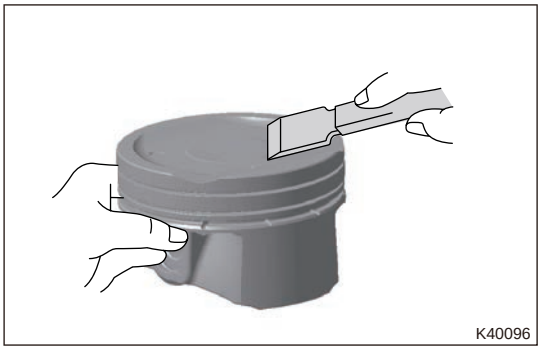


Measurement Item	Specification (mm)	Limit Value (mm)
Cylinder Diameter	80.5	80.513
Clearance Between Piston and Cylinder	0.04	0.063

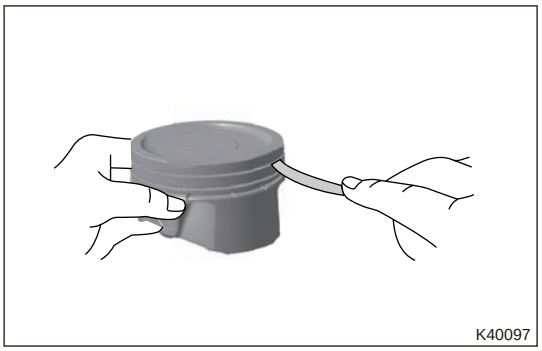
Hint:
If the cylinder diameter is beyond the limit, replace the cylinder block. If the clearance between piston and cylinder is beyond the specified value, check cylinder diameter and piston diameter. Replace as necessary.

(4) Check piston

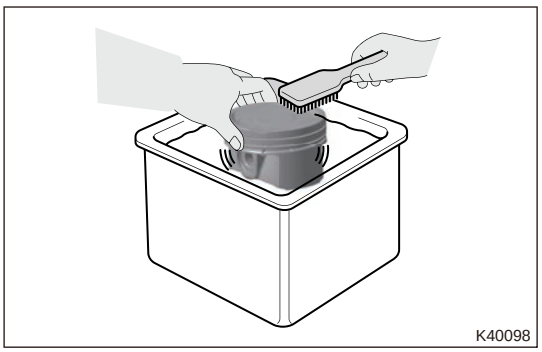
1) Using a scraper, remove carbon deposits on piston top.



2) Using a piston ring, remove carbon deposits from piston ring grooves.



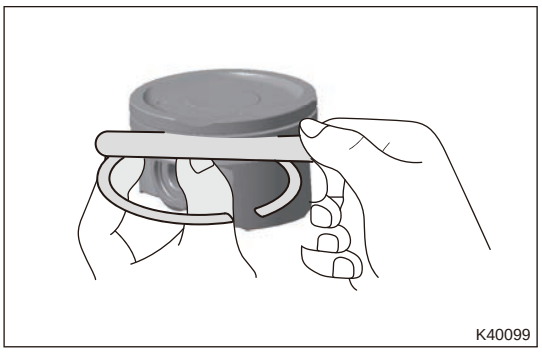
3) Using a brush and solvent, thoroughly clean piston.



(5) Check piston ring

1) Using a feeler gauge, measure clearance between new piston ring and ring groove side.

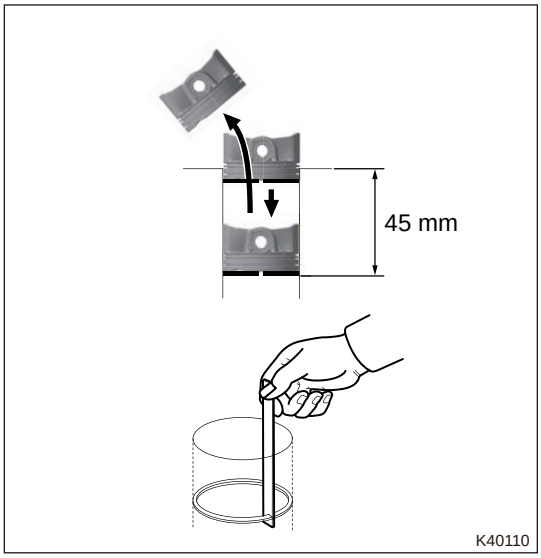
Measurement Item	Specification (mm)
First compression ring groove side clearance	0.035 - 0.075
Second compression ring groove side clearance	0.03 - 0.07



Hint:
If piston ring side clearance exceeds specified range, replace piston ring and piston assembly.

2) Using a piston, push piston ring from top of cylinder to bottom of cylinder bore, that is 45 mm from bottom of cylinder bore. Keep the piston ring level.

3) Measure at the specified position, which has the minimum piston ring wear with a feeler gauge.



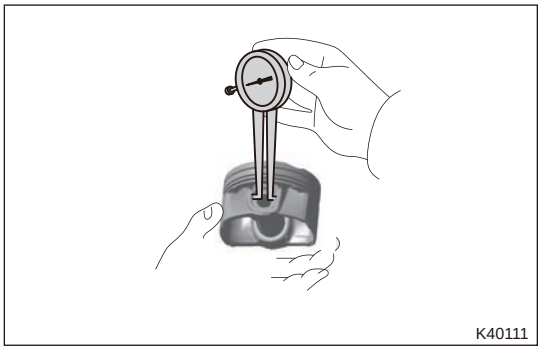
Measurement Item		Limit Value (mm)
Piston Ring End Gap	First ring	0.2 - 0.39
	Second ring	0.4 - 0.6

Hint:

- If piston ring end gap is not within specified range, replace piston ring with a new set.
- If end gap is still not within specified range after replacement, replace cylinder block assembly.

(6) Check piston pin

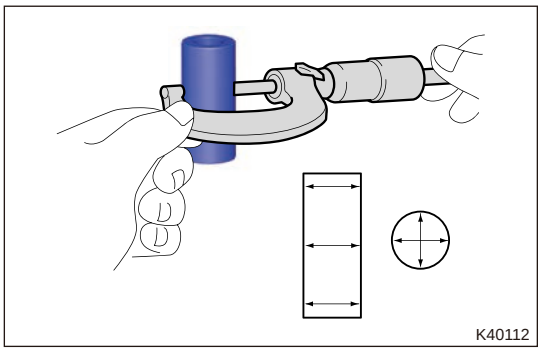
1) Using a feeler gauge, measure diameter of piston pin hole.



Measurement Item	Specification (mm)
Piston Pin Hole Diameter	22.004 - 22.009

Hint:
If piston pin hole diameter is not within specified range, replace piston.

2) Using an external micrometer, measure diameter of piston pin.

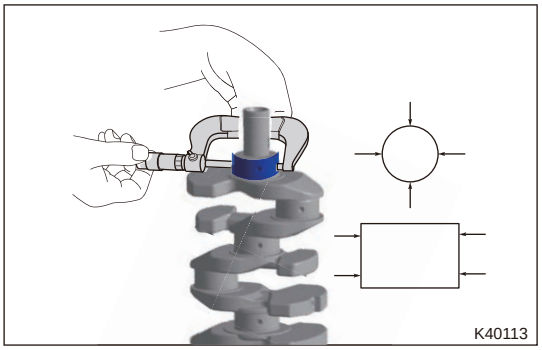


Measurement Item	Specification (mm)
Piston Pin Diameter	21.995 - 22

Hint:
If piston pin diameter is not within specified range, replace piston.

(7) Check crankshaft main journal diameter

1) Measure crankshaft main bearing diameter with an external micrometer, and measure again after rotating the crankshaft 90°.



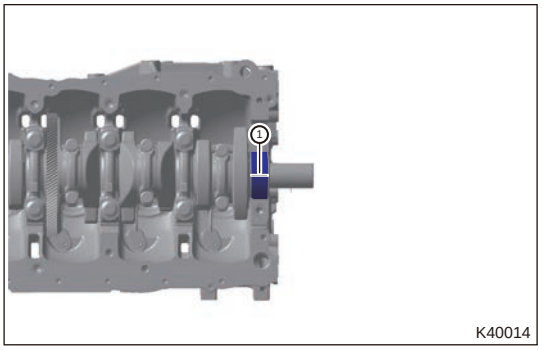
Measurement Item	Specification (mm)	Limit Value (mm)
Crankshaft Main Journal Diameter	52	51.981

Hint:
- If crankshaft main journal diameter is not within specified range, replace main bearing shells with new ones and check matching clearance of crankshaft main bearing.
- If matching clearance of main bearing is still not within specified range after replacing with new main bearing shells, replace crankshaft.

(8) Check matching clearance of crankshaft main bearing

1) Clean crankshaft main journals and main bearing shells.

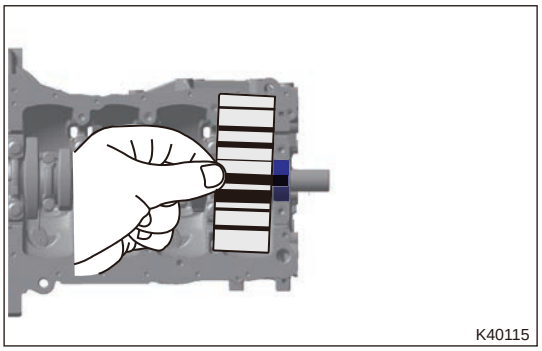
2) Install the crankshaft. Place feeler gauge (1) on crankshaft main journal, parallel to crankshaft center axis and as wide as distance covered by main bearing cap.



3) Install main bearing cap and tighten main bearing cap fixing bolts to specified torque.

Torque: 1st step: 60 ± 5 N·m, 2nd step: 120° ± 5°

4) Remove the main bearing cap; Using a feeler gauge, measure widest part of compressed feeler gauge. Measured value is matching clearance of crankshaft main bearing.



Measurement Item	Specification (mm)
Matching Clearance of Crankshaft Main Bearing	0.020 -0.048

Hint:
- If matching clearance of crankshaft main bearing is not within specified range, install new main bearing shells; Replace crankshaft assembly if necessary.
- Replace bearing shells in pairs.

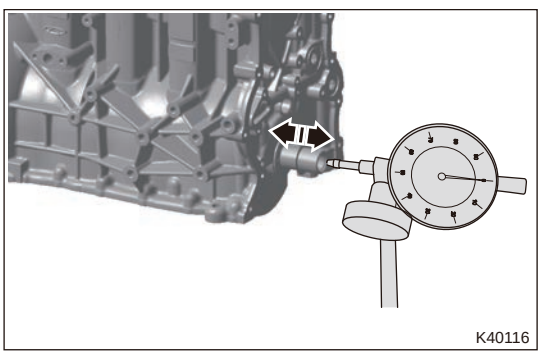
(9) Check crankshaft axial clearance

1) Clean crankshaft main journals and main bearing shells.

2) Install main bearing cap and tighten main bearing cap fixing bolts to specified torque.

Torque: 1st step: 60 ± 5 N·m, 2nd step: 120° ± 5°

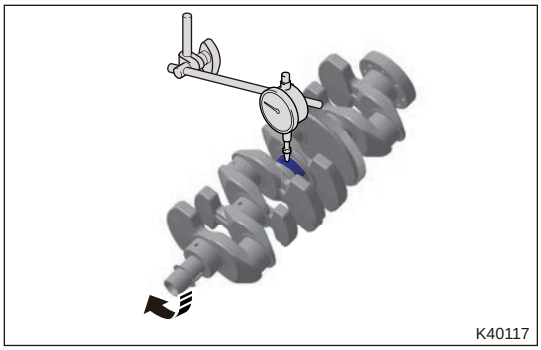
3) Using a flat tip screwdriver, pry crank position left and right, and read value on dial indicator.



Measurement Item	Specification (mm)	Limit Value (mm)
Crankshaft Axial Clearance	0.120 - 0.315	0.315

(10) Check crankshaft main journal coaxiality

1) Install crankshaft onto tester and keep it level.
2) Rotate crankshaft slowly and read maximum change value from dial indicator. (Readings on dial indicator)/ 2 is the coaxiality of crankshaft main journal.

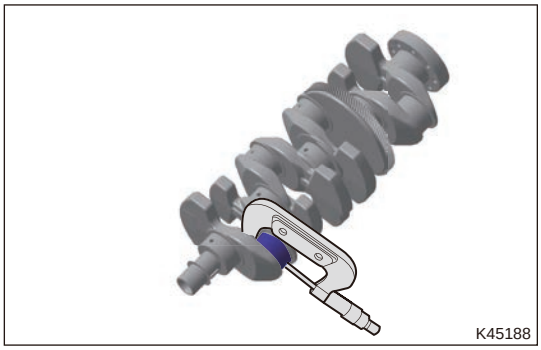


Measurement Item	Specification (mm)	Limit Value (mm)
Crankshaft Main Journal Coaxiality	0	0.05

Hint:
If crankshaft main journal coaxiality is not within specified range, replace crankshaft assembly.

(11) Measure diameter of crankshaft connecting rod journal

1) Using an external micrometer, measure diameter of crankshaft connecting rod journal.



Measurement Item	Specification (mm)	Limit Value (mm)
Crankshaft Connecting Rod Journal Diameter	50	49.984

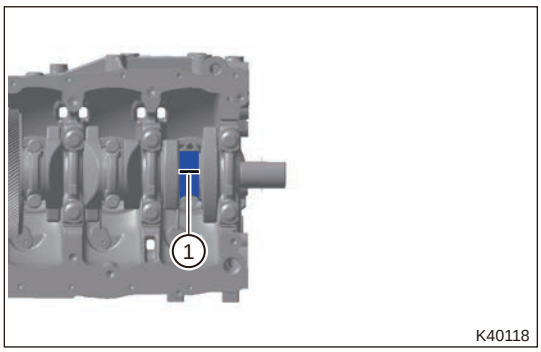
Hint:
- If connecting rod journal diameter is not within specified range, replace connecting rod bearing shells with new ones, and check radial clearance of connecting rod bearing shell.
- If radial clearance of connecting rod bearing shell is still not within specified range after replacement, replace crankshaft.

(12) Check radial clearance of crankshaft connecting rod bearing shell

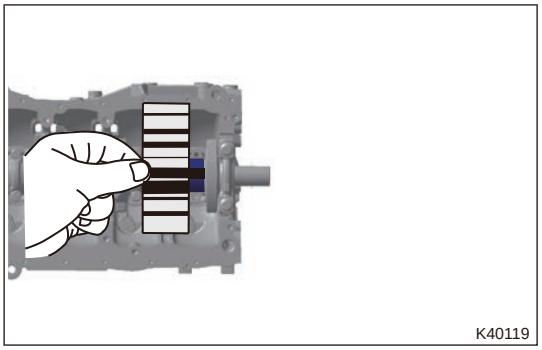
1) Clean connecting rod journals and connecting rod bearing shells.
2) Place a feeler (1) on connecting rod journal.
3) Install connecting rod bearing caps, and tighten connecting rod bearing cap fixing bolts to specified torque.

   Torque: 1st step: 25 ± 3 N·m, 2nd step: 90° ± 5°

   Hint:
   DO NOT turn crankshaft during installation.
4) Remove the connecting rod bearing cap.



5) Using gauge scale of feeler gauge, measure the widest part of compressed feeler gauge to obtain radial clearance of connecting rod bearing shell.



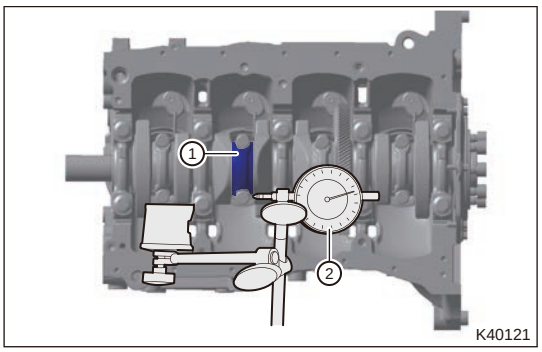
Measurement Item	Specification (mm)
Connecting Rod Bearing Shell Radial Clearance	0.035 - 0.067

Hint:
If radial clearance of connecting rod outer diameter is not within specified range, replace connecting rod bearing shells. Replace crankshaft assembly if necessary.

(13) Check axial clearance of connecting rod

1) Install connecting rod bearing caps, and tighten connecting rod bearing cap fixing bolts to specified torque.

Torque: 1st step: 25 ± 3 N·m, 2nd step: 90° ± 5°



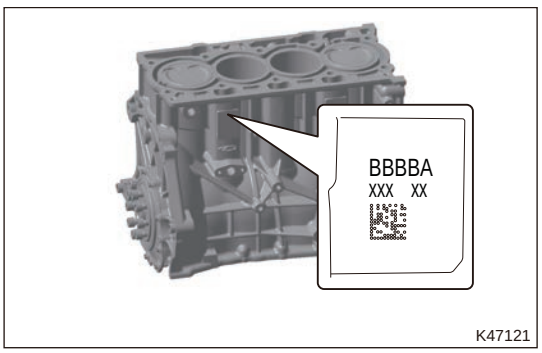
2) Install a dial indicator (2) with its plunger contacting the side of connecting rod cap (1) Reset dial of dial indicator to zero.
3) Push connecting rod bearing cap forward and backward (do not move crankshaft forward and backward) and read value on dial indicator.

Measurement Item	Specifications
Connecting Rod Axial Clearance	0.15 – 0.40

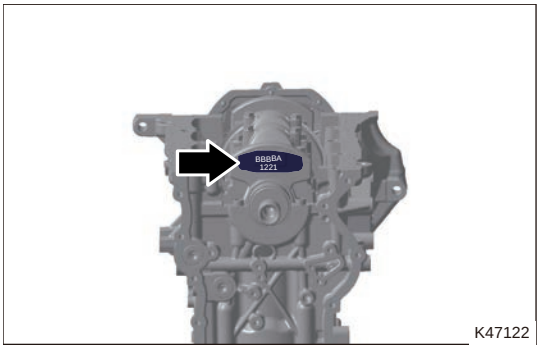
Hint:
If axial clearance of connecting rod is not within specified range, replace piston connecting rod assembly. Replace crankshaft assembly if necessary.

■ Selection of Main Bearing Shell

(1) Related letter marks are available on cylinder block (- consisting of A, B, C). Such as “BBBBA” in illustration, each letter from left to right is corresponding to the size of each cylinder block main bearing hole. First letter "B" indicates the first main bearing hole and the fifth letter "A" indicates the fifth main bearing hole.



(2) Related letter marks are available on first balancer at front end of crankshaft (consisting of A, B, C). Such as “BBBBA” in illustration, each letter from left to right is corresponding to the size of each crankshaft main journal. First letter "B" indicates the first main journal and the fifth letter "A" indicates the fifth main journal.



(3) Classification Method

No.	Name	Color	Level	Size (mm)
1	Main Bearing Hole	Red	A	57.000 - 57.005
2	Main Bearing Hole	Blue	B	57.005 - 57.010
3	Main Bearing Hole	Yellow	C	57.010 - 57.015
4	Main Bearing Hole	Black	D	57.015 - 57.019
5	Main Bearing Upper Shell	Red	/	2.489 - 2.493
6	Main Bearing Upper Shell	Blue	/	2.493 - 2.497
7	Main Bearing Upper Shell	Yellow	/	2.497 - 2.501
8	Main Bearing Upper Shell	Black	/	2.501 - 2.505
9	Main Journal	Red	A	51.995 - 52.000
10	Main Journal	Blue	B	51.990 - 51.995
11	Main Journal	Yellow	C	51.985 - 51.990
12	Main Journal	Black	D	51.981 - 51.985
13	Main Bearing Lower Shell	Red	/	2.489 - 2.493
14	Main Bearing Lower Shell	Blue	/	2.493 - 2.497
15	Main Bearing Lower Shell	Yellow	/	2.497 - 2.501
16	Main Bearing Lower Shell	Black	/	2.501 - 2.505

(4) Selection Method

No.	Main Bearing Hole	Main Journal	Main Bearing Upper Shell	Main Bearing Lower Shell
1	A Red	A Red	A Red	A Red
2	A Red	B Blue	A Red	B Blue
3	A Red	C Yellow	A Red	C Yellow
4	A Red	D Black	A Red	D Black
5	B Blue	A Red	B Blue	A Red
6	B Blue	B Blue	B Blue	B Blue
7	B Blue	C Yellow	B Blue	C Yellow
8	B Blue	D Black	B Blue	D Black
9	C Yellow	A Red	C Yellow	A Red
10	C Yellow	B Blue	C Yellow	B Blue
11	C Yellow	C Yellow	C Yellow	C Yellow
12	C Yellow	D Black	C Yellow	D Black
13	D Black	A Red	D Black	A Red
14	D Black	B Blue	D Black	B Blue
15	D Black	C Yellow	D Black	C Yellow
16	D Black	D Black	D Black	D Black

(5) Selection of Connecting Rod Bearing Shell

No.	Connecting Rod Big End Hole	Connecting Rod Upper Shell	Connecting Rod Journal	Connecting Rod Lower Shell
1	A Red	A Red	1 Red	A Red
2	A Red	A Red	2 Blue	B Blue
3	A Red	A Red	3 Yellow	C Yellow
4	A Red	A Red	4 Black	D Black
5	B Blue	B Blue	1 Red	A Red
6	B Blue	B Blue	2 Blue	B Blue
7	B Blue	B Blue	3 Yellow	C Yellow
8	B Blue	B Blue	4 Black	D Black
9	C Yellow	C Yellow	1 Red	A Red
10	C Yellow	C Yellow	2 Blue	B Blue
11	C Yellow	C Yellow	3 Yellow	C Yellow
12	C Yellow	C Yellow	4 Black	D Black
13	D Black	D Black	1 Red	A Red
14	D Black	D Black	2 Blue	B Blue
15	D Black	D Black	3 Yellow	C Yellow
16	D Black	D Black	4 Black	D Black

(6) Classification Method

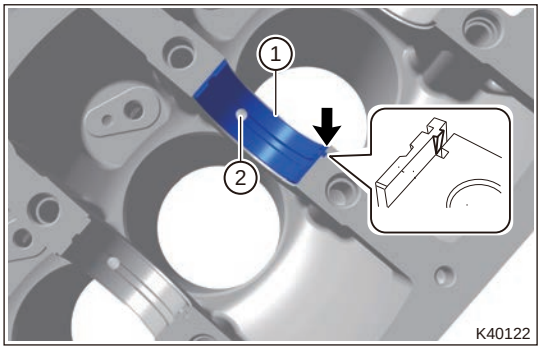
No.	Name	Color	Level	Size (mm)
1	Connecting Rod Big End Hole	Red	A	53.000 - 53.005
2	Connecting Rod Big End Hole	Blue	B	53.005 - 53.010
3	Connecting Rod Big End Hole	Yellow	C	53.010 - 53.015
4	Connecting Rod Big End Hole	Black	D	53.015 - 53.019
5	Connecting Rod Upper Shell	Red	/	1.483 - 1.487
6	Connecting Rod Upper Shell	Blue	/	1.487 - 1.491
7	Connecting Rod Upper Shell	Yellow	/	1.491 - 1.495
8	Connecting Rod Upper Shell	Black	/	1.495 - 1.499
9	Connecting Rod Journal	Red	1	49.996 - 50.000
10	Connecting Rod Journal	Blue	2	49.992 - 49.996
11	Connecting Rod Journal	Yellow	3	49.988 - 49.992
12	Connecting Rod Journal	Black	4	49.984 - 49.988
13	Connecting Rod Lower Shell	Red	/	1.483 - 1.487
14	Connecting Rod Lower Shell	Blue	/	1.487 - 1.491
15	Connecting Rod Lower Shell	Yellow	/	1.491 - 1.495
16	Connecting Rod Lower Shell	Black	/	1.495 - 1.499

■ Installation

(1) Install 4 fixing bolts to piston cooling nozzles.

Torque: 20 - 25 N·m

(2) Carefully install crankshaft main bearing upper shell in direction of arrow, and notch of each main bearing upper shell should be aligned with cylinder block. Oil passage hole (2) on crankshaft main bearing upper shell should be aligned with passage hole on cylinder block after installation.

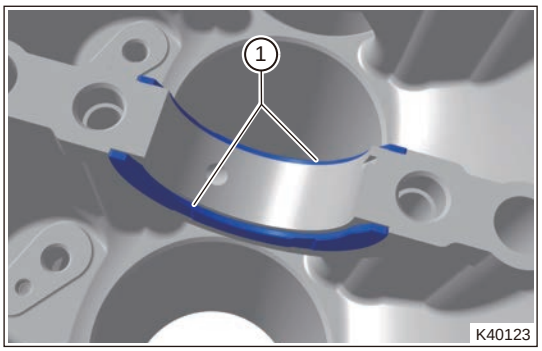


⚠ Caution

- **Apply a proper amount of engine oil to inner surface of main bearing shell before installation.**
- **Install main bearing lower shell in the same way of crankshaft main bearing upper shell.**

(3) Install crankshaft thrust washer to front and rear thrust surfaces of 3rd main bearing seat respectively.

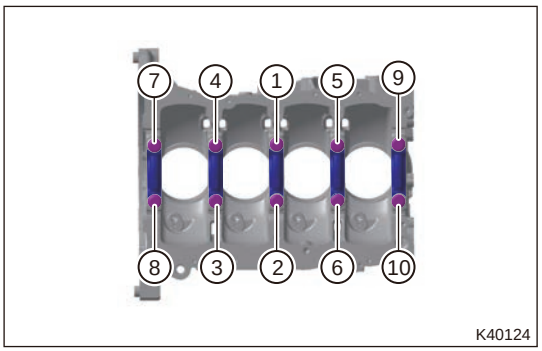
Hint:
The side of crankshaft thrust washers (1) without groove should face cylinder block side while the other side with groove should face crankshaft side.



(4) Place crankshaft on cylinder block carefully.

(5) Install the crankshaft main bearing cap. Install crankshaft main bearing cap fixing bolts in place by hands, and then tighten 10 crankshaft main bearing cap fixing bolts in order shown in illustration.

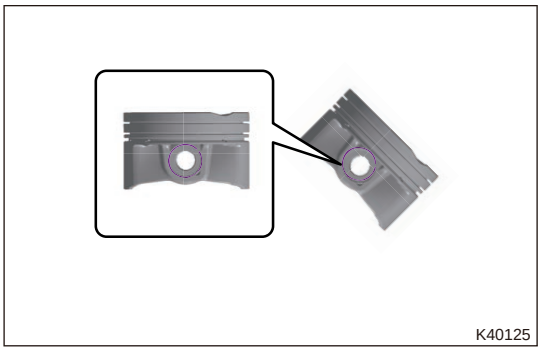
Torque: 1st step: 60 ± 5 N·m, 2nd step: 120° ± 5°



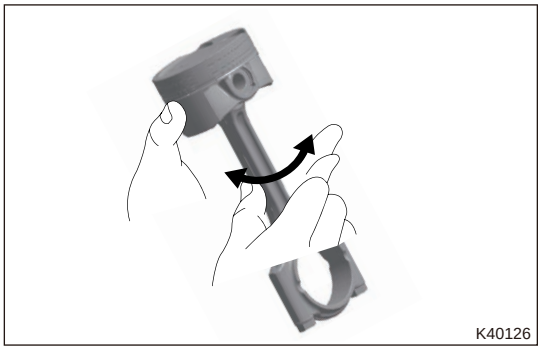
(6) Using a small screwdriver, install new elastic circlip to one end of piston pin hole.

Hint:
Relative angle between elastic circlip opening and removed notch is 180° ± 40°

(7) Align front marks on piston and connecting rod, push piston pin with thumb until it contacts with elastic circlip.

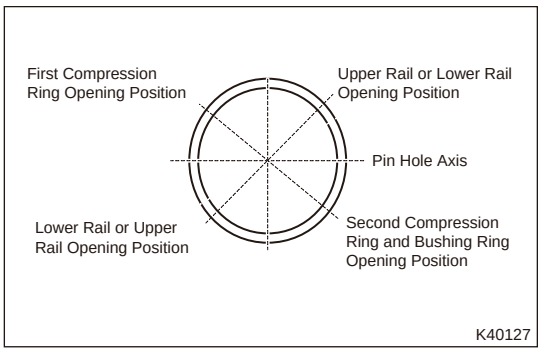


(8) Install elastic circlip to the other end of piston pin hole, and check for free rotation between piston and connecting rod assembly.



(9) Apply a small amount of engine oil to piston ring groove and piston. Pay attention that the sides with words of first compression ring (1) and second compression ring (2) should face upward.

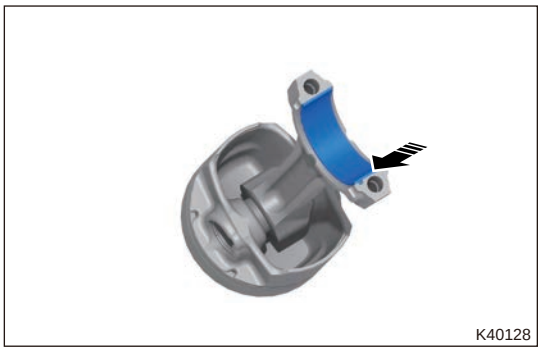
(10) When installing the oil ring, first install the expander into oil groove, then install upper and lower rails with opening staggered by 90° from the expander, and the upper and lower rails at 180°. Then install the second compression ring, and install the first compression ring finally with two compression rings staggered by 90° from upper rail opening; The piston ring should rotate in the ring groove freely without any stuck condition.



(11) Rotate piston ring several turns after addling engine oil to piston ring groove, and note that the position of ring notch should be the same with that described above; clean crankshaft connecting rod journal and cylinder with a non-woven fabric cloth.

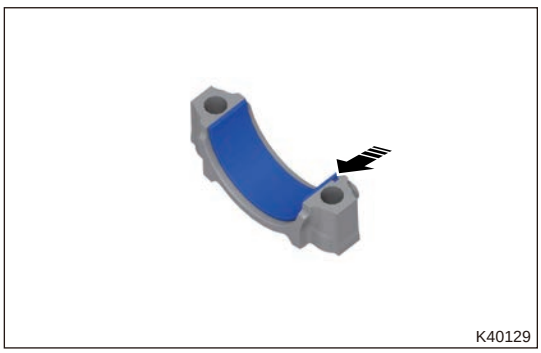
(12) Carefully install the connecting rod bearing upper shell in direction of arrow, and keep notch of each connecting rod bearing upper shell face the cutout of connecting rod bearing cap.

Hint:
Apply a proper amount of engine oil to connecting rod bearing shell inner surface before installation.



(13) Carefully install connecting rod bearing lower shell in direction of arrow, and keep notch of each connecting rod bearing lower shell face the cutout of connecting rod bearing cap.

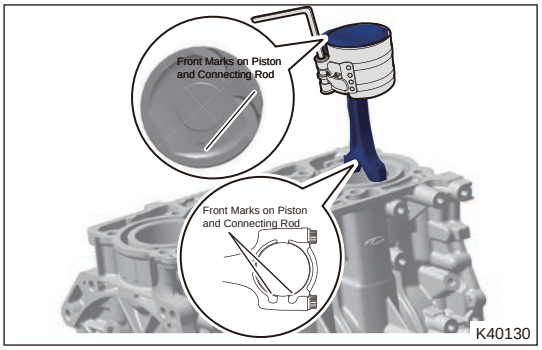
Hint:
Back side of connecting rod bearing shell should be clean without any foreign matter during assembly.



(14) Rotate crankshaft to top dead center of cylinder 1 and cylinder 4.

(15) Apply a coat of engine oil to piston surface and cylinder inner wall.

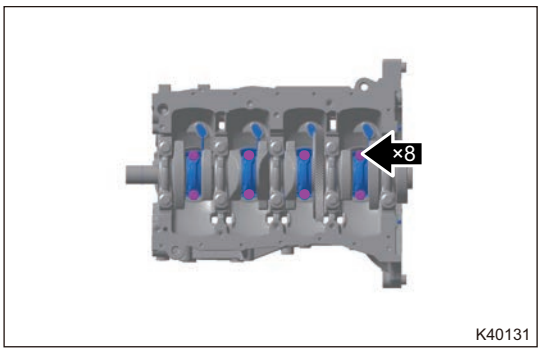
(16) As shown in illustration, install piston connecting rod assembly to cylinder with piston installer; Pay attention to front marks on piston and connecting rod during assembly, without being reversed.



(17) Install connecting rod bearing caps in place, install connecting rod bearing cap fixing bolts and tighten connecting rod bearing cap fixing bolts to specified torque.

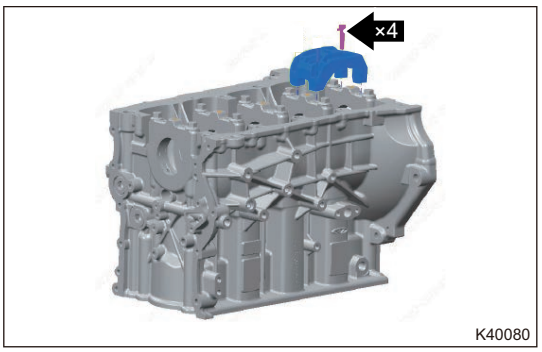
Torque: 1st step: 25 ± 3 N·m, 2nd step: 90° ± 5°

Hint:
Apply a small amount of engine lubricant to connecting rods, connecting rod bearing caps and thread joint surfaces.



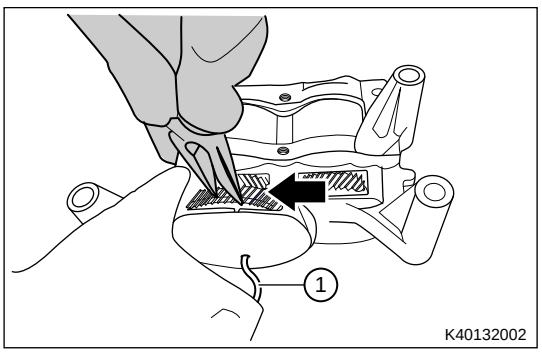
(18) Install the connecting bracket and tighten 4 fixing bolts.

Torque: 8 + 3 N•m



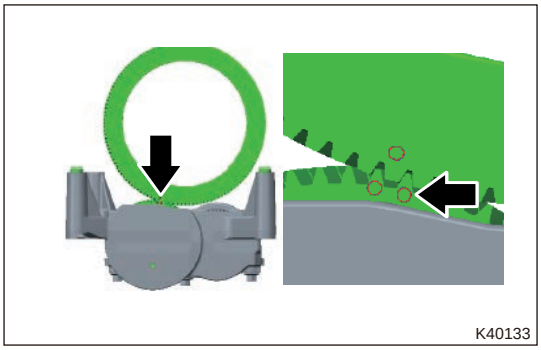
(19) Install the balance shaft with housing assembly

1) After aligning the balance shaft gears, insert the locking fixture (1) and reset the balance shaft.



2) Align the pin sleeve hole of the balance shaft with housing assembly with the pin sleeve, assemble the balance shaft with housing assembly, slightly turn the balance shaft assembly locking fixture on the left and right to make the balance shaft gear mesh with the crankshaft gear ring.

3) Check the gear timing mark, and the three mark points are required to be aligned as shown in illustration.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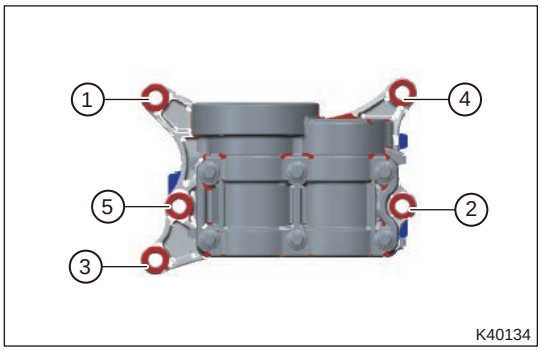
4) Press the balance shaft housing firmly and make it is closed to the lower end surface of cylinder block, install 5 fixing bolts, and tighten them to the specified torque in sequence.

Torque: 45 ± 5 N m



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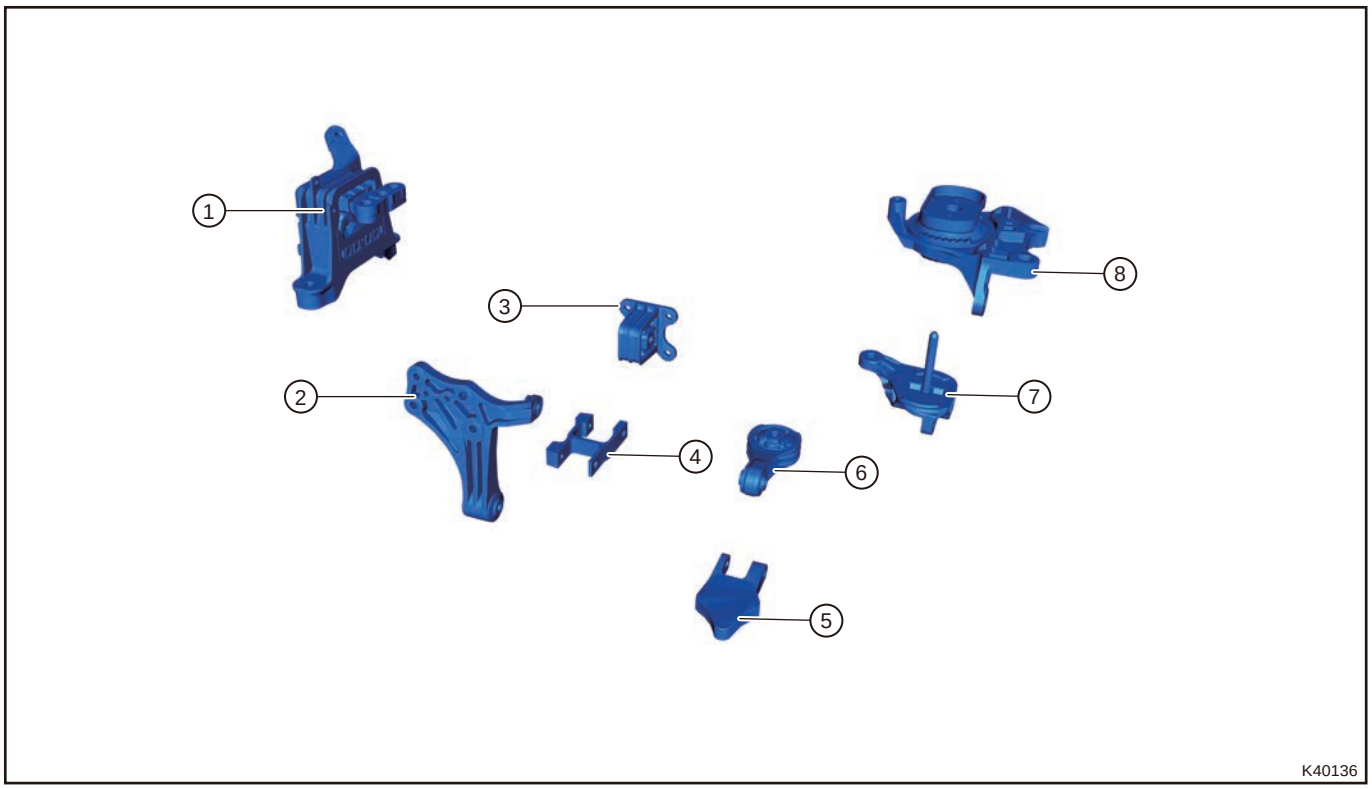
5) After the installation is complete, the balance shaft locking fixture needs to be removed.

(20) Install the knock sensor.
(21) Install the oil pump assembly.
(22) Install the oil pump chain.
(23) Install the oil pan assembly.
(24) Install the cylinder cover assembly.
(25) Install the engine timing chain.
(26) Install the A/C compressor bracket and A/C compressor.
(27) Install the oil filter.
(28) Install the water pump assembly.
(29) Install the alternator assembly.
(30) Install the timing chain cover.
(31) Install the torsion shock absorber.
(32) Install the tensioner assembly.
(33) Install the idler pulley assembly.
(34) Install the engine accessory drive belt.
(35) Install the intake manifold assembly.
(36) Install the turbocharger assembly.
(37) Install the flywheel assembly.
(38) Install the transmission assembly.
(39) Install the engine assembly to vehicle body.

5.12 Engine Mounting Assembly



1	Right Mounting Cushion Assembly	5	Rear Mounting Bracket
2	Rear Right Mounting Bracket	6	Rear Mounting Pull Rod
3	Rear Right Mounting Cushion Assembly	7	Left Mounting Bracket
4	Rear Right Mounting Connecting Rod	8	Left Mounting Cushion Assembly

■ Removal of Rear Mounting Assembly

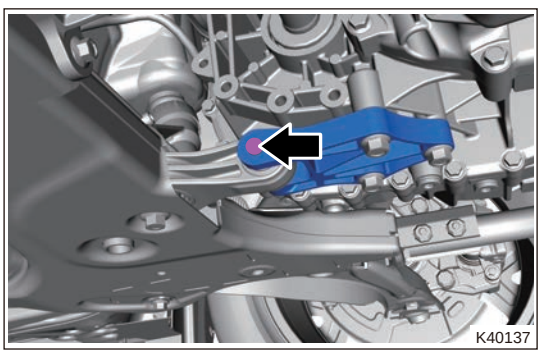
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing rear mounting assembly.**
- **Appropriate force should be applied when removing rear mounting assembly. Be careful not to operate roughly.**

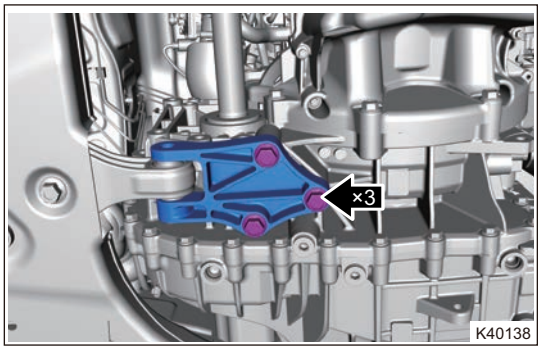
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Raise the vehicle to a proper position.

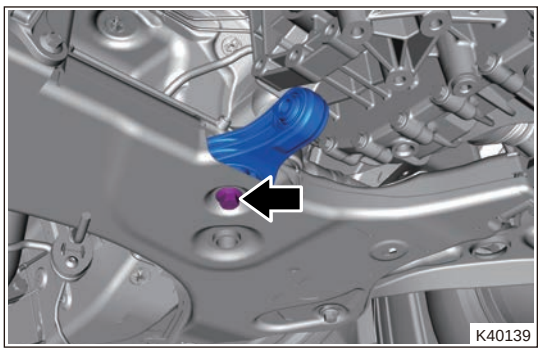
(3) Remove 1 fixing bolt between rear mounting bracket and rear mounting pull rod.



(4) Remove 3 fixing bolts between rear mounting bracket and transmission assembly and remove rear mounting bracket.



(5) Remove 1 fixing bolt between rear mounting pull rod and front sub frame and remove rear mounting pull rod.



■ Inspection

(1) Check rubber part on rear mounting pull rod for damage or deformation. Replace rear mounting pull rod as necessary.
(2) Check rear mounting bracket for deformation or cracks. Replace rear mounting bracket as necessary.

■ Installation

⚠ Caution

- **Pre-tighten 2 to 3 threads manually first during assembly of bolts, then pre-tighten and tighten it to specified torque with a tool.**

(1) Install 1 fixing bolt between rear mounting pull rod and front sub frame.

Torque: 200 ± 15 N m

(2) Install 3 fixing bolts between rear mounting bracket and transmission assembly.

Torque: 110 ± 8 N·m

(3) Install 1 fixing bolt to rear mounting pull rod and rear mounting bracket.

Torque: 200 ± 15 N m

■ Removal of Rear Right Mounting Assembly

⚠ Warning

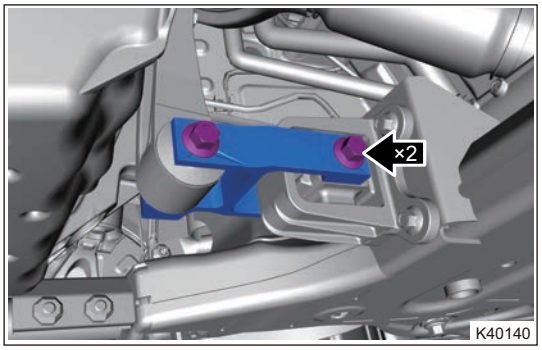
- **Be sure to wear safety equipment to prevent accidents, when removing rear right mounting assembly.**
- **Appropriate force should be applied when removing rear right mounting assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Raise the vehicle to a proper position.
(3) Remove the drive shaft.
(4) Remove the transfer case assembly.

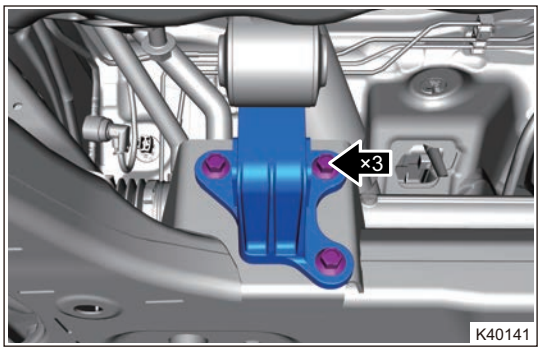
(5) Remove 1 fixing bolt between rear right mounting connecting rod and rear right mounting bracket.

(6) Remove 1 fixing bolt between rear right mounting connecting rod and rear right mounting cushion assembly.

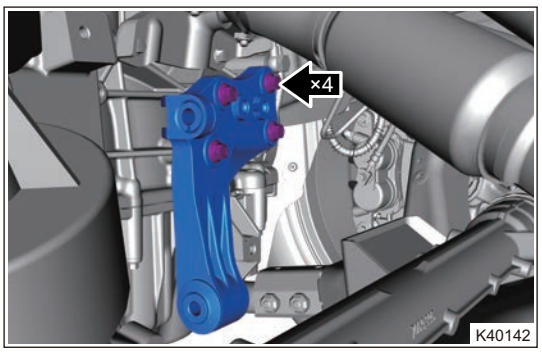
(7) Remove the rear right mounting connecting rod.



(8) Remove 3 fixing bolts between rear right mounting cushion assembly and front sub frame and remove rear right mounting cushion assembly.



(9) Remove 4 fixing bolts between rear right mounting bracket and cylinder block and remove rear right mounting bracket.



■ Inspection

(1) Check rubber part on rear right mounting pull rod for damage or deformation. Replace rear right mounting pull rod as necessary.

(2) Check rear right mounting bracket for deformation or cracks. Replace rear right mounting bracket as necessary.

■ Installation

⚠ Caution

- **Pre-tighten 2 to 3 threads manually first during assembly of bolts, then pre-tighten and tighten it to specified torque with a tool.**

(1) Install 4 fixing bolts between rear right mounting bracket and cylinder block.

Torque: 70 ± 15 N m

(2) Install 3 fixing bolts between rear right mounting cushion and front sub frame.

Torque: 70 ± 15 N·m

(3) Installation 1 fixing bolt between rear right mounting connecting rod and rear right mounting bracket.

Torque: 105 ± 10 N m

(4) Install 1 fixing bolt between rear right mounting connecting rod and rear right mounting cushion assembly.

Torque: 105 ± 10 N m

■ Removal of Left Mounting Assembly

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing left mounting assembly.**
- **Appropriate force should be applied when removing left mounting assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Remove the engine compartment trim cover assembly.

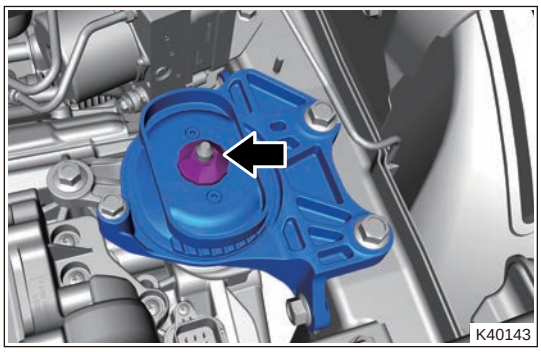
(3) Disconnect the negative battery cable.

(4) Remove the air filter assembly.

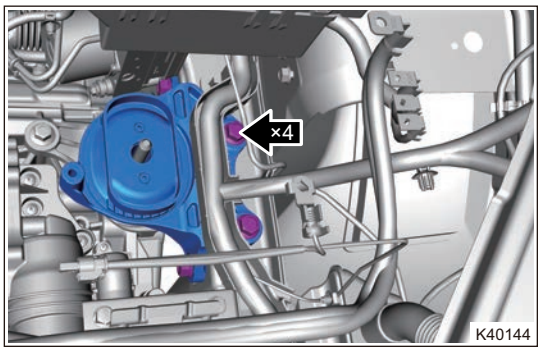
(5) Remove the battery assembly.

(6) Remove the battery tray.

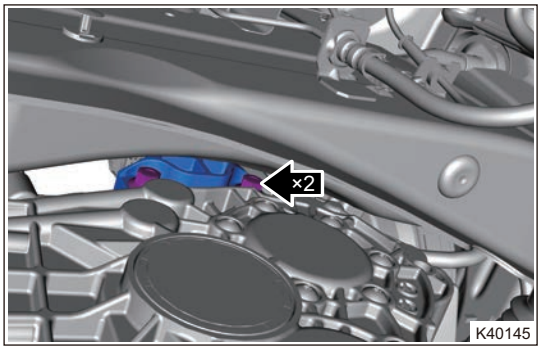
(7) Remove 1 fixing nut between left mounting cushion assembly and left mounting bracket.

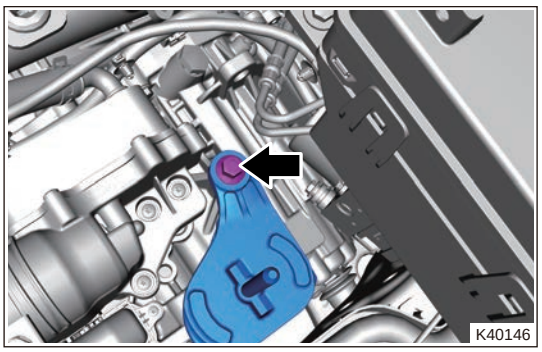


(8) Remove 4 fixing bolts between left mounting cushion assembly and body and remove left mounting cushion assembly.



(9) Remove 3 fixing bolts between left mounting bracket and transmission assembly and remove left mounting bracket.





■ Inspection

(1) Check rubber part on left mounting cushion assembly for damage or deformation. Replace left mounting cushion as necessary.
(2) Check left mounting bracket for deformation or cracks. Replace left mounting bracket as necessary.

■ Installation

⚠ Caution

- **Pre-tighten 2 to 3 threads manually first during assembly of bolts, then pre-tighten and tighten it to specified torque with a tool.**

(1) Install 3 fixing bolts between left mounting bracket and transmission assembly.

Torque: 110 ± 15 N m

(2) Install 4 fixing bolts between left mounting cushion assembly and body.

Torque: 110 ± 15 N·m

(3) Install 1 fixing nut between left mounting cushion assembly and left mounting bracket.

Torque: 110 ± 15 N m

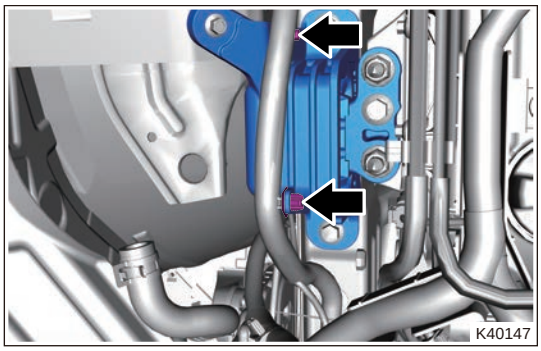
(4) Install the battery tray.
(5) Install the battery assembly.
(6) Install the air filter assembly.
(7) Install the engine compartment trim cover.

■ Removal of Right Mounting Cushion Assembly

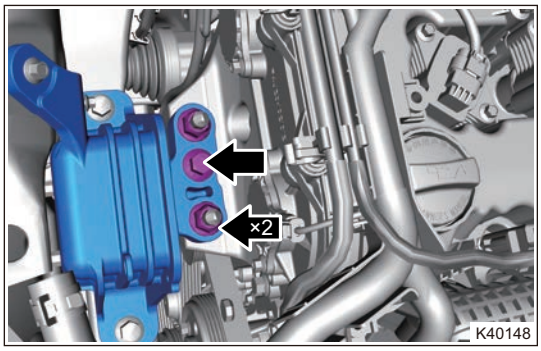
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing right mounting cushion assembly.**
- **Appropriate force should be applied when removing right mounting cushion assembly. Be careful not to operate roughly.**

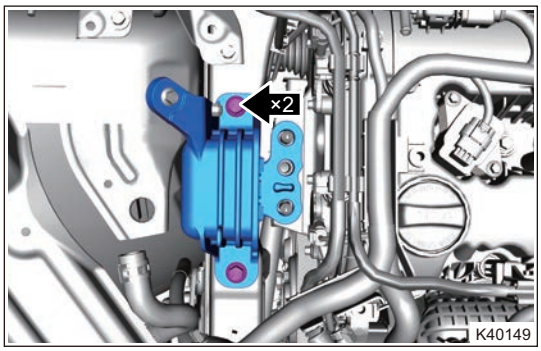
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Move the expansion tank to proper position.
(4) Disconnect the fixing clips from interior floor wire harness.

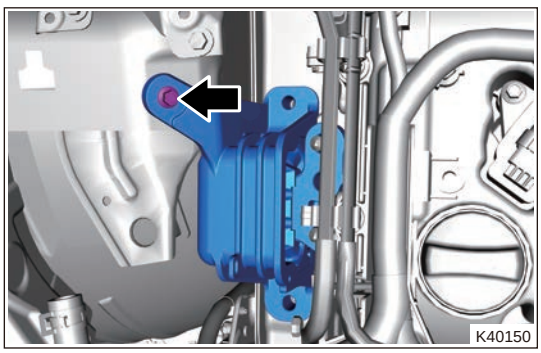


(5) Remove 2 fixing nuts and 1 fixing bolt between right mounting cushion assembly and timing chain cover assembly.



(6) Remove 3 fixing bolts between right mounting cushion assembly and right side rail.





(7) Remove the right mounting cushion assembly.

■ Inspection

(1) Check rubber part on right mounting cushion assembly for damage or deformation. Replace right mounting cushion as necessary.

■ **Installation**

⚠ Caution

- **Pre-tighten 2 to 3 threads manually first during assembly of bolts, then pre-tighten and tighten it to specified torque with a tool.**

(1) Install 3 fixing bolts between right mounting cushion assembly and right side rail.

Torque: 110 ± 15 N m

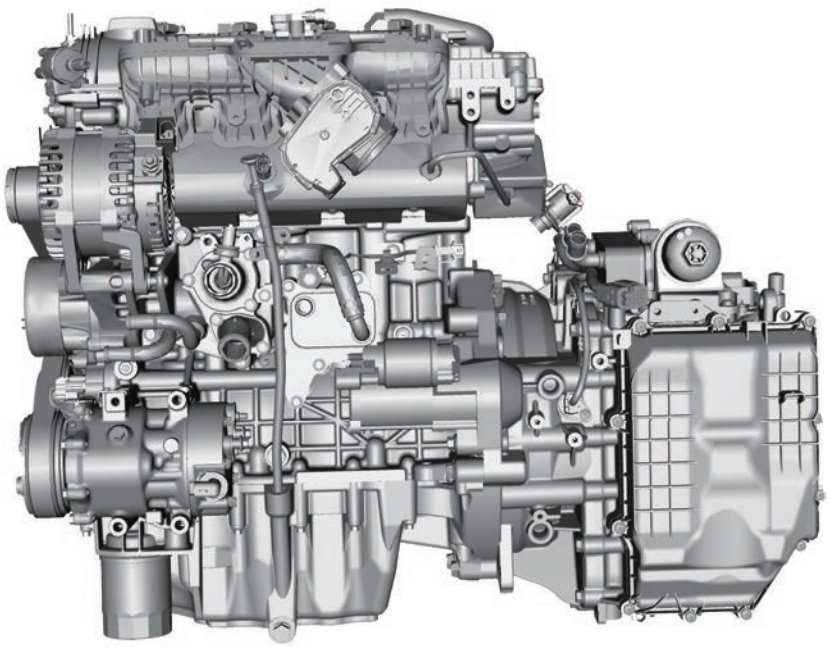
Torque: 25 ± 3 N m

(2) Install 2 fixing nuts and 1 fixing bolt on right mounting cushion assembly and timing chain cover assembly.

Torque: 110 ± 15 N·m

(3) Fix the fixing clips to interior floor wire harness.
(4) Install the expansion tank.
(5) Install the engine compartment trim cover.

5.13 Engine Assembly



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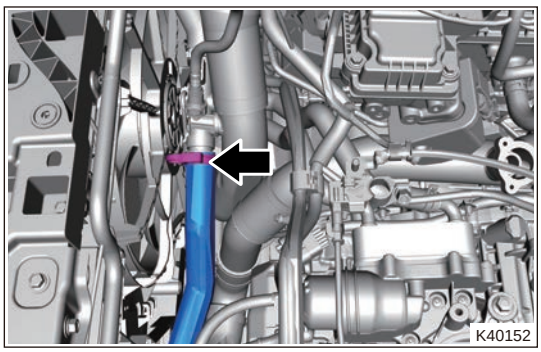
■ **Removal**

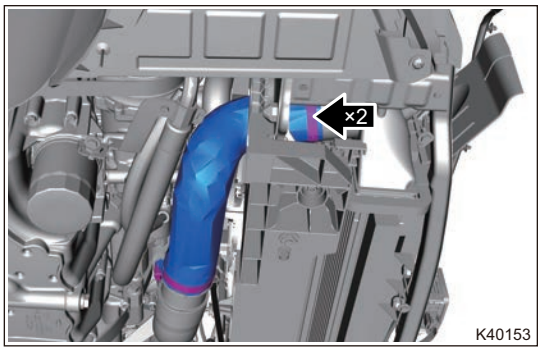
⚠ Caution

- **Remove engine and transmission as an assembly.**
- **Install protector to prevent body from being scratched.**
- **Plug inlet port of intake pipe to prevent foreign matter from entering after removing intake system components. Or the foreign matter will block cylinder intake passage when starting to seriously damage the engine.**

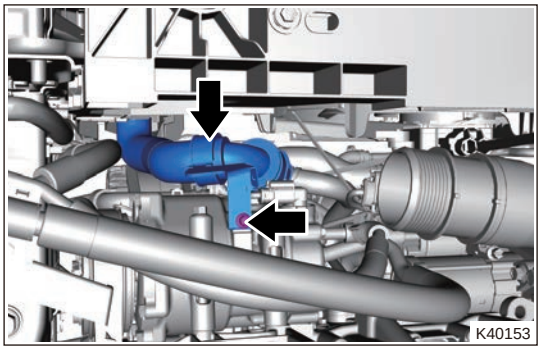
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the engine trim cover assembly.
(4) Disconnect the negative battery cable.
(5) Drain the coolant.
(6) Recover/Drain the refrigerant.
(7) Drain the transmission oil.
(8) Remove the air filter assembly.
(9) Remove the intake hose assembly.
(10) Remove the battery assembly.
(11) Remove the battery tray.
(12) Remove the engine compartment lower protector assembly.
(13) Remove the intercooler outlet pipe assembly Ⅱ.
(14) Remove the intercooler intake pipe assembly Ⅲ.
(15) Remove the front wheel tire.
(16) Remove the left/right side rail assembly.
(17) Remove the front left drive shaft assembly.
(18) Remove the front right drive shaft assembly.
(19) Remove the transfer case assembly.
(20) Remove the precatalytic converter assembly.
(21) Remove the front sub frame assembly.
(22) Loosen elastic clamps and disconnect engine inlet pipe connection.



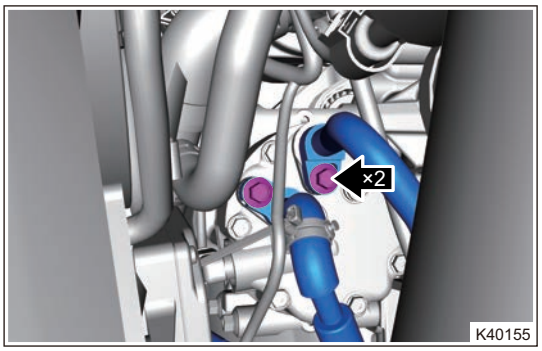
(23) Loosen 2 elastic clamps and remove the intercooler outlet pipe assembly Ⅰ.



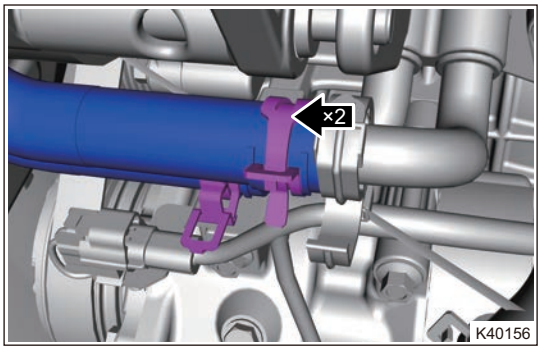
(24) Loosen elastic clamps, remove 1 bolt from fixing bracket and disconnect engine outlet pipe connection.



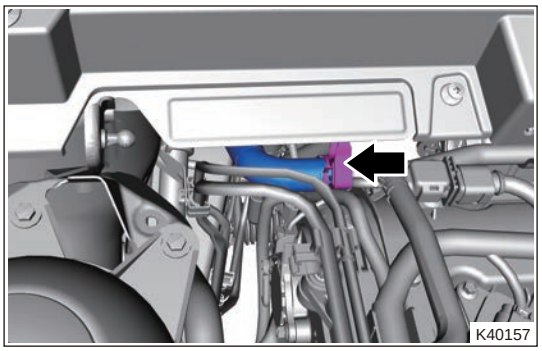
(25) Remove 2 fixing bolts from A/C pipes, disconnect the compressor.



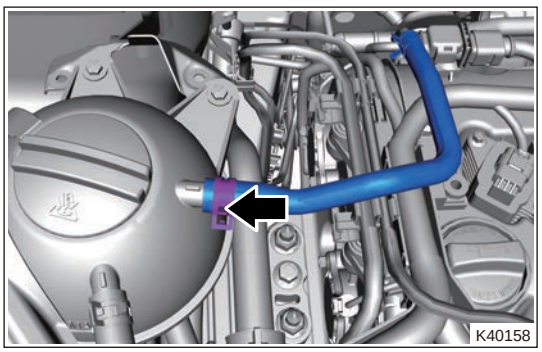
(26) Loosen 2 elastic clamps and disconnect the expansion tank inlet pipe.



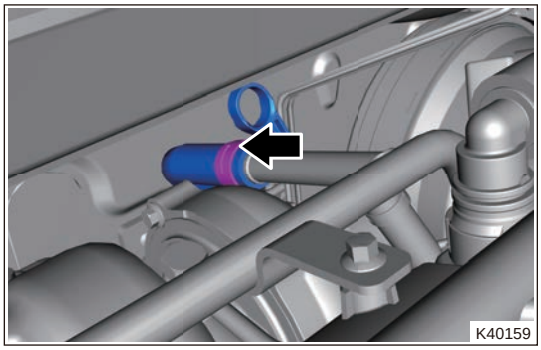
(27) Loosen elastic clamp and disconnect the heater inlet pipe assembly Ⅱ.



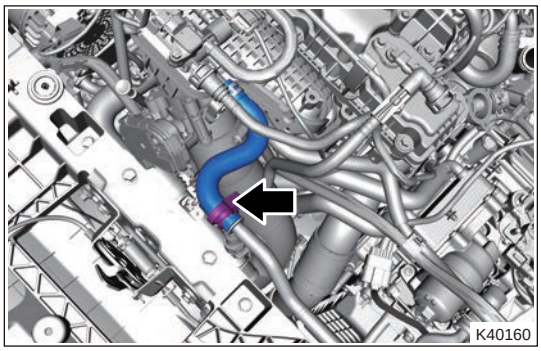
(28) Loosen elastic clamps and disconnect engine discharge pipe.



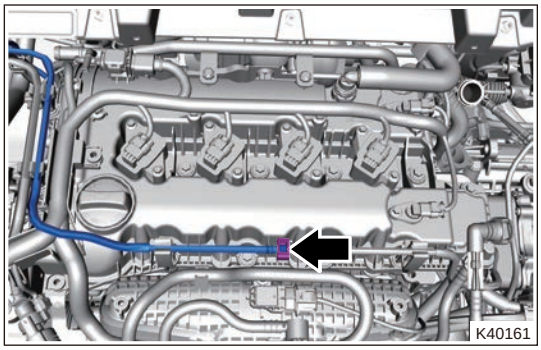
(29) Loosen elastic clamp and disconnect the rear heater inlet and outlet pipe assembly Ⅱ (if equipped).



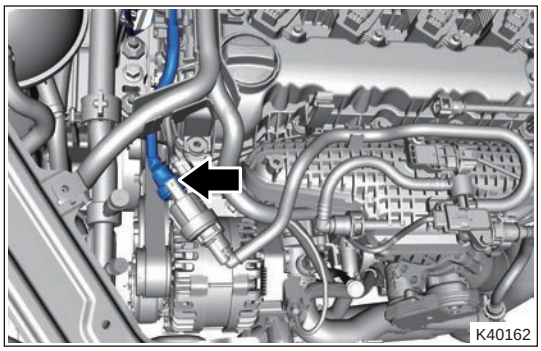
(30) Loosen elastic clamps and disconnect vacuum pipe.



(31) Disconnect the oil inlet pipe Ⅰ.

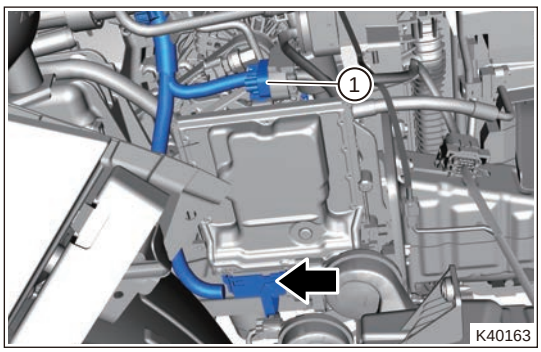


(32) Disconnect the fuel vapor pipe Ⅲ.

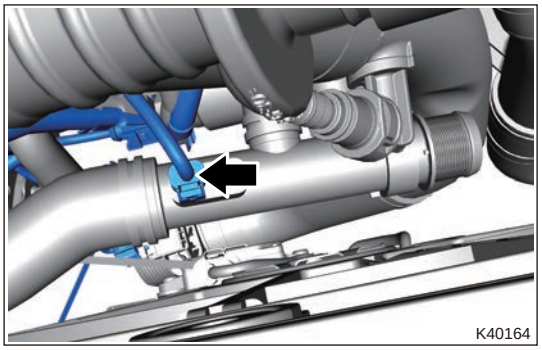


(33) Disconnect the connector (1) between engine electronic injection wire harness and interior floor wire harness.

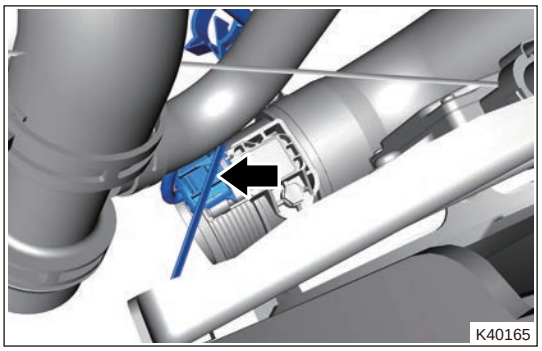
(34) Disconnect the ECM connector.



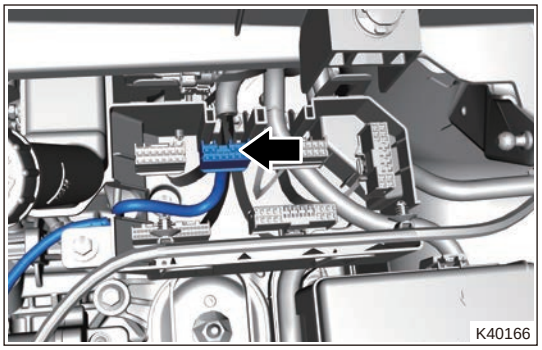
(35) Disconnect the coolant temperature sensor connector.



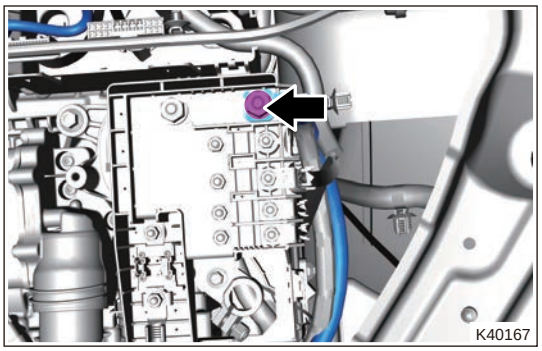
(36) Disconnect the boost pressure sensor connector.



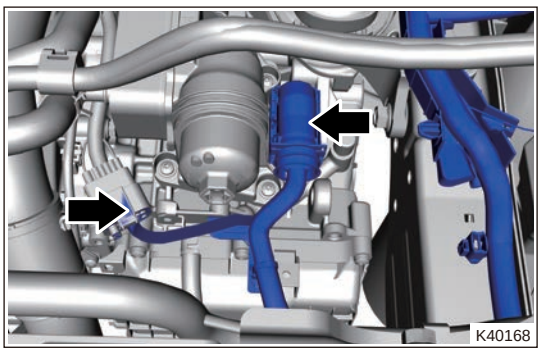
(37) Disconnect connector between engine electronic injection wire harness and engine compartment fuse and relay box.



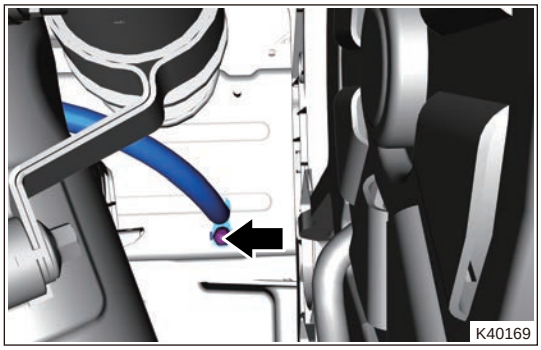
(38) Remove fixing nuts from positive battery wire harness and positive battery wire harness.



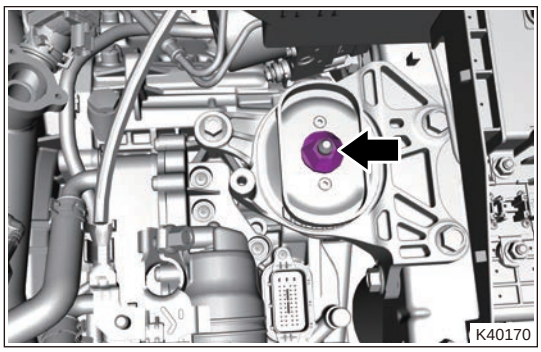
(39) Disconnect the transmission assembly connectors connector.



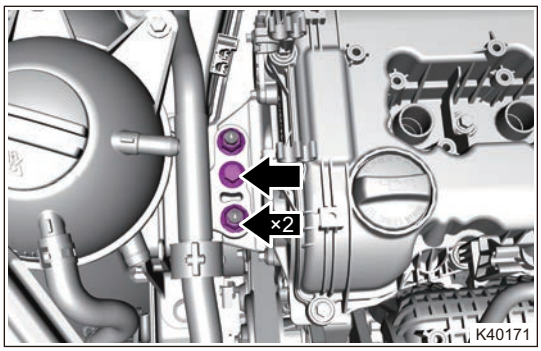
(40) Remove fixing nuts from ground wire harness and move away the ground wire.



(41) Remove 1 fixing nut between left mounting cushion assembly.



(42) Remove 2 fixing nuts and 1 fixing bolt from right mounting cushion assembly.

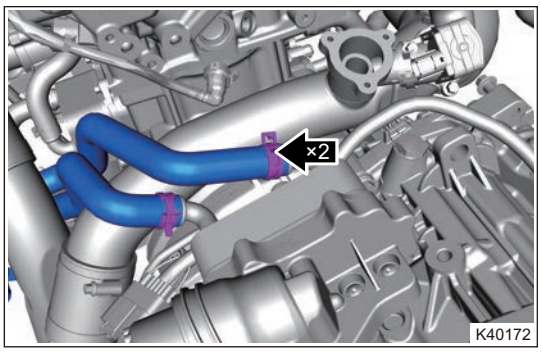


(43) Check that engine assembly is separated with external components.

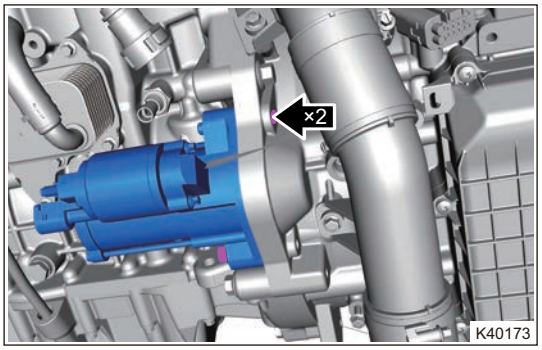
(44) Remove engine and transmission assembly.

(45) Remove engine electronic injection wire harness from engine assembly.

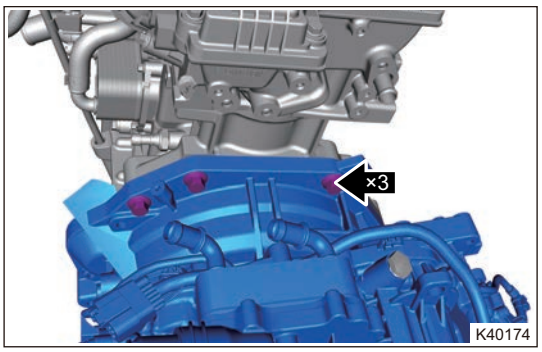
(46) Loosen 2 elastic clamps and disconnect engine inlet pipe assembly - rear connections.



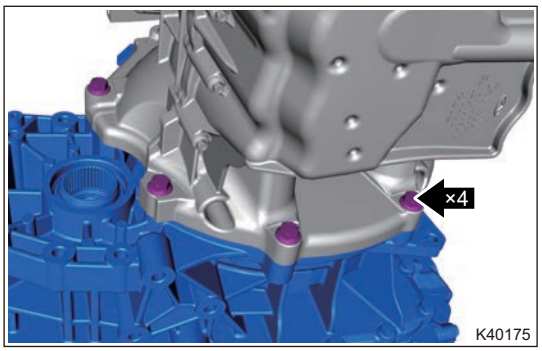
(47) Remove 2 fixing bolts and starter assembly.



(48) Remove 3 fixing bolts from upper part of transmission assembly.



(49) Remove 4 fixing bolts from lower part of transmission assembly.



(50) Separate transmission assembly from engine assembly.

(51) Install engine assembly to engine service platform.

■ **Installation**

(1) Install the transmission assembly.
(2) Install engine electronic injection wire harness to engine.
(3) Install 2 fixing nuts and 1 fixing bolt to right mounting cushion assembly.
(4) Install 1 fixing nut on left mounting cushion assembly.
(5) Fix the connecting clip between interior floor wire harness and right mounting cushion assembly.
(6) Connect transmission assembly connectors.
(7) Connect the engine ground wire harness and tighten fixing nut.
(8) Install and tighten the fixing nut between engine compartment fuse and relay box positive cable and engine compartment fuse box.
(9) Connect the ECU connector.
(10) Connect connectors between interior floor wire harness and engine electronic injection wire harness.
(11) Connect connector between engine electronic injection wire harness and engine compartment fuse and relay box.
(12) Connect the coolant temperature sensor.
(13) Connect boost pressure sensor.
(14) Connect fuel vapor pipe III.
(15) Connect oil inlet pipe Ⅰ.
(16) Connect vacuum tube and install elastic clamps.
(17) Connect rear heater inlet and outlet pipe assembly Ⅱ and install elastic clamp.
(18) Connect engine outlet pipe and install elastic clamp.
(19) Connect heater inlet pipe assembly Ⅱ and install elastic clamp.
(20) Connect expansion tank inlet pipe assembly and install elastic clamp.
(21) Connect compressor A/C line and tighten fixing bolts.
(22) Connect engine inlet pipe and install elastic clamp.
(23) Install the front sub frame assembly.
(24) Install the precatalytic converter assembly.
(25) Install the transfer case assembly.
(26) Install the front left drive shaft assembly.
(27) Install the front right drive shaft assembly.
(28) Install the left/right side rail assembly.
(29) Install the battery tray and battery assembly.
(30) Install the intake hose assembly.
(31) Install the air filter assembly.
(32) Add transmission oil to specified position.
(33) Add coolant to specified value.
(34) Connect the negative battery cable.
(35) Add refrigerant to specified value.
(36) Install the engine trim cover assembly.
(37) Install the engine compartment trim cover assembly.
(38) Install the engine compartment lower protector assembly.

4.3 INTAKE SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) Wasted air filter element should be handled by the specialized department according to local laws and regulations. Never discard it at will.

(2) Check for foreign matter in air filter and hose when installing. Avoid inhaling foreign matter after engine running, causing damage to the components.

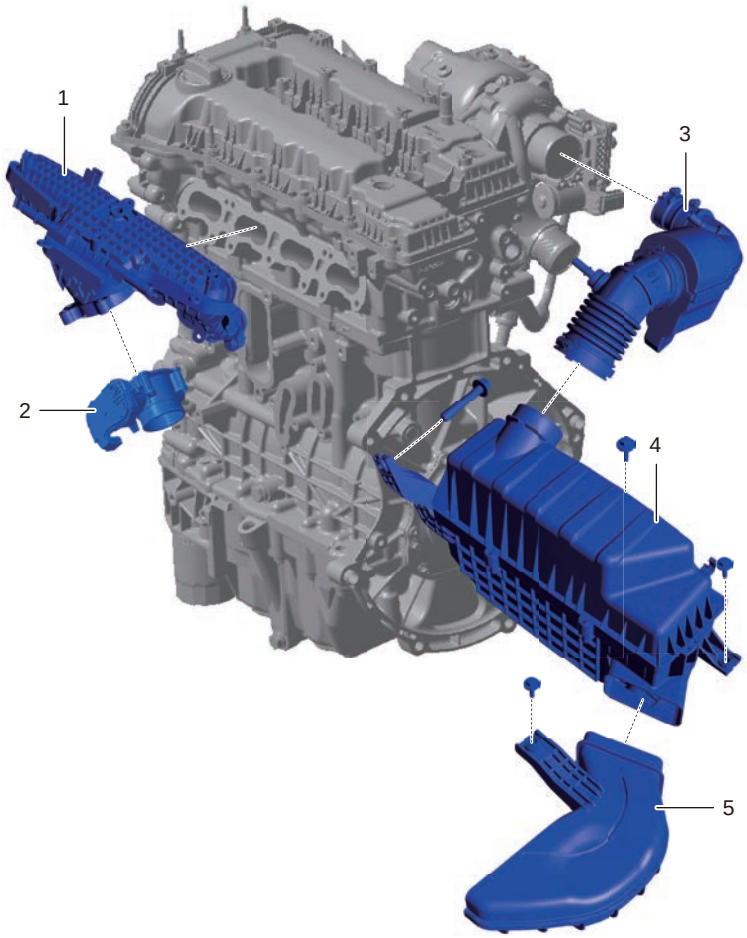
(3) After removing electronic throttle, block intake manifold intake port with suitable blocking pieces to prevent foreign matter from entering, causing damage to the components.

2 System Overview

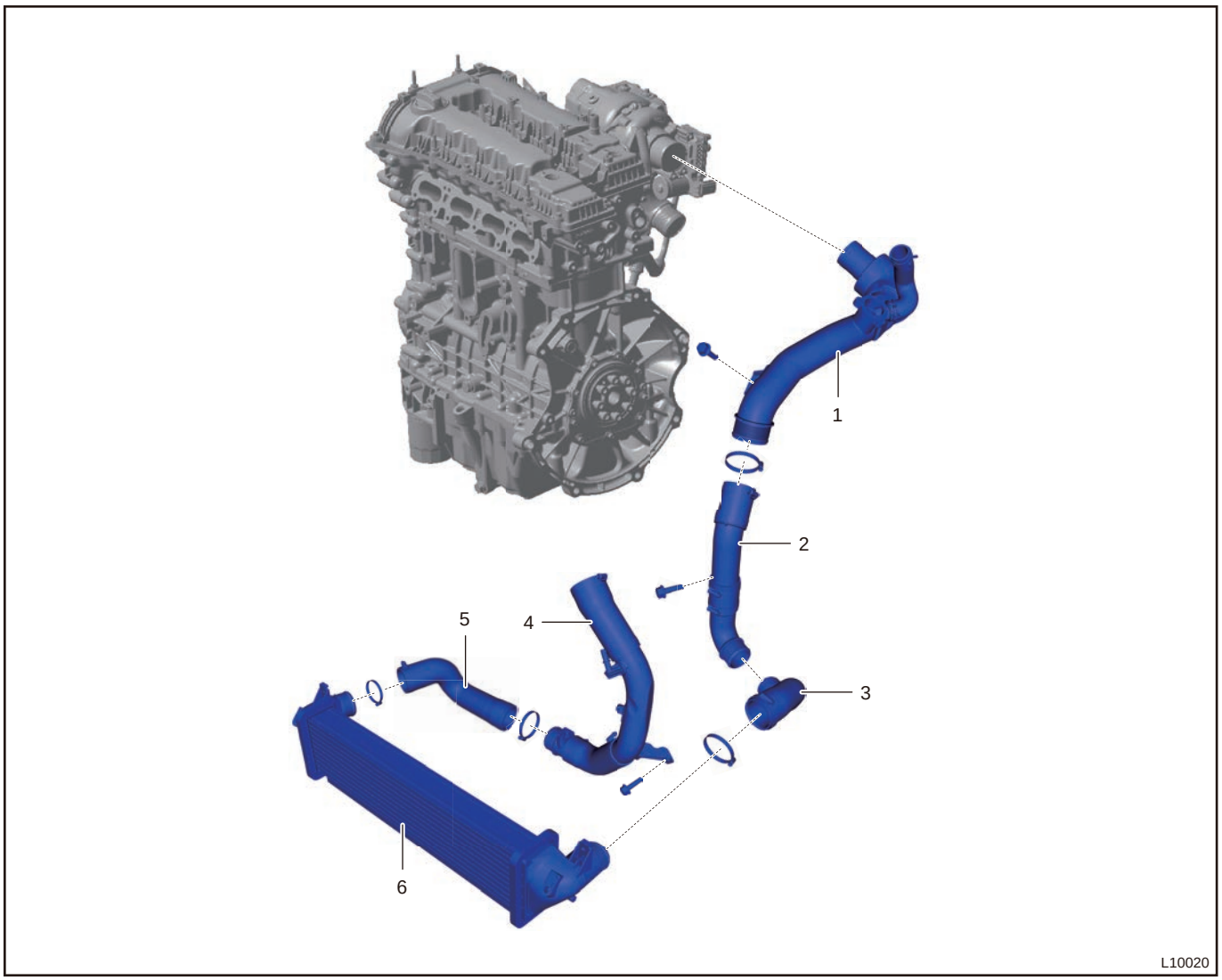
2.1 System Description

Intake system uses air filter to remove particulates and dust in the air, the air is pressurized by the turbocharger and cooled by the intercooler, then flows into the intake manifold assembly through the electronic throttle assembly, and the cooled fresh air is evenly delivered to each cylinder by the intake manifold to cooperate with the engine.

2.2 System Components Diagram

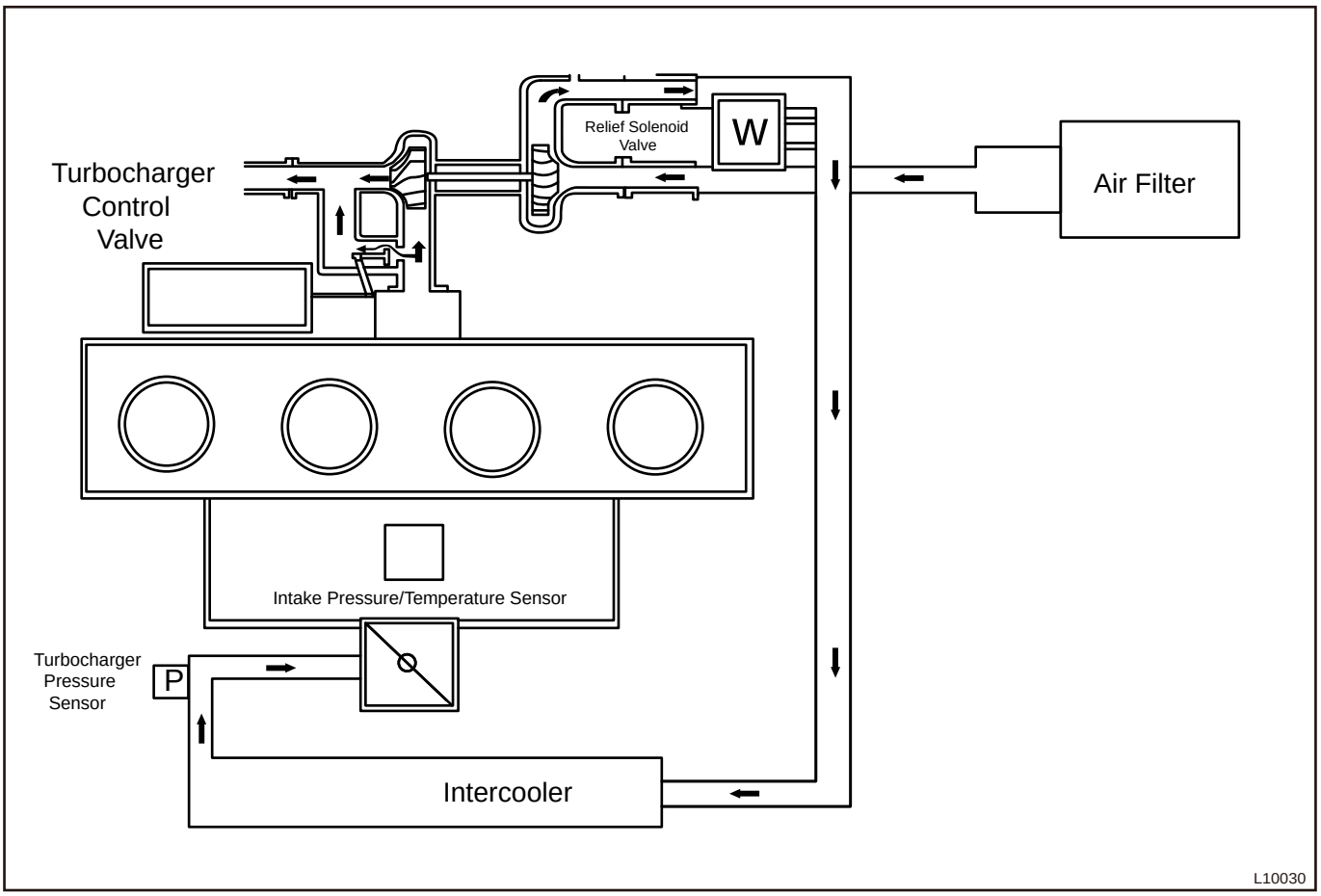


1	Intake Manifold Assembly	4	Air Filter Assembly
2	Electric Throttle Assembly	5	Air Direct Pipe Assembly
3	Intake Hose Assembly		



1	Intercooler Inlet Pipe Ⅰ Assembly	4	Intercooler Outlet Pipe Ⅱ
2	Intercooler Inlet Pipe Ⅱ Assembly	5	Intercooler Outlet Pipe Ⅰ
3	Intercooler Inlet Pipe Ⅲ	6	Intercooler Assembly

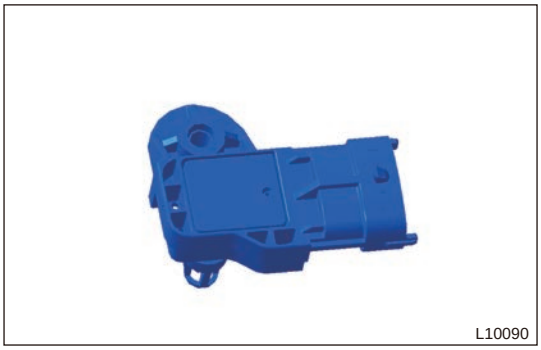
2.3 System Schematic Diagram



2.4 System Components Description

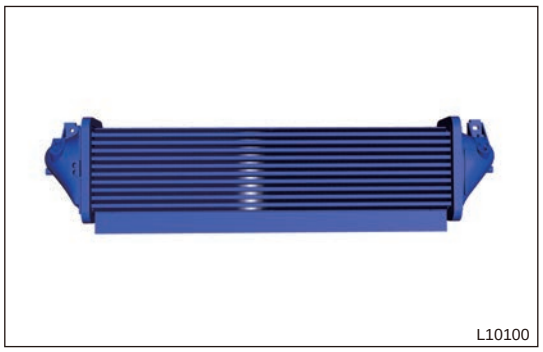
■ Intake Pressure/Temperature Sensor

Intake pressure sensor: monitor absolute pressure changes of the intake manifold, send reference signal to ECU for calculating the duration of fuel injection.
Intake temperature sensor: monitor intake temperature, provide it to ECU as the basis for calculating air density.



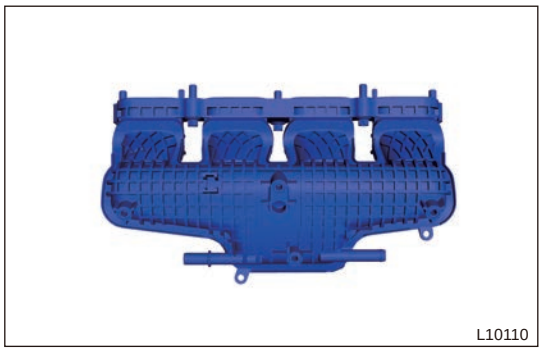
■ Intercooler

Its function is to reduce the high temperature air temperature after supercharging, so as to reduce the heat load of engine, increase the intake air volume, and then increase the engine power; For the engine, intercooler is an important component of supercharging system.


L10100

■ Intake Manifold Assembly

Distribute the fresh air cooled by intercooler to each cylinder.


L10110

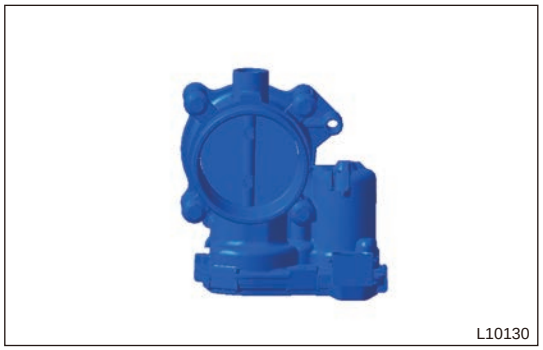
■ Air Filter Assembly

The air filter is mainly used to remove particulate impurities in the air.


L10120

■ Electronic Throttle

It consist of four parts: drive module, train module, executive module and feedback module, and all components are integrated into the same throttle valve housing. Throttle feedback module uses two redundant structures. When malfunction occurs, throttle valve plate will stop at the limp home position (above mechanical bottom dead center) determined by mechanical way. Electronic throttle performs control only by corresponding electronic control unit or electronic test circuit. In principle, it is necessary to ensure that the throttle valve plate does not operate dynamically to the mechanical dead center.

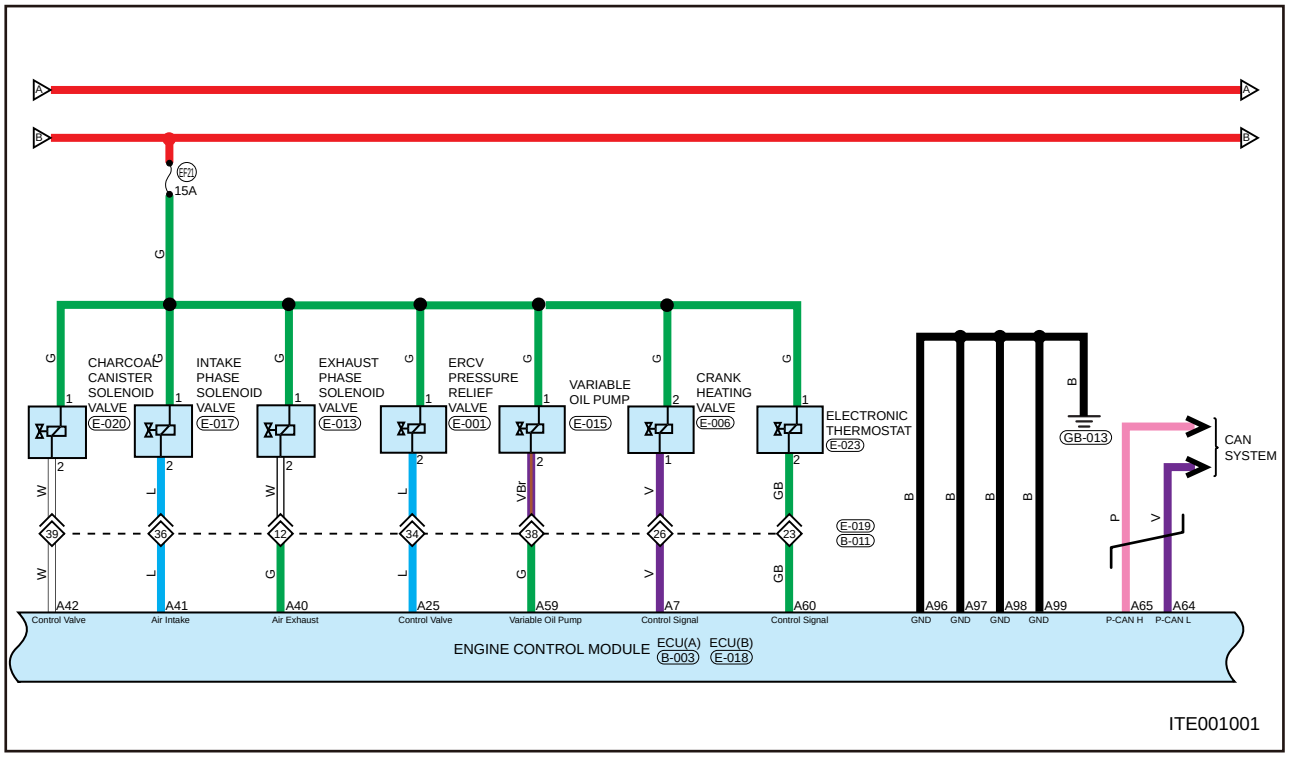

L10130

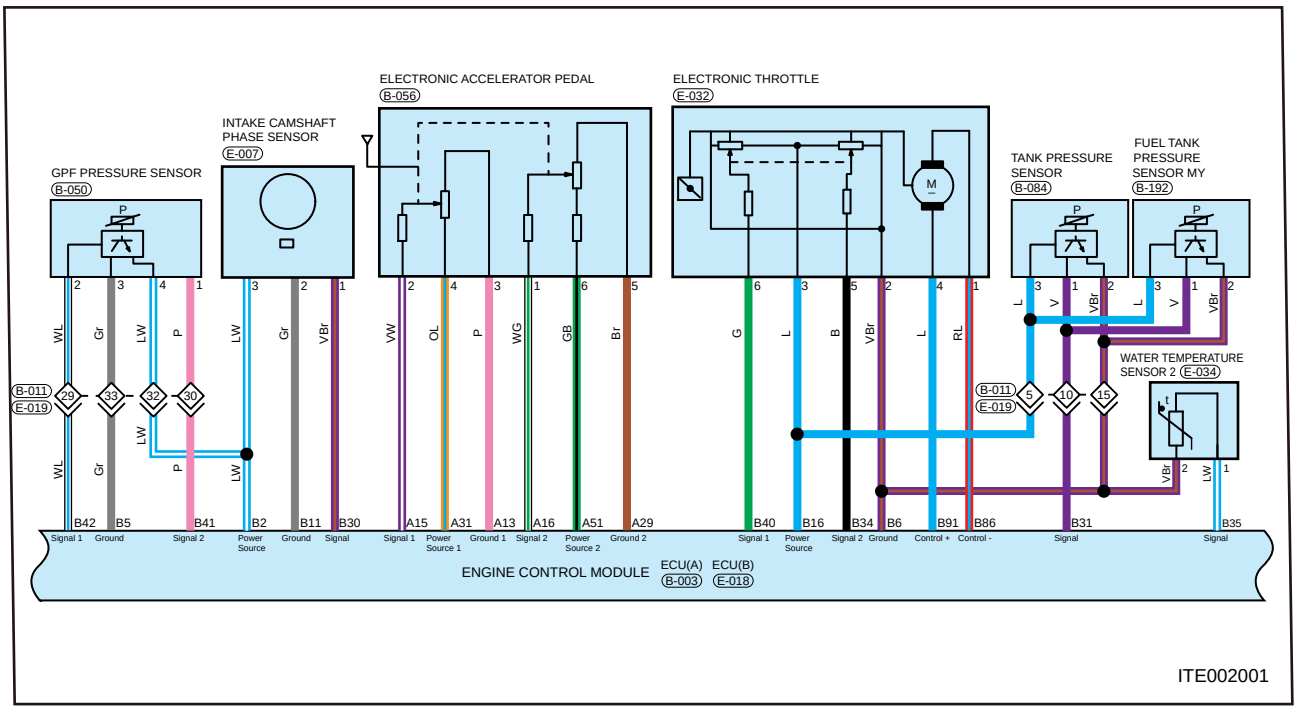
■ Electronic Accelerator Pedal

There are two identical potentiometer type sensors in the electronic accelerator pedal, which provide the driving demand signal of driver to the ECU. This process is exactly the same as the current mechanical pedal in operation to adapt to the driver’ s driving habits for many years. Two identical sensors provide accelerator signals to ECU respectively, thus ensuring the safety and reliability of this system.

3 System Circuit Diagram

3.1 Circuit Diagram





4 Diagnosis & Testing

4.1 Problem Symptoms Table

Hint:

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

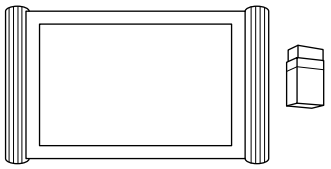
Intake System

Symptom	Possible Cause
Engine idles roughly	Electronic throttle assembly (dirty)
	Intake manifold assembly (broken, leaked)
	Activated charcoal canister solenoid valve (remains on)
	Intake pressure sensor
	Electronic throttle assembly gasket (damaged)
	Fuel rail injector assembly (installed incorrectly)

5 ON-VEHICLE SERVICE

5.1 Tools

■ Special Tool

Tool Name	Tool Drawing
Diagnostic Tester	 S00001

5.2 Air Filter Element

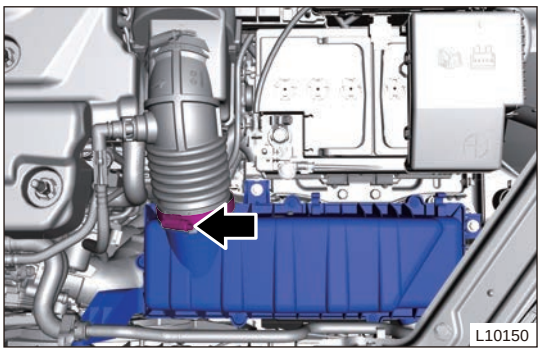
■ Removal

⚠ Warning

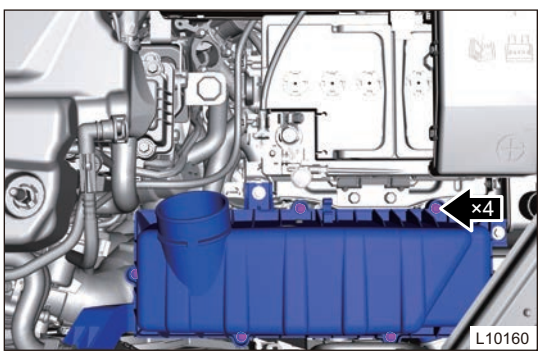
- **Be sure to wear safety equipment to prevent accidents, when removing air filter element.**
- **Appropriate force should be applied when removing air filter element. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the negative battery cable.

(4) Loosen worm clamp and disconnect intake hose.

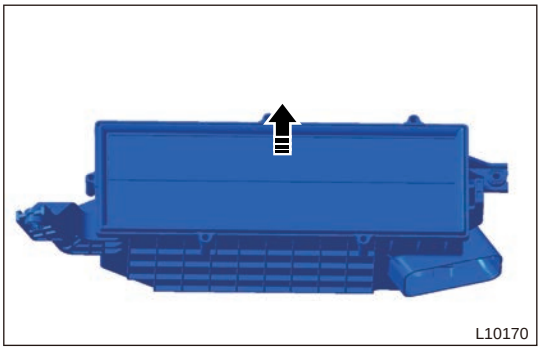

L10150

(5) Remove 5 fixing screws (cross screwdriver) between air filter upper housing and lower housing, and remove upper housing carefully.



L10160

(6) Remove the air filter element in the direction of arrow.



■ **Inspection**

(1) Check if air filter is dirty, if it is dirty severely, it is required to replace new air filter.

■ **Installation**

⚠ Caution

- **Clean the air filter upper housing and lower housing.**
- **Wasted air filter element should be handled by the specialized department according to local laws and regulations. Never discard it at will.**

(1) Install 5 fixing screws between air filter upper housing and lower housing.
Torque: 1.3 ± 0.2 N·m

(2) Connect intake hose, and tighten worm clamp.
Torque: 4 ± 0.5 N·m

(3) Install the engine compartment trim cover assembly.

5.3 Air Filter Assembly

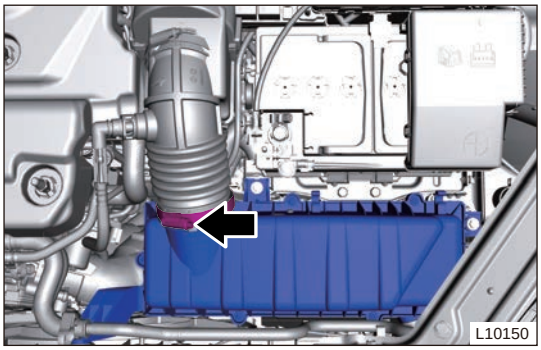
■ **Removal**

⚠ Caution

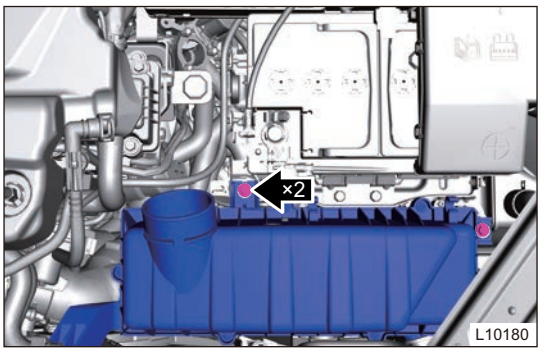
- **Be sure to wear safety equipment to prevent accidents, when removing air filter assembly.**
- **Appropriate force should be applied when removing air filter assembly. Be careful not to operate roughly.**

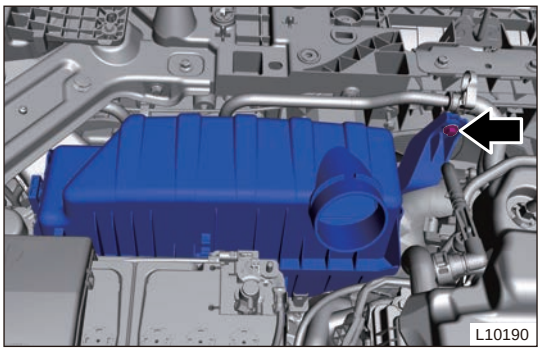
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Loosen worm clamp and disconnect intake hose.



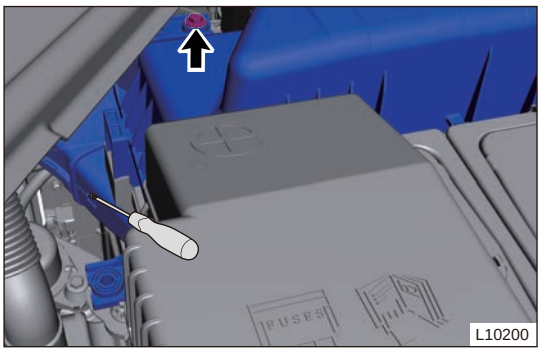
(5) Remove 3 fixing bolts from air filter assembly (10# socket wrench).





(6) Using a flat tip screwdriver, separate air direct pipe and air filter assembly carefully. Remove the air filter assembly carefully.

Hint:
In order to separate the air direct pipe from air filter assembly more conveniently and effectively, it is recommended to remove the drainage pipe on the wiper washer reservoir first to reserve enough space, and then remove one fixing bolt of the air direct pipe. At this time, it will be easier to separate and remove the air direct pipe from air filter assembly.



■ Installation

⚠ Caution

- **Check for foreign matter in air filter and hose when installing. Avoid inhaling foreign matter after engine running, causing damage to the components.**

(1) Insert air direct pipe into air filter assembly, and install 3 fixing bolts to air filter assembly.
Torque: 7 ± 1 N·m.

(2) Connect intake hose, and tighten worm clamp.
Torque: 4 ± 0.5 N·m

(3) Install the engine compartment trim cover assembly.

5.4 Air Direct Pipe

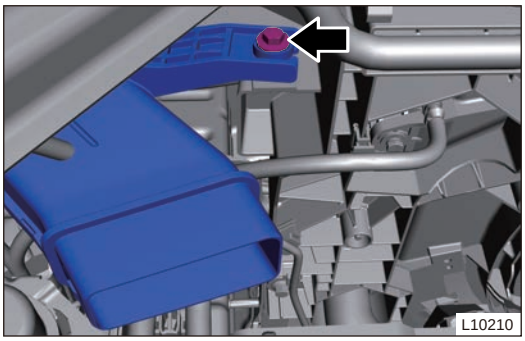
■ Removal

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing air direct pipe assembly.**
- **Appropriate force should be applied, when removing air direct pipe assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.

(5) Remove 1 fixing bolt from air direct pipe. Remove the air direct pipe assembly carefully.



■ Installation

⚠ Caution

- **Check for foreign matter in air filter and related lines when installing. Avoid inhaling foreign matter after engine running, causing damage to the components.**

(1) Insert air direct pipe into air filter assembly, and install 3 fixing bolts to air filter assembly.
Torque: 7 ± 1 N·m.

(2) Install 1 fixing bolt to air direct pipe.
Torque: 7 ± 1 N·m.

(3) Connect intake hose, and tighten worm clamp.
Torque: 4 ± 0.5 N·m

(4) Install the engine compartment trim cover assembly.

5.5 Intake Hose Assembly

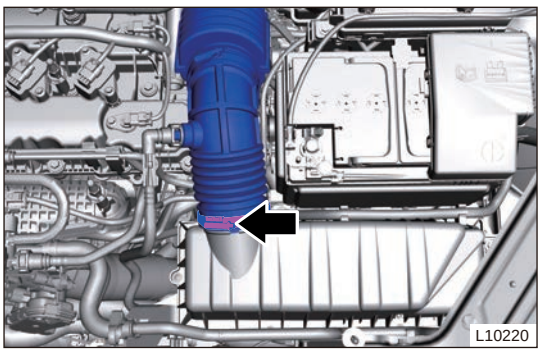
■ Removal

⚠ Warning

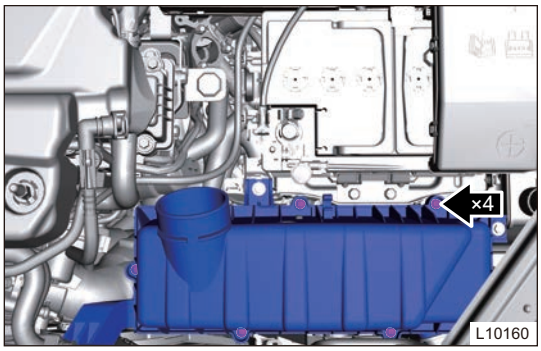
- **Be sure to wear safety equipment to prevent accidents, when removing intake hose assembly.**
- **Appropriate force should be applied, when removing intake hose assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched during removal of intake hose assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.

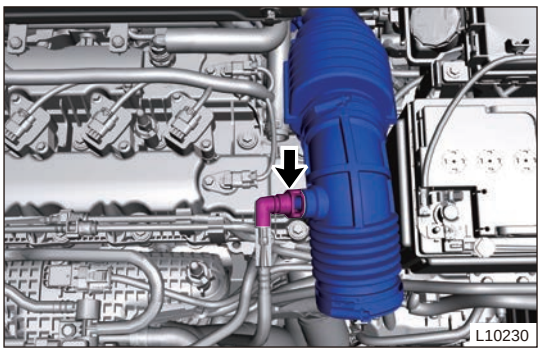
(3) Loosen worm clamp and disconnect the connection between intake hose and air filter assembly.



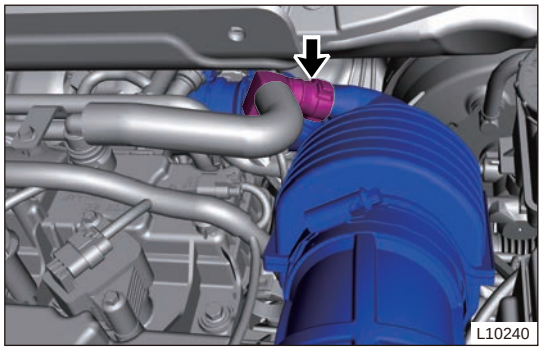
(4) Remove 5 fixing bolts from air filter upper housing and remove the air filter upper housing.



(5) Disconnect the connection between canister solenoid valve outlet pipe and intake hose assembly.



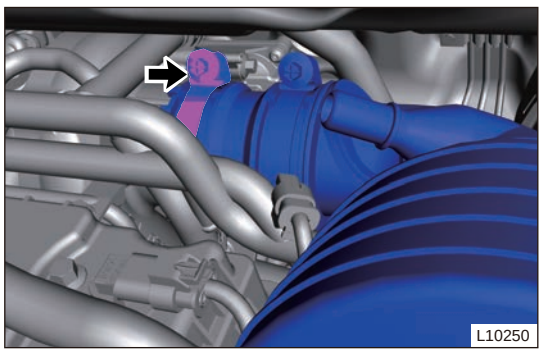
(6) Disconnect the connection between crankcase ventilation hose and intake hose assembly.



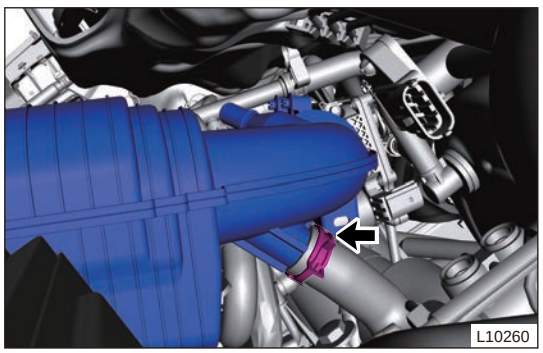
⚠ Caution

- **The crankshaft ventilation system line is a non-reusable part, which must be destroyed before being removed and cannot be reused.**

(7) Loosen worm clamp and disconnect the connection between intake hose assembly and turbocharger.



(8) Loosen elastic clamp (slip-joint plier) and disconnect the connection between intercooler inlet pipe to hose and intake hose assembly.



(9) Remove the intake hose assembly carefully.

■ Installation

(1) Connect the intercooler inlet pipe to hose and intake hose assembly. Use a tool (slip-joint plier) to install and return the elastic clamp to its original position.

(2) Install the intake hose outlet to the turbocharger inlet. Tighten the worm clamp.

Torque: 4 ± 0.5 N·m

(3) Insert the lower bracket of intake hose assembly muffler into the rubber cushion.

(4) Install the air filter upper housing, and fix 5 screws

Torque: 1.3 ± 0.2 N·m

(5) Install the intake hose inlet to the air filter assembly. Tighten the worm clamp.

Torque: 4 ± 0.5 N·m

(6) Connect the canister solenoid valve outlet pipe and crankcase ventilation hose to the intake hose separately, and lock the quick connector buckle after they are connected.

⚠ Caution

- **When pipe is connected using quick connector, pay attention to the fitting size and direction of the connector. During assembly, install the connector into place along the axial direction of quick connector until it is clip into mechanically and a "click" sound is heard. In order to check if the installation is in good condition, pull it forcibly in reverse direction and make sure it does not fall off.**

(7) Install the engine compartment trim cover assembly.

5.6 Intake Hose Bracket

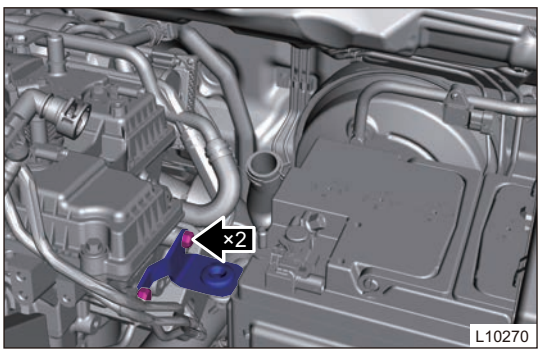
■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing intake hose bracket assembly.**
- **Appropriate force should be applied, when removing intake hose bracket assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the intake hose assembly.

(4) Remove 2 bolts from intake hose bracket.



(5) Remove the intake hose bracket assembly carefully.

■ Installation

(1) Align intake hose bracket and mounting hole of engine bolt, and secure 2 fixing bolts.

Torque: 9 ± 1.5 N·m

(2) Install the intake hose assembly.
(3) Install the engine compartment trim cover assembly.

5.7 Electronic Throttle

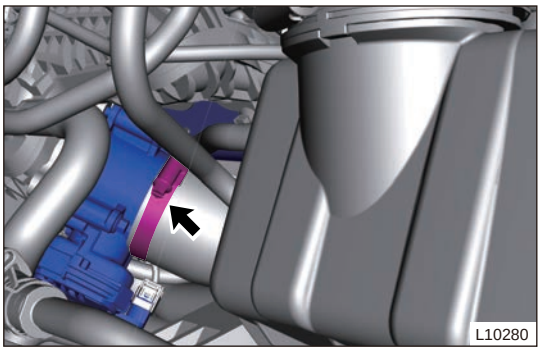
■ Removal

⚠ Warning

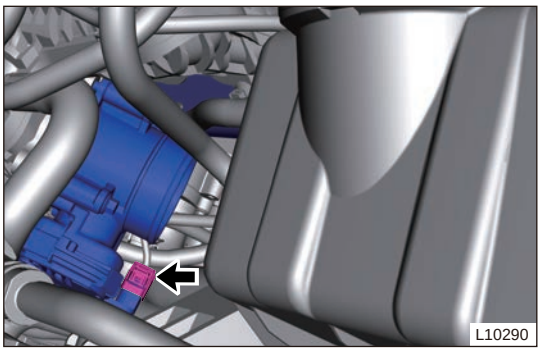
- **Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing electronic throttle.**
- **Appropriate force should be applied when removing electronic throttle. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

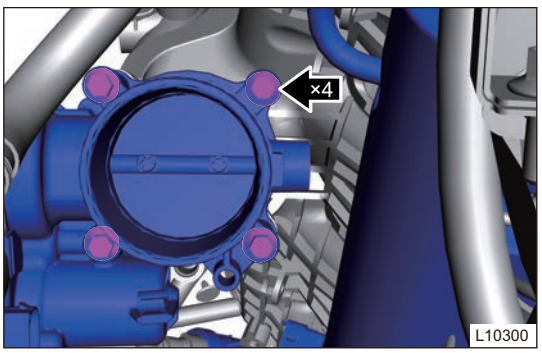
(4) Loosen worm clamp and disconnect the connection between electronic throttle and intercooler outlet pipe Ⅱ.



(5) Disconnect the electronic throttle connector.

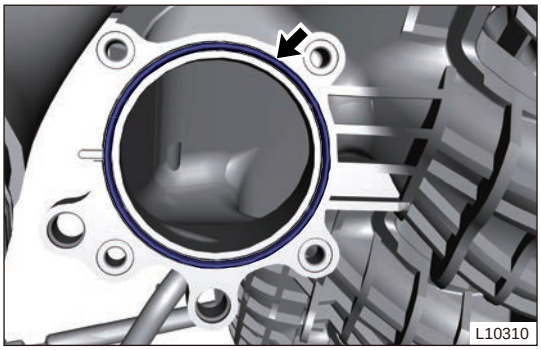


(6) Remove 4 fixing bolts from electronic throttle (8#-socket wrench).



(7) Remove the electronic throttle assembly.

(8) Remove electronic throttle gasket from intake manifold.



⚠ Caution

- **After removing electronic throttle, block intake manifold intake port with suitable blocking pieces to prevent foreign matter from entering, causing damage to the components.**

■ Throttle Cleaning

(1) Cleaning Tool

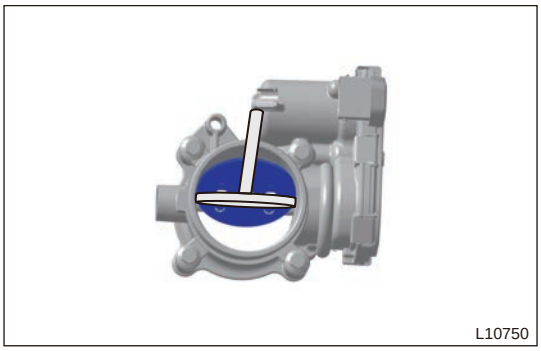
- Thin stick: Used to support throttle valve plate for cleaning the carbon deposited on contact wall between valve plate and throttle. Please use plastic, wooden or bamboo thin stick. Do not use metal thin stick to avoid scratching or deforming the valve plate.
- Clean cloth or paper towel.

■ Cleaning Process

(1) Remove electronic throttle assembly, and make the valve plate face upward in free condition. Avoid cleaner flowing into electronic element through valve plate shaft, resulting in functional failure.

(2) Apply appropriate amount of cleaner to the inner wall of throttle valve body, and wipe off the carbon with clean cloth.

(3) Support the throttle valve plate with a thin stick, and clean the carbon on valve plate and throttle valve body inner wall.



(4) Turn over the throttle 90°, and clean with the same procedures as above. Repeat several times until it is clean.

(5) Push the valve plate by hand, and check if it rotates smoothly. If it is stuck, clean again according to the cleaning procedures.

(6) After cleaning, wipe off the cleaner in throttle valve body with absorbent paper.

⚠ Warning

- **Cleaner is a kind of flammable and corrosive fluid. Follow safety cautions to prevent accidents, and avoid skin contacting with cleaner.**
- **Pay attention to that the amount of cleaner should not be too much, so as to overflows into sensor and motor, resulting in functional failure.**

■ **Check Electronic Throttle**

(1) Judgment methods for specific mechanical damage

- Valve plate should be in default position with power off and can rotate smoothly when flipping it by hand. If catching occurs, it indicates that internal components may be damaged.

(2) Perform the simple measurement for throttle internal sensor in following steps:

Step	Operation	Test Value	Test Result	Subsequent Step
1	Apply 5V direct current to terminal 3 (+) and 2 (-), close valve plate to full close manually, and measure voltages between terminals 5 and 2, and between terminals 6 and 2 with voltage band of multimeter. Voltage between terminals 6 and 2 is within 0.25 V and 0.75 V, voltage between terminals 5 and 2 is within 4.25 V and 4.75 V, and the sum of both voltages is about 5 V.	/	Yes	Next
		/	No	Replace throttle body
2	Apply 5V direct current to terminal 3 (+) and 2 (-), turn valve plate to full open manually, and measure voltages between terminals 5 and 2, and between terminals 6 and 2 with voltage band of multimeter. Voltage between terminals 6 and 2 is within 4.4V and 4.9V, voltage between terminals 5 and 2 is within 0.1V and 0.6V, and the sum of both voltages is about 5 V.	/	Yes	Next
		/	No	Replace throttle body
3	Turn the digital multimeter to ohm band, directly measure resistance of copper windings on DC motor between terminals 1 and 4. It is usually between 1.5 and 3.0 Ω at normal temperature, this value does not change with the valve plate opening.	/	Yes	Check wire harness or diagnostic help
		/	No	Replace throttle body

■ **Electronic Throttle Learning Method**

(1) Perform throttle body self-learning once after installing electronic throttle body (turn ENGINE START STOP switch to ON and then to OFF after waiting for 30 seconds, and then perform ignition normally). Start vehicle and observe if it operates normally after self-learning is finished.

■ **Installation**

⚠ **Caution**

- **Clean fitting surface of electronic throttle.**
- **Check if O-ring in the manifold fitting surface groove is in good condition has no damage.**
- **Perform electronic throttle self-learning procedures after installation.**
- **After self-learning is completed, start the vehicle and check for proper operation.**

(1) Install 4 fixing bolts to electronic throttle. Tighten in diagonally installation order.

Torque: 8 + 3 N•m

(2) Connect intercooler outlet pipe, and tighten worm clamp.

Torque: 5 ± 1 N m

(3) Connect electronic throttle assembly connector.

(4) Install the engine compartment trim cover assembly.

5.8 Intake Manifold Assembly

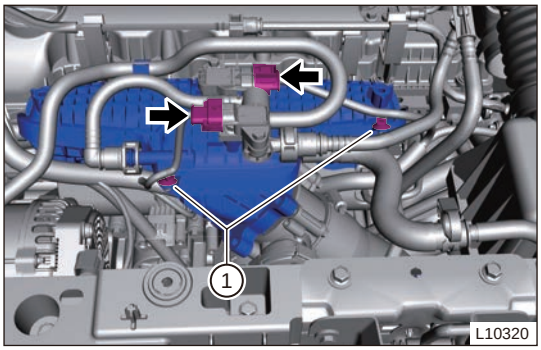
■ Removal

⚠ Warning

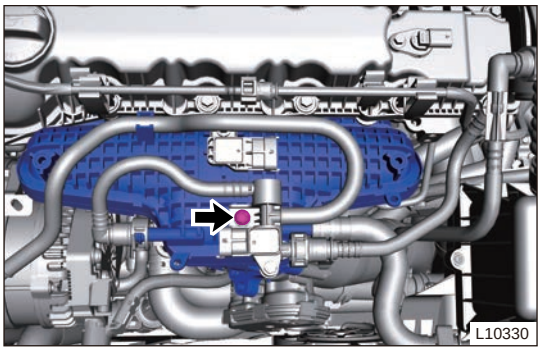
- **Be sure to wear safety equipment to prevent accidents, when removing intake manifold assembly.**
- **Appropriate force should be applied, when removing intake manifold assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Disconnect the intake pressure/temperature sensor connector and detach the wire harness fixing clip (1).
(5) Disconnect the desorption pressure sensor connector, and detach the wire harness fixing clip (1).

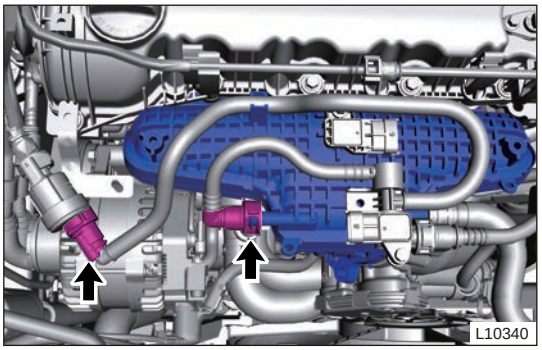


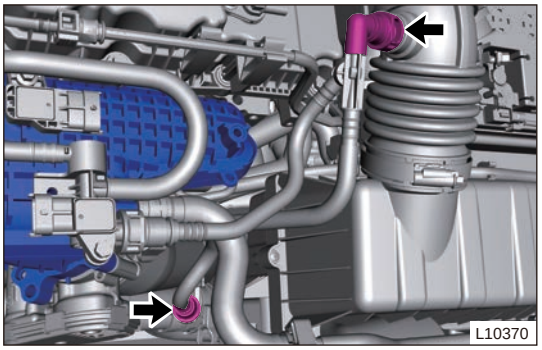
(6) Remove 1 fixing bolt from canister solenoid valve outlet pipe assembly.



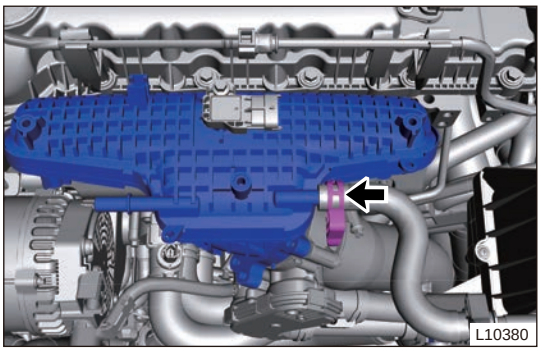
(7) Disconnect the canister solenoid valve outlet pipe from the canister solenoid valve, intake manifold, intake hose, and intercooler outlet pipe II.

(8) Separate the fixing clip from canister solenoid valve outlet pipe and remove the canister solenoid valve outlet pipe assembly.



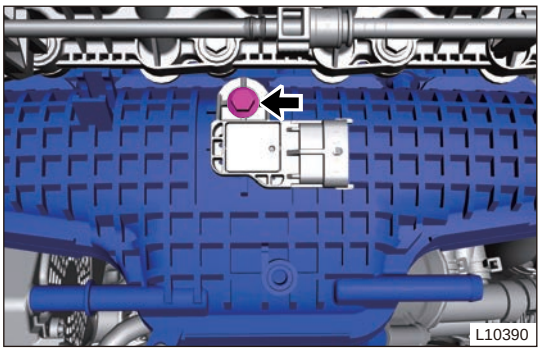


(9) Loosen elastic clamp and disconnect the connection between brake vacuum pipe and intake manifold assembly.

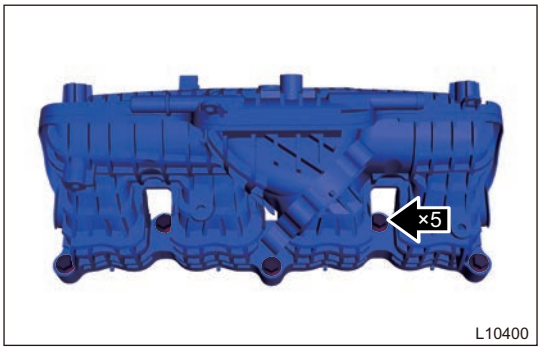


(10) Remove the electronic throttle assembly.

(11) Remove 1 fixing bolt and intake pressure/temperature sensor.



(12) Remove 5 fixing bolts from intake manifold assembly.



(13) Remove the intake manifold assembly.

■ Inspection

(1) Clean and check contact surface between intake manifold assembly and cylinder head. If warpage on surface is greater than 0.8 mm, replace intake manifold assembly.

(2) Check the appearance of intake manifold assembly for damage and cracks.

(3) Check the intake manifold gasket, and replace if it is deteriorated or damaged.

■ Installation

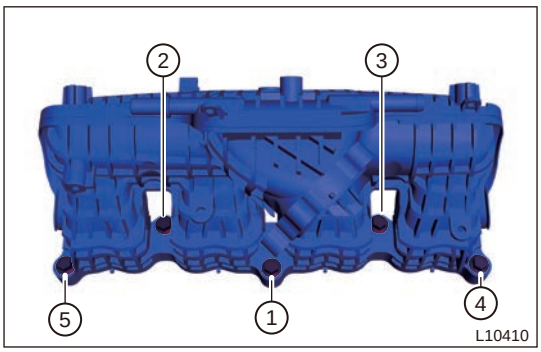
⚠ Caution

- **Before assembly, visually check that intake manifold surface is free of collision, and the sealing rings on the flange surface of the intake manifold are free of mistakes, omissions, damages, lodging etc.**

(1) Align the two positioning pins on the intake manifold and press them into the positioning hole of the cylinder head.

(2) As shown in illustration, install 5 fixing bolts respectively and tighten them in the corresponding order.

Torque: 20 + 5 N•m



(3) Fix the engine wire harness clip and bracket.
(4) Install intake pressure/temperature sensor.
(5) Connect the brake vacuum pipeline.
(6) Install canister solenoid valve outlet pipe assembly.
(7) Install the air filter assembly.
(8) Install the engine compartment trim cover assembly.

5.9 Electronic Accelerator Pedal

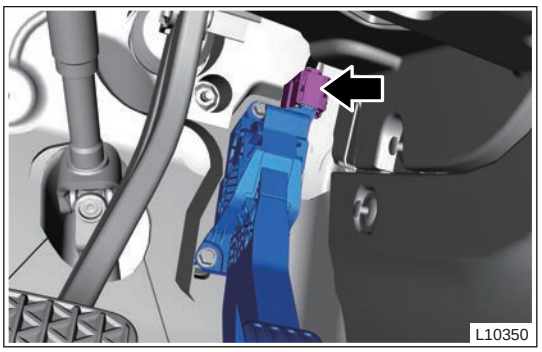
■ Removal

⚠ Warning

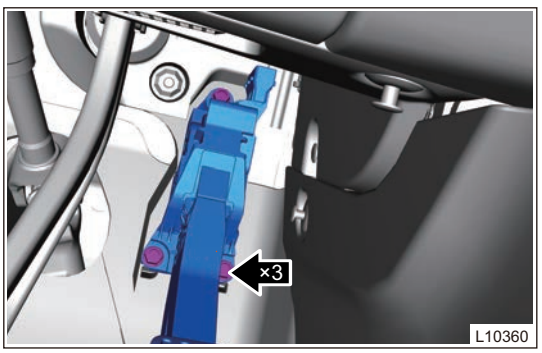
- **Be sure to wear necessary safety equipment to prevent accidents, when removing electronic accelerator pedal.**
- **Appropriate force should be applied when removing electronic accelerator pedal. Be careful not to operate roughly.**
- **Try to prevent interior from being scratched during removal and installation.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.

(3) Disconnect the electronic accelerator pedal connector.



(4) Remove of 3 fixing bolts from electronic accelerator pedal.



(5) Remove the electronic accelerator pedal.

■ Inspection

(1) Press the electronic accelerator pedal by hand, If it is stuck, it indicates that internal components may be damaged.

■ Installation

(1) Install 3 fixing bolts on electronic accelerator pedal.
Torque: 3.5 ± 0.5 N·m

(2) Connect the electronic accelerator pedal connector.

5.10 Intercooler Assembly

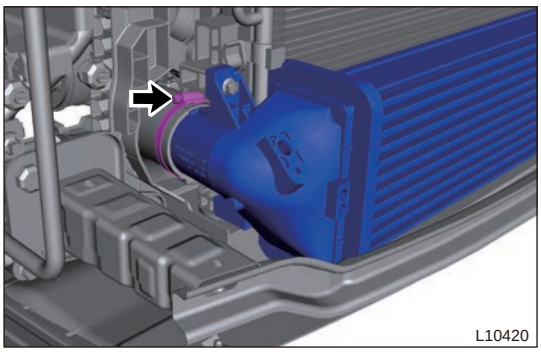
■ Removal

⚠ Warning

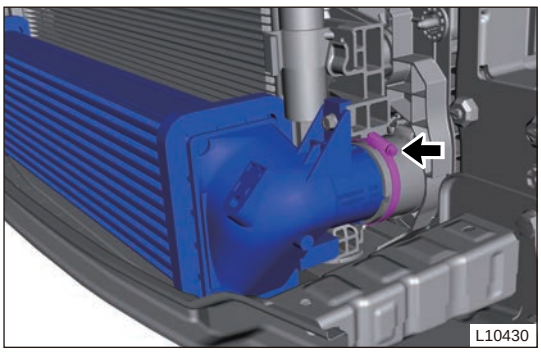
- **Be sure to wear safety equipment to prevent accidents, when removing intercooler assembly.**
- **Appropriate force should be applied, when removing the intercooler assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment lower protector assembly.
(4) Remove the front bumper assembly.
(5) Remove the front upper impact beam assembly.
(6) Remove the left and right air deflector assembly.

(7) Loosen worm clamp and disconnect the connection between intercooler outlet pipe Ⅰ and intercooler.



(8) Loosen worm clamp and disconnect the connection between intercooler inlet pipe Ⅲ and intercooler.



(9) Remove 2 fixing bolts from intercooler assembly.

(10) Remove the intercooler assembly.

■ **Cleaning**

(1) Exterior cleaning: Use a water gun with a low pressure to spray water from top to bottom and from left to right at an angle perpendicular to the intercooler plane. Never flush the intercooler at an angle, it will damage the intercooler.

(2) Interior cleaning: Fill the intercooler with water solution containing 2% soda ash at 80 ˚C. After waiting for half an hour, check for leaks. If so, replace the intercooler. If not, shake it back and forth several times, and then pour out the sewage. Then fill with water solution containing 2% soda ash again until it is washed out. Increase water temperature to 90 ˚C properly at the last washing. Wash out with same method and water solution.

■ **Installation**

(1) Install 2 fixing bolts on intercooler assembly.
Torque: 5 ± 1 N·m

(2) Connect intercooler inlet pipe Ⅲ, and tighten worm clamp after aligned and connected.
Torque: 5 ± 1 N·m

(3) Connect intercooler outlet pipe Ⅰ, and tighten worm clamp after aligned and connected.
Torque: 5 ± 1 N·m.

⚠ **Caution**
• **The connection clearing between rubber pipe and plastic should not exceed 3 mm.**

(4) Install the left and right air deflector assembly.
(5) Install the front upper impact beam assembly.
(6) Install the front bumper assembly.
(7) Install the engine compartment lower protector assembly.

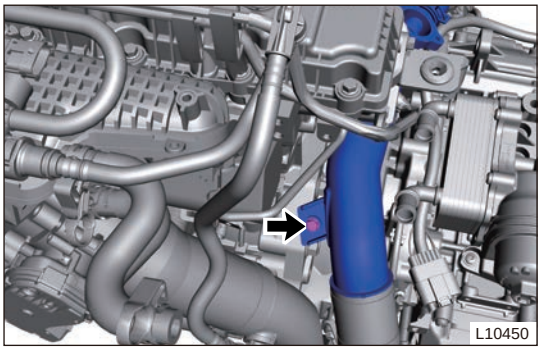
5.11 Intercooler Inlet Pipe Ⅰ Assembly

■ **Removal**

⚠ **Warning**
• **Be sure to wear safety equipment to prevent accidents, when removing intercooler inlet pipe Ⅰ assembly.** • **Appropriate force should be applied, when removing the intercooler inlet pipe Ⅰ assembly. Be careful not to operate roughly.**

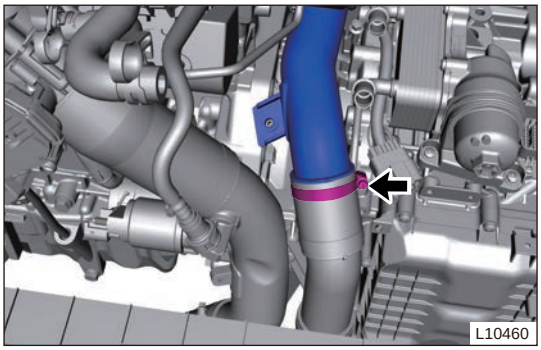
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the air filter assembly.
(4) Remove the intake hose assembly.

(5) Remove 1 fixing bolt between intercooler inlet pipe Ⅰ and transmission.

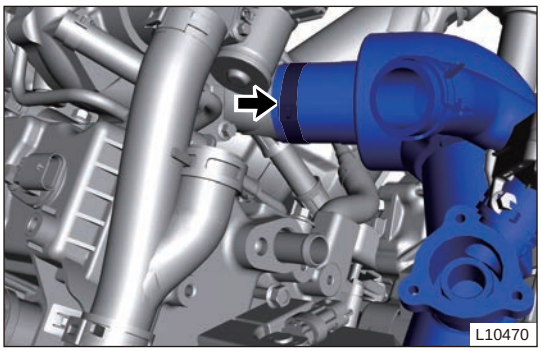


(6) Disconnect the relief solenoid valve connector.

(7) Loosen worm clamp and disconnect the connection between intercooler inlet pipe Ⅱ and intercooler inlet pipe assembly I.



(8) Loosen worm clamp and disconnect connection between intercooler inlet pipe Ⅰ and turbocharger intake port.



(9) Remove the intercooler inlet pipe Ⅰ assembly carefully.

(10) Remove the relief solenoid valve assembly.

■ Inspection

(1) Check the appearance of intercooler inlet pipe assembly Ⅰ for damage.

(2) Check if the inner of intercooler inlet pipe assembly Ⅰ is dirty.

■ Installation

(1) Install the relief solenoid valve assembly.

(2) Connect the intercooler inlet pipe Ⅰ to turbocharger intake port and intercooler inlet pipe Ⅱ respectively, and tighten worm clamp after aligned and connected.

Torque: 5 ± 1 N·m

⚠ Caution

- **The connection clearing between rubber pipe and plastic should not exceed 3 mm.**

(3) Connect the relief solenoid valve connector.

(4) Fix the intercooler inlet pipe Ⅰ to transmission with 1 bolt.
Torque: 9 ± 1.5 N·m

(5) Install the intake hose assembly.
(6) Install the air filter assembly.
(7) Install the engine compartment trim cover assembly.

5.12 Intercooler Inlet Pipe Ⅱ Assembly

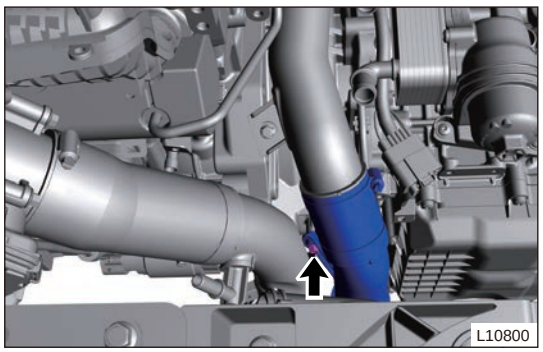
■ Removal

⚠ Warning

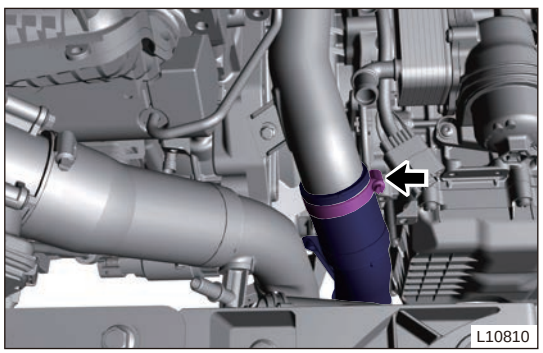
- **Be sure to wear safety equipment to prevent accidents, when removing intercooler inlet pipe Ⅱ assembly.**
- **Appropriate force should be applied, when removing the intercooler inlet pipe Ⅱ assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the air filter assembly.

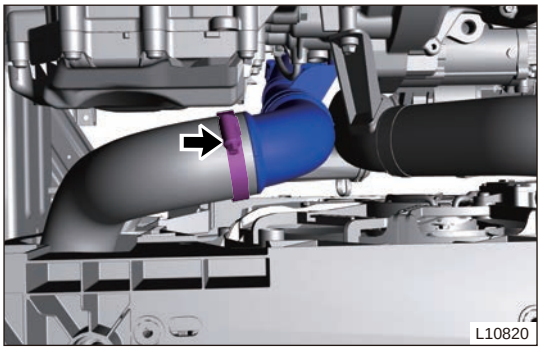
(4) Remove 1 fixing bolt between intercooler inlet pipe Ⅱ and transmission.



(5) Loosen worm clamp and disconnect the connection between intercooler inlet pipe Ⅱ and intercooler inlet pipe assembly Ⅰ.



(6) Loosen worm clamp and disconnect the connection between intercooler inlet pipe Ⅱ and intercooler inlet pipe Ⅲ assembly.



(7) Remove the intercooler inlet pipe Ⅱ assembly carefully.

■ **Inspection**

(1) Check the appearance of intercooler inlet pipe assembly Ⅰ for damage.

(2) Check if the inner of intercooler inlet pipe assembly Ⅰ is dirty.

■ **Installation**

(1) Connect the intercooler inlet pipe Ⅱ to intercooler inlet pipe Ⅲ and intercooler inlet pipe Ⅰ respectively, and tighten worm clamp after aligned and connected.

Torque: 5 ± 1 N·m

⚠ Caution
• **The connection clearing between rubber pipe and plastic should not exceed 3 mm.**

(2) Fix the intercooler inlet pipe Ⅱ to transmission with 1 bolt.

Torque: 9 ± 1.5 N·m

(3) Install the air filter assembly.

(4) Install the engine compartment trim cover assembly.

5.13 Intercooler Inlet Pipe Ⅲ Assembly

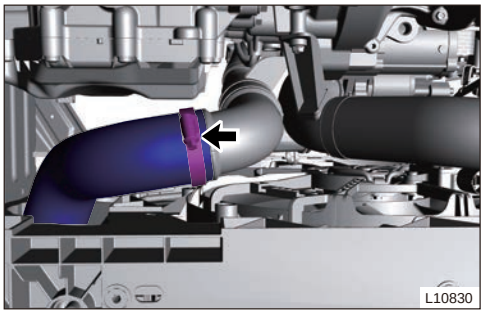
■ **Removal**

⚠ Warning
• **Be sure to wear safety equipment to prevent accidents, when removing intercooler connecting pipe assembly.** • **Appropriate force should be applied, when removing the intercooler connecting pipe assembly. Be careful not to operate roughly.**

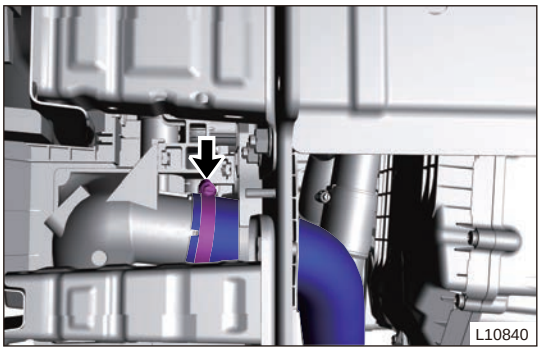
(1) Raise the vehicle to a proper position.

(2) Remove the engine compartment lower protector assembly.

(3) Loosen worm clamp and disconnect the connection between intercooler inlet pipe Ⅱ and intercooler inlet pipe Ⅲ.



(4) Loosen worm clamp and disconnect the connection between intercooler inlet pipe Ⅲ and intercooler assembly.



(5) Remove the intercooler inlet pipe Ⅲ assembly carefully.

■ **Installation**

(1) After aligning and connecting intercooler inlet pipe Ⅲ and intercooler assembly, tighten worm clamp.
Torque: 5 ± 1 N·m

(2) After aligning and connecting intercooler inlet pipe Ⅲ and intercooler inlet pipe Ⅱ, and tighten worm clamp.
Torque: 5 ± 1 N·m

⚠ Caution

- **The connection clearing between rubber pipe and plastic should not exceed 3 mm.**

(3) Install the engine compartment lower protector assembly.

5.14 Intercooler Outlet Pipe Ⅰ Assembly

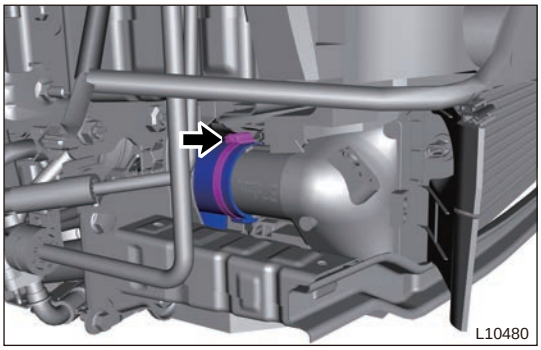
■ **Removal**

⚠ Warning

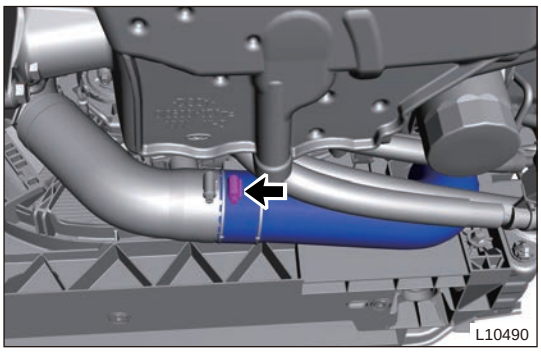
- **Be sure to wear safety equipment to prevent accidents, when removing intercooler outlet pipe Ⅰ assembly.**
- **Appropriate force should be applied, when removing the intercooler outlet pipe Ⅰ assembly. Be careful not to operate roughly.**

(1) Raise the vehicle to a proper position.
(2) Remove the engine compartment lower protector assembly.
(3) Remove the front bumper assembly.

(4) Loosen worm clamp and disconnect the connection between intercooler outlet pipe I and intercooler assembly.



(5) Loosen worm clamp and disconnect the connection between intercooler outlet pipe I and intercooler outlet pipe II assembly.



(6) Remove the intercooler outlet pipe I assembly carefully.

■ **Installation**

(1) After aligning and connecting intercooler outlet pipe I and intercooler assembly, tighten worm clamp.

Torque: 5 ± 1 N·m

(2) After aligning and connecting intercooler outlet pipe I and intercooler outlet pipe II assembly, tighten worm clamp.

Torque: 5 ± 1 N·m

⚠ Caution
• **The connection clearing between rubber pipe and plastic should not exceed 3 mm.**

(3) Install the engine compartment lower protector assembly.

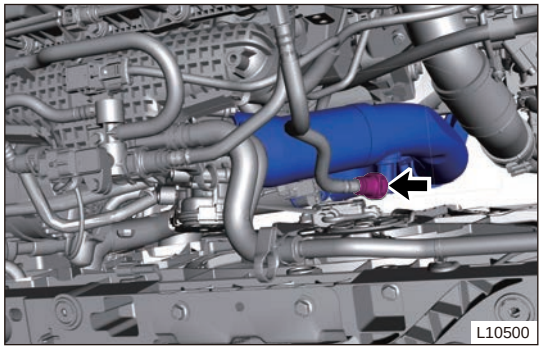
5.15 Intercooler Outlet Pipe II Assembly

■ **Removal**

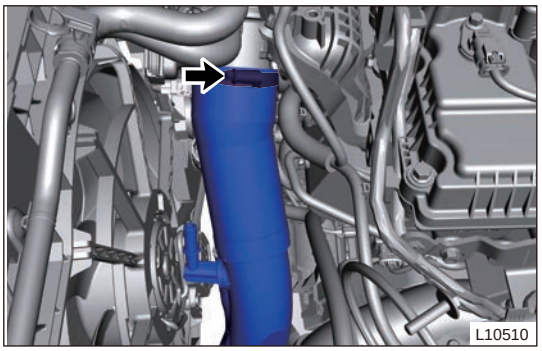
⚠ Warning
• **Be sure to wear safety equipment to prevent accidents, when removing intercooler outlet pipe II assembly.** • **Appropriate force should be applied, when removing the intercooler outlet pipe II assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the engine compartment lower protector assembly.

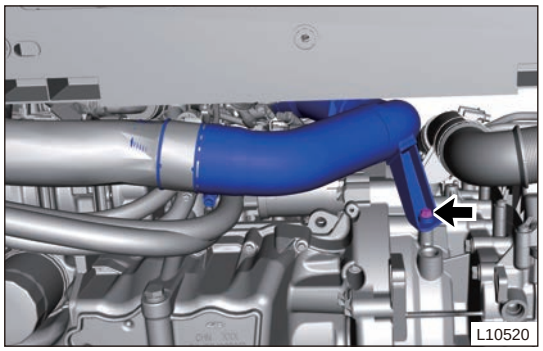
(5) Disconnect the connection between charcoal canister solenoid valve outlet pipe and intercooler outlet pipe Ⅱ.



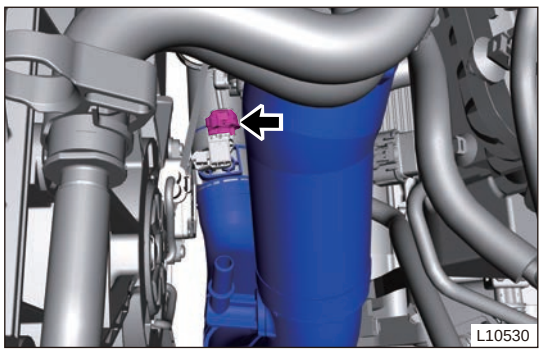
(6) Loosen worm clamp and disconnect connection between intercooler outlet pipe Ⅱ and throttle assembly.



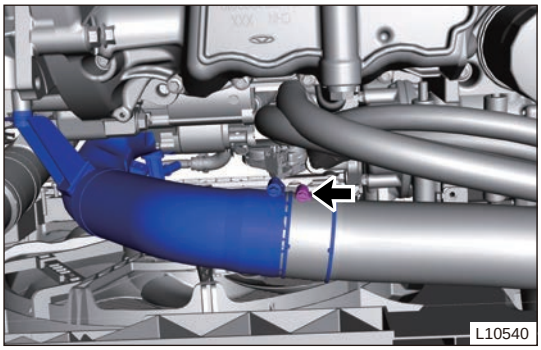
(7) Remove 1 fixing bolt between intercooler outlet pipe Ⅱ and transmission.



(8) Disconnect the boost pressure sensor connector.



(9) Loosen worm clamp and disconnect the connection between intercooler outlet pipe I and intercooler outlet pipe Ⅱ.



(10) Remove the intercooler outlet pipe Ⅱ assembly carefully.

(11) Remove the boost pressure/temperature sensor from intercooler outlet pipe Ⅱ.

■ **Installation**

(1) Install the boost pressure/temperature sensor to intercooler outlet pipe Ⅱ assembly.

(2) After aligning and connecting intercooler outlet pipe Ⅱ and intercooler outlet pipe I, tighten worm clamp.
Torque: 5 ± 1 N·m

⚠ **Caution**
• **The connection clearing between rubber pipe and plastic should not exceed 3 mm.**

(3) Connect the boost pressure/temperature sensor connector.

(4) After connecting intercooler outlet pipe Ⅱ and throttle assembly, and tighten worm clamp.
Torque: 5 ± 1 N·m

(5) Connect charcoal canister solenoid valve outlet pipe and intercooler outlet pipe Ⅱ assembly.

(6) Install and tighten 1 fixing bolt.
Torque: 7 ± 1 N·m

(7) Install the engine compartment lower protector assembly.

4.4 EXHAUST SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Before repairing the exhaust system, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) If exhaust gasket is damaged, replace it, and remove foreign matters on joints and threads.

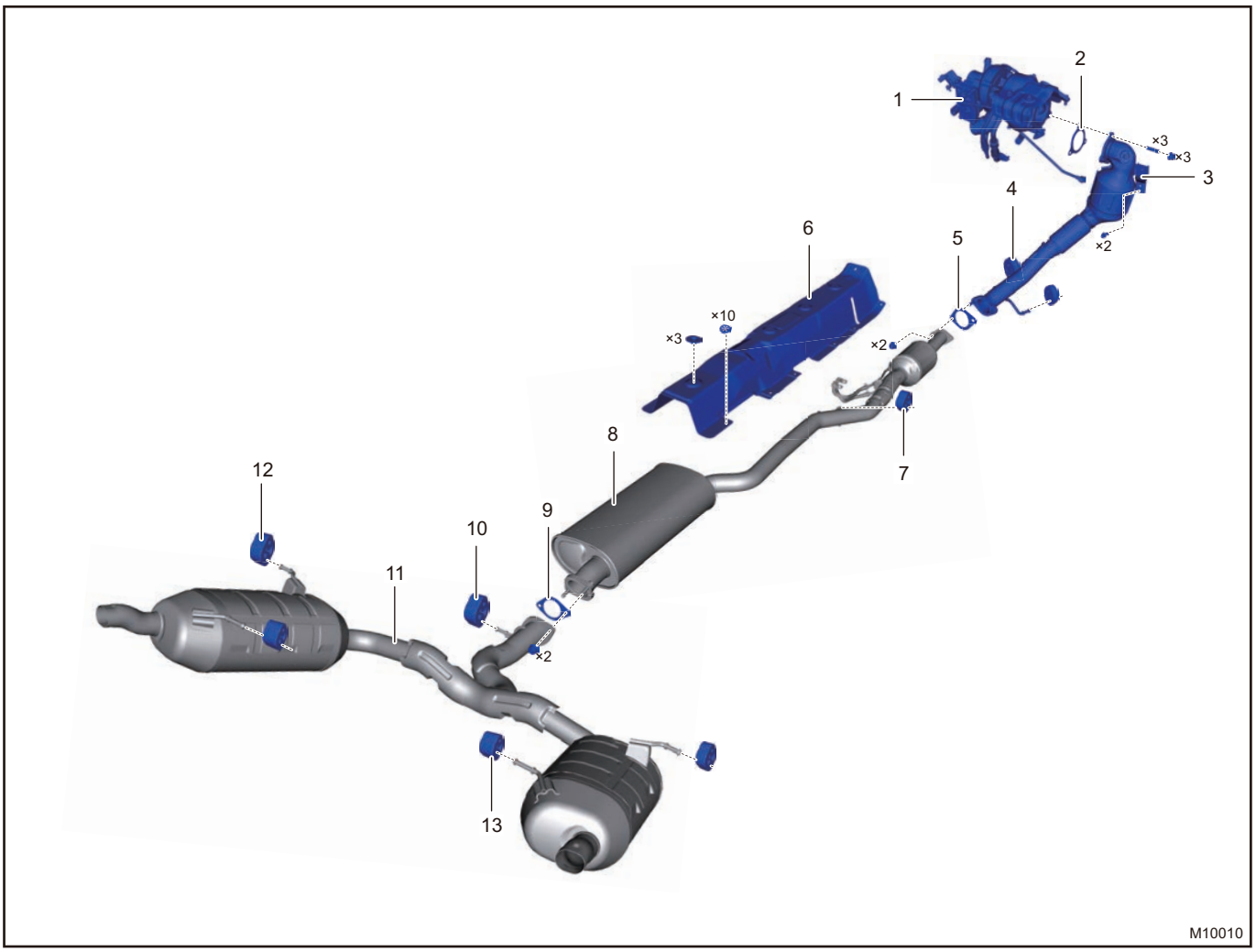
(2) Check exhaust gas for leakage. If gas leaks, tighten malfunctioning part to prevent leakage. Replace damaged parts as necessary.

2 System Overview

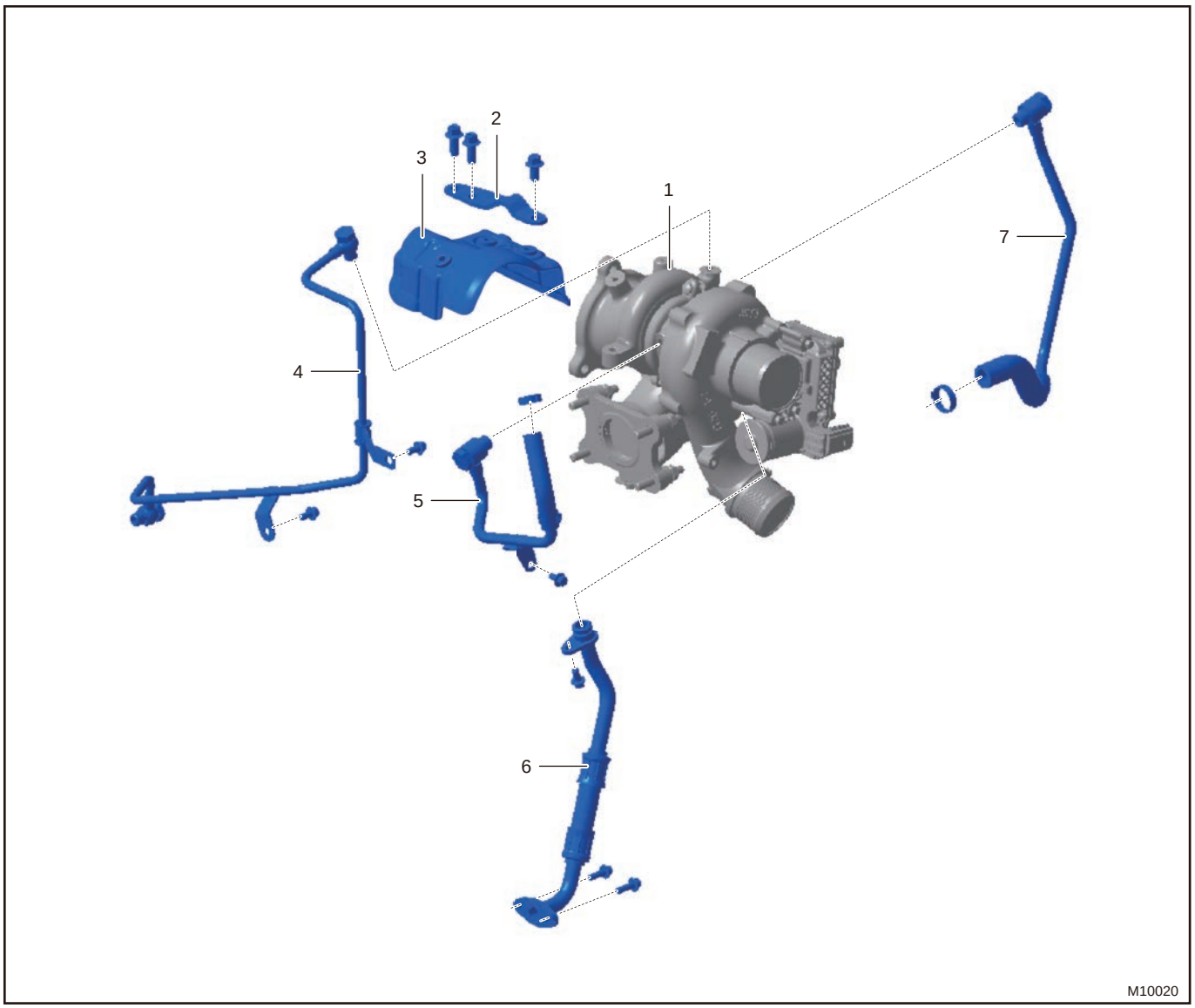
2.1 System Description

Exhaust system controls engine exhaust, reducing vehicle emissions by precatalytic converter and main catalytic converter, and eliminating exhaust noise by muffler. When exhaust system discharges exhaust gas, oxygen sensor monitors oxygen content in exhaust gas. Engine control module adjusts air-fuel ratio of combustible gas mixture to control vehicle emissions and achieve optimal fuel economy and satisfy the emissions standard of regulation according to feedback signals of oxygen sensor and combining with other sensor signals.

2.2 System Components Diagram

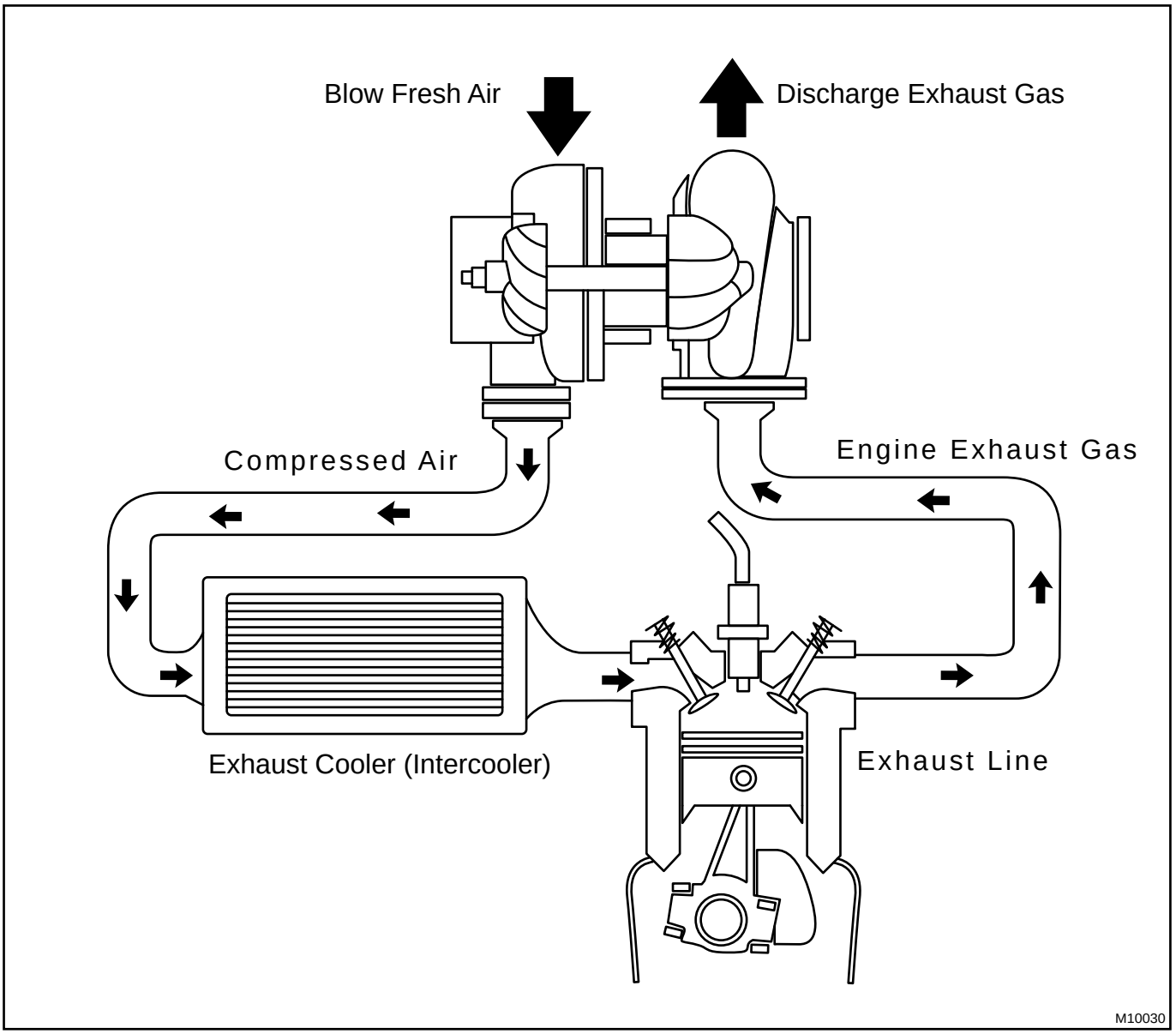


1	Turbocharger Assembly	8	Front Muffler and Line
2	Washer Between Turbocharger and Precatalytic Converter	9	Gasket Between Front Muffler and Rear Muffler
3	Precatalytic Converter Assembly	10	Front Muffler Hanger Block
4	Main Catalytic Converter Assembly Hanger Block	11	Muffler Assembly
5	Washer	12	Rear Muffler Hanger Block
6	Center Passage Heat Insulator Assembly	13	Rear Muffler Hanger Block
7	Front Muffler Hanger Block		



1	Supercharger Assembly	5	Turbocharger Cooling Water Outlet Pipe
2	Turbocharger Bracket	6	Turbocharger Oil Return Pipe Assembly
3	Turbocharger Heat Insulator	7	Turbocharger Water Inlet Pipe Assembly
4	Turbocharger Oil Inlet Pipe Assembly		

2.3 System Schematic Diagram

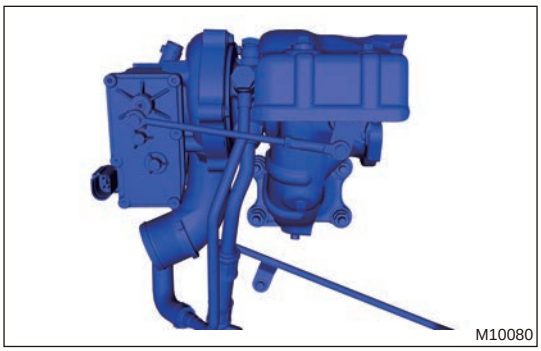


The fresh air filtered by the air filter enters the intercooler after being pressed by the turbocharger, and then enters the cylinder after being cooled by the intercooler. The exhaust gas drives turbo impeller to rotate, and then drives compressor impeller to press the inlet fresh air.

2.4 System Components Description

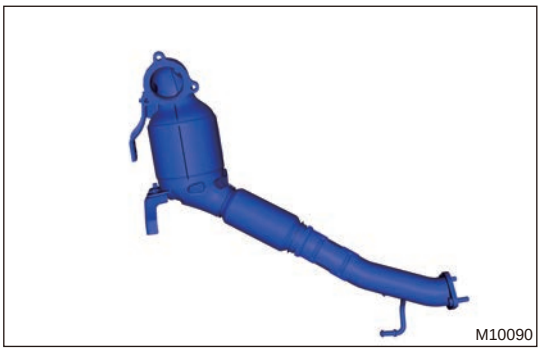
■ Turbocharger

Turbocharger uses the exhaust gas discharged from the engine to push the turbine impeller to rotate, and then drives the compressor impeller to pressurize the air filtered by the air filter and send it to the cylinder. As more air enters the cylinder, more fuel is allowed to be injected, thus generating more power from the engine. In addition, the turbocharger can also make the engine obtain power compensation when working at high altitude.



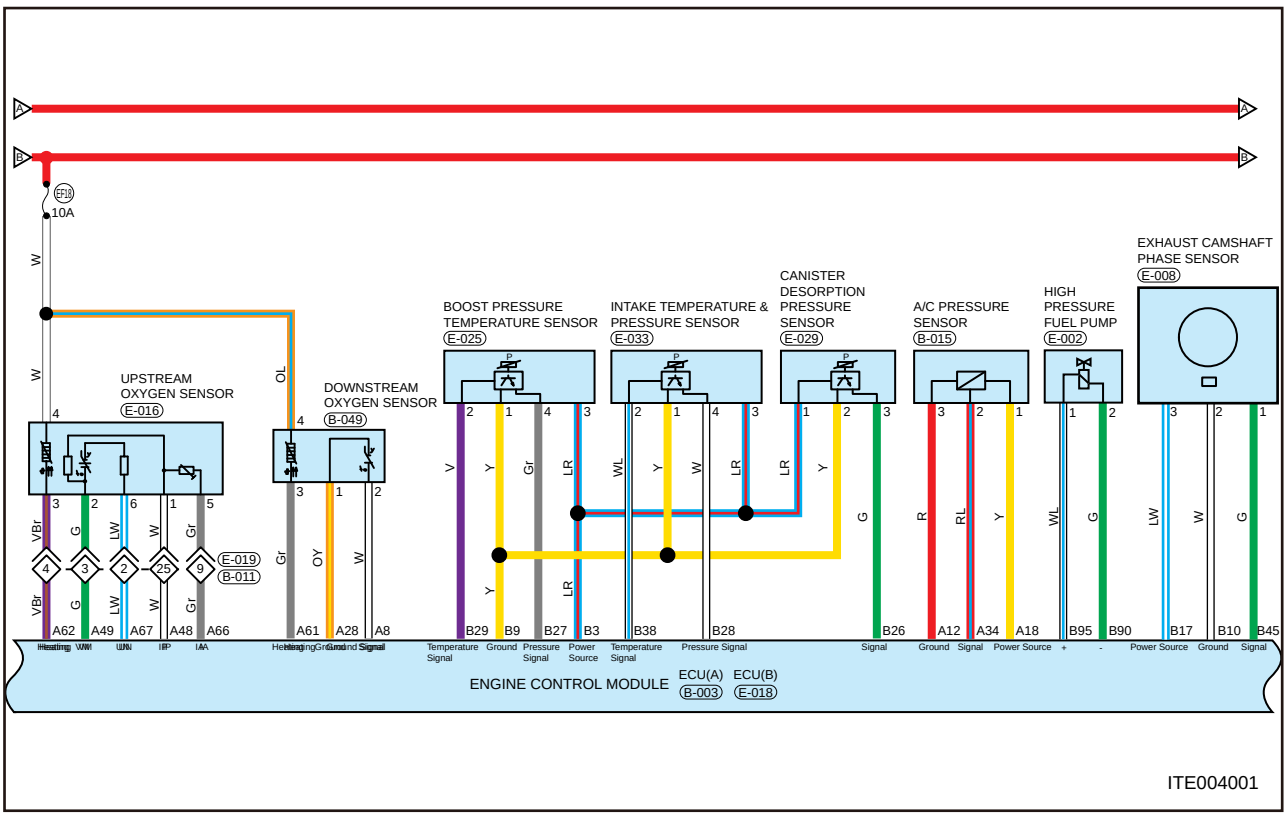
■ Catalytic Converter

Catalytic converter is the most important external purification device fixed in vehicle exhaust system, which can convert harmful gases such as carbon monoxide, hydrocarbons and nitrogen oxides from exhaust gas into carbon dioxide, water and nitrogen by oxidation and reduction.



3 System Circuit Diagram

3.1 Circuit Diagram



4 Diagnosis & Testing

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Exhaust System

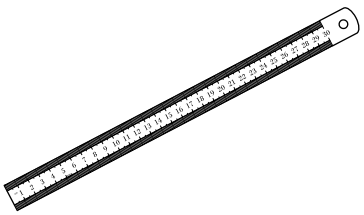
Symptom	Possible Cause
Excessive exhaust noise	Exhaust pipe (loose connection)
	Turbocharger (damaged)

Symptom	Possible Cause
	Muffler assembly (damaged or leaked)
	Main catalytic converter assembly (damaged or leaked)
	Exhaust pipe gasket (damaged)
Excessive exhaust temperature	Inadequate gas mixture combustion
	Main catalytic converter assembly (blocked)
	Precatalytic converter assembly (blocked)
	Turbocharger (blocked)
Exhaust pipe leakage	Main catalytic converter assembly (damaged or leaked)
	Muffler assembly (damaged or leaked)
	Precatalytic converter assembly (damaged or leaked)

5 ON-VEHICLE SERVICE

5.1 Tool

■ General Tool

Tool Name	Tool Drawing
Precision Straightedge	 S00044

5.2 Turbocharger Heat Insulator

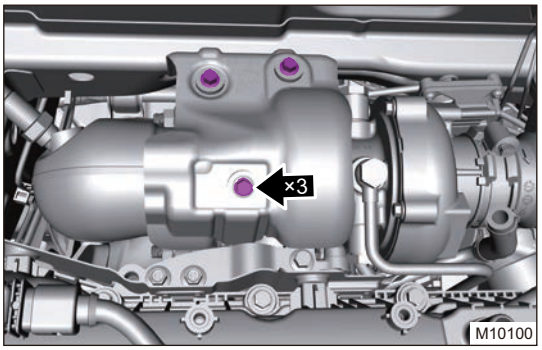
■ Removal

⚠ Warning

- **Before removing turbocharger heat insulator assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing turbocharger heat insulator assembly.**
- **Appropriate force should be applied, when removing the turbocharger heat insulator assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the negative battery cable.

(4) Remove 3 fixing bolts from turbocharger heat insulator assembly.



(5) Remove turbocharger heat insulator assembly carefully.

■ **Installation**

(1) Install 3 fixing bolts on turbocharger heat insulator assembly.

Torque: 8 + 3 N·m

(2) Install the engine compartment trim cover assembly.

5.3 Turbocharger Bracket

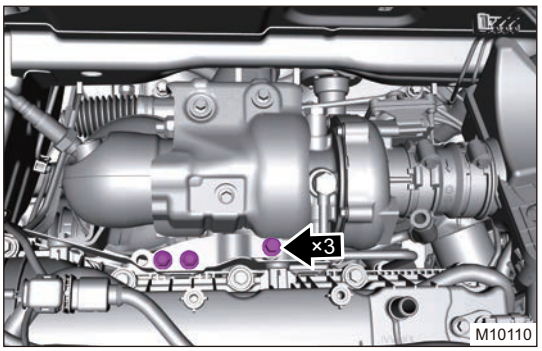
■ **Removal**

⚠ Warning

- **Before removing turbocharger bracket assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing turbocharger bracket assembly.**
- **Appropriate force should be applied, when removing turbocharger bracket assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the negative battery cable.

(4) Remove 3 fixing bolts from turbocharger bracket assembly.

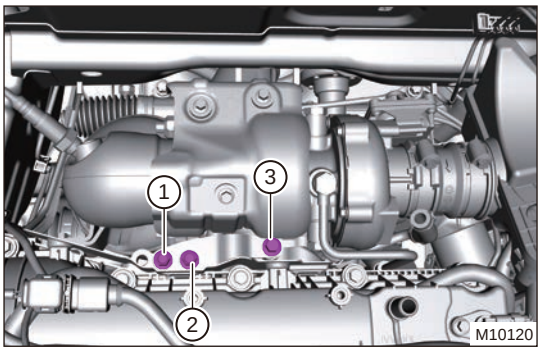


(5) Remove turbocharger bracket assembly carefully.

■ **Installation**

(1) Tighten 3 installation bolts in order shown in illustration.

Torque: 1st step: 6 ± 2 N·m, 2nd step: 30 ± 5 N·m



(2) Install the engine compartment trim cover assembly.

5.4 Turbocharger Assembly

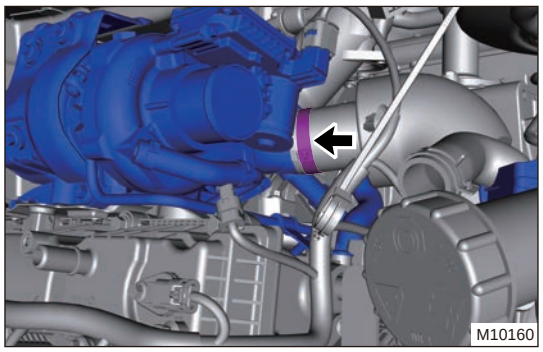
■ **Removal**

⚠ Warning

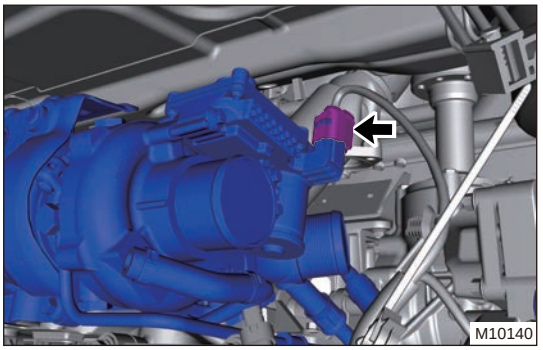
- **Before removing turbocharger assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing turbocharger assembly.**
- **Appropriate force should be applied, when removing turbocharger assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the intake hose assembly.
(6) Drain the coolant.
(7) Removal turbocharger heat insulator assembly.
(8) Remove the heating inlet pipe assembly Ⅰ.
(9) Remove the turbocharger bracket.
(10) Remove the precatalytic converter assembly.

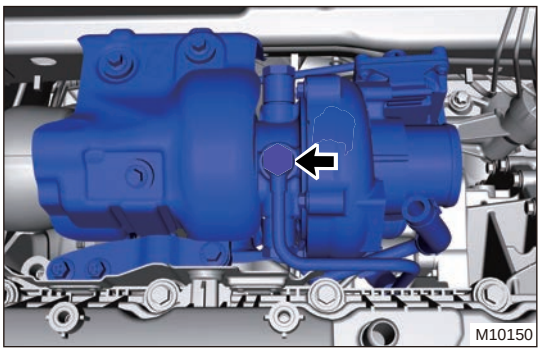
(11) Loosen worm clamp and disconnect connection between intercooler inlet pipe 1 and turbocharger assembly.



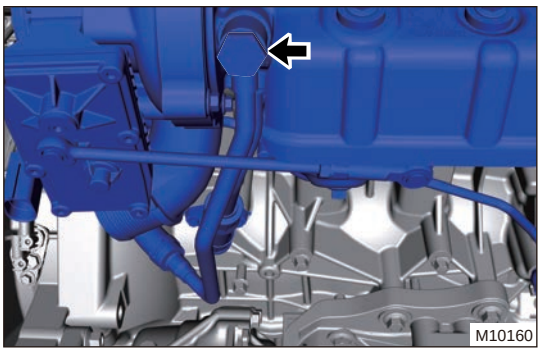
(12) Disconnect turbocharger electronic exhaust gas valve connector.



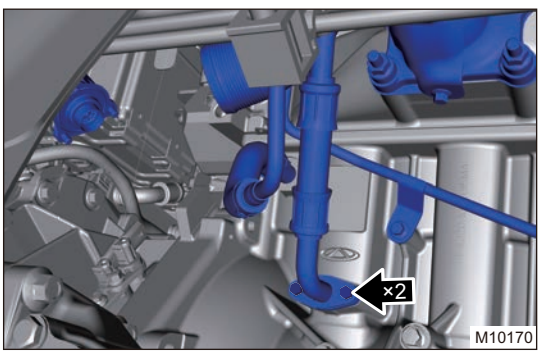
(13) Remove 1 hollow bolt between oil inlet pipe assembly and turbocharger. Remove the copper washer carefully.



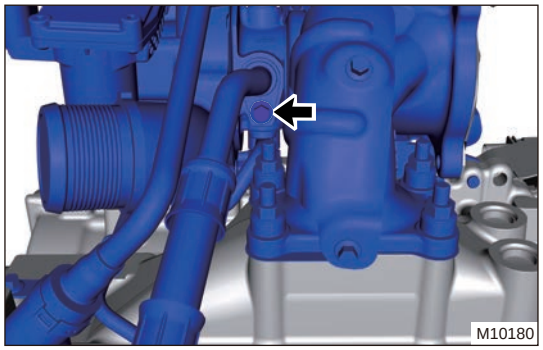
(14) Remove 1 hollow bolt between oil inlet pipe assembly and turbocharger. Remove the copper washer carefully.



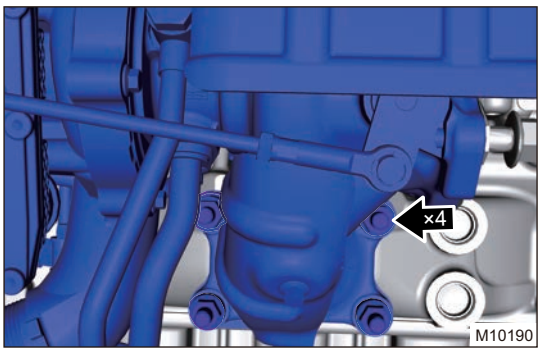
(15) Remove 2 fixing bolts between oil return pipe assembly and cylinder block. Remove the washer carefully.



(16) Remove 1 fixing bolt between oil return pipe assembly and turbocharger. Unplug the oil return pipe assembly from turbocharger oil return hole.

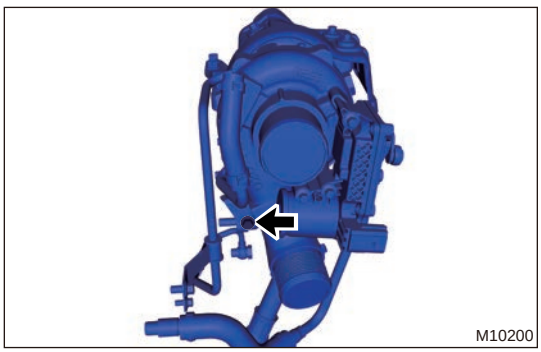


(17) Remove 4 high temperature nuts between turbocharger and cylinder head, and remove the cushion from each bolt.

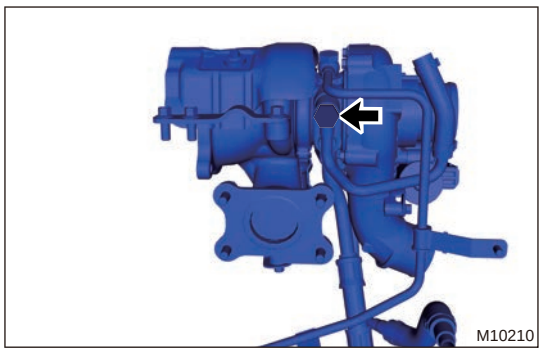


(18) Remove the turbocharger assembly carefully. And remove gasket from cylinder head flange.

(19) Remove 1 fixing bolt between water outlet pipe bracket and turbocharger.



(20) Remove 1 hollow bolt between water outlet pipe assembly and turbocharger. Remove the washer carefully.



■ Daily inspection of turbocharger

(1) Check the sealing and tightness of connecting lines between air filter and turbocharger, turbocharger and engine intake/exhaust pipe.

(2) Check if turbocharger oil inlet pipe and return pipe are damaged or throttling, and if the connecting bolts of joints are loose.

(3) Check the air filter and clean or replace the element regularly.

(4) Check if engine crankcase blow-by gas is too large, breather is smooth, ensure crankcase pressure is normal.

■ **Other requirements of turbocharger**

(1) Avoid low engine idle for long time (maximum should not exceed 20 minutes).

(2) Never use the operation with "Accelerate - Stall - Neutral coasting",before the engine lubricating oil pressure is established, the engine must be kept in idling condition (3 - 5 minutes).

(3) Before stopping the engine, let it gradually decrease its temperature and speed from maximum value (3 - 5 minutes).

■ **Firstly perform basic inspection to turbocharger system when DTC indicating too high or too low boost pressure occurs or when power decreases.**

(1) Check there are no cranks causing by overheating, biting, deformation or other damage on exhaust turbocharger turbo housing, otherwise, replace exhaust turbocharger.

(2) Check there are no deposition and blocking on turbo oil hole.

(3) Check there are no blockage, squash, deformation or other damage on oil inlet and return pipes of exhaust turbocharger.

(4) Check there is no sticking in actuator mechanism, and if actuator connector is connected normally.

(5) Check there is no obvious deformation in turbocharger impeller, and the rotation is normal without blocking.

(6) Check if each actuator connector is connected reliably (intake relief valve and exhaust gas bypass electric valve) and check for no damage of appearance.

■ **Installation**

⚠ **Caution**

- **Do not pull the turbocharger actuator rod by hand, and avoid impacting the turbocharger during assembly.**
- **Check for foreign matter in turbocharger and line when installing. Avoid inhaling foreign matter after turbocharger running, causing damage to the components.**

(1) If the four high temperature studs on flange surface of the cylinder head are removed, the bolts need to be replaced. Before installing the bolts, apply high temperature thread adhesive to the short threads of the high temperature studs, and screw them into threaded hole of cylinder head according to the corresponding torque.

Torque: 14 + 3 N·m

Thread adhesive: Loctite 2422

⚠ **Caution**

- **Use it immediately after applying the thread adhesive. The stud should be fastened within 5 minutes after applying the thread adhesive. If removal, the bolts need to be replaced and re-apply thread adhesive to tighten.**

(2) Pass the washer through the high temperature stud and put on the exhaust flange surface of the cylinder head.

⚠ **Caution**

- **Pay attention to the direction of the failure-proof identification point after installation, as shown in illustration.**

(3) Put a washer on the hollow bolt, insert it into the ball joint of the water outlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on turbocharger. Screw in at least 3 teeth without tightening.

Torque: 40 ± 2 N·m

(4) Screw the water outlet pipe bracket into threaded hole of the turbocharger with 1 fixing bolt. Screw in at least 3 teeth without tightening.

Torque: 8 + 3 N·m

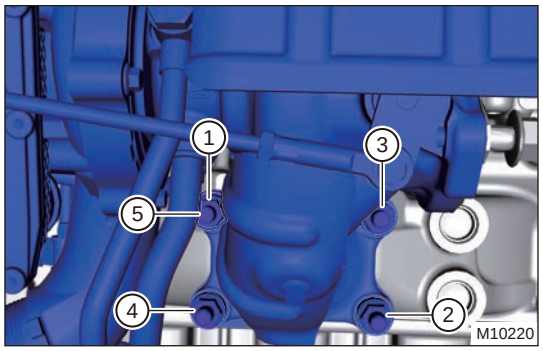
⚠ Caution

- **First tighten the hollow bolts according to the torque requirements, and then tighten the bracket fixing bolts.**

(5) Put the turbocharger mounting hole on the cylinder head exhaust flange stud carefully. Put 1 cushion on each bolt. Install 4 high temperature nuts, and tighten them diagonally in the order shown in illustration.

Hint:
The serial number 5 is to re-tighten position 1 once.

Torque: 33 ± 3 N·m



(6) Dip a small amount of oil on the oil return pipe seal ring (the oil type is the same as the engine oil), rotate the end with seal ring into the oil return hole in the middle of turbocharger, and screw in 1 fixing bolt at least 3 teeth without tightening.

Torque: 8 + 3 N·m

(7) Install 2 bolts into the installation hole of oil return pipe, then put the gasket, and screw 2 bolts into the installation hole of oil return flange surface on cylinder block. Screw in at least 3 teeth without tightening.

Torque: 8 + 3 N·m

⚠ Caution

- **First tighten 2 hollow bolts between oil return pipe and cylinder block according to the torque requirements, and then tighten 1 fixing bolt between oil return pipe and turbocharger.**

(8) Loosen 2 fixing bolts on oil inlet pipe assembly bracket.

Torque: 8 + 3 N·m

(9) Loosen the hollow bolt between oil inlet pipe assembly and cylinder block.

Torque: 25 + 5 N·m

Hint:
The purpose of loosening is to install the oil inlet pipe assembly to turbocharger side.

(10) Put a washer on the hollow bolt, insert it into the ball joint of the oil inlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on turbocharger. Final tightening.

Torque: 25 + 5 N·m

⚠ Caution

- **First tighten the hollow bolts at both ends of the oil inlet pipe assembly according to the torque requirements, and then tighten 2 fixing bolts on oil inlet pipe bracket.**

(11) Put a washer on the hollow bolt, insert it into the ball joint of the water inlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on turbocharger. Final tightening.

Torque: 40 ± 2 N·m

(12) Connect intercooler inlet pipe assembly Ⅰ and turbocharger, then tighten the worm clamp.

Torque: 5 ± 1 N·m

(13) Connect the turbocharger exhaust electric valve connector.
(14) Install the precatalytic converter assembly.
(15) Install the turbocharger bracket.
(16) Install the heating inlet pipe assembly Ⅰ.
(17) Install turbocharger heat insulator assembly.
(18) Install the intake hose assembly.
(19) Install the air filter assembly.
(20) Add the coolant.
(21) Add oil to proper position.
(22) Install the engine compartment trim cover assembly.

5.5 Turbocharger Cooling Water Outlet Pipe

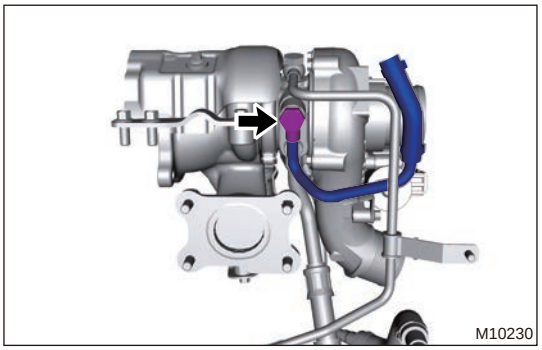
■ Removal

⚠ Warning

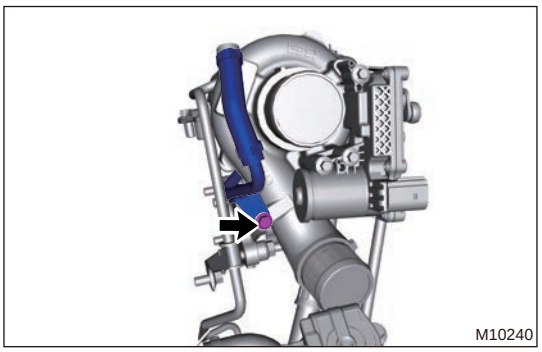
- **Before removing turbocharger cooling water outlet pipe assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing cooling water outlet pipe assembly.**
- **Appropriate force should be applied, when removing turbocharger cooling water outlet pipe. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the intake hose assembly.
(6) Drain the coolant.
(7) Remove the turbocharger assembly.

(8) Remove 1 hollow bolt between water outlet pipe and turbocharger water outlet port. Remove the copper washer carefully.



(9) Remove 1 fixing bolt from water outlet pipe bracket.



(10) Remove the turbocharger water outlet pipe assembly.

■ Installation

(1) Put a washer on the hollow bolt, insert it into the ball joint of the water outlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on turbocharger. Screw in at least 3 teeth without tightening.

Torque: 40 ± 2 N·m

(2) Screw the water outlet pipe bracket into threaded hole of the turbocharger with 1 fixing bolt. Screw in at least 3 teeth without tightening.

Torque: 8 + 3 N·m

⚠ Caution

- **First tighten the hollow bolts according to the torque requirements, and then tighten the bracket fixing bolts.**

(3) Put a clamping ring on water outlet pipe and insert it into the corresponding branch pipe of the heating steel pipe. Adjust the position of the clamping ring so that the center of clamp is aligned with the center of “T” shape at the end of water outlet pipe, and clamp it with clamp pliers.

⚠ Caution

- **When connecting supercharger cooling water outlet pipe and heating steel pipe, a small amount of lubricant can be applied if necessary, and the same type of coolant can be used for the engine.**

(4) Install the turbocharger.
(5) Install the intake hose assembly.
(6) Install the air filter assembly.
(7) Add the antifreeze.
(8) Install the engine compartment trim cover assembly.

5.6 Turbocharger Water Inlet Pipe Assembly

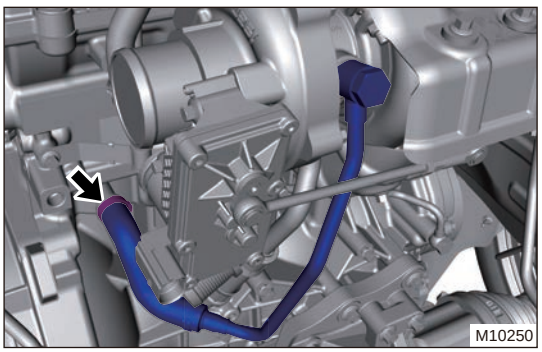
■ Removal

⚠ Warning

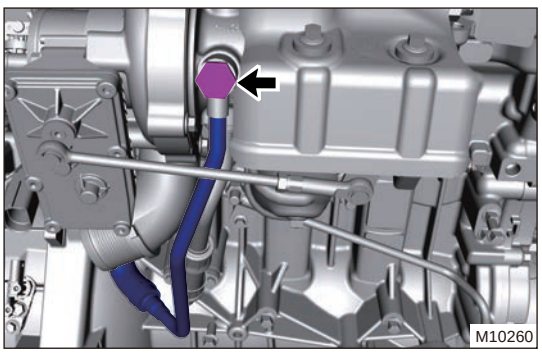
- **Before removing turbocharger water inlet pipe assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing turbocharger water inlet pipe assembly.**
- **Appropriate force should be applied, when removing turbocharger water inlet pipe. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the intercooler intake pipe Ⅰ assembly.
(5) Drain the coolant.

(6) Loosen clamping ring and disconnect connection between water inlet pipe and cylinder block pipe joint.



(7) Remove 1 hollow bolt between water inlet pipe and turbocharger water inlet port. Remove the copper washer carefully.



(8) Remove the turbocharger water inlet pipe assembly carefully.

■ Installation

(1) Put a clamping ring on the cylinder block pipe joint, insert the water inlet pipe hose until it reaches the check drum of the cylinder block pipe joint, and adjust the water pipe so that the "T"-shaped mark faces the rear end of the cylinder, and then adjust the position of clamp so that the center of clamp is aligned with the "T" center of water inlet pipe, and then clamp tightly with clamp plier.

⚠ Caution

- **When connecting supercharger water inlet pipe and cylinder block pipe joint, a small amount of lubricant can be applied if necessary, and the same type of coolant can be used for the engine.**

(2) Put a washer on the hollow bolt, insert it into the ball joint of the water inlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on turbocharger. Final tightening.

Torque: 40 ± 2 N·m

(3) Install the intercooler inlet pipe Ⅰ assembly.
(4) Add the coolant.
(5) Install the engine compartment trim cover assembly.

5.7 Turbocharger Oil Inlet Pipe Assembly

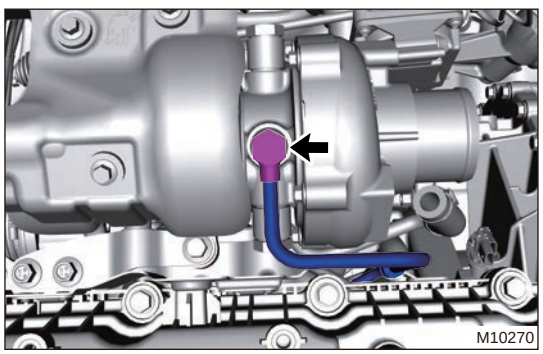
■ Removal

⚠ Warning

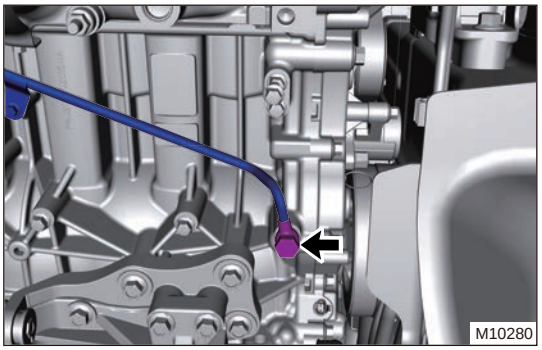
- **Before removing turbocharger oil inlet pipe assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing turbocharger oil inlet pipe assembly.**
- **Appropriate force should be applied, when removing turbocharger oil inlet pipe assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the intake hose assembly.
(6) Remove the rear right mounting link assembly.
(7) Remove the rear right mounting cushion assembly.

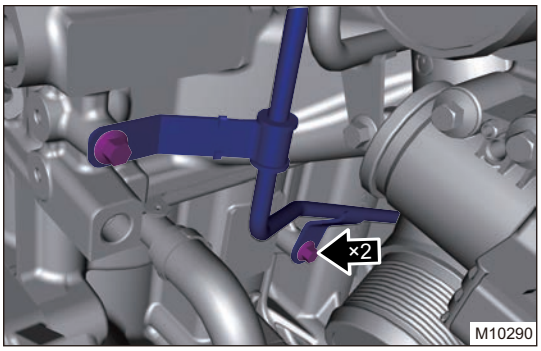
(8) Remove 1 hollow bolt between oil inlet pipe and turbocharger oil inlet port. Remove the copper washer carefully.



(9) Remove 1 hollow bolt between oil inlet pipe and cylinder block. Remove the copper washer carefully.



(10) Remove 2 fixing bolts from oil inlet pipe assembly.



(11) Remove the turbocharger oil inlet pipe assembly carefully.

■ Installation

(1) Put a washer on the hollow bolt, insert it into the ball joint of the oil inlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on turbocharger. Screw in at least 3 teeth without tightening.

Torque: 25 + 5 N·m

(2) Install 2 fixing bolts to oil inlet pipe assembly bracket, and screw in at least 3 teeth without tightening.

Torque: 8 + 3 N·m

(3) Put a washer on the hollow bolt, insert it into the ball joint of the oil inlet pipe, and put another washer on the hollow bolt, and screw it into the corresponding threaded hole on cylinder block. Screw in at least 3 teeth without tightening.

Torque: 25 + 5 N·m

⚠ Caution

- **First tighten the hollow bolts at both ends of the oil inlet pipe assembly according to the torque requirements, and then tighten 2 fixing bolts on oil inlet pipe bracket.**

(4) Install the rear right mounting cushion assembly.
(5) Install the rear right mounting link assembly.
(6) Install the intake hose assembly.
(7) Install the air filter assembly.
(8) Add oil to proper position.
(9) Install the engine compartment trim cover assembly.

5.8 Turbocharger Oil Return Pipe Assembly

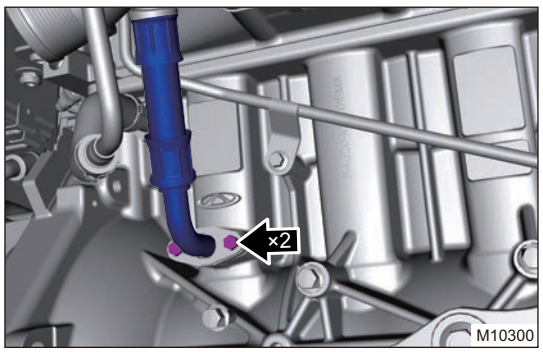
■ Removal

⚠ Warning

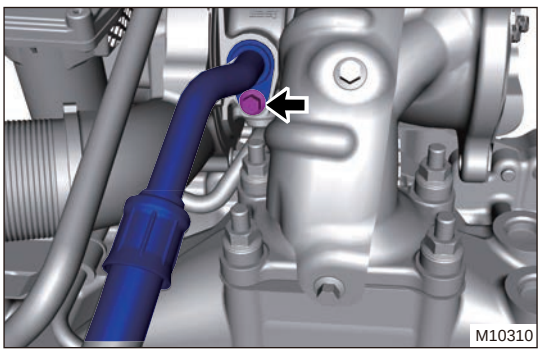
- **Before removing turbocharger oil return pipe assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing turbocharger oil return pipe assembly.**
- **Appropriate force should be applied, when removing turbocharger oil return pipe assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine lower protector assembly.
(3) Remove the rear right mounting link assembly.
(4) Remove the rear right mounting cushion assembly.

(5) Remove 2 fixing bolts between oil return pipe assembly and cylinder block. Remove the washer carefully.



(6) Remove 1 fixing bolt between oil return pipe assembly and turbocharger. Remove the oil return pipe assembly from turbocharger oil return hole.



■ Installation

(1) Dip a small amount of oil on the oil return pipe seal ring (the oil type is the same as the engine oil), rotate the end with seal ring into the oil return hole in the middle of turbocharger, and screw in 1 fixing bolt at least 3 teeth without tightening.

Torque: 8 + 3 N·m

(2) Install 2 bolts into the installation hole of oil return pipe, then put the gasket, and screw 2 bolts into the installation hole of oil return flange surface on cylinder block. Screw in at least 3 teeth without tightening.

Torque: 8 + 3 N·m

⚠ Caution

- **First tighten 2 hollow bolts between oil return pipe and cylinder block according to the torque requirements, and then tighten 1 fixing bolt between oil return pipe and turbocharger.**

(3) Install the rear right mounting cushion assembly.
(4) Install the rear right mounting link assembly.
(5) Add oil to proper position.
(6) Install the engine lower protector assembly.

5.9 Relief Control Solenoid Valve

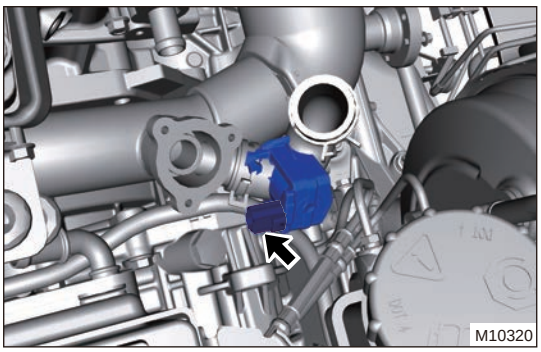
■ Removal

⚠ Warning

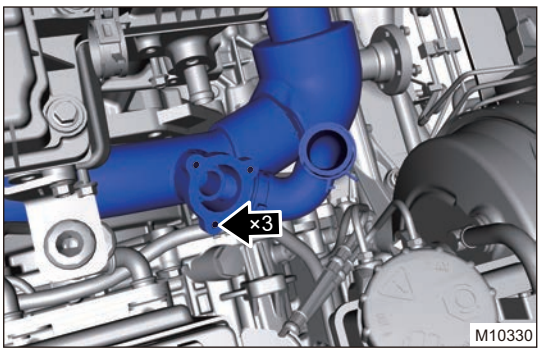
- **Before removal of pressure discharge control solenoid valve assembly, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing relief control solenoid valve assembly.**
- **Appropriate force should be applied, when removing relief control solenoid valve assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.
(4) Remove the intake hose assembly.

(5) Disconnect the relief control solenoid valve connector.



(6) Remove 3 fixing bolts from relief control solenoid valve.



(7) Remove the relief solenoid valve assembly.

■ **Installation**

(1) Install relief control solenoid valve and tighten 3 fixing bolts.
Torque: 8 + 3 N·m

(2) Connect the relief control solenoid valve connector.
(3) Install the intake hose assembly.
(4) Install the engine compartment trim cover assembly.

5.10 Precatalytic Converter Assembly

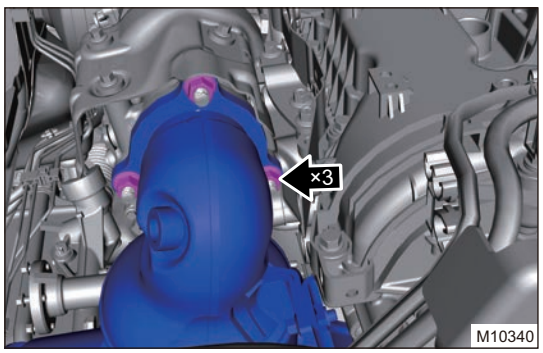
■ **Removal**

⚠ Warning

- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing precatalytic converter assembly.**
- **Appropriate force should be applied, when removing the precatalytic converter assembly. Be careful not to operate roughly.**

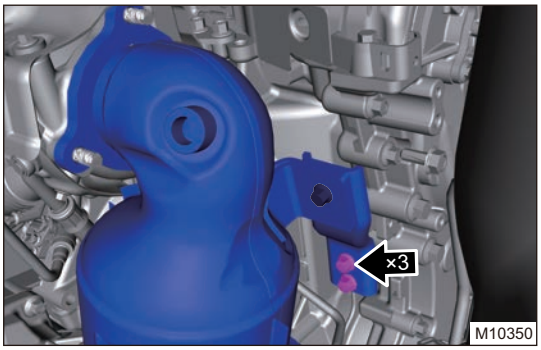
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.
(4) Remove the engine lower protector assembly.
(5) Remove the rear right mounting link.
(6) Remove the rear right mounting cushion assembly.
(7) Remove the front right drive shaft assembly.
(8) Remove the propeller intermediate shaft assembly (If equipped).
(9) Remove the front wheel drive transfer (If equipped).
(10) Remove the upstream oxygen sensor.

(11) Remove 3 fixing nuts between precatalytic converter and turbocharger.

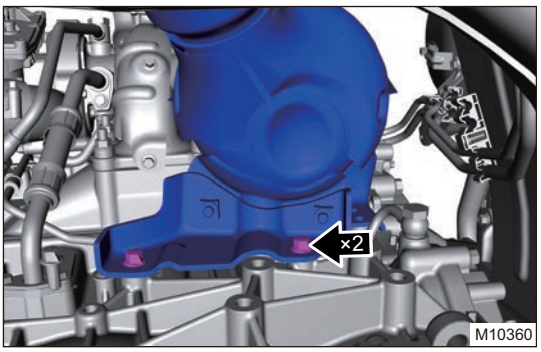


(12) Remove 1 bolt between precatalytic upper bracket and precatalytic converter.

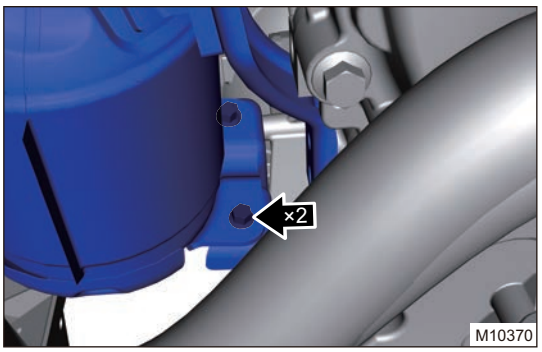
(13) Remove 2 fixing bolts between precatalytic upper bracket and cylinder block. Remove the precatalytic upper bracket.



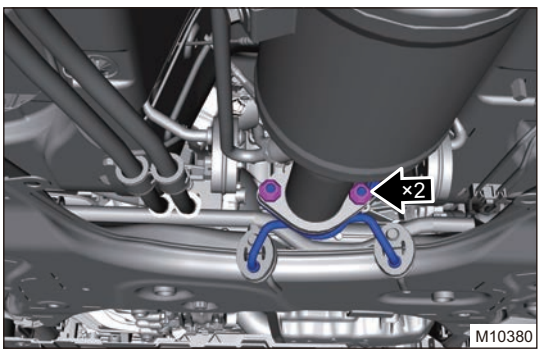
(14) Remove 2 bolts between bracket and cylinder block.



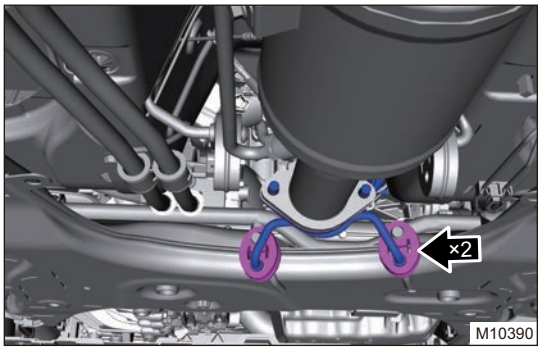
(15) Remove 2 bolts between bracket and precatalytic converter, and remove the bracket.



(16) Remove 2 nuts between precatalytic converter and front muffler.



(17) Disconnect the connection between precatalytic converter and body hook.



(18) Remove the precatalytic converter assembly carefully and slowly.

■ Installation

(1) Install the precatalytic converter, move the precatalytic to a proper position, and insert the corresponding stud of turbocharger into three holes on precatalytic converter. Insert it into the two mounting holes of front muffler at the same time. Install the nuts at both ends and pre-tighten them.

(2) Connect the precatalytic converter and body hook.

(3) Install and tighten 2 fixing bolts between precatalytic upper bracket and cylinder block.
Torque: 25 ± 3.5 N·m

(4) Install the bracket and pre-tighten the 2 fixing bolts on the cylinder block.

(5) Tighten 3 nuts between precatalytic converter and turbocharger.
Torque: 45 ± 5 N·m

(6) Tighten 2 bolts between precatalytic converter and bracket.
Torque: 25 ± 3.5 N·m

(7) Tighten 1 coupling bolt between precatalytic converter and upper bracket.
Torque: 25 ± 3.5 N·m

(8) Tighten 2 coupling bolts between bracket and cylinder block.
Torque: 25 ± 3.5 N·m

(9) Tighten 2 coupling nuts between precatalytic converter and front muffler.
Torque: 40 ± 5 N·m

(10) Remove the engine lower protector assembly.
(11) Install upstream oxygen sensor.
(12) Install the front wheel drive transfer.
(13) Install the propeller intermediate shaft assembly.
(14) Install the front right drive shaft assembly.
(15) Install the rear right mounting cushion assembly.
(16) Install the rear right mounting link.
(17) Install the engine lower protector assembly.
(18) Install the engine compartment trim cover assembly.

5.11 Front Muffler Assembly

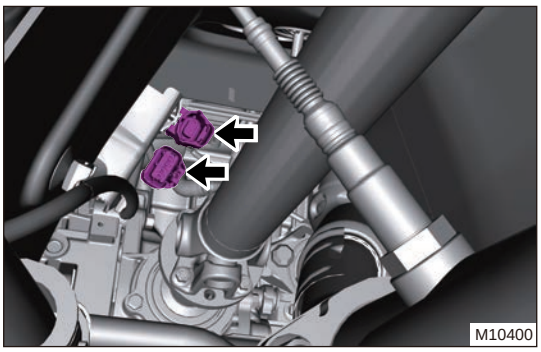
■ Removal

⚠ Warning

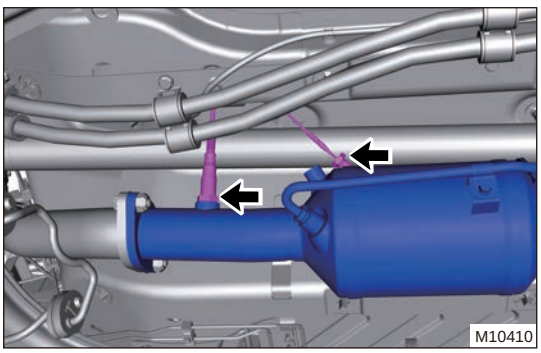
- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing front muffler assembly.**
- **Appropriate force should be applied, when removing the front muffler assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.

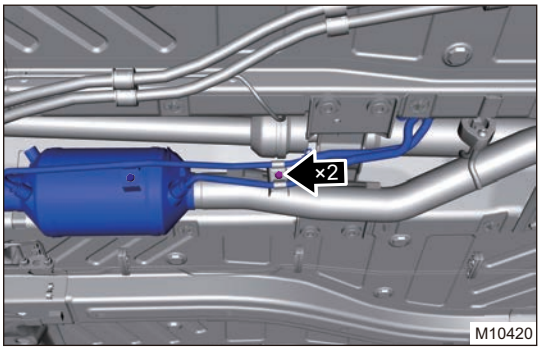
(3) Disconnect the downstream oxygen sensor connector.
(4) Disconnect the GPF exhaust temperature sensor connector.



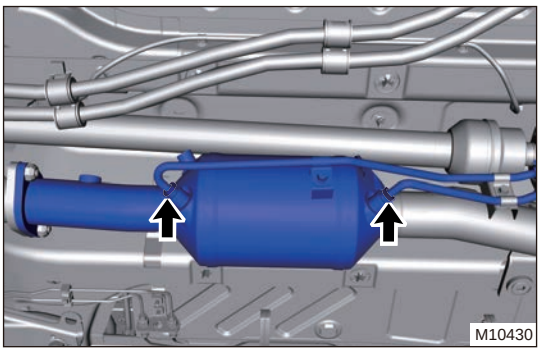
(5) Remove the downstream oxygen sensor and GPF exhaust temperature sensor.



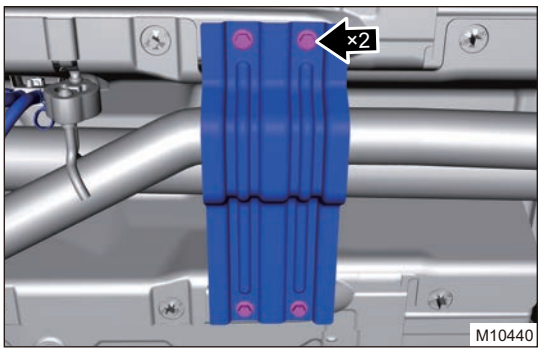
(6) Remove the 2 bolts fixed to the differential pressure sampling pipe bracket.



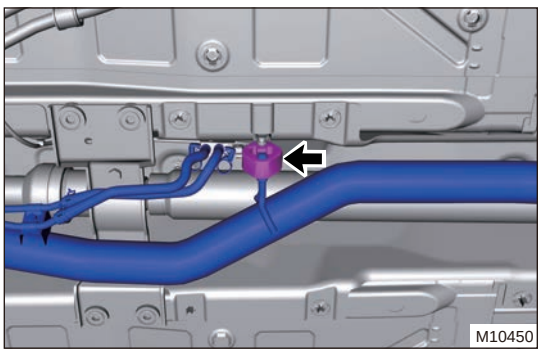
(7) Remove 2 fixing bolts from differential pressure sampling pipe, separate pipe joint and GPF.



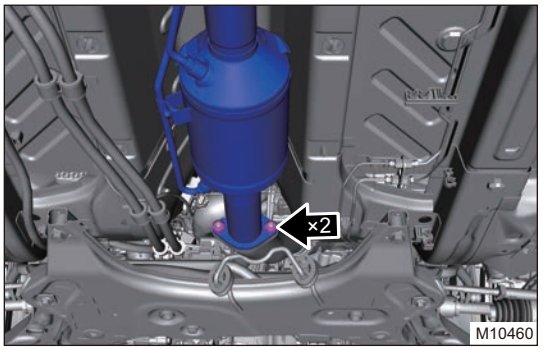
(8) Remove 4 fixing bolts from center passage rear mounting board.



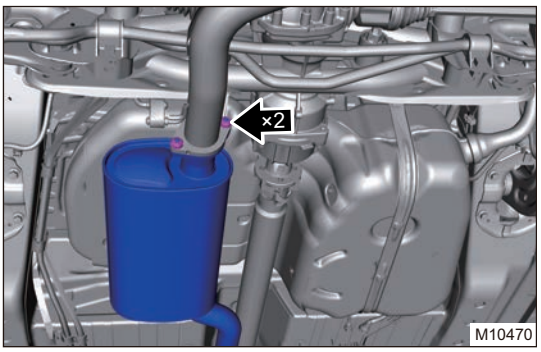
(9) Separate 1 hanger block from front muffler.



(10) Remove 2 fixing nuts between precatalytic converter and front muffler.



(11) Remove 2 fixing nuts between front muffler and rear muffler.



(12) Remove the front muffler assembly carefully.

■ Installation

(1) Install the front muffler.

Torque: 40 ± 5 N·m

(2) Connect front muffler body hanger block.

(3) Install the differential pressure sampling pipe joint to fixed bracket.
(4) Install the GPF exhaust temperature sensor.
(5) Install the downstream oxygen sensor.
(6) Install the center passage rear mounting board.

5.12 Rear Muffler Assembly

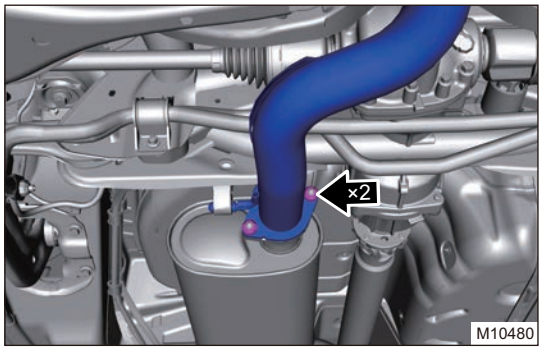
■ Removal

⚠ Warning

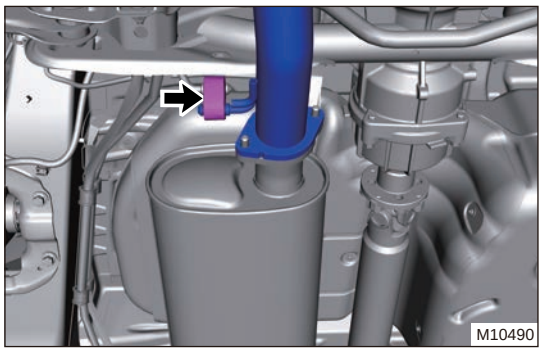
- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing rear muffler assembly.**
- **Appropriate force should be applied, when removing the rear muffler assembly. Be careful not to operate roughly.**

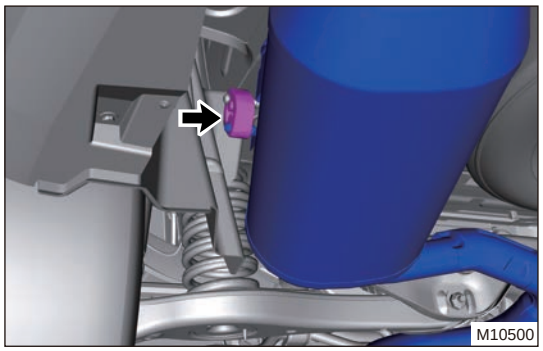
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.

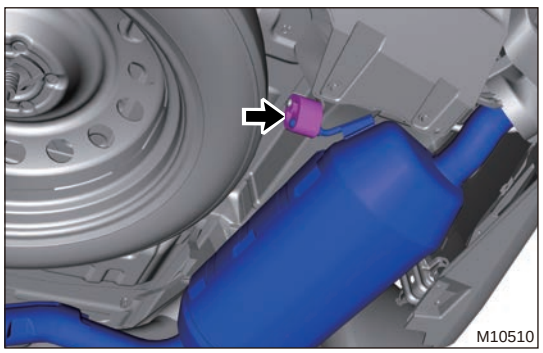
(3) Remove 2 fixing nuts between front muffler and rear muffler.



(4) Disengage 3 fixing hanger blocks from rear muffler assembly.







(5) Carefully remove the rear muffler assembly.

■ Installation

(1) Install 3 fixing hanger blocks to rear muffler.

(2) Tighten 2 fixing nuts between rear muffler and front muffler.

Torque: 45 ± 5 N·m

5.13 Center Passage Heat Insulator

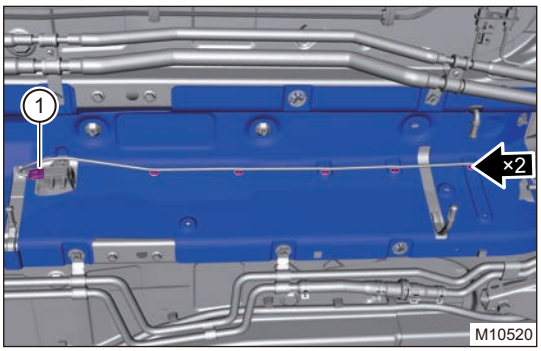
■ Removal

⚠ Warning

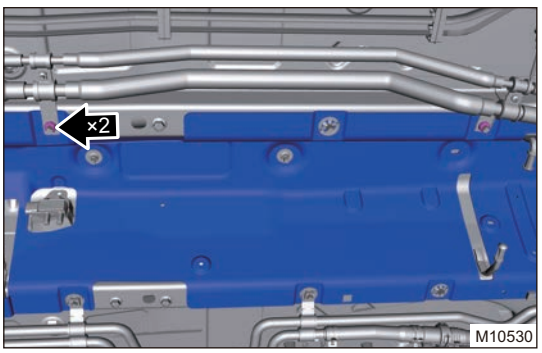
- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing center passage heat insulator assembly.**
- **Appropriate force should be applied, when removing the center passage heat insulator assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front muffler assembly.
(4) Remove the propeller intermediate shaft assembly. (If equipped)

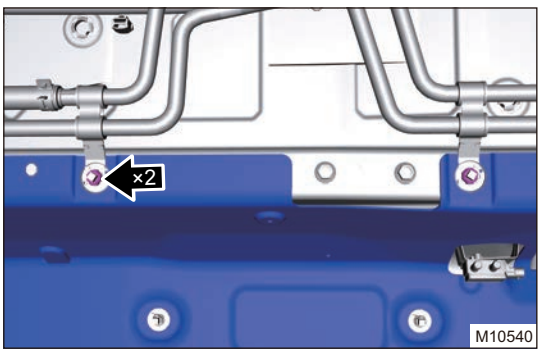
(5) Disconnect the differential difference sensor connector (1).
(6) Disengage 5 fixing clips from differential difference sensor connector wire harness.



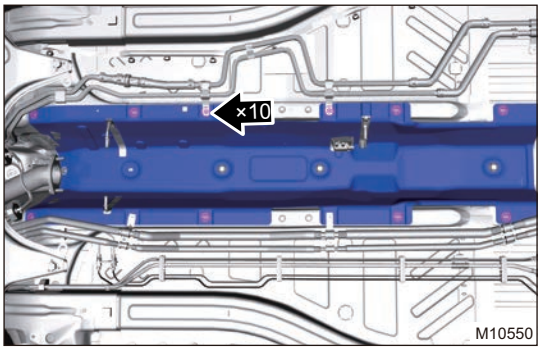
(7) Remove 2 fixing nuts from rear A/C line.



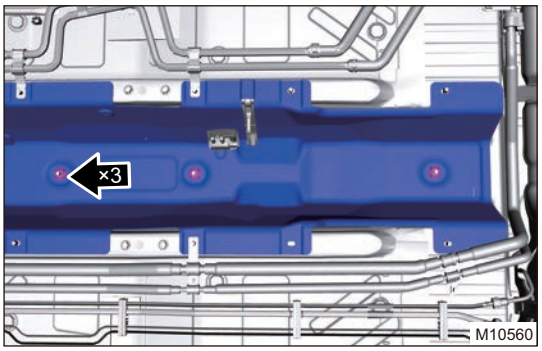
(8) Remove 2 fixing nuts from rear heater water inlet and outlet pipe Ⅱ.



(9) Remove 10 clamping washers from center passage heat insulator.



(10) Remove 3 fixing nuts from center passage heat insulator.



(11) Remove center passage heat insulator carefully.

■ Installation

(1) Install 9 clamping washers to tighten center passage heat insulator.
(2) Install 3 fixing nuts on center passage heat insulator.
(3) Install 2 fixing nuts to rear A/C line.
(4) Install 2 fixing nuts to rear heater water inlet and outlet pipe Ⅱ.
(5) Connect the differential difference sensor connector. Clamp 5 fixing clips of wire harness.
(6) Clamp 1 fixing clip of GPF differential difference sensor connector wire harness.
(7) Install the propeller intermediate shaft assembly. (If equipped)
(8) Install the front muffler assembly.

4.5 IGNITION SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) It is prohibited to use short circuit spark test to test ignition function during repair, otherwise it may damage the module.

(2) During using, do not remove ignition coil from spark plug with bare hands with power on, and do not contact the metal part and rubber guide rod directly, to avoid electric shock.

(3) Make sure that ground wire of ignition coil assembly is short to the nearest GND separately from ECU and other electrical device to reduce signal interfere as possible.

(4) Ensure that connector or wire harness has no damage; the wire harness connector is connected correctly. Ensure that wire harness and connector have no short circuit or poor contact.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) DO NOT remove the spark plugs when engine is hot; failure to do this may cause damage to the spark plug thread holes on cylinder head.

(2) When installing spark plug and ignition coil, check if there is impurities in cylinder head mounting holes, and if the inner wall is smooth.

(3) Do not make paint mark on spark plug assembly ceramic body. If there is paint or other organic mark, it is necessary to clean. Never apply grease such as lubricant and anti-rust oil etc. on spark plug assembly. If so, it is required to clean it.

(4) Before removal, remove the dirt and foreign matter around ignition coil and ignition coil mounting hole to prevent them from dropping into cylinders.

(5) After removing or when replacing ignition coil, do not place ignition coil on the ground or other dusty places, otherwise, dust or foreign matter may enter rubber guide and lead to ignition coil failure.

(6) When replacing spark plug, remove and install ignition coil carefully. Do not rotate ignition coil (avoid scratching rubber guide).

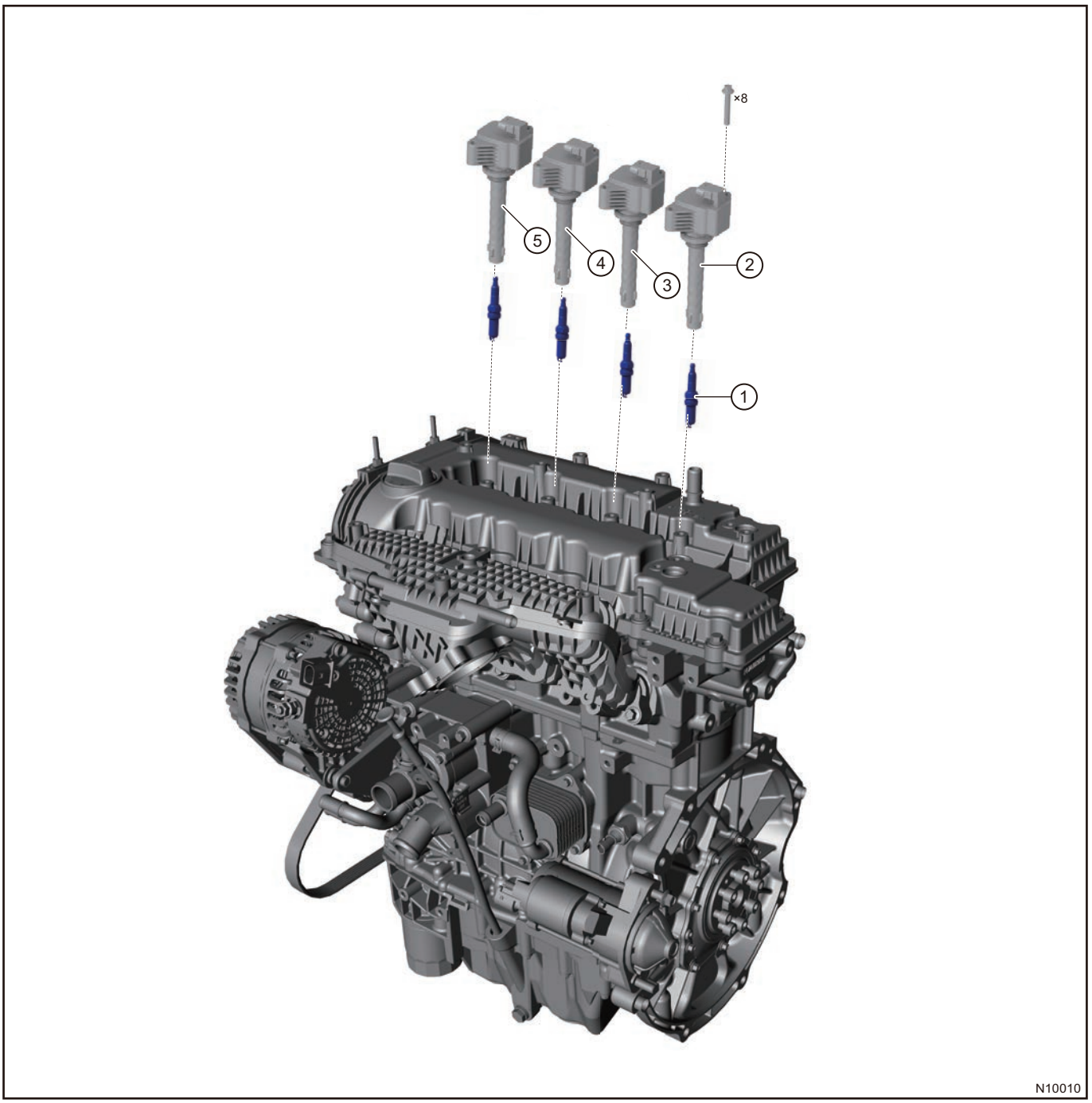
(7) Do not separate ignition coil rubber guide and ignition coil body. If so, it may cause the decrease of seal performance and fuel gas enter and corrode inner structure when reinstalling.

2 System Overview

2.1 System Description

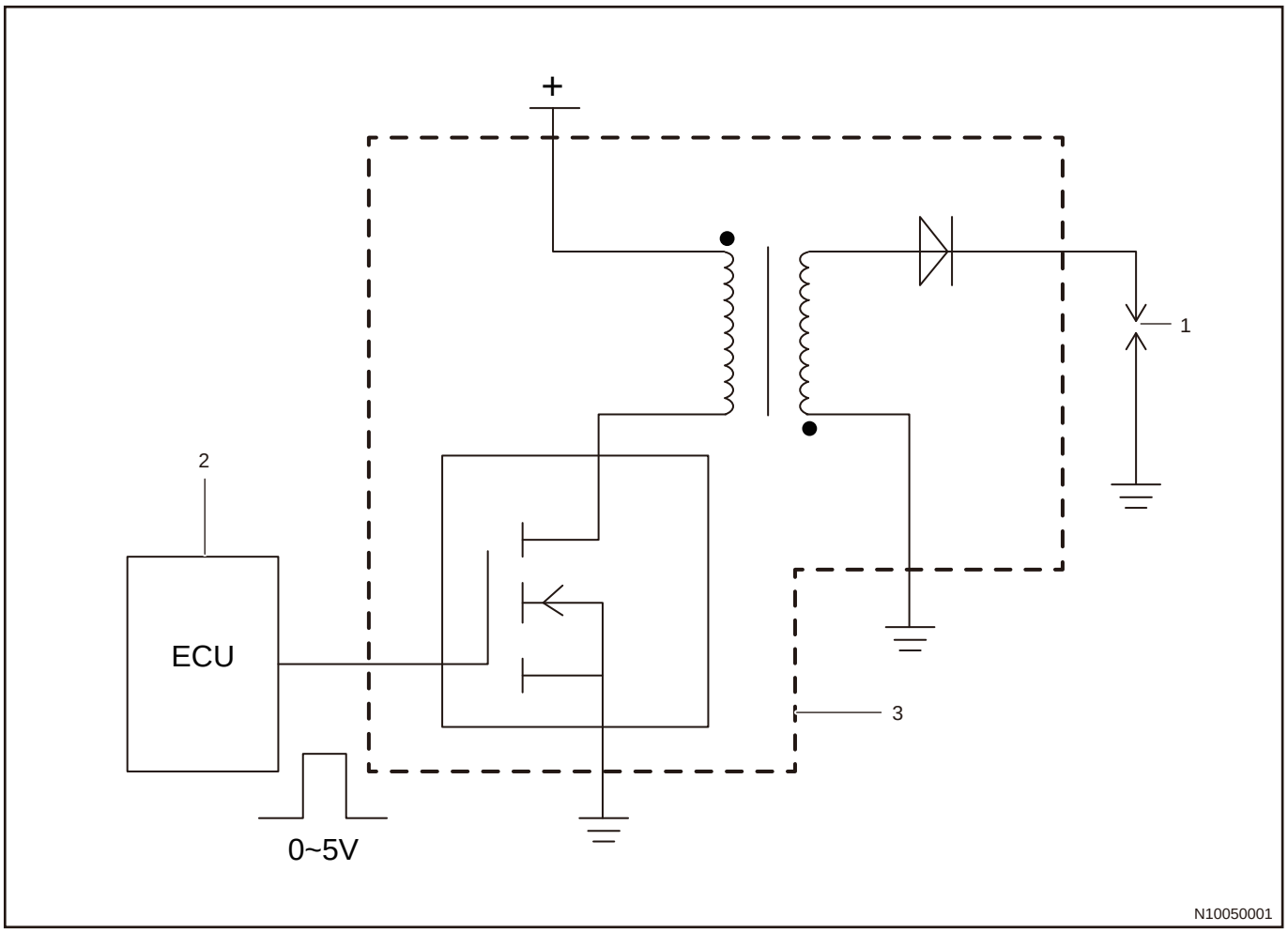
Ignition system mainly consists of sensors, engine control module, ignition coils (integrated drive module can not be disassembled), spark plugs, etc.Ignition coil integrated drive module uses 4-line coil-on-plug system, and has over current and overtime protection function.The secondary (secondary high-voltage terminal) of each ignition coil is connected to spark plugs in engine cylinder respectively via high-voltage damping anti-interference rubber connecting rod. Ignition coil primary (original low-voltage terminal) is controlled by the internal integrated drive module via the pulse signal command issued by the engine control module (working state: power on, power off)Engine control module receives the top dead center position of each cylinder piston via camshaft position sensor, and uses the speed sensor signal to issue pulse drive command. Correct ignition advance angle according to knock sensor signal; Make ignition system operate normally.

2.2 System Components Diagram



1	Spark Plug	4	Cylinder 2 Ignition Coil Assembly
2	Cylinder 4 Ignition Coil Assembly	5	Cylinder 1 Ignition Coil Assembly
3	Cylinder 3 Ignition Coil Assembly		

2.3 System Schematic Diagram



1	Spark Plug	3	Ignition Coil
2	Engine Control Unit		

2.4 Components Description

■ Ignition Coil

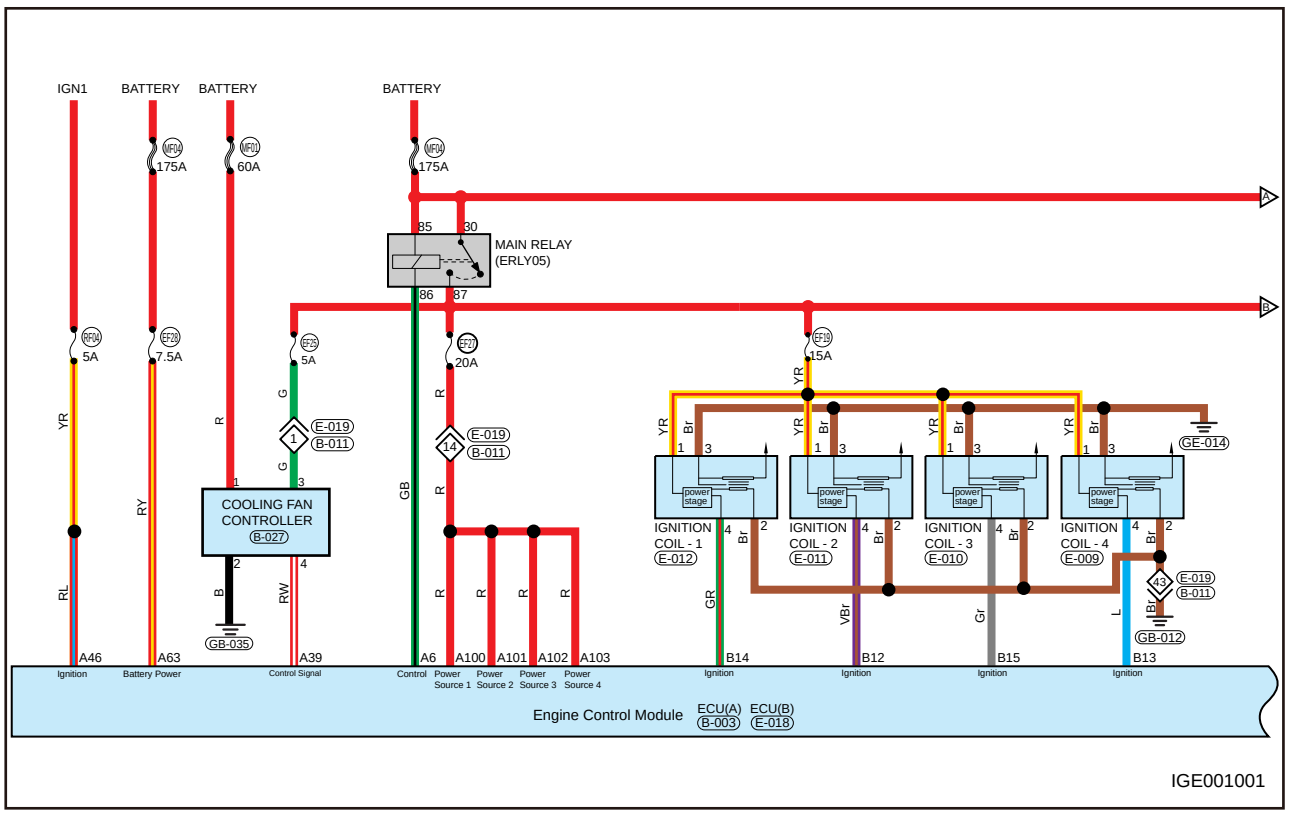
Ignition coil consists of primary winding, secondary winding, integrated module, iron core and housing etc. When the ground circuit of a primary winding is on, this primary winding starts charging (magnetizing). When ECU cut off pulse signal (high level to low level) circuit, charging (magnetizing) is terminated. At this time, high voltage will be induced in the secondary winding by the magnetic field coupling. In the process of passing the spark plug circuit, the spark plug will discharge (ignition).

■ Spark Plug

Spark plug consists of wired nut, insulator ceramic body, wired screw, central electrode, side electrode (the side electrode is wield to case) and case.
The high-voltage current passes through the center electrode of the spark plug to the side electrode ,which forms a circuit. In this process, the high-voltage current break through the air to produce sparks, that is, ignite the combustible mixture in the cylinder.

3 System Circuit Diagram

3.1 Circuit Diagram



4 Diagnosis & Testing

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Ignition System

Symptom	Possible Cause
Stall	Ignition coil
	Camshaft position sensor

Symptom	Possible Cause
	Spark plug
	Intake camshaft phaser control valve
	Exhaust camshaft phaser control valve
	Wire harness
	ECU
Knock	Ignition coil
	Knock sensor
	ECU
Difficult to start	Battery
	Ignition coil
	Spark plug
	Engine speed sensor
Engine hesitation, power drop, unstable performance	Ignition coil
	Intake camshaft phaser control valve
	Exhaust camshaft phaser control valve
	Engine speed sensor
	Spark plug
	Camshaft position sensor
	ECU

4.2 Spark Plug Common Problems

■ Normal

Spark plug porcelain small end is between white and yellowish, gray or brownish.Air-fuel ratio and ignition time are normal, there is no misfire, and cold-start enriching function is normal.

■ Carbon Accumulation

A layer of velvety black charcoal smoke attaches on the insulator small end, electrode and spark plug body		
Cause	Result	Treatment
Mixture is excessively rich due to improper adjustment of air fuel mixture.	Poor starting ability	Check air filter and adjust air-fuel ratio and cold starting system.
Traveling distance of vehicle is too short, engine temperature is low, and combustion is incomplete.		
Fuel quality is poor or fuel deteriorates, fuel is abnormal.		
Spark plug type is incorrect.		

■ **Oil Dirt**

A layer of black oily charcoal smoke and dirt attach on the insulator small end, electrode and spark plug body		
Cause	Result	Treatment
Piston ring has bad elasticity or is worn excessively, and oil breaks into combustion chamber.	Difficult to start.	Check and repair engine, or replace spark plug.
Excessive matching clearance between piston skirt and cylinder wall causes oil breaking and air leakage.		
Air leakage occurs due to incorrect installation of piston ring in direction of inside and outside tangent angle, causing oil breaking into combustion chamber.		
Excessive clearance occurs between valve stem and valve guide due to excessive wear, or valve guide oil seal fails, causing oil leakage.		
Oil level is too high and oil breaks into combustion chamber.		

■ **Lead Deposits**

Brownish yellow enamels or greenish deposits exist on the insulator small end		
Cause	Result	Treatment
The fuel additive contains lead, when engine runs under high load conditions with throttle partially opened for a long time, enamel is formed.	Causing misfire	Replace spark plug.

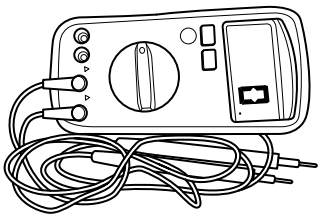
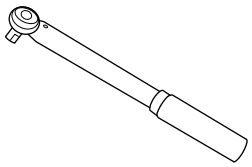
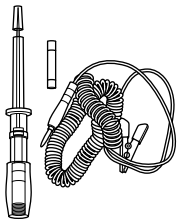
■ **Red Deposits**

There are severe red brown deposits on insulator skirt and electrodes, and clear radial discharge traces can be seen on the surface of insulator small end		
Cause	Result	Treatment
In the unleaded gasoline, Mn-based anti-riot agent MMT is used instead of lead tetraethyl, the oxide of Mn after combustion adheres on the surface of insulator and electrode.	At high temperature, these deposits are easily conductive, resulting in flashover on insulator skirt surface, unstable combustion, high engine speed, and jitter under heavy load conditions.	Use qualified fuel, replace spark plug.

5 ON-VEHICLE SERVICE

5.1 Tool

■ General Tool

Tool Name	Tool Drawing
Digital Multimeter	 S00002
5 - 25 N·m Torque Wrench	 S00079
LED Test Light	 S00077

5.2 Ignition Coil Assembly

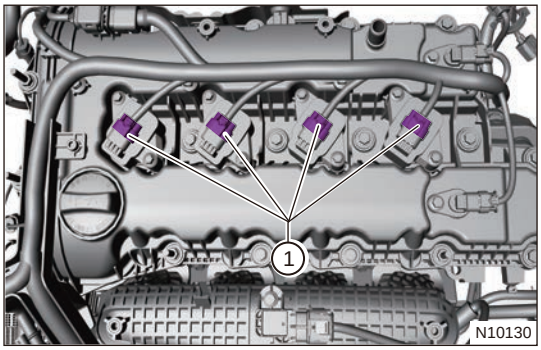
■ Removal

⚠ Warning

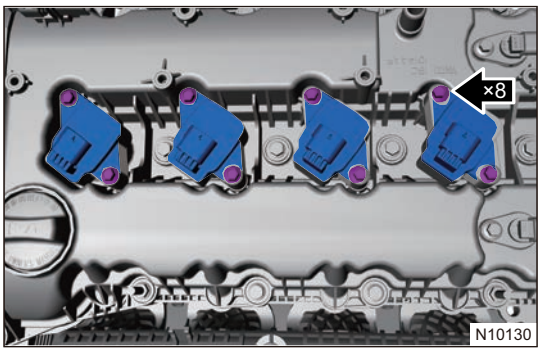
- **Appropriate force should be applied, when removing ignition coil assembly. Be careful not to operate roughly.**
- **It is prohibited to use short circuit spark test to test ignition function during repair, otherwise it may damage the module.**
- **During using, do not remove ignition coil from spark plug with bare hands with power on, and do not contact the metal part and rubber guide rod directly, to avoid electric shock.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the engine trim cover.

(5) Disconnect the ignition coil assembly connectors (1), and move away the wire harness connector from ignition coil.



(6) Remove 8 fixing bolts from ignition coil assembly (8# socket wrench).



(7) Remove the ignition coil assembly.

⚠ Caution

- **After removing ignition coil, do not place ignition coil on the ground or other dusty places, otherwise, dust or foreign matter may enter rubber guide and torsion ignition coil failure.**
- **Remove ignition coil carefully. Do not rotate ignition coil (avoid scratching rubber guide).**
- **Do not separate ignition coil rubber guide and ignition coil body. If so, it may cause the decrease of seal performance and air oil enter and corrode inner structure when reinstalling.**

■ Inspection

⚠ Caution

- **It is prohibited to use short circuit spark test to test ignition coil performance, otherwise it may cause damage to electronic controller.**
- **During inspection, do not remove ignition coil from spark plug with bare hands with power on, and do not contact the metal part and rubber guide rod directly, to avoid electric shock.**

Terminal	Terminal Definition
1	Ground
2	Ground
3	Power supply
4	Pulse drive signal

(1) Use a digital multimeter to measure if ignition coil power supply/ground is normal.

(2) Use LED test light to measure the pulse drive signal of ignition coil and obverse if LED test light flashes.

(3) The ignition coil assembly can be exchanged for each cylinder to judge if the ignition coil assembly is in good condition.

■ **Installation**

⚠ Caution

- **Make sure that ground wire of ignition coil assembly is short to the nearest GND separately from ECU and other electrical device to reduce signal interfere as possible.**
- **Ignition coil assembly rubber guide rod end is applied with specified grease of its self, which can help in assembly of ignition coil assembly and spark plug assembly. Do not remove it arbitrarily.**
- **Make sure that the connection of ignition coil high-voltage output terminal and spark plug is reliable, or it may cause high-voltage leakage, resulting in poor ignition.**
- **Before installation, check the mounting hole of cylinder head spark plug, and no impurities can be brought in during assembly.**
- **Install the ignition coil into cylinder head cover mounting hole and press it to close to mounting boss on cylinder head cover. Never turn ignition coil to left/right after pressing and do not tap ignition coil with a hammer etc.**
- **To prevent accidental scratches to ignition coil assembly, do not allow sharp edge to contact with rubber guide rod under ignition coil assembly during installation.**

(1) Install 8 fixing bolts on ignition coil assembly.

Torque: 8 ± 3 N m

(2) Connect the ignition coil assembly connector.

(3) Install the engine trim cover.

(4) Install the engine compartment trim cover assembly.

5.3 Spark Plug Assembly

■ **Removal**

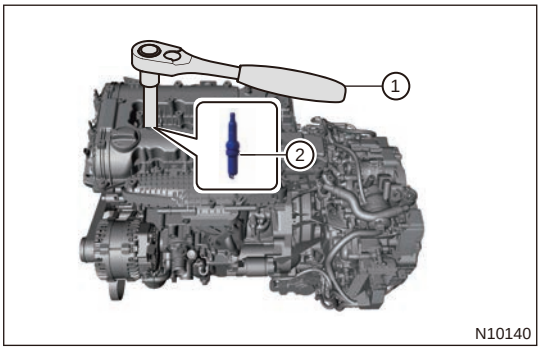
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing spark plug.**
- **Appropriate force should be applied when removing spark plug. Be careful not to operate roughly.**
- **DO NOT remove the spark plugs when engine is hot; failure to do this may cause damage to the spark plug thread holes on cylinder head.**
- **Before removal, remove the dirt and foreign matter around spark plug holes to prevent them from dropping into cylinders.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the engine trim cover.
(5) Remove the ignition coil assembly.

(6) Using a special spark plug socket ratchet wrench (1), loosen the spark plug.

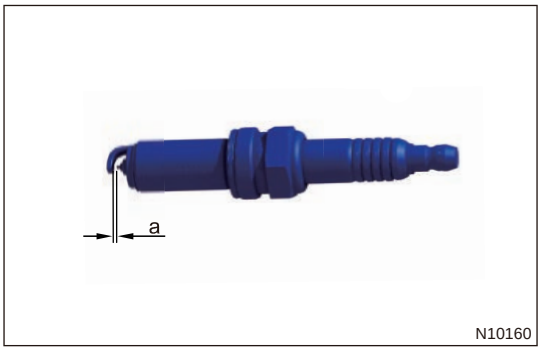
(7) Remove the spark plug (2).



■ Inspection

(1) Check the spark plug gap a: 0.7 - 0.8 mm

- It is not necessary to adjust the gap.



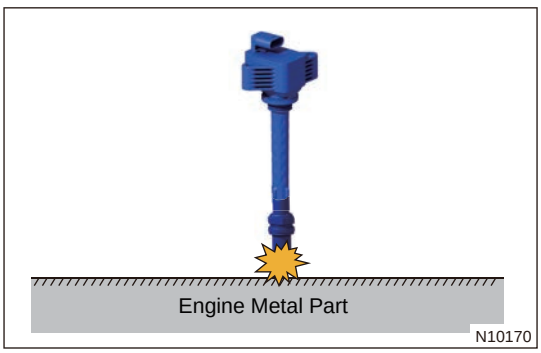
■ Spark Jump Test Method

(1) Remove the spark plug from engine and connect it to high-voltage cable, put the spark plug case 5 - 7 mm away from engine body and start vehicle to check the spark jump.

⚠ Warning

- **Always disconnect the injector circuit before test to avoid injection during spark jump test.**

(2) If there is a thick spark with blue-white color and popping occurs between spark plug and engine body and also spark generated between center electrode and side electrode, that indicates ignition system is normal.



(3) If the spark is red and short or there is no spark, check ignition coil wire and ECU.

■ **Installation**

⚠ Caution

- **Check the spark plug type to confirm if it is suitable.**
- **Check if there is impurities in cylinder head mounting holes, the inner wall is smooth.**
- **Do not make paint mark on spark plug assembly ceramic body. If there is paint or other organic mark, it is necessary to clean. Never apply grease such as lubricant and anti-rust oil on spark plug assembly. If so, it is required to clean it.**
- **Please install spark plug with a special spark plug socket, and never damage the normal spark plug gap.**
- **Avoid to install the spark plug from higher position from mounting hole during installation to prevent spark plug side electrode gap from damaging, resulting in poor ignition.**
- **Always tighten the spark plug according to specified torque using a torque wrench when installing it.**

(1) Install 4 spark plugs respectively into the cylinder head mounting holes for pre-tightening tighten, and then retighten the spark plugs with a torque wrench.

Torque: 20 ± 3 N m

(2) Install the ignition coil assembly.

(3) Install the engine trim cover.

(4) Install the engine compartment trim cover assembly.

4.6 Emission Control System

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.

(2) Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) The specified grease must be used. Use of other grease will lead to oxygen sensor poisoning. The new sensor has been applied with grease and the grease must be applied to the mounting threads when reassembling.

(2) Unneeded activated charcoal canister assembly should be handled by the specialized department according to local laws and regulations. Never discard it at will.

(3) If the oxygen sensor falls, never pick it up to install and it needs to return to factory for testing.

2 System Overview

2.1 System Description

Emission control system includes: Fuel vapor recovery/leakage diagnosis system, exhaust emission conversion system, Gasoline Particulate Filter (GPF) system and crankcase forced ventilation system.

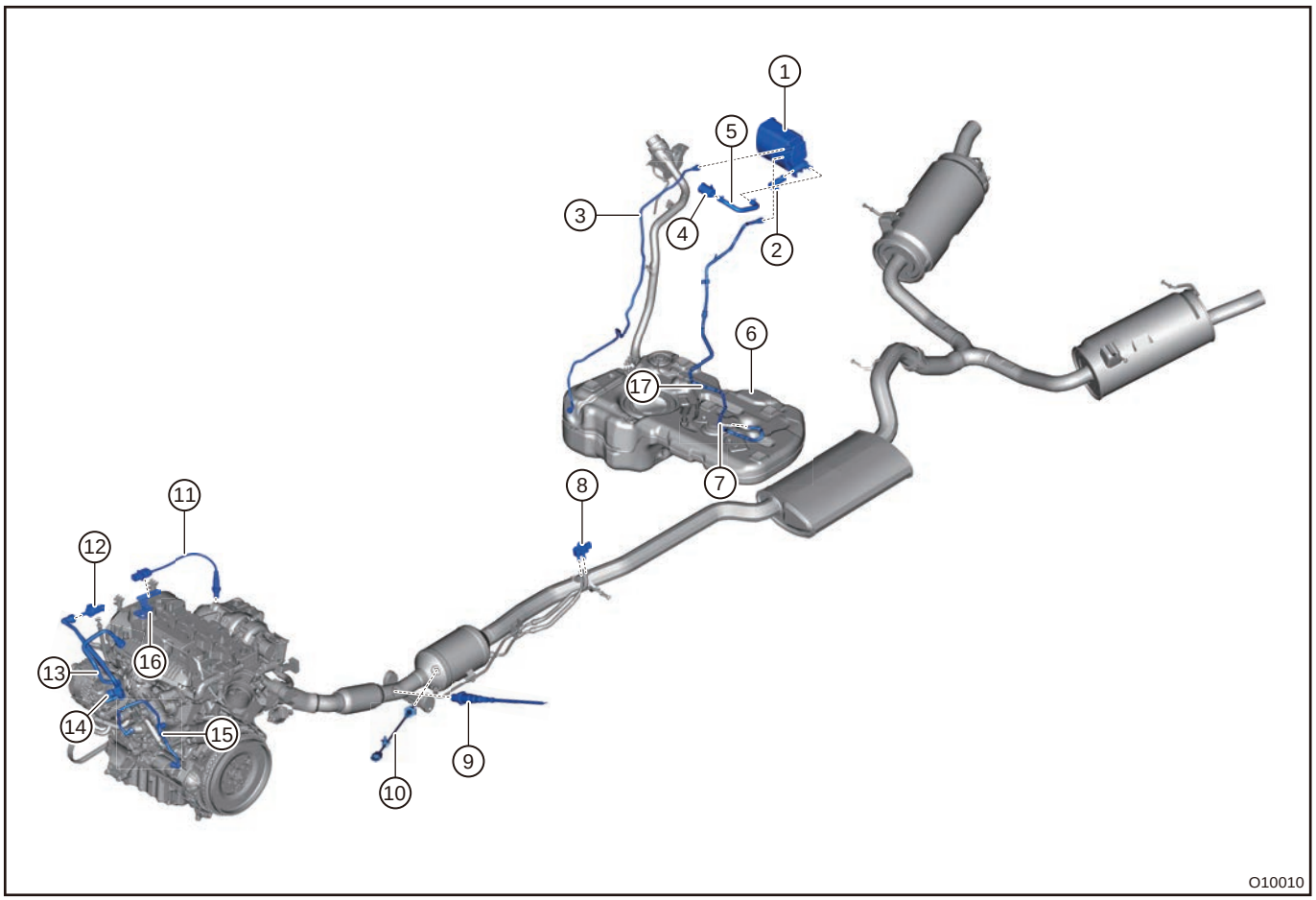
(1) The function of fuel vapor recovery/leakage diagnosis system: Fuel vapor (HC) is recovered and inhaled into engine cylinder for combustion, which can reduce emission and improve fuel economy. According to National VI regulation, fuel vapor recovery system adds leakage diagnosis function, the generated fuel vapor is not allowed to leak into atmosphere in the process of recovery, desorption and refilling etc. The system judge whether it leaks according to leakage diagnosis test. Once leakage occurs, the system will turn on malfunction light to warn and avoid polluting environment.

(2) The function of exhaust emission conversion system: Through front and rear oxygen sensors determine whether oxygen is excess (namely oxygen content) in exhaust gas after engine combustion, convert oxygen content into voltage signal and transmit to alternator computer, then engine can realize closed-loop control which aims at excess air coefficient. Make sure three-way catalytic converter can convert harmful gases such as CO, HC and NOX from exhaust gas into harmless carbon dioxide, water and nitrogen by oxidation and reduction. Avoid polluting environment.

(3) The function of Gasoline Particulate Filter (GPF) system: According to National VI regulation, GPF is added in order to avoid the emission of gasoline particulates, which can reduce the particulates leaked into the air and avoid polluting environment.

(4) The function of crankcase forced ventilation system: The air in cylinder leaks into crankshaft space during normal engine operation. The leaked air contains unburned fuel and all exhaust air contents, which will cause the deterioration of lubricant and increase of crankshaft pressure and temperature. In order to avoid this, the gas leaked into crankshaft is inhaled into cylinder for combustion and recover HC, which reduces the air pollution.

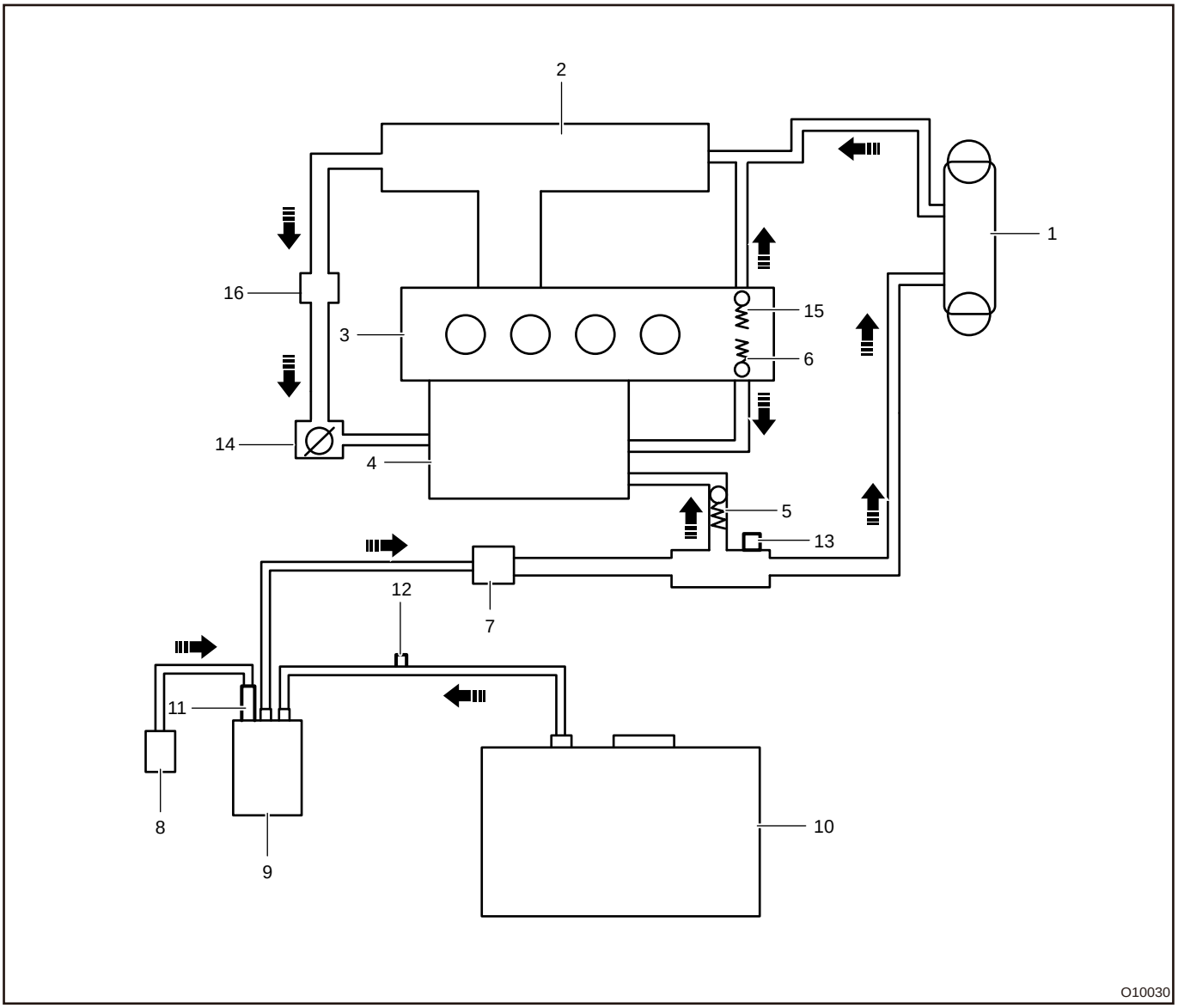
2.2 System Components Diagram



1	Charcoal Canister Solenoid Valve Assembly	7	Fuel Vapor Pipe II
2	Upstream Oxygen Sensor	8	Fuel Vapor Pipe I
3	Charcoal Canister Solenoid Valve Outlet Pipe	9	Dust Filter
4	Rear Oxygen Sensor	10	Activated Charcoal Canister Cut-off Valve
5	Exhaust Temperature Sensor	11	Activated Charcoal Canister Assembly
6	Pressure Difference Sensor	12	Activated Charcoal Breather Pipe

2.3 System Schematic Diagram

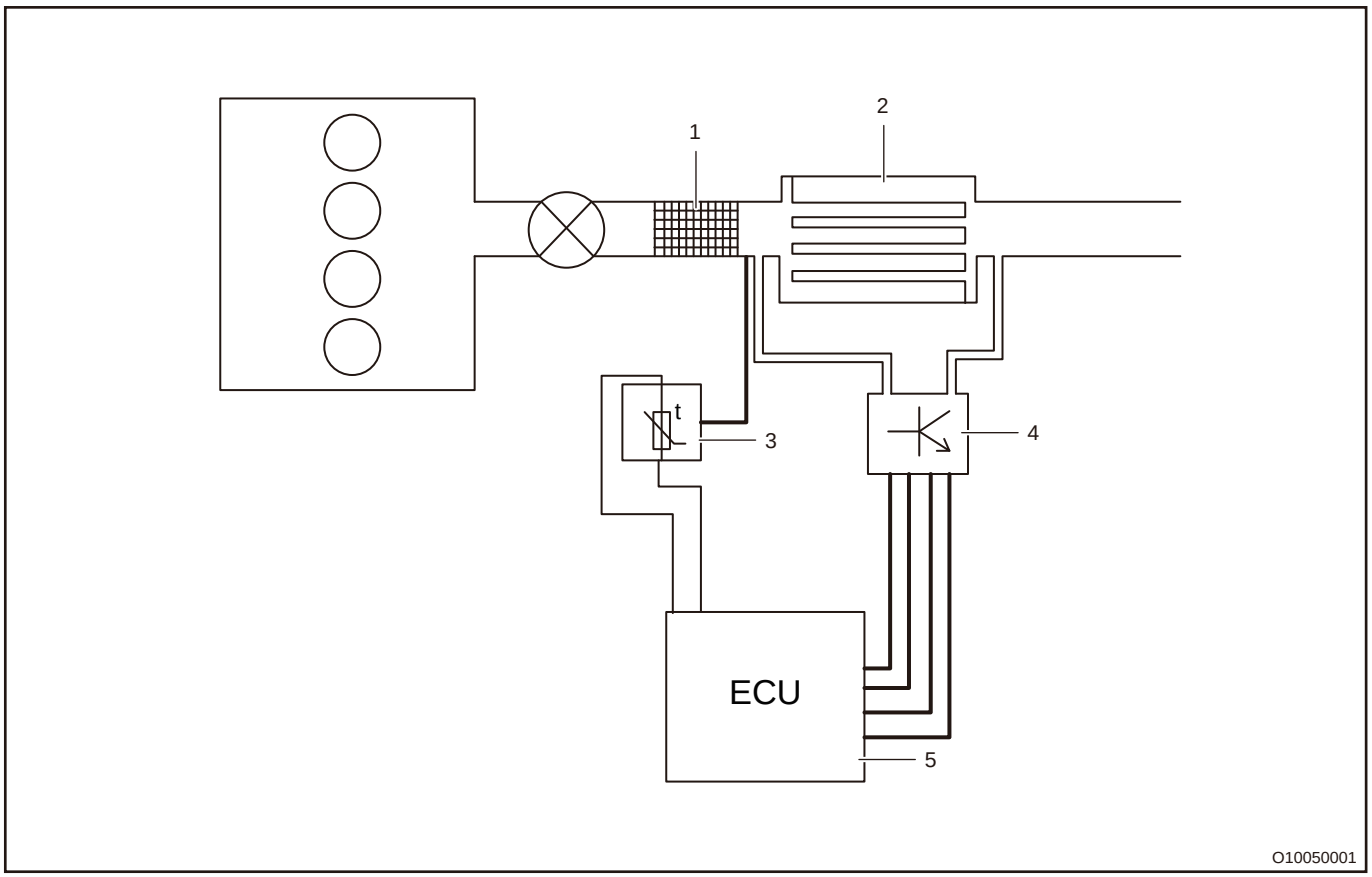
■ Fuel Vapor Recovery/Leakage Diagnosis System



1	Activated Charcoal Canister Assembly	5	Fuel Tank Pressure Sensor
2	Activated Charcoal Canister Cut-off Valve	6	Fuel Tank Assembly
3	Dust Filter	7	Charcoal Canister Desorption Pressure Sensor
4	Intake Hose Assembly		

Two desorption pipelines are equipped in fuel vapor recovery system. One desorption pipeline is connected to intake manifold through canister solenoid valve, which is low load desorption pipeline. Another desorption pipeline is connected to intake hose through canister solenoid valve pipeline (venturi tube), which is high load desorption pipeline.Principle of fuel vapor leakage diagnosis: After closing the charcoal canister ventilation valve, pump the fuel tank into a certain negative pressure through the intake manifold vacuum degree. If the negative pressure cannot be established, it is considered that there is a large leakage, i.e. a coarse leakage. Then close the canister solenoid valve, and form a closed space between canister solenoid valve rear pipe and fuel tank. When there are holes and no holes, the attenuation gradient of vacuum degree in this closed space is different, so it can be judged whether there is leakage.

■ **Gasoline Particulate Filter (GPF) System**



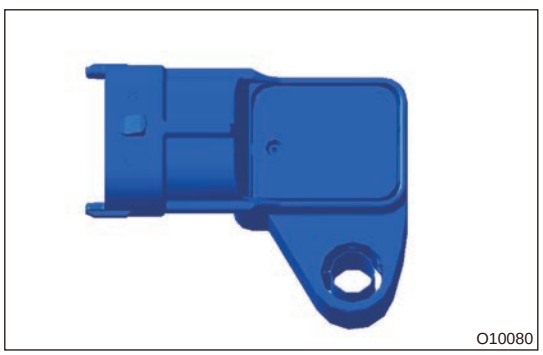
1	Precatalytic Converter Assembly	4	Pressure Difference Sensor
2	Gasoline Particulate Filter	5	Engine Control Unit
3	Exhaust Temperature Sensor		

GPF is a ceramic filter installed in gasoline engine emission system, which can capture gasoline particulates before they enter the atmosphere.Although GPF can capture the gasoline particulates in exhaust gas effectively, with the increase of captured gasoline particulates, exhaust back pressure will increase, which will effect the vehicle power and economy.When particulates in GPF are accumulated to a certain extent, particulates in GPF will be oxidized and burned by adjusting engine operation condition (such as fuel cut-off, delayed ignition angle), ECU controls the regeneration of GPF and remove particulates in GPF, and finally realize positive cycle of “capture-regeneration-capture”.

2.4 System Components Description

■ **Charcoal Canister Desorption Pressure Sensor**

As a varistor type, the sensor mainly detects whether the pressure (negative pressure) in high load desorption pipeline meets charcoal canister desorption requirement. Thereby complete high load desorption.



■ Fuel Tank Pressure Sensor

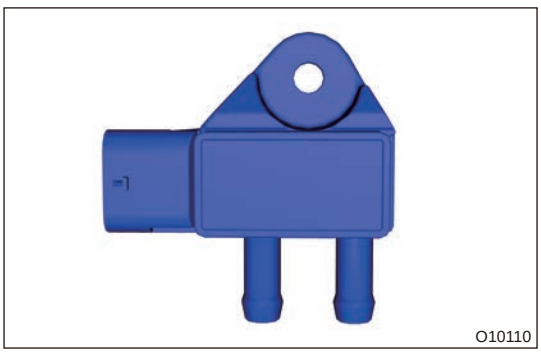
As a varistor type, the sensor mainly detects the pressure change in fuel tank, then judges whether the absorbed fuel vapor in charcoal canister is saturated and whether there is leakage in fuel vapor system.

■ Canister Solenoid Valve Outlet Pipe Ⅱ (Venturi Tube）

Venturi effect is adopted in the venturi tube. The principle of venturi tube is to change the air flow from coarse to fine, so as to speed up the air flow rate and form a "vacuum area" at the rear side of venturi tube outlet; this vacuum area will produce certain adsorption to the outside, thereby complete high load desorption.

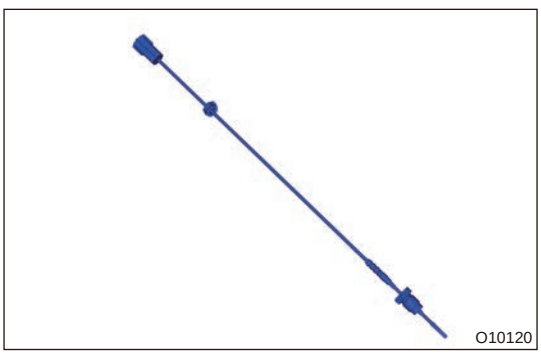
■ Pressure Difference Sensor

The sensor is a dual-mode differential pressure sensor, and the output dual-mode signals are digital signals, which mainly detects pressure difference between the two ends of GPF, so as to indirectly judges the amount of captured particulates. Realize the “regeneration” condition.



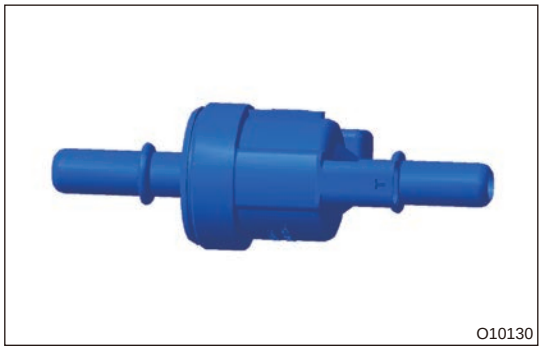
■ Exhaust Temperature Sensor

The sensor is a positive temperature coefficient thermistor (PTC) whose resistance value becomes larger as the temperature increases and becomes smaller as the temperature decreases. It mainly detects GPF inlet temperature and make sure GPF can regenerate safely.



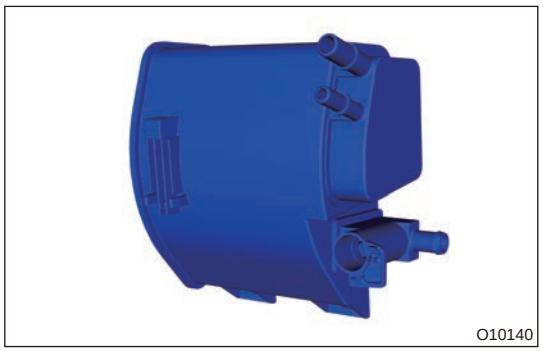
■ Charcoal Canister Solenoid Valve

Canister solenoid valve consists of solenoid coil, armature, valve body and other parts, and it is controlled by ECU by means of duty ratio control.



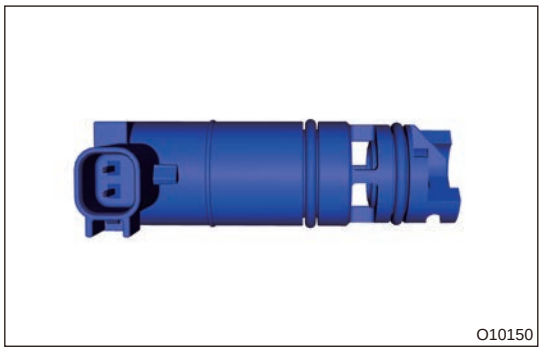
■ Activated Charcoal Canister Assembly

The inside of charcoal canister is filled with active carbon with strong adsorption. The excess fuel vapor in fuel tank is no longer discharged into the atmosphere, but introduced into the charcoal canister by hose. The active carbon absorbs the fuel vapor. When it meets engine desorption conditions, the canister solenoid valve is opened, and the absorbed fuel vapor is poured into the intake manifold for combustion, so as to achieve the purpose of fuel saving and environmental protection.



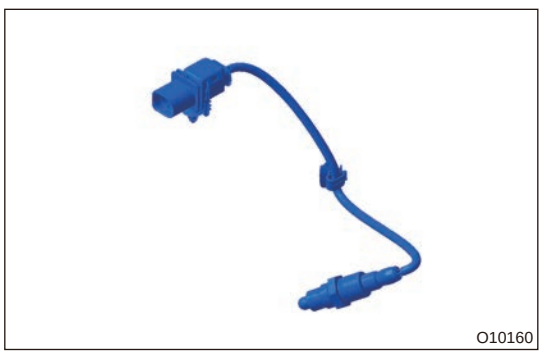
■ Activated Charcoal Canister Cut-off Valve

As a normal open valve, when power is on and when fuel vapor leakage diagnosis is performed, it performs closing action which cuts off the vent of charcoal canister to the atmosphere.



■ Upstream Oxygen Sensor

The upstream oxygen sensor is a ceramic body and is integrated with a micro pump for oxygen ion transportation. The pump supplies enough oxygen to the electrode on the exhaust gas contact side to keep the voltage on both sides constant, about 450 mV. The electronic controller converts the power consumption of pump into excess air coefficient. The output current is almost linearly related to λ, and λ = 0.65 ~ infinity, so it is also called a linear oxygen sensor. It can not only determine whether λ is greater than 1 or less than 1. Moreover, the specific value of λ can be measured in the lean and rich regions, so that the excess air coefficient in a larger range (i.e. broadband) can be measured, and continuous control of λ < 1 to λ > 1 can be realized.

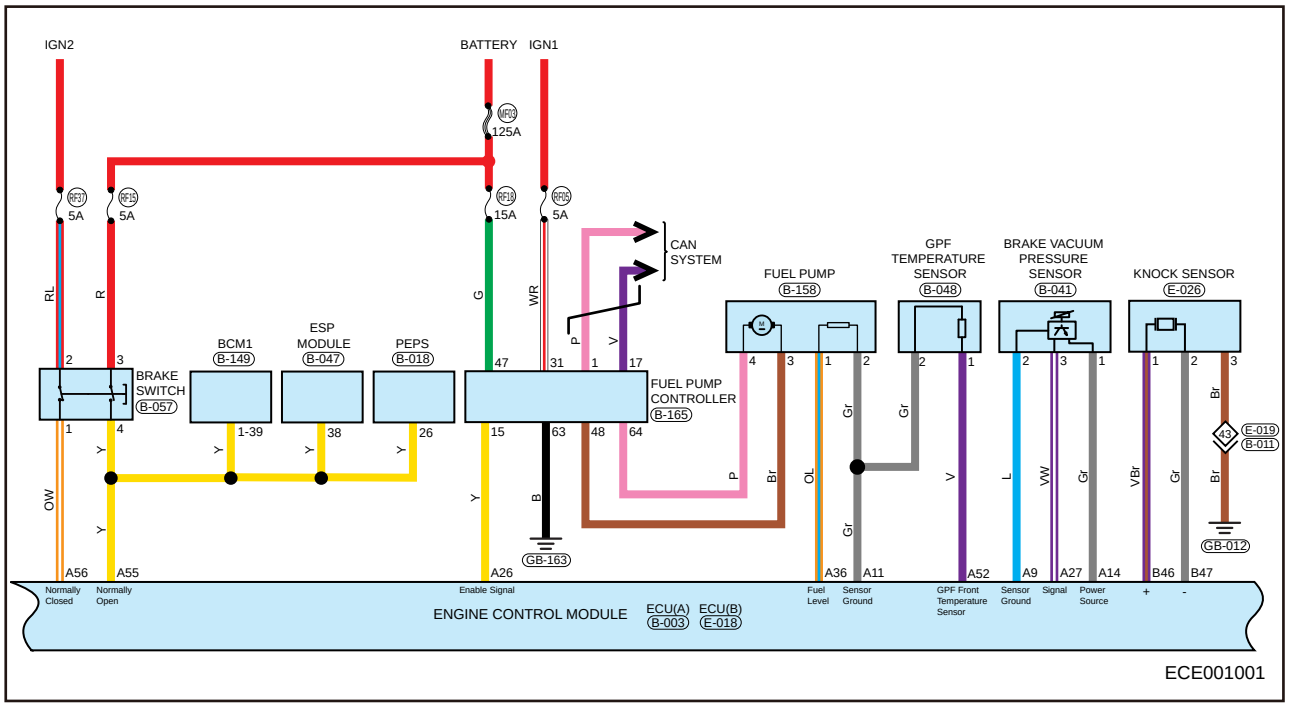


■ Downstream Oxygen Sensor

The sensing element of downstream oxygen sensor is a ceramic flat body with pores. The outer side of ceramic is surrounded by engine exhaust, and the inner side is open to atmosphere. Sensing ceramic body wall is a type of solid electrolyte with heating electrodes inside. Operation of oxygen sensor is realized by converting the concentration difference of oxygen ions inside and outside the sensing ceramic body into voltage signals for output. When the temperature of sensing ceramic body reaches 350 ˚C, it will have the characteristics of solid electrolyte. Oxygen ions can freely pass through it due to special material of ceramic body. It is precisely by taking advantage of this characteristic, it converts the concentration difference into the potential difference, thus forming the electrical signal output. If the gas mixture is rich, the concentration difference of oxygen ions inside and outside of ceramics body is higher, potential difference is higher, a large amount of oxygen ions move from inside to outside, and the output voltage is higher (-approximately 800 mV - 1000 mV); If the gas mixture is lean, the concentration difference of oxygen ions inside and outside of ceramics body is lower, potential difference is lower, only a few oxygen ions move from inside to outside, and the output voltage is lower (approximately 100 mV). Signal voltage changes suddenly when near the theoretical equivalent air-fuel ratio (λ = 1).

3 System Circuit Diagram

3.1 Circuit Diagram



4 DIAGNOSIS & TESTING

4.1 Problem Symptoms Table

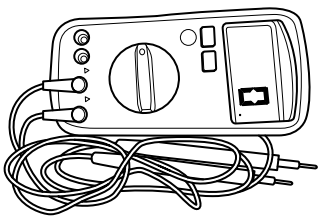
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Emission Control System

Symptom	Possible Cause
Fuel tank flat	Charcoal canister closed valve (damaged)
	Activated charcoal canister (blocked)
	Activated charcoal canister filter (blocked)
Lean mixture	Intake pressure sensor
	Oxygen sensor invalid
	Low fuel pressure in electric fuel pump
	Fuel injector blocked
Rich mixture	Fuel injector leakage
	Air filter blocked
	Oxygen sensor invalid
Lack of power	Oxygen sensor invalid
	Air flow meter malfunction
	Fuel pressure too low
	Cylinder compression pressure drop

5 ON-VEHICLE SERVICE

5.1 Tool

■ **General Tool**

Tool Name	Tool Drawing
Battery Tester	 S00002

5.2 Charcoal Canister Solenoid Valve

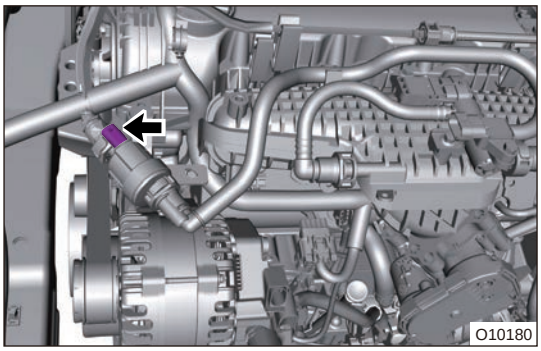
■ Removal

⚠ Warning

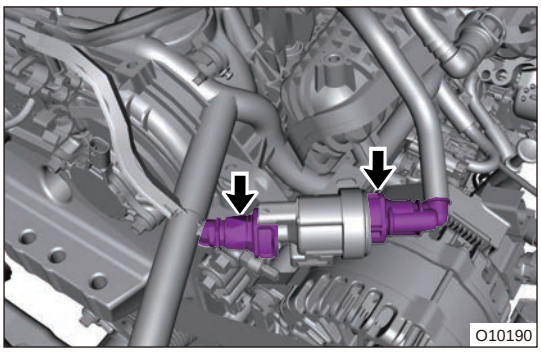
- **Be sure to wear safety equipment to prevent accidents, when removing canister solenoid valve.**
- **Appropriate force should be applied, when removing canister solenoid valve. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the negative battery cable.

(4) Disconnect the canister solenoid valve connector.



(5) Disconnect the fuel vapor pipe Ⅲ and canister solenoid valve outlet pipe from canister solenoid valve assembly.



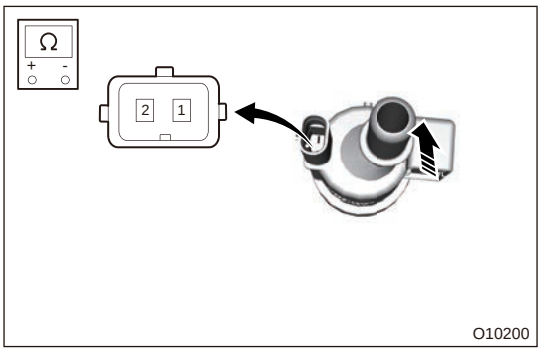
(6) Remove the charcoal canister solenoid valve assembly.

■ Inspection

(1) Measure the resistance of canister solenoid valve with a digital multimeter.

Measurement Temperature	Specification (Ω)
20 ˚C	16 ± 2

Hint:
If resistance is not as specified, replace the canister solenoid valve assembly.



(2) Connect the positive battery to canister solenoid valve No. 1 pin and connect the negative battery to canister solenoid valve No. 2 pin. Check if the canister solenoid valve opens. After it opened, bleed air to direction of canister solenoid valve (arrow), and air flows easily.

■ **Installation**

(1) Install canister solenoid valve, and connect fuel vapor pipe Ⅲ and canister solenoid valve outlet pipe to both ends of canister solenoid valve.
(2) Connect the canister solenoid valve connector.
(3) Install the engine compartment trim cover assembly.

5.3 Canister Solenoid Valve Outlet Pipe Assembly

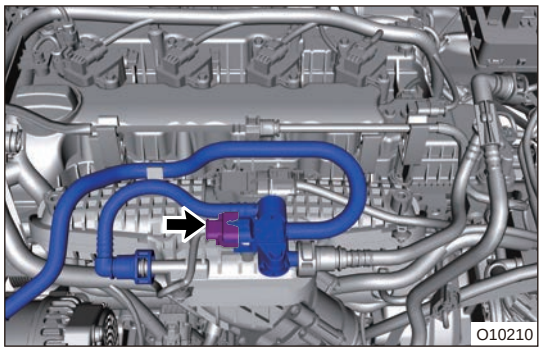
■ **Removal**

⚠ Caution

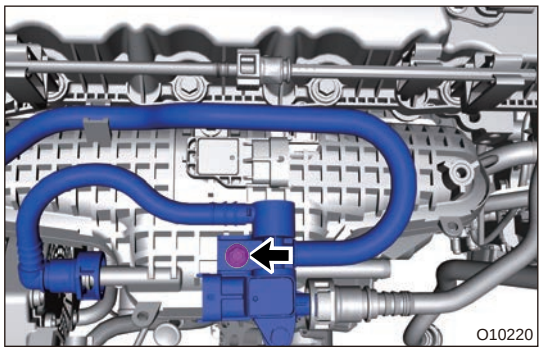
- **Be sure to wear safety equipment to prevent accidents, when removing canister solenoid valve outlet pipe assembly.**
- **Appropriate force should be applied, when removing canister solenoid valve outlet pipe assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

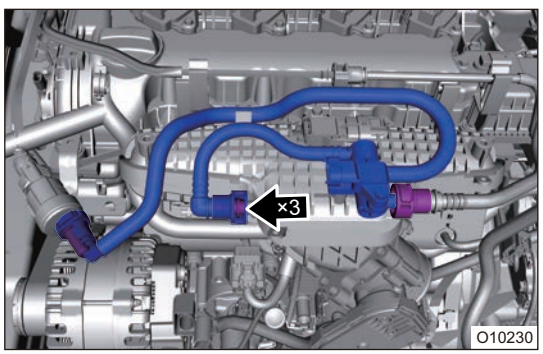
(4) Disconnect the charcoal canister desorption pressure sensor connector.



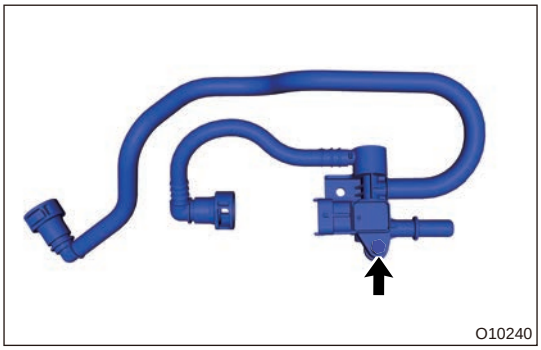
(5) Remove 1 fixing bolt from canister solenoid valve outlet pipe three-way bracket.



(6) Disconnect the connection between canister solenoid valve outlet pipe and canister solenoid valve.
(7) Disconnect the connection between canister solenoid valve outlet pipe and intake manifold.
(8) Disconnect the connection between canister solenoid valve outlet pipe and canister solenoid valve outlet pipe Ⅱ.



(9) Remove canister solenoid valve outlet pipe assembly and remove 1 fixing bolt from charcoal canister desorption pressure sensor to separate it.



■ **Installation**

(1) Install charcoal canister desorption pressure sensor and fix 1 bolt.
Torque: 8 + 3 N·m

(2) Install 1 fixing bolt to canister solenoid valve outlet pipe three-way bracket.
Torque: 7 ± 1 N·m

(3) Connect the charcoal canister solenoid valve outlet pipe to charcoal canister solenoid valve.
(4) Connect the charcoal canister solenoid valve outlet pipe to intake manifold.
(5) Connect the canister solenoid valve outlet pipe Ⅱ to canister solenoid valve outlet pipe.
(6) Connect the desorption pressure sensor connector.
(7) Install the engine compartment trim cover assembly.

5.4 Canister Solenoid Valve Outlet Pipe Ⅱ Assembly

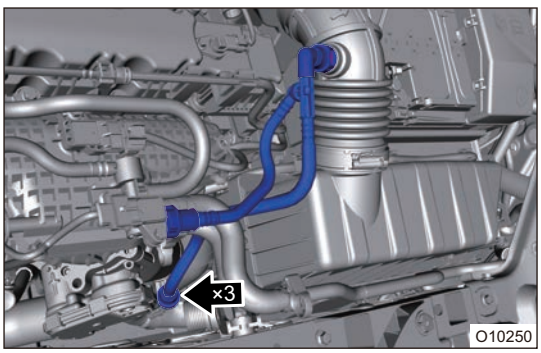
■ **Removal**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing canister solenoid valve outlet pipe Ⅱ assembly.**
- **Appropriate force should be applied, when removing canister solenoid valve outlet pipe Ⅱ assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.

(3) Disconnect the connection between canister solenoid valve outlet pipe Ⅱ and canister solenoid valve outlet pipe.
(4) Disconnect the connection between charcoal canister solenoid valve outlet pipe Ⅱ and intercooler outlet pipe Ⅱ.
(5) Disconnect the connection between charcoal canister solenoid valve outlet pipe Ⅱ and intake hose.



(6) Remove canister solenoid valve outlet pipe Ⅱ assembly.

■ **Installation**

(1) Connect the canister solenoid valve outlet pipe Ⅱ to canister solenoid valve outlet pipe.
(2) Connect the canister solenoid valve outlet pipe Ⅱ to intercooler outlet pipe Ⅱ.
(3) Connect the canister solenoid valve outlet pipe Ⅱ to intake hose.
(4) Install the engine compartment trim cover assembly.

5.5 Upstream Oxygen Sensor

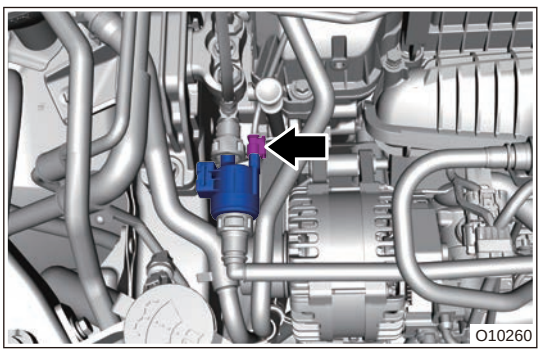
■ **Removal**

⚠ Warning

- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Appropriate force should be applied when removing upstream oxygen sensor. Be careful not to operate roughly.**

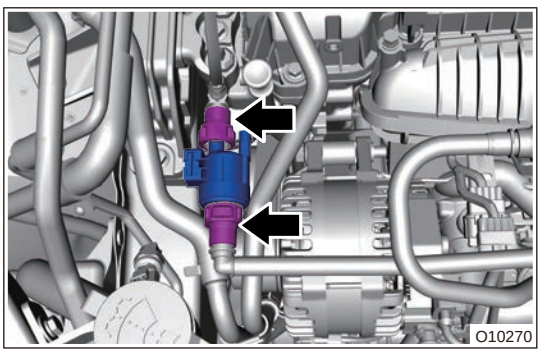
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.

(4) Remove the upstream oxygen sensor connector from fixing bracket and disconnect the connector.



(5) Remove the upstream oxygen sensor from front part of precatalytic converter assembly.

Hint:
Remove it with special oxygen sensor socket.

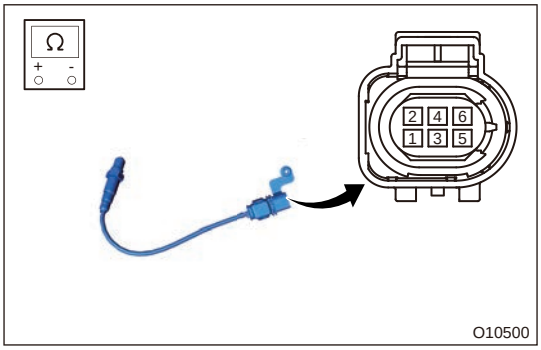


■ **Inspection**

(1) Measure the resistance of upstream oxygen sensor with a digital multimeter.

Multimeter Connection	Terminal Definition
Terminal 1	Controlled by oxygen pump
Terminal 2	(Reference ground) Analog ground
Terminal 3	Heater power supply
Terminal 4	Heater control
Terminal 5	Correction resistance
Terminal 6	Refererence signal

Multimeter Connection	Condition	Specified Condition
Terminal 3 - Terminal 4	Normal Temperature	4 - 5 Ω
Terminal 1 - Terminal 5	Normal Temperature	114 Ω



Hint:
If result is not as specified, replace the upstream oxygen sensor.

■ **Installation**

⚠ Caution

- **The specified grease must be used. Use of other grease will lead to oxygen sensor poisoning. The new sensor has been applied with grease and the grease must be applied to the mounting threads when reassembling.**

  Material No.: 5964080112 (120 g/pot) or 5964080145 (450 g/pot)

⚠ Warning

- **If oxygen sensor falls, never install it directly.**

(1) Install upstream oxygen sensor with special oxygen sensor socket.

Torque: 45 ± 5 N•m

(2) Install the upstream oxygen sensor connector.
(3) Install the engine compartment trim cover assembly.

5.6 Downstream Oxygen Sensor

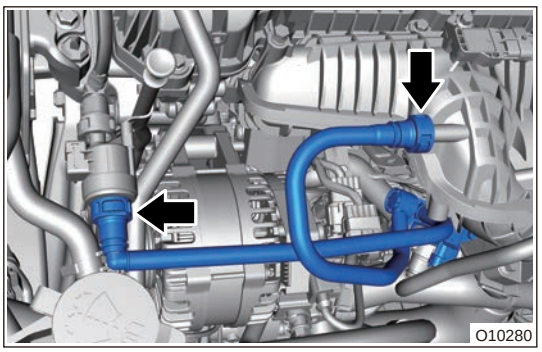
■ Removal

⚠ Warning

- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Appropriate force should be applied when removing downstream oxygen sensor. Be careful not to operate roughly.**

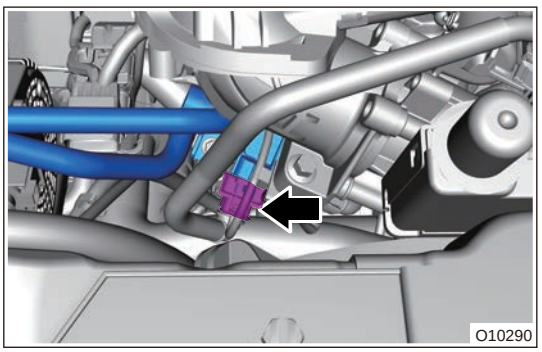
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Raise the vehicle to a proper position.

(4) Disconnect the downstream oxygen sensor connector.



(5) Remove the downstream oxygen sensor.

Hint:
Remove it with special oxygen sensor socket.

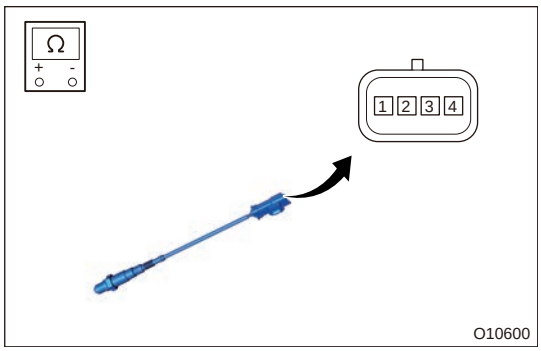


■ Inspection

(1) Measure the resistance of upstream oxygen sensor with a digital multimeter.

Multimeter Connection	Terminal Definition
Terminal 1	Ground
Terminal 2	Signal
Terminal 3	Heat control
Terminal 4	Heater power supply

Multimeter Connection	Condition	Specified Condition
Terminal 3 - Terminal 4	Normal Temperature	5 - 22 Ω
Terminal 1 - Terminal 2	Always	No continuity
Terminal 1 - Terminal 4		
Terminal 2 - Terminal 3		
Terminal 2 - Terminal 4		



Hint:
If result is not as specified, replace the downstream oxygen sensor.

■ Installation

⚠ Caution

- **The specified grease must be used. Use of other grease will lead to oxygen sensor poisoning. The new sensor has been applied with grease and the grease must be applied to the mounting threads when reassembling.**

  Material No.: 5964080112 (120 g/pot) or 5964080145 (450 g/pot)

⚠ Warning

- **If oxygen sensor falls, never install it directly.**

(1) Install downstream oxygen sensor with special oxygen sensor socket.

Torque: 45 ± 5 N•m

(2) Install the downstream oxygen sensor connector.

5.7 Activated Charcoal Canister Assembly

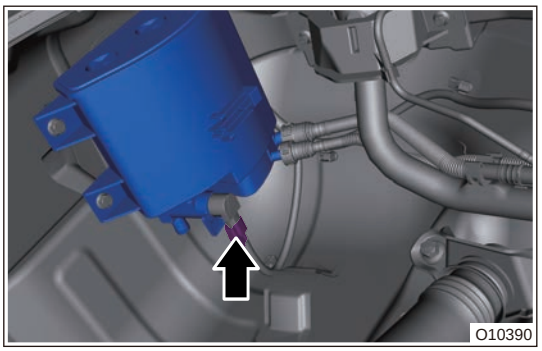
■ Removal

⚠ Warning

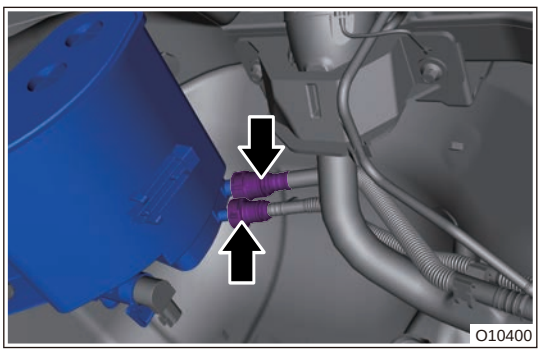
- **Be sure to wear necessary safety equipment to prevent accidents when removing activated charcoal canister assembly.**
- **Appropriate force should be applied when removing activated charcoal canister assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the rear right wheel.
(5) Remove the rear right wheel house protector assembly.
(6) Remove the dust filter.

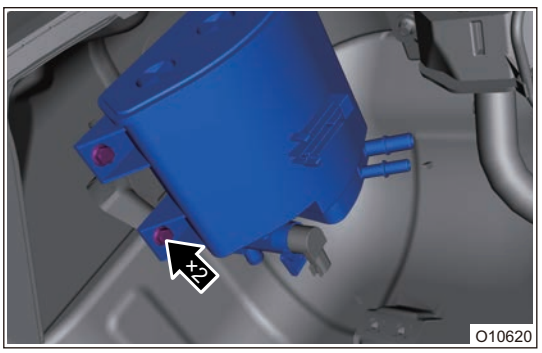
(7) Disconnect the activated charcoal canister cut-off valve connector.



(8) Disconnect the connection between charcoal canister and fuel vapor pipe Ⅰ.
(9) Disconnect the connection between charcoal canister and fuel vapor pipe Ⅱ.



(10) Remove 2 fixing bolts from charcoal canister assembly.

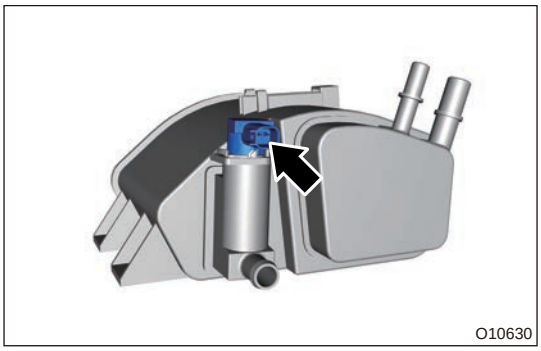


(11) Remove charcoal canister assembly from charcoal canister bracket.

⚠ Caution

- **Unneeded activated charcoal canister assembly should be handled by the specialized department according to local laws and regulations. Never discard it at will.**

(12) Remove charcoal canister cut-off valve from charcoal canister assembly.

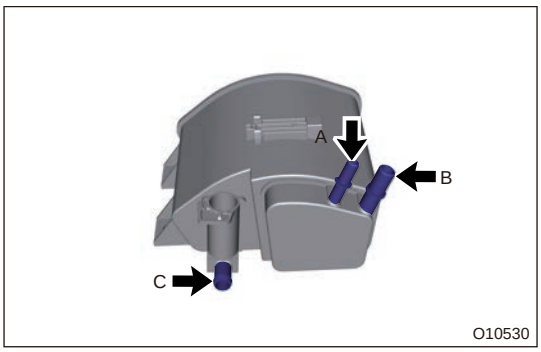


■ Inspection

(1) Close port C and blow compressed air into port A. Check that air flows out from port B. If result is not as specified, replace canister.

(2) Close port C and blow compressed air into port B, check that air flows from port A. If result is not as specified, replace the canister.

(3) Close port A and use vacuum pump to pump the vacuum from port B, check that air enters from port C. If result is not as specified, replace the filter and canister.



■ Installation

(1) Install charcoal canister cut-off valve to charcoal canister assembly.
(2) Install charcoal canister assembly to fixing bracket. Install 2 fixing bolts.

Torque: 19 ± 3 N·m

(3) Connect fuel vapor pipe Ⅰ to charcoal canister assembly.
(4) Connect fuel vapor pipe Ⅱ to charcoal canister assembly.
(5) Connect the activated charcoal canister cut-off valve connector.
(6) Install the dust filter.
(7) Install rear right wheel house protector assembly.
(8) Install the rear right wheel.
(9) Install the intake hose assembly.
(10) Install the engine compartment trim cover assembly.

5.8 Dust Filter

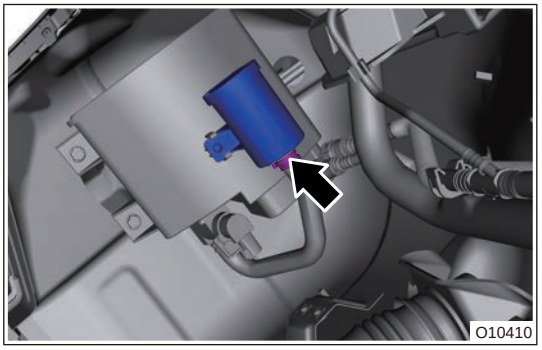
■ Removal

⚠ Warning

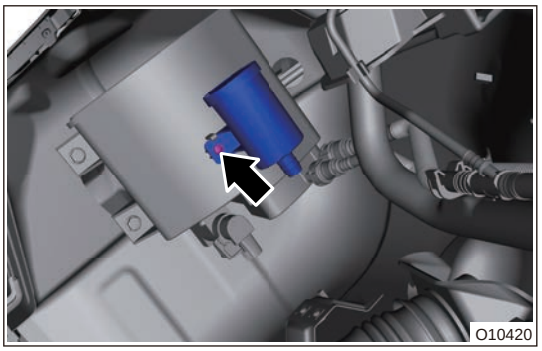
- **Be sure to wear necessary safety equipment to prevent accidents when removing dust filter.**
- **Appropriate force should be applied when removing dust filter. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear right wheel.
(4) Remove the rear right wheel house protector.

(5) Loosen elastic clamp, and disconnect connection of activated charcoal canister breather pipe and dust filter.



(6) Remove 1 fixing bolt from dust filter.



(7) Remove the dust filter.

■ Inspection

(1) Check dust filter for blockage, damage.

■ Installation

(1) Install 1 fixing bolt to dust filter.
Torque: 7 ± 1 N m

(2) Connect activated charcoal canister breather pipe to dust filter.
(3) Install rear right wheel house protector.
(4) Install the rear right wheel.

5.9 Activated Charcoal Canister Breather Pipe Assembly

■ Removal

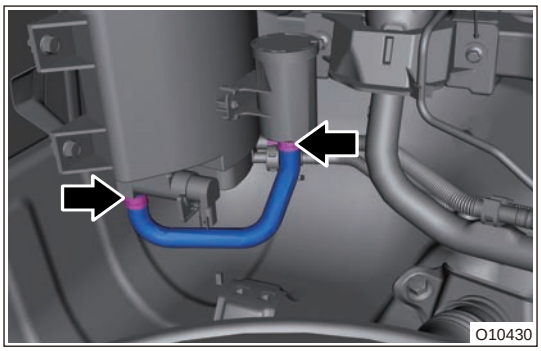
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents when removing activated charcoal canister breather pipe assembly.**
- **Appropriate force should be applied when removing activated charcoal canister breather pipe assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear right wheel.
(4) Remove the rear right wheel house protector.

(5) Loosen elastic clamp, and disconnect connection of activated charcoal canister breather pipe and activated charcoal canister cut-off valve.

(6) Loosen elastic clamp, and disconnect connection of activated charcoal canister breather pipe and dust filter.



(7) Remove activated charcoal canister breather pipe assembly.

■ **Inspection**

(1) Check activated charcoal canister breather pipe for blockage, damage.

■ **Installation**

(1) Connect activated charcoal canister breather pipe to activated charcoal canister cut-off valve and install elastic clamp.
(2) Connect activated charcoal canister breather pipe to dust filter and install elastic clamp.
(3) Install rear right wheel house protector.
(4) Install the rear right wheel.

5.10 Exhaust Temperature Sensor

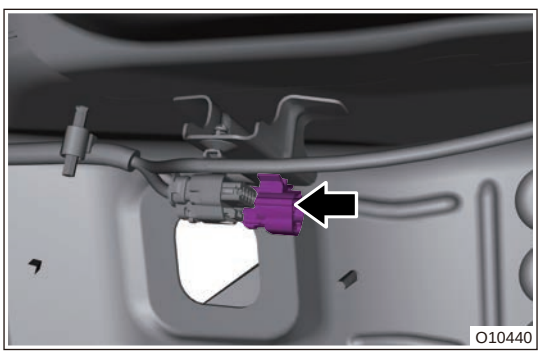
■ **Removal**

⚠ Warning

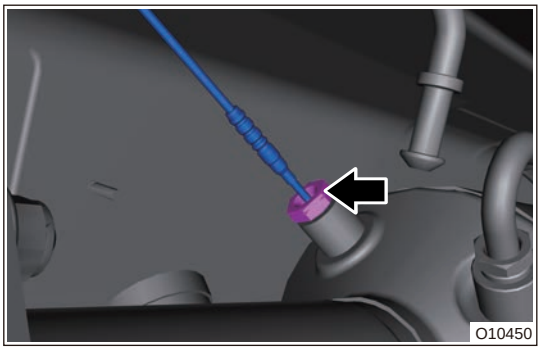
- **Temperature of exhaust system is very high when engine is running. Before removal, make sure that engine has stopped running and exhaust system has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Appropriate force should be applied when removing exhaust temperature sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Raise the vehicle to a proper position.

(4) Disconnect the exhaust temperature sensor connector.



(5) Remove exhaust temperature sensor from the front end of GPF.



■ **Inspection**

(1) Heating the front end of sensor, measure resistance with multimeter ohm band. The resistance should change in accordance with temperature.

(2) Turn digital multimeter to ohm band, connect two probes to two terminals (no polarity) respectively, the normal resistance should be 200 ~ 230 Ω at normal temperature (0 ~ 40 ˚C). If the resistance is abnormal (out of range), the performance is invalid. Abnormal conditions usually include open (- resistance is ∞) or short (resistance is 0).

Temperature (˚C)	Resistance (Ω)
-40	170.68
0	201.50
10	209.15
50	239.49
100	276.90
150	313.72
200	349.96
250	385.61
300	420.68
350	455.16
400	489.06
450	522.37
500	555.10
550	587.24
600	618.80
650	649.77
700	680.16
750	709.96
800	739.18
850	767.81
900	795.86

■ **Installation**

(1) Install the exhaust temperature sensor.

Torque: 35 ± 5 N•m

(2) Connect the exhaust temperature sensor connector.

5.11 Pressure Difference Sensor

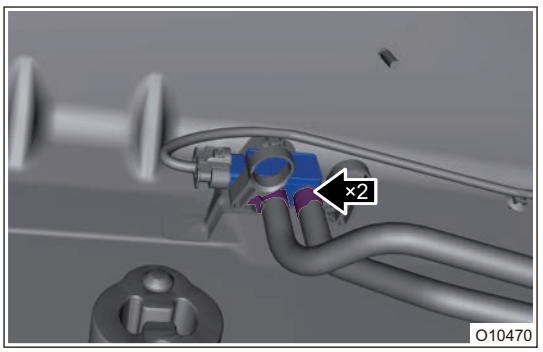
■ **Removal**

⚠ Warning

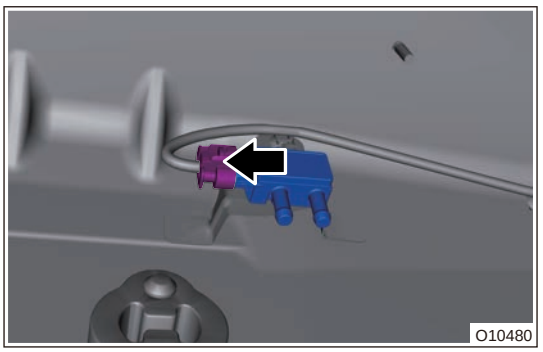
- **Be sure to wear necessary safety equipment to prevent accidents, when removing pressure difference sensor.**
- **Appropriate force should be applied when removing pressure difference sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Raise the vehicle to a proper position.

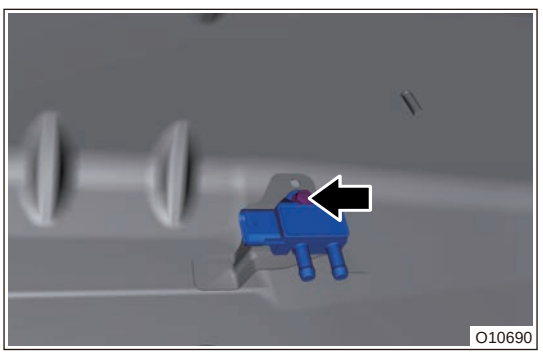
(4) Loosen 2 elastic clamps and disconnect the connection between hose and pressure difference sensor.



(5) Disconnect the pressure difference sensor connector.



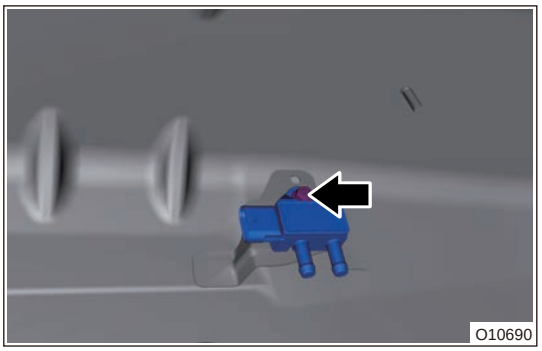
(6) Remove 1 fixing bolt from pressure difference sensor.



(7) Remove the pressure difference sensor assembly carefully.

■ Inspection

(1) Turn digital multimeter to ohm band, ground the black probe 3#, connect red probe to pins 1# and 2# respectively. It is normal that resistance is greater than 2.5 MΩ.



(2) Connect pin 4# VDD of sensor to 5V power supply, pin 3# GND to ground, and connect output pins 1# and 2# through SENT signal collector (oscilloscope). At normal temperature (30 ± 10º) and normal pressure (101 kpa ± 5 kpa), the output value in decimal number 1184 ~ 1423 is normal.

Hint:
SENT is the abbreviation of Single Edge Nibble Transmission. As a point-to-point and one-way transmission scheme launched by Society of Automotive Engineers (SAE), it is used to transmit HD sensor data between vehicle sensor and electronic control unit (ECU). Sensor data is transmitted through a series of pulse sequence between two falling periods. SENT provides a reference calibration pulse at the beginning of signal and provides a check bit at the end. The length of message varies with half bit value. As a new interface standard of vehicle sensor, compared with analog output and PWM output, SENT (SAE J2716) has a good EMC performance with low cost which saves wire harness and pin connector, and it can transmit DTC, so that sensor system has an excellent malfunction diagnosis ability.

■ Installation

(1) Install 1 fixing bolt to pressure difference sensor.

Torque: 9 ± 1.5 N·m

(2) Connect the differential difference sensor connector.
(3) Connect hose to pressure difference sensor and install elastic clamp.

5.12 Fuel Tank Pressure Sensor

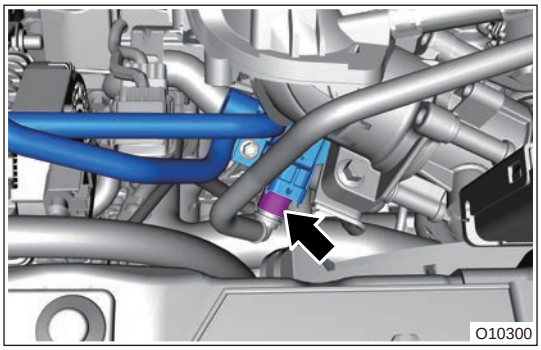
■ Removal

⚠ Warning

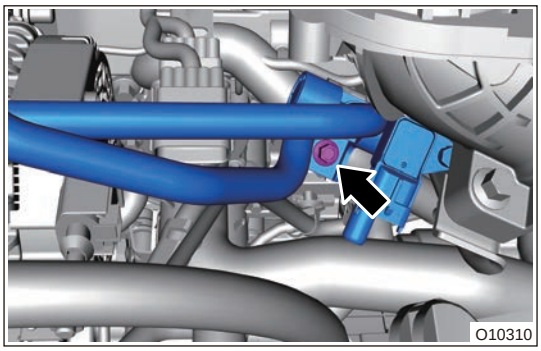
- **Be sure to wear necessary safety equipment to prevent accidents, when removing fuel tank pressure sensor.**
- **Appropriate force should be applied when removing fuel tank pressure sensor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear right wheel.
(4) Remove the rear right wheel house protector.

(5) Disconnect fuel tank pressure sensor connector.



(6) Disconnect the fuel vapor hose pipe Ⅰ.



(7) Remove the fuel vapor pipe Ⅰ with fuel tank pressure sensor assembly.

■ Installation

⚠ Caution

- **Before connecting the hose, check if there is any damage or foreign matter on the hose or joint.**
- **When pipe is connected using quick connector, pay attention to the fitting size and direction of the connector. During assembly, install the male connector into place along the axis direction of quick connector until it is bounced into mechanically and a "click" sound is heard. In order to check if the installation is in good condition, pull it forcibly in reverse direction.**

(1) Connect the fuel vapor hose pipe Ⅰ.
(2) Connect the fuel tank pressure sensor connector.
(3) Install rear right wheel house protector.
(4) Install the rear right wheel.

4.7 EMISSION CONTROL SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.

(2) If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) When testing cooling system, please pressurize the system to specified pressure. Otherwise, system components may be damaged.

(2) DO NOT mix different colors or types of coolant.

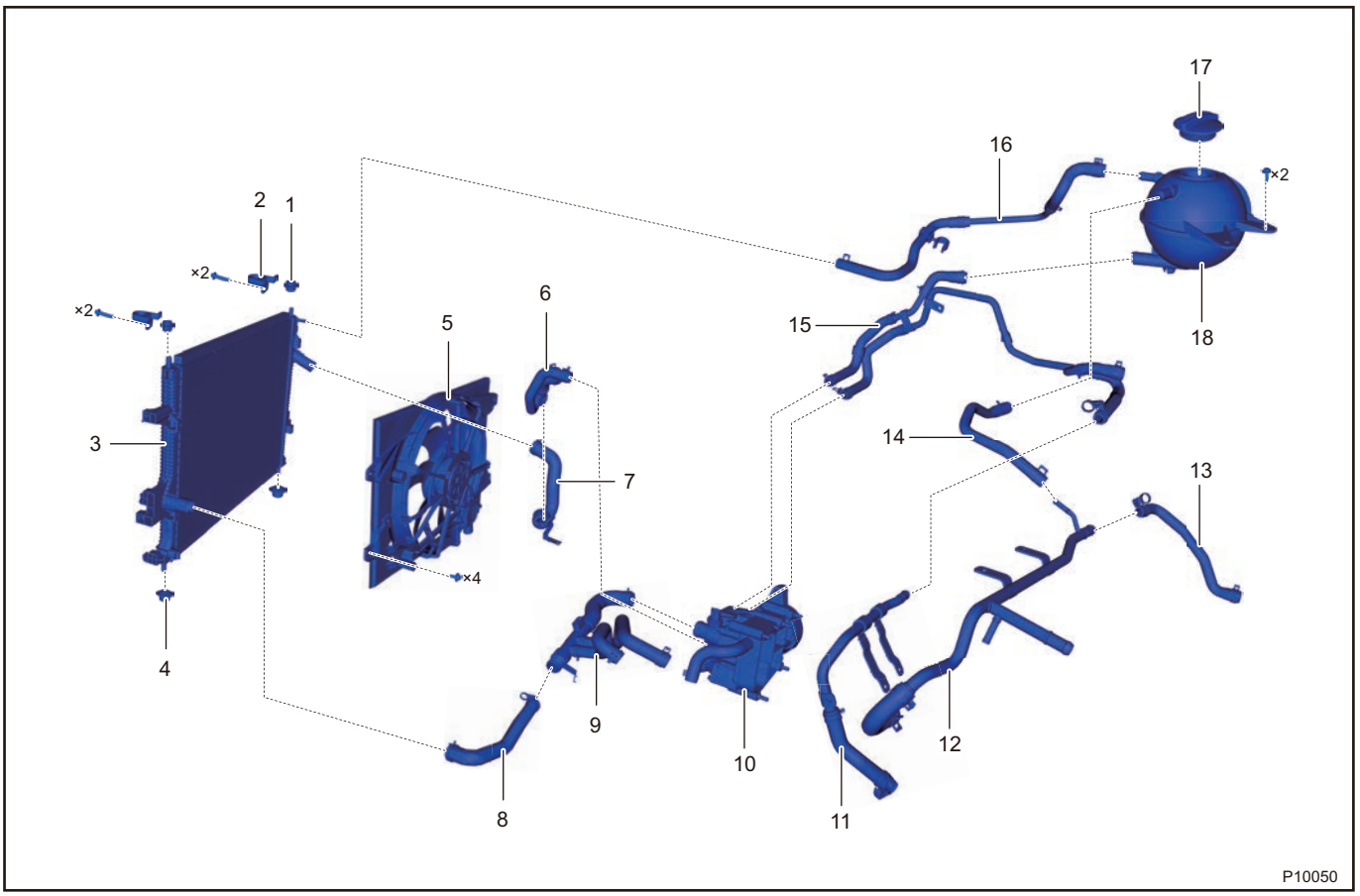
(3) Please select coolant which is suitable for local climate in different areas.

2 System Overview

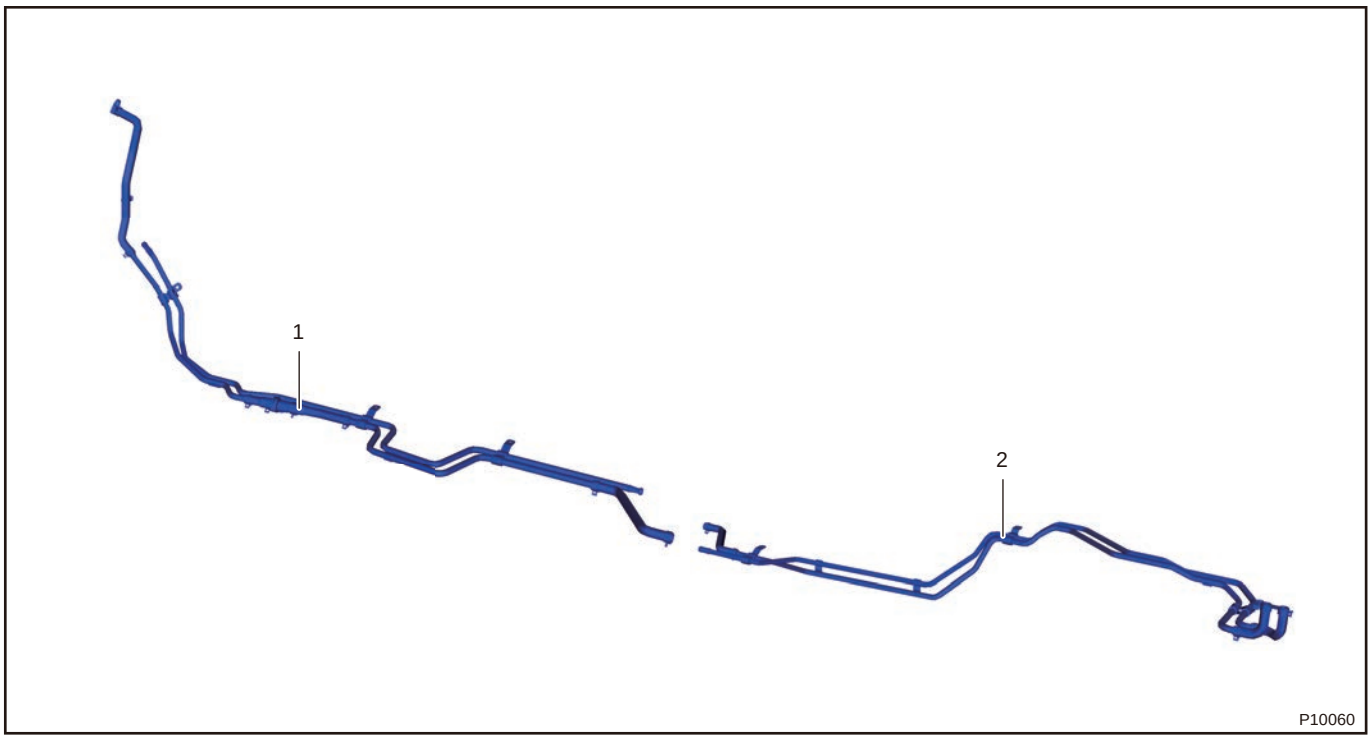
2.1 System Description

Engine cooling system adjusts engine operating temperature by the flow of coolant and makes engine operate normally under various operating conditions. And effectively improve the service life and fuel economy of the engine.

2.2 System Components Diagram

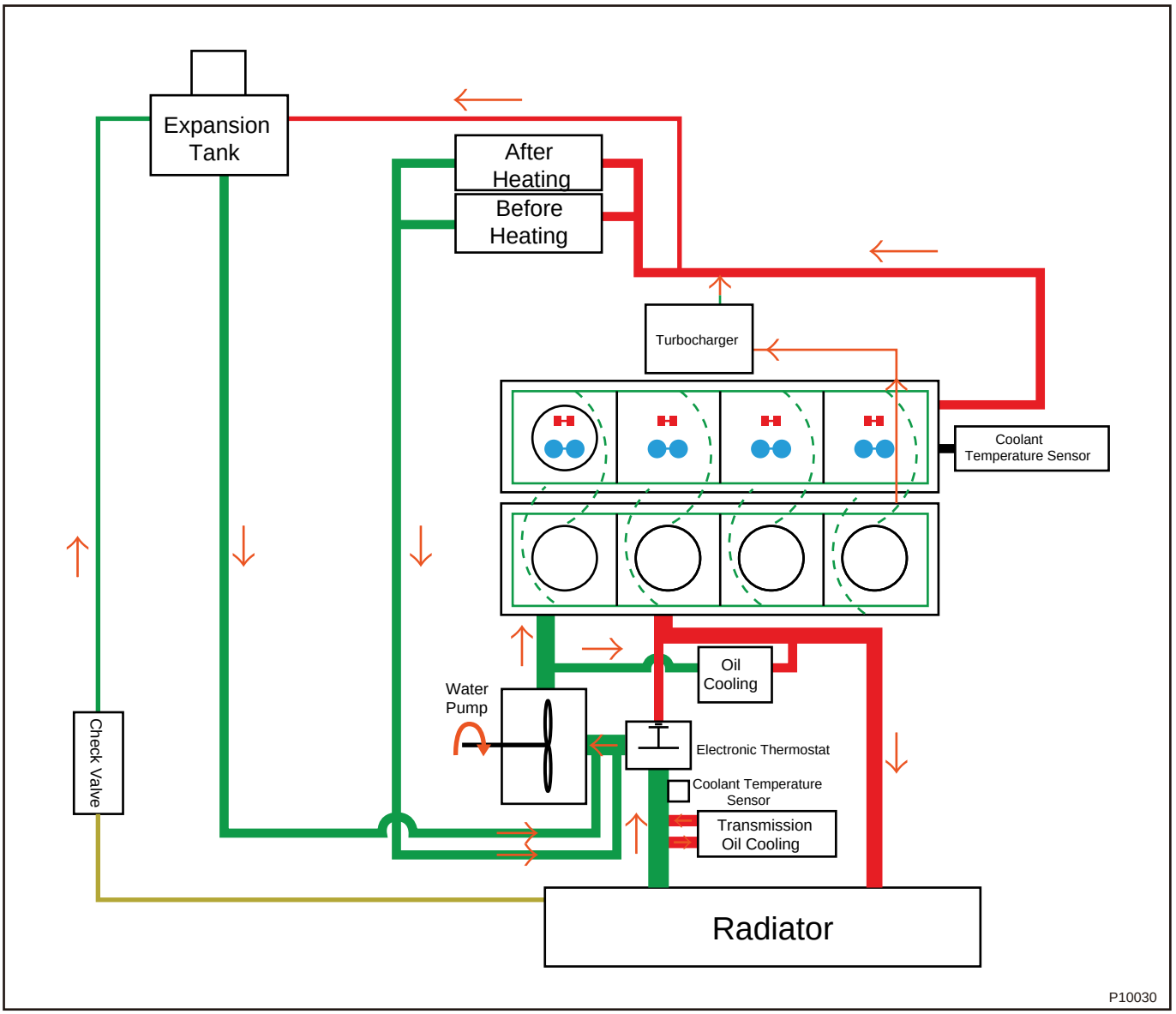


1	Rubber Bushing	10	Water Pump Module
2	Radiator Mounting Bracket	11	Rear Heater Outlet Pipe Assembly
3	Radiator Assembly	12	Heater Inlet Pipe Assembly Ⅰ
4	Rubber Cushion	13	Heater Inlet Pipe Assembly Ⅱ
5	Cooling Fan Assembly	14	Engine Discharge Pipe Assembly
6	Engine Outlet Pipe Assembly - Rear	15	Inlet Pipe Assembly
7	Engine Outlet Pipe Assembly - Front	16	Radiator Discharge Pipe Assembly Ⅰ
8	Engine Inlet Pipe Assembly - Front	17	Expansion Tank Cap
9	Engine Inlet Pipe Assembly - Rear	18	Expansion Tank Body



1	Rear Heater Inlet and Outlet Pipe Assembly II	2	Rear Heater Inlet Pipe Assembly III

2.3 System Schematic Diagram



After engine operates, the water pump starts operating. Coolant begins to flow circularly. Displacement of water pump depends on engine speed. The higher the speed, the larger the displacement, and vice versa. When the coolant temperature does not reach the opening temperature of electronic thermostat, the engine coolant circulates in cylinder block, the cylinder head, turbocharger and heater water tank under the operation of water pump, and the coolant does not radiate through the radiator.When coolant temperature reaches the opening temperature of electronic thermostat, coolant flowing out of cylinder block enters radiator for radiating. It then returns to cylinder block for circulation by water pump. Due to radiating in radiator, engine coolant temperature decreases quickly to prevent engine from overheating.

2.4 System Components Description

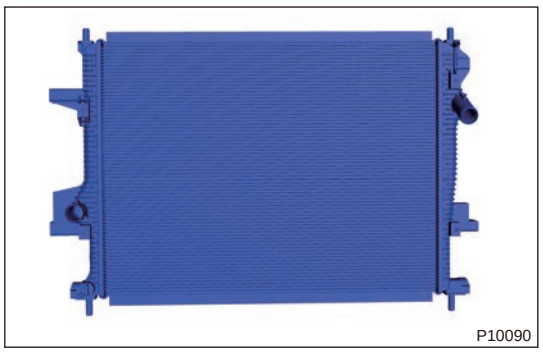
■ Expansion Tank Body

The expansion tank is an integral part of the vehicle cooling system. When the engine is running, the coolant will circulate continuously in the cooling water channel, and will flow through the expansion tank at halfway. If the pressure is too high or the coolant is too much, the excess gas and coolant will flow out of the bypass water channel of the expansion tank to avoid the high pressure of the cooling system.


P10080

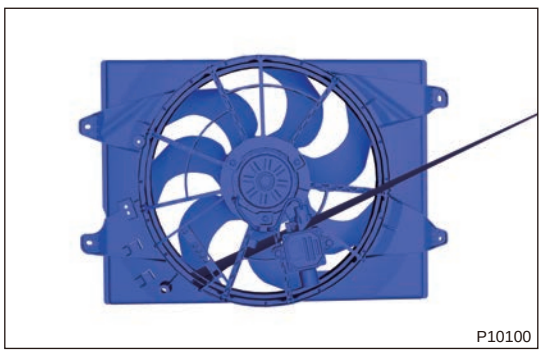
■ Radiator Assembly

The radiator is composed of three parts: Inlet chamber, outlet chamber and radiator core. The coolant flows in the radiator core and the air flows outside the radiator core. The hot coolant cools down because radiating heat to air, and the cold air heats up because absorbing the heat from the coolant, so the radiator is a heat exchanger.


P10090

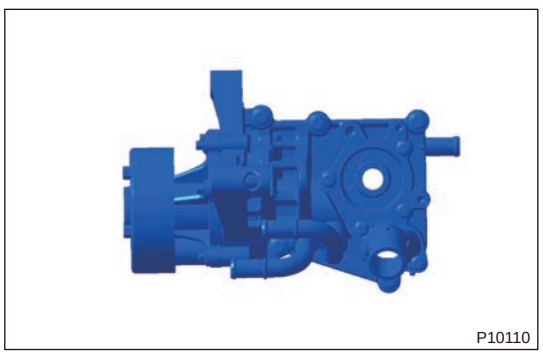
■ Cooling Fan Assembly

The rotation of radiator fan helps to radiate the radiator. Fan speed is controlled by ECU according to coolant temperature.


P10100

■ Water Pump Assembly

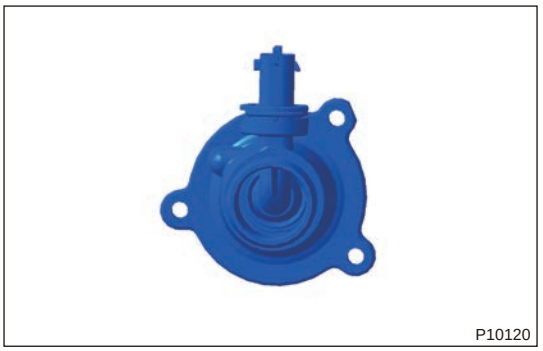
Pressurize coolant to ensure it can circulate in cooling system. Its displacement varies with engine speed.


P10110

■ Electronic Thermostat

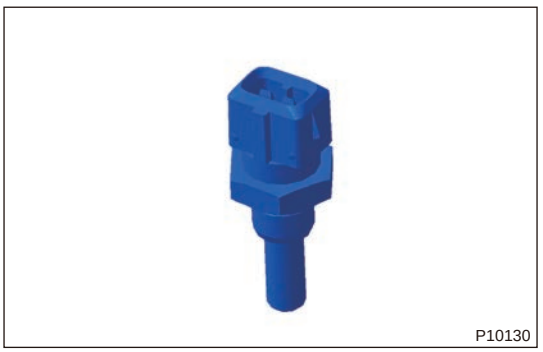
The electronic thermostat can calculate the target temperature according to engine running speed, load state, intake air temperature, coolant temperature, etc., accurately regulate the coolant temperature to ensure that the engine always works at a reasonable temperature. According to the calculated value of the sensor signal, ECU provides the signal working voltage to heating resistance element in electronic thermostat, which makes the paraffin expand and displace. Through this displacement, the temperature regulating unit mechanically adjusts the large circulation and small circulation of water temperature.
The operation of electronic thermostat shall meet the following conditions at the same time:

(1) Under low speed and low load, electronic thermostat controls to open at 105 ˚C to improve fuel economy.
(2) Under high speed and high load, electronic thermostat controls to open at 90 ˚C to ensure engine safety.
(3) If there is fault in line, electronic thermostat can be opened mechanically. Initially opening temperature: 100 ˚C ± 2 ˚C, fully opening temperature: 110 ˚C ± 2 ˚C.
(4) Opening stroke of thermostat: 8mm.


P10120

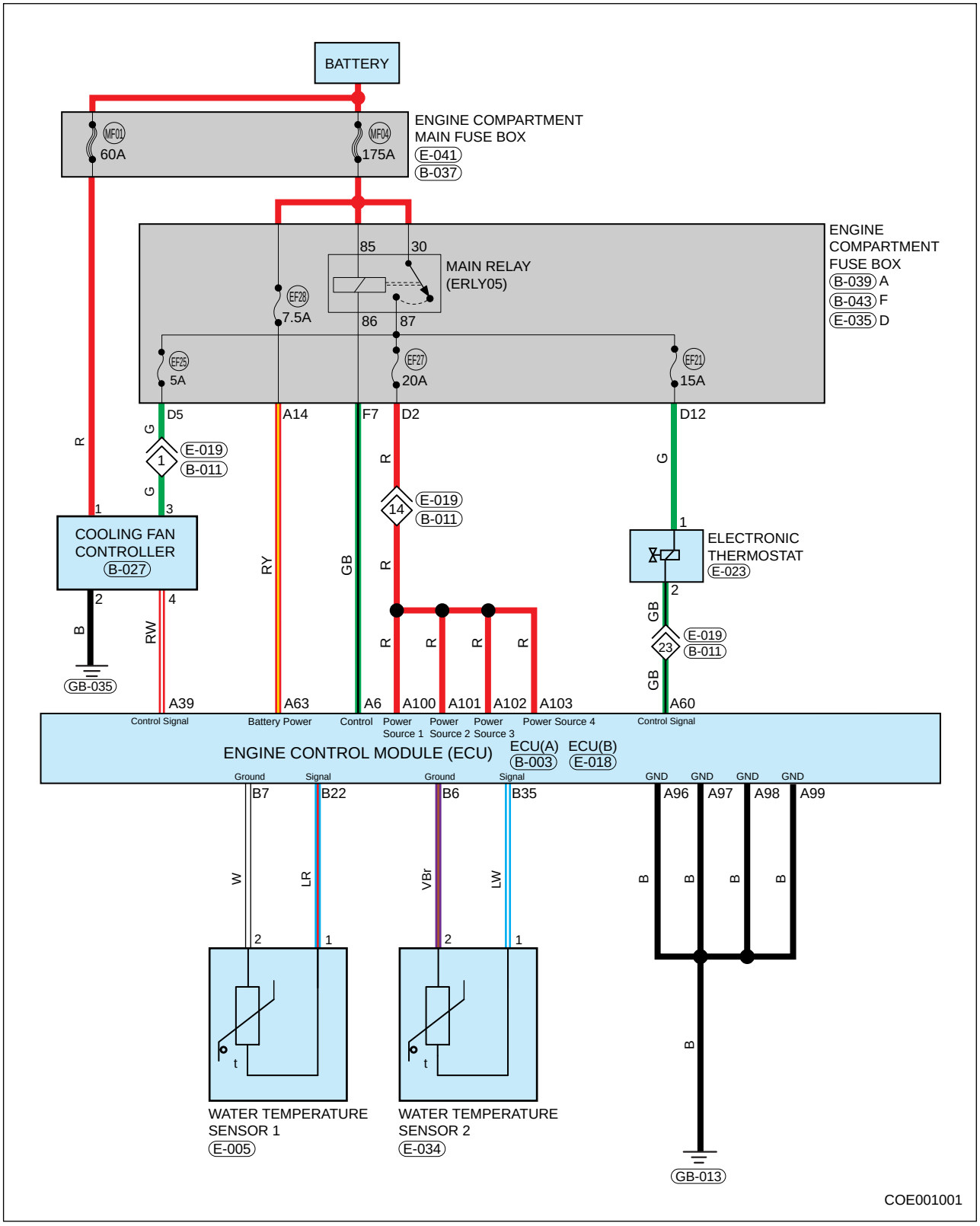
■ Coolant Temperature Sensor

NTC thermistor packaged inside temperature sensor is used for coolant temperature sensor, its resistance changes in accordance with ambient temperature, thus accurately reflecting the small changes in coolant temperature. The temperature of contact medium can be reflected by measuring its output resistance, and the signals from both terminals of resistor are output to ECM. Engine coolant temperature can be obtained by ECU according to output signal of the sensor, thus judging the engine operating condition.


P10130

3 System Circuit Diagram

3.1 Circuit Diagram



4 DIAGNOSIS & TESTING

4.1 Problem Symptoms Table

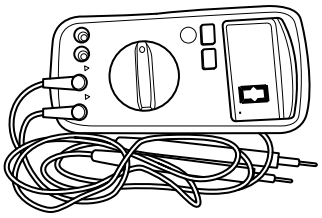
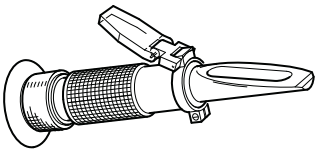
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Cooling System

Symptom	Possible Cause
Insufficient coolant	Coolant pipe (deteriorated and leaks)
	Expansion tank (leakage)
	Radiator assembly (leakage)
	Heater core (leakage)
	Electronic thermostat improperly sealed
	Water pump (improperly sealed)
	Engine cylinder head gasket (damaged)
	Engine cylinder head (cracked and Leakage)
	Engine cylinder block (water jacket leaks and cylinder block cracked)
Engine overheating	Low coolant level
	Air resistance exists in cooling pipe
	Expansion luggage cap damaged
	ECU fault
	Cooling fan assembly
	Electronic thermostat
	Radiator assembly
	Coolant temperature sensor
Engine undercooling	Electronic thermostat
	Cooling fan
Unable to reach normal engine temperature	Cooling fan (constantly operating)
	Electronic thermostat
Cooling fan does not operate or operate abnormally	Cooling fan
	Cooling fan controller
	Fan controller wire harness
	ECU fault

5 ON-VEHICLE SERVICE

5.1 Tool

■ General Tool

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Freezing Point Tester	 S00005

5.2 Cooling System Leakage Test

■ Test Procedures

⚠ Warning

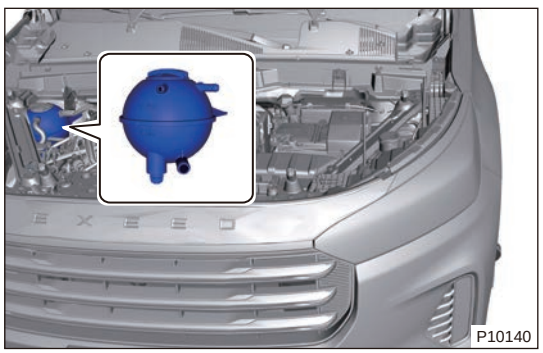
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**

⚠ Caution

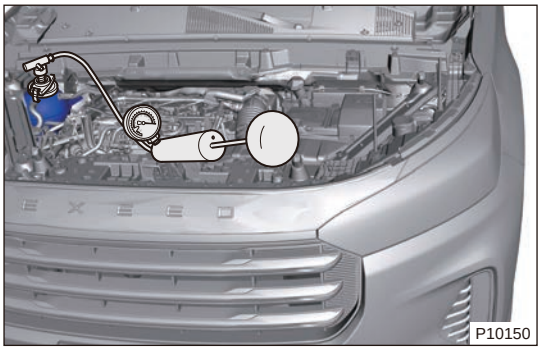
- **When testing cooling system, please pressurize the system to specified pressure. Otherwise, system components may be damaged.**
- **Before testing cooling system, do not perform operation until coolant temperature drops to normal level. Otherwise, it may cause scald.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Check if coolant level is between "MAX" and "MIN" lines. If coolant level is below "MIN" line, add coolant.


P10140

(3) Connect cooling system pressure tester to coolant pressure release cap opening (expansion tank body cap opening) and tighten it slowly.



⚠ Caution

- **Make sure there is no leakage in connecting part of coolant system pressure tester, in order to avoid pressure leakage during test.**

(4) Pressurize cooling system to 1.2 bar with the cooling system pressure tester, and then observe the pressure changes. If system pressure does not drop within 2 minutes, it indicates there is no leakage in system. If pressure changes greatly, it indicates that there is a leakage in system; find the leaking area and perform troubleshooting.

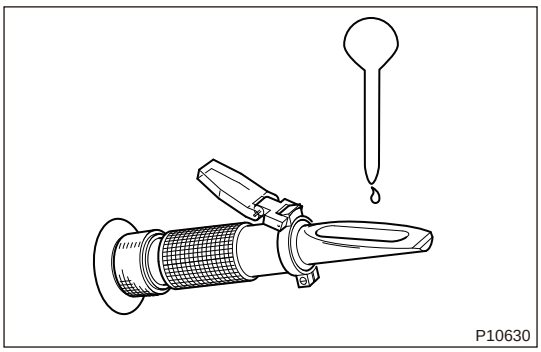
5.3 Coolant Freezing Point Test

■ Test Procedures

⚠ Caution

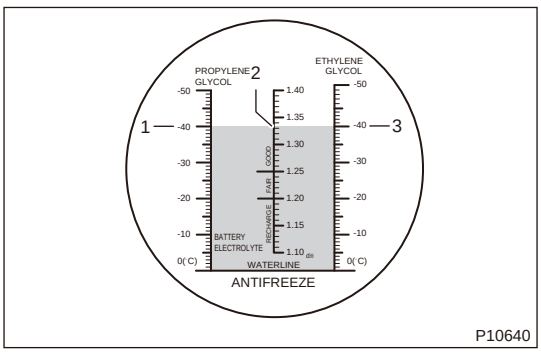
- **DO NOT mix different colors or types of coolant.**
- **Please select coolant which is suitable for local climate in different areas.**
- **Please read measured value at the scale line. In order to distinguish the scale line more clearly, drip a drop of water on the glass of freezing point tester with a pipette, then the scale line can be clearly distinguished via a "waterline".**

(1) As shown in illustration, drip a drop of coolant on the glass of freezing point tester with a pipette, and then observe freezing point value of coolant.



(2) As shown in illustration, observe scale 3 of freezing point tester to read ethylene glycol coolant freezing point value. The freezing point value must be kept at -40 °C (value varies with geography, climate or freezing point).

Hint:
Scale 1 is used to measure the freezing point value of propylene glycol coolant, and scale 2 is used to measure the battery electrolyte concentration.



(3) If freezing point is beyond the specified value, replace the coolant.

5.4 Draining and Adding Coolant

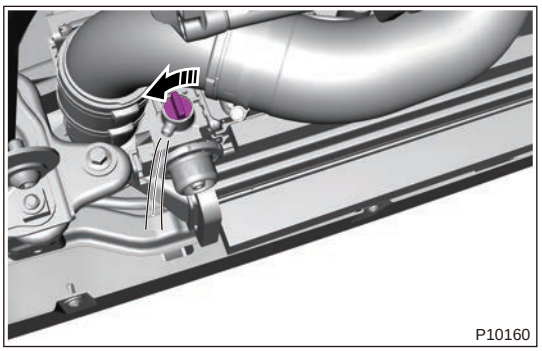
■ Draining Coolant

⚠ Warning

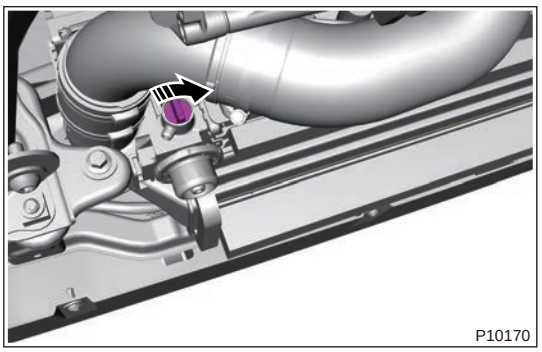
- **Never open expansion tank cap when engine is operating or temperature is high. Otherwise, it may cause scald.**
- **Be careful when opening expansion tank cap, the high-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **Wait until the engine has cooled down, and then cover the expansion tank cap with a piece of damp cloth and turn it one turn slowly (counterclockwise). Step back when releasing cooling system pressure. After confirming that all pressure has been released, turn the pressure release cap with cloth covered and remove it.**
- **Violating above descriptions may cause serious personal injury.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the expansion tank cap when engine temperature is low.
(4) Remove the engine lower protector assembly.

(5) Put a coolant collector under the vehicle, rotate the radiator drain cock plug counterclockwise as shown in figure and drain the coolant in radiator and expansion tank.


P10160

(6) After coolant stops flowing, re-tighten the radiator drain cock plug.


P10170

⚠ Caution

- **Tighten drain cock plug to prevent leakage.**
- **Wasted coolant should be handled by the specialized department according to local laws and regulations. Never discard it at will.**

■ **Coolant Adding**

⚠ Warning

- **If it is necessary to add coolant when engine is hot, loosen expansion tank cap slightly first to release internal pressure and loosen the cap completely after waiting for a while, and then add coolant.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**

Coolant Capacity

Type	Capacity (L)
If equipped with rear heater	10.4 ± 0.2 L

(1) Open expansion tank body cap until add coolant until coolant level reaches the “MAX” line.

(2) Tighten expansion tank body cap, start and run engine. Maintain engine speed between 2000 and 2500 rpm to warm up the engine until cooling fan operates.

⚠ Caution

- **If there is no coolant in expansion tank body after engine just starts, perform the followings: Stop the engine; wait until coolant cools down; add coolant to "MAX" line on expansion tank; run the engine at 2500 rpm until coolant level becomes stable.**

(3) Stop engine and wait until coolant temperature drops to the ambient temperature. Check that coolant level is between “MAX” and “MIN” lines. If coolant level is below the “MIN” line, repeat all the above procedures. Keep the coolant level between “MAX” and “MIN” lines.

(4) Check each pipe for leaks, lack of antifreeze, if so, handle it.

⚠ Caution

- **Do not open the expansion tank cap at high engine temperature to prevent burns.**

5.5 Expansion Tank Body

■ **Removal**

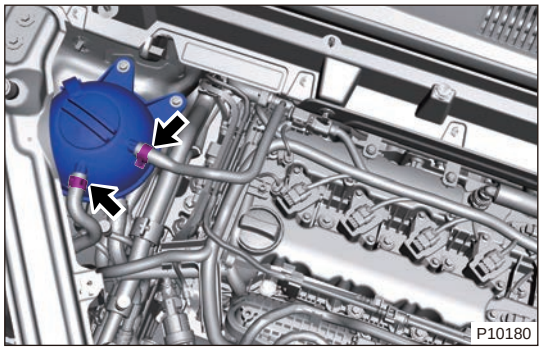
⚠ Warning

- **Always make sure engine is cold before operating cooling system. Never open expansion tank body cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**

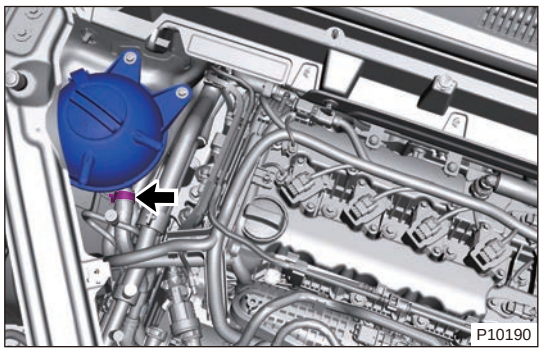
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

(5) Loosen the elastic clamp and disconnect the connection between radiator discharge pipe Ⅰ and expansion tank.

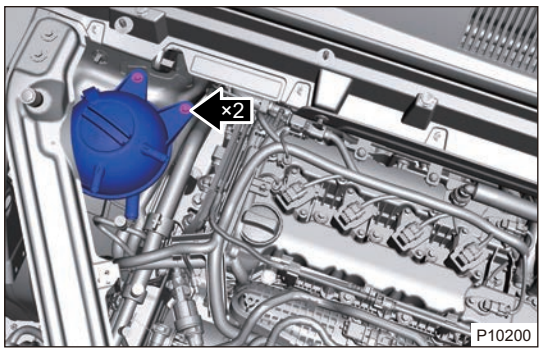
(6) Loosen the elastic clamp and disconnect the connection between engine discharge pipe and expansion tank body.



(7) Loosen elastic clamp and disconnect the connection between inlet pipe and expansion tank body.



(8) Remove 2 fixing bolts from expansion tank body.



(9) Remove the expansion tank body assembly carefully.

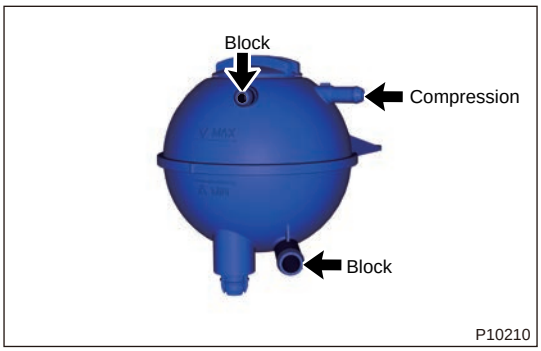
■ Inspect the expansion tank body

(1) Check that the expansion tank is welded firmly, and there are no defects such as fractures and cracks at the weld.

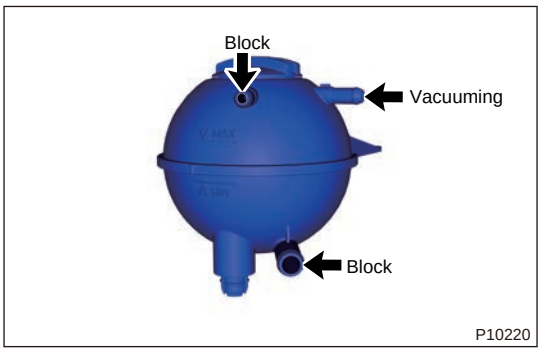
(2) The expansion tank should be colorless and transparent. During use of vehicle, expansion tank assembly is not allowed to have discoloration that affects the appearance and function, and scale line should be clearly visible.

■ Inspect the expansion tank cap

(1) Block two holes of expansion tank and pressurize one of them. When pressure reaches the opening pressure of relief valve (120 - 150 kpa), the pressure in expansion tank should be maintained at the relief valve opening pressure value.



(2) Block two holes of expansion tank and vacuumize one of them. When vacuum pressure reaches the opening pressure of vacuum valve (-2 - 10kpa), vacuum pressure in expansion tank should be maintained at the vacuum valve opening pressure value.



■ Installation

⚠ Caution

- **When connecting engine discharge pipe and expansion tank body, align the "土" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of "土" mark, align the edge of elastic clamp with lower edge of "二" position of "土" mark.**
- **When connecting engine inlet pipe and expansion tank body, align the "土" mark on pipe port with boss, and align center position of elastic clamp tab with "I" position of "土" mark, align the edge of elastic clamp with lower edge of "二" position of "土" mark.**
- **When connecting radiator discharge pipe Ⅰ and expansion tank body, align the "工" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of "工" mark, align the edge of elastic clamp with lower edge of "二" position of "工" mark.**
- **Check that coolant has been added to the specified level after installation.**

(1) Connect the inlet pipe to expansion tank body and install elastic clamp.

(2) Install 2 fixing bolts to expansion tank body.

Torque: 5 ± 1 N·m

(3) Connect the engine discharge pipe to expansion tank body and install elastic clamp.

(4) Connect the radiator discharge pipe Ⅰ to expansion tank body and install elastic clamp.

(5) Add the coolant.

(6) Install the engine compartment trim cover assembly.

5.6 Inlet Pipe Assembly (If equipped with rear heater)

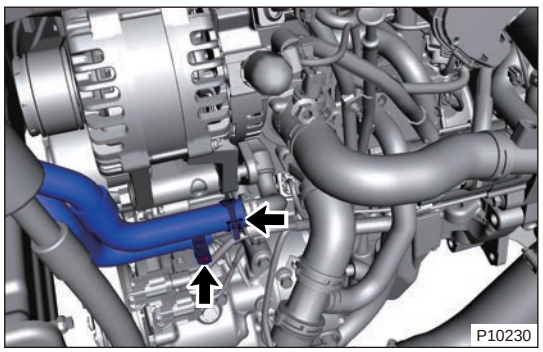
■ Removal

⚠ Warning

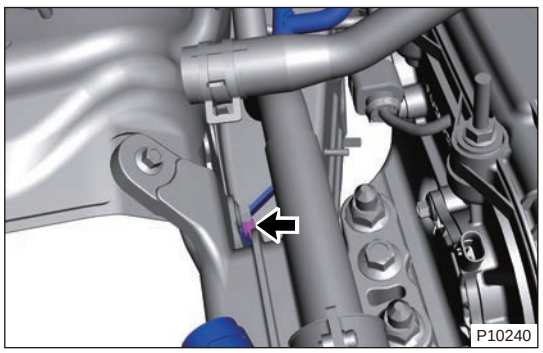
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**

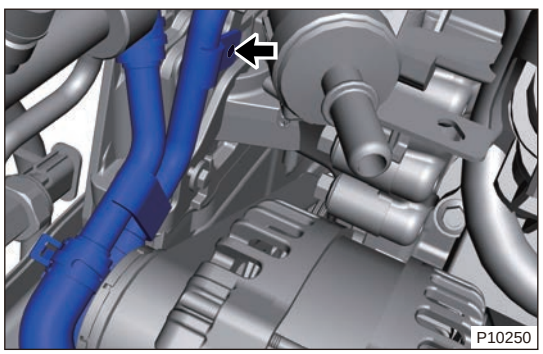
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Drain the coolant.
(4) Remove the expansion tank body assembly.

(5) Loosen 2 elastic clamps and disconnect the connection between inlet pipe assembly and water pump module.

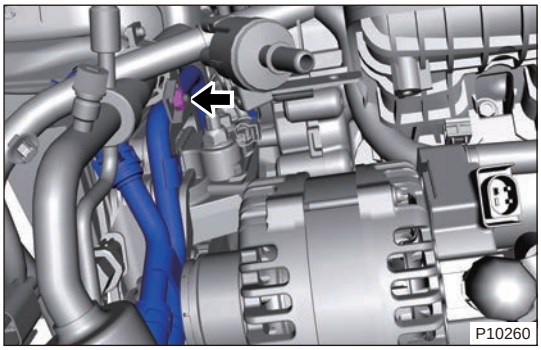


(6) Remove 2 fixing bolts from inlet pipe assembly.



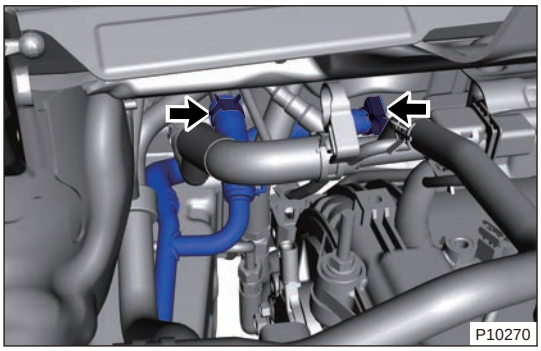


(7) Remove 1 fixing nut that fixed the clip which between A/C coaxial line and inlet pipe assembly. Separate the two line.



(8) Loosen elastic clamps and disconnect the connection between inlet pipe assembly and rear heater outlet pipe assembly.

(9) Loosen elastic clamp and disconnect connection between inlet pipe assembly and heater water tank.



(10) Remove the inlet pipe assembly carefully.

■ **Installation**

(1) Install 2 fixing bolts to inlet pipe assembly.

Torque: 5 ± 1 N·m

(2) Tighten 1 fixing nut that fixed the clip which between A/C coaxial line and inlet pipe assembly.
(3) Connect the inlet pipe to water pump module assembly. Install the elastic clamp.
(4) Connect the inlet pipe to rear heater outlet pipe. Install the elastic clamp.
(5) Connect inlet pipe to heater water tank. Install the elastic clamp.
(6) Add the coolant.
(7) Install the engine compartment trim cover assembly.

5.7 Heater Inlet Pipe Assembly | (If equipped with rear heater)

■ **Removal**

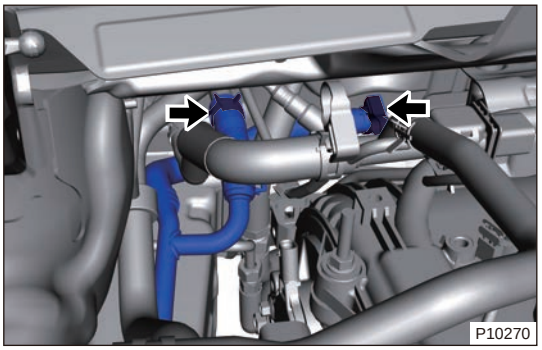
⚠ Warning

- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**

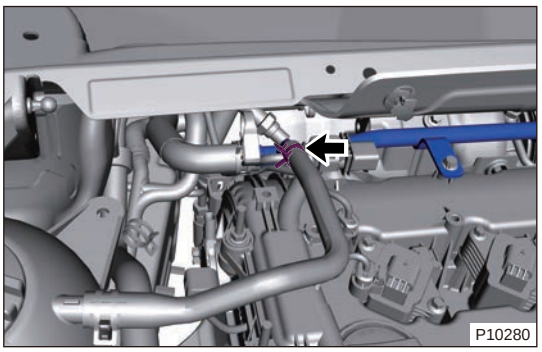
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the intake hose assembly.
(4) Drain the coolant.

(5) Loosen elastic clamps and disconnect the connection between inlet pipe assembly and rear heater outlet pipe assembly.

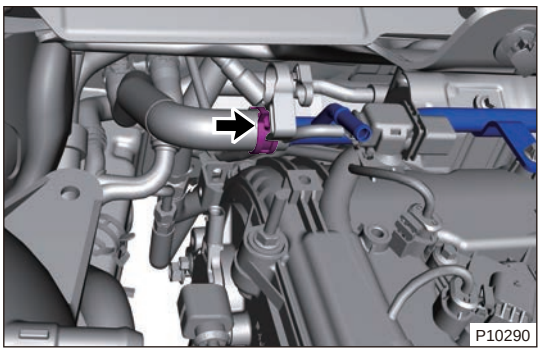
(6) Loosen elastic clamp and disconnect connection between inlet pipe assembly and heater water tank.



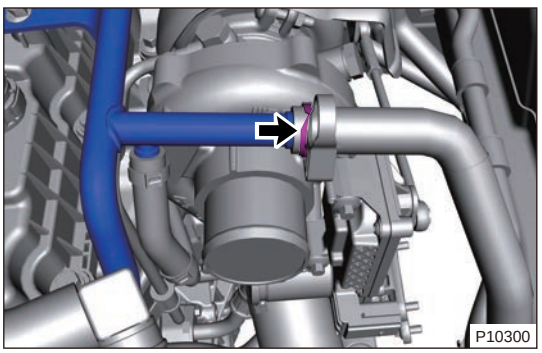
(7) Loosen elastic clamps and disconnect the connection between engine discharge pipe and heater inlet pipe Ⅰ.



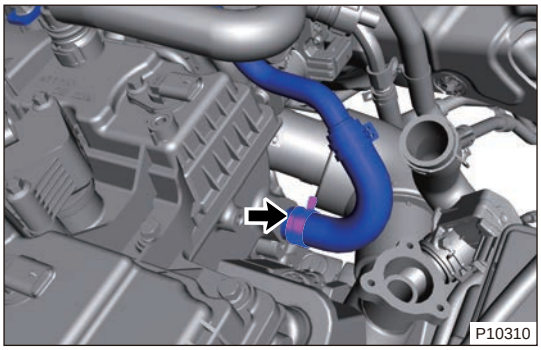
(8) Loosen elastic clamps and disconnect the connection between heater inlet pipe Ⅱ and heater inlet pipe Ⅰ.



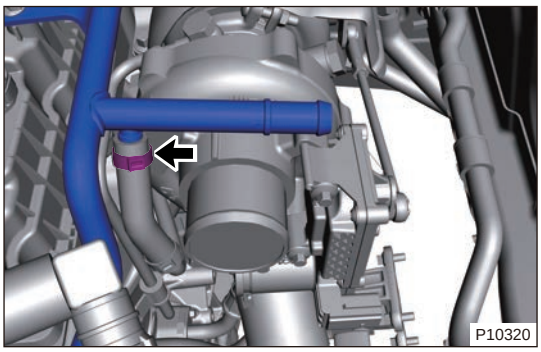
(9) Loosen elastic clamps and disconnect the connection between rear heater inlet / outlet pipe and heater inlet pipe Ⅰ.



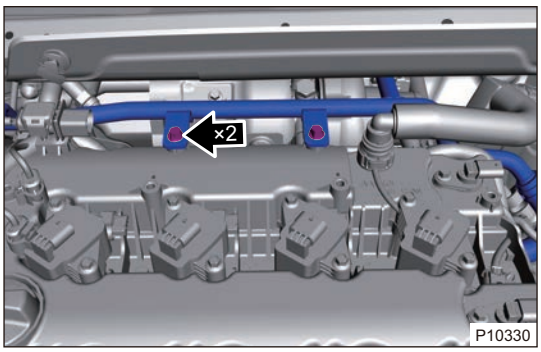
(10) Loosen elastic clamps and disconnect the connection between cylinder head and heater inlet pipe Ⅰ.



(11) Loosen clamping ring and disconnect the connection between turbocharger water outlet pipe and heater inlet pipe Ⅰ.



(12) Remove 2 fixing bolts from heater inlet pipe assembly Ⅰ.



(13) Remove the heater inlet pipe assembly Ⅰ carefully.

■ Installation

(1) Install 2 fixing bolts to heater inlet pipe Ⅰ.
Torque: 9 ± 1.5 N·m

(2) Connect heater inlet pipe Ⅰ to cylinder head and install elastic clamp.
(3) Connect the turbocharger outlet pipe to heater inlet pipe Ⅰ and clamp the clamping ring.
(4) Connect heater inlet pipe Ⅱ to heater inlet pipe Ⅰ and install elastic clamp.
(5) Connect engine discharge pipe to heater inlet pipe Ⅰ and install elastic clamp.
(6) Connect rear heater inlet and outlet pipe to heater inlet pipe Ⅰ and install elastic clamp.
(7) Add the coolant.
(8) Install the engine compartment trim cover assembly.

5.8 Cooler Upper Bracket Assembly

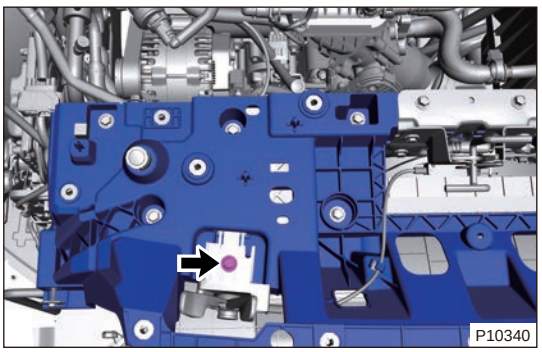
■ Removal

⚠ Warning

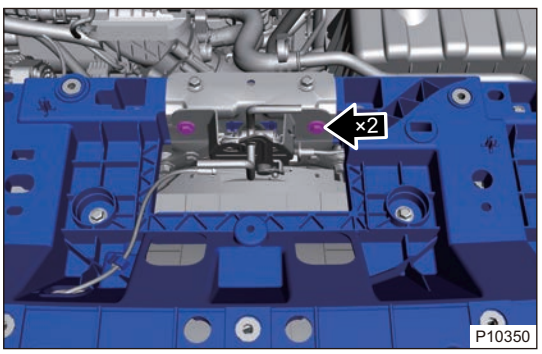
- **Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing the front plastic end.**
- **Appropriate force should be applied when removing the front plastic end. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the front bumper assembly.
(6) Remove the right headlight assembly.
(7) Remove the left headlight assembly.
(8) Remove the right headlight crossmember assembly.
(9) Remove the left headlight crossmember assembly.

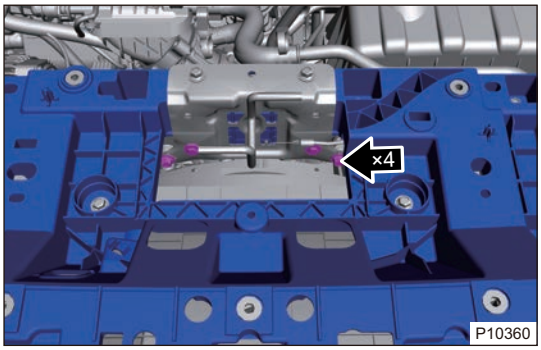
(10) Remove 1 fixing bolt from engine hood secondary lock opening mechanism, then detach the cable.



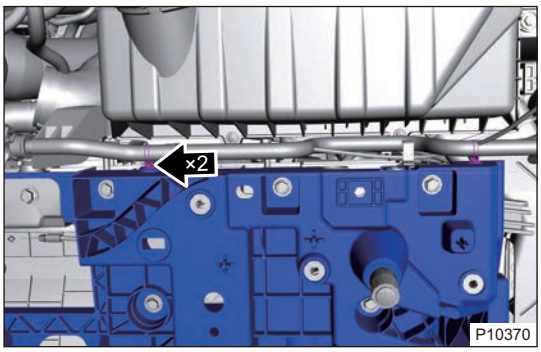
(11) Remove 2 fixing bolts from engine hood lock assembly.



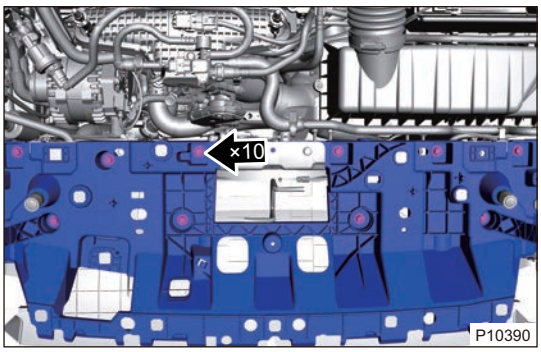
(12) Remove 4 fixing bolts from lower part of engine hood lock mounding plate.



(13) Disengage 2 clips of vacuum brake hose from cooler upper bracket.



(14) Remove 10 fixing bolts from cooler upper bracket.



(15) Remove cooler upper bracket assembly carefully.

■ Installation

(1) Install 10 fixing bolts to cooler upper bracket.
Torque: 10 ± 1.5 N m

(2) Install 4 fixing bolts to lower part of engine hood lock mounding plate.
(3) Install the engine hood lock assembly.
(4) Install the engine hood secondary lock opening mechanism assembly.
(5) Fix 2 clips to vacuum brake hose.
(6) Install the left and right headlight crossmember assembly.
(7) Install the left and right headlight assembly.
(8) Install the front bumper assembly.
(9) Install the air filter assembly.
(10) Install the engine compartment trim cover assembly.

5.9 Front Plastic End Assembly

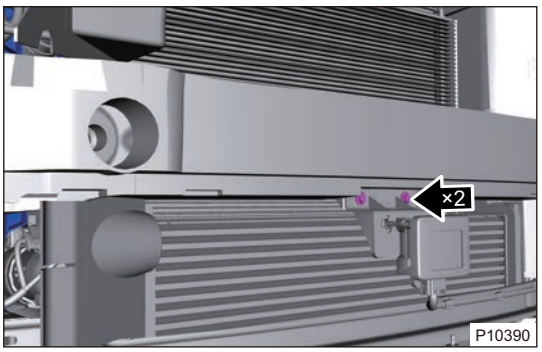
■ Removal

⚠ Warning

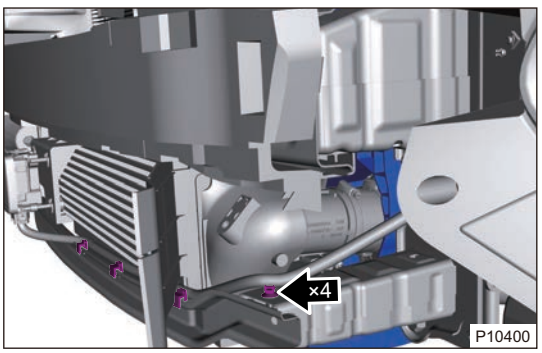
- **Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing the front plastic end.**
- **Appropriate force should be applied when removing the front plastic end. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the front bumper assembly.
(6) Remove the right headlight assembly.
(7) Remove the left headlight assembly.
(8) Remove the right headlight crossmember assembly.
(9) Remove the left headlight crossmember assembly.
(10) Remove cooler upper bracket assembly.
(11) Drain the coolant.
(12) Recover the refrigerant.

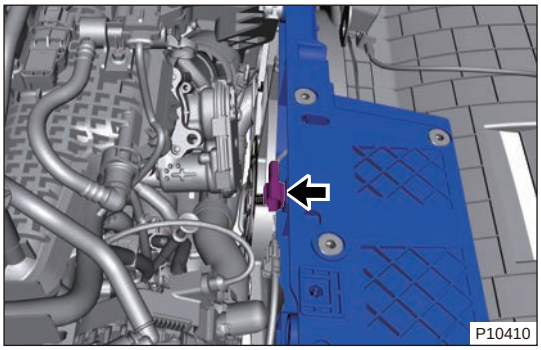
(13) Remove 2 fixing bolts from microwave radar bracket.

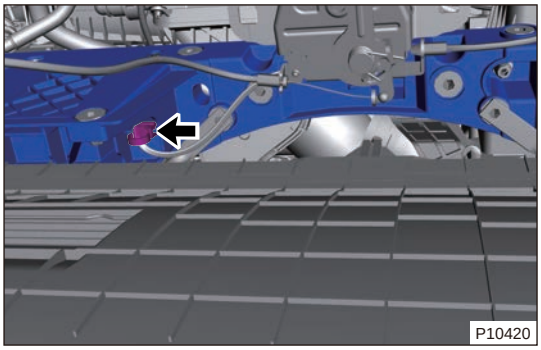


(14) Disengage 4 clips of interior floor wire harness from lower support beam and remove the microwave radar assembly.

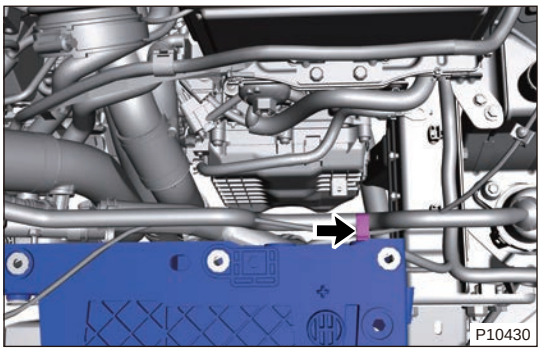


(15) Disconnect the engine hood lock connector. Disengage the connecting wire harness clip from front plastic end.

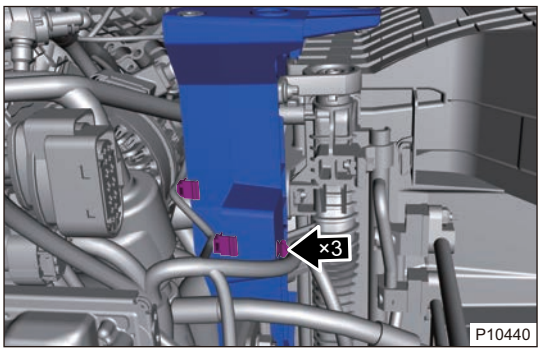




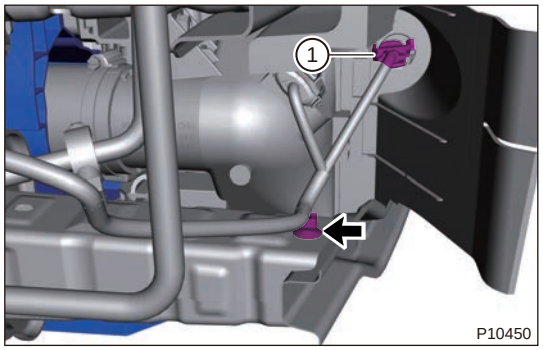
(16) Disengage 1 fixing clip of engine hood lock cable from front plastic end, and remove the engine hood lock assembly.



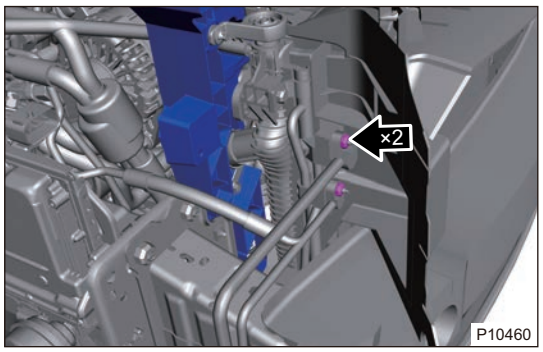
(17) Disengage 3 clips of interior floor wire harness from front plastic end. Disengage the front bumper wire harness connector from front upper impact beam assembly.



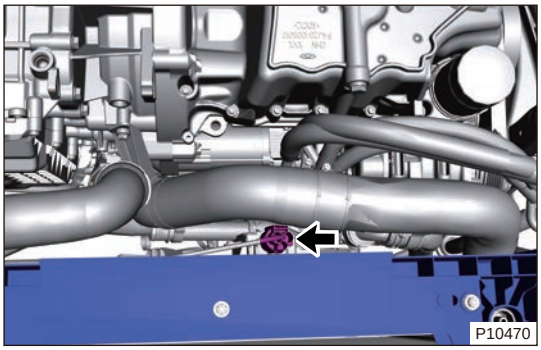
(18) Remove the outside temperature sensor (1) from right air deflector assembly and disconnect the connector wire harness fixing clip.

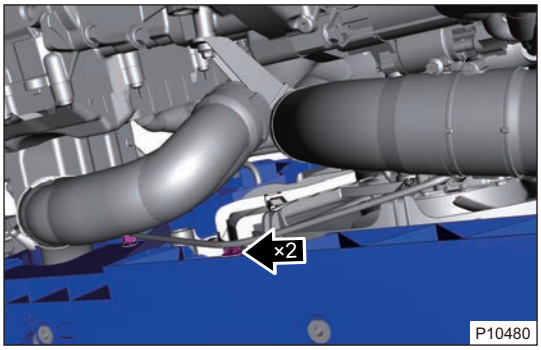


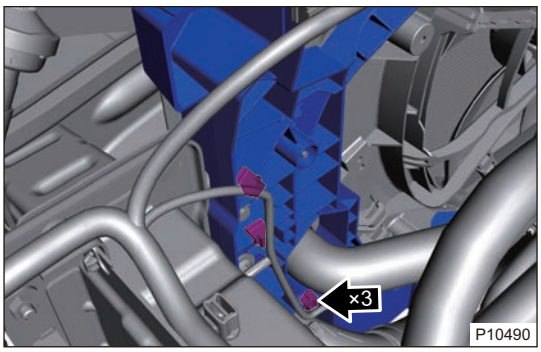
(19) Disconnect the condenser pipeline.



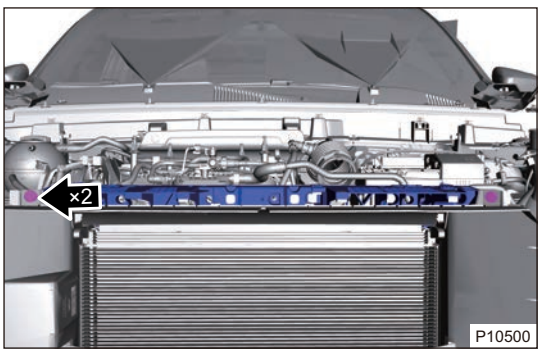
(20) Disconnect the cooling fan module connector and disconnect 5 fixing clips from connector wire harness.



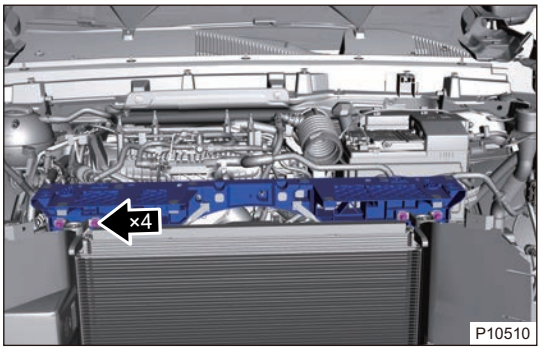




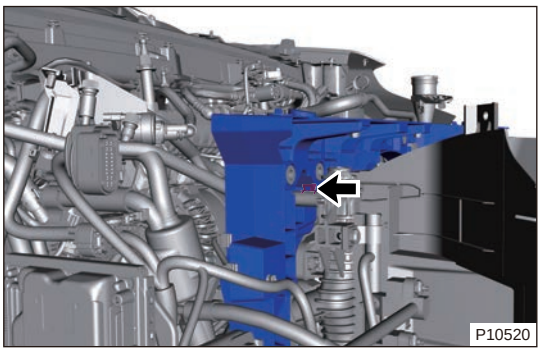
(21) Remove the fixing clips on both sides of air deflector and remove the upper air deflector assembly.



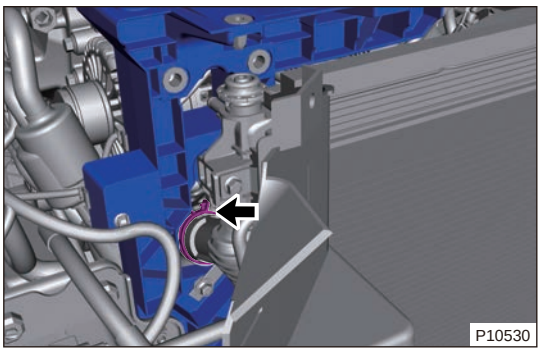
(22) Remove 4 fixing bolts from left and right side of radiator and remove the mounting bracket.



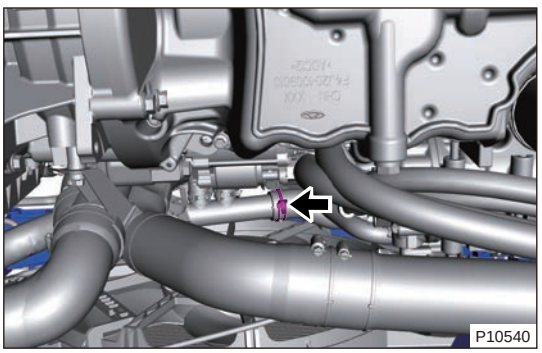
(23) Loosen elastic clamp and disconnect the connection between radiator discharge pipe Ⅰ and radiator assembly.



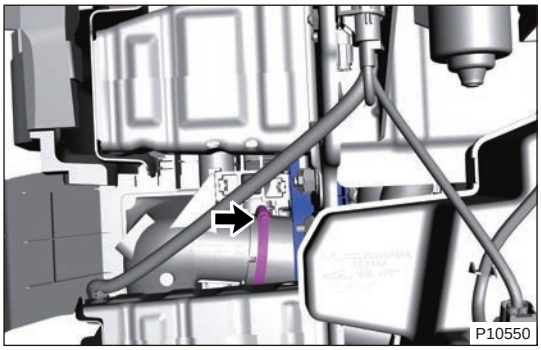
(24) Loosen elastic clamp and disconnect the connection between engine outlet pipe assembly - front and radiator assembly.



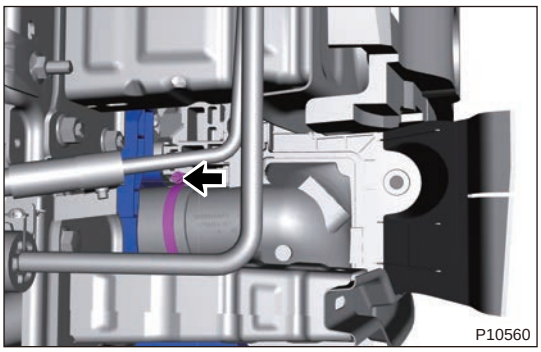
(25) Loosen elastic clamps and disconnect the connection between engine inlet pipe - rear and engine inlet pipe - front.



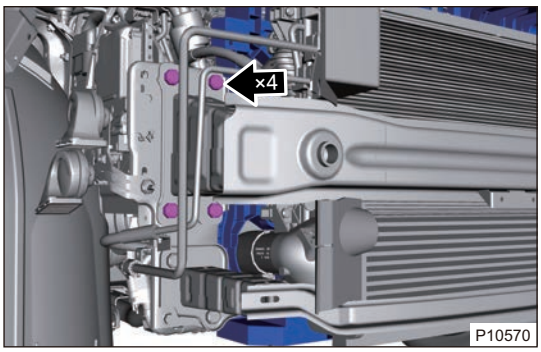
(26) Loosen worm clamp and disconnect the connection between intercooler inlet pipe III and intercooler.

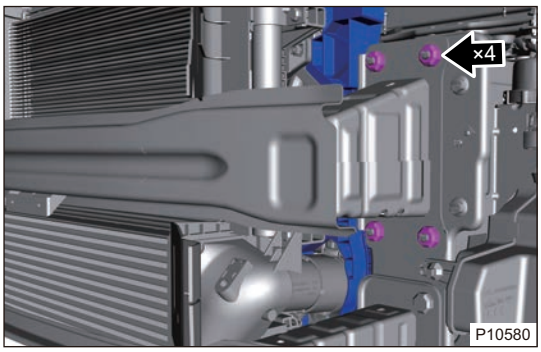


(27) Loosen worm clamp and disconnect the connection between intercooler outlet pipe I and intercooler.

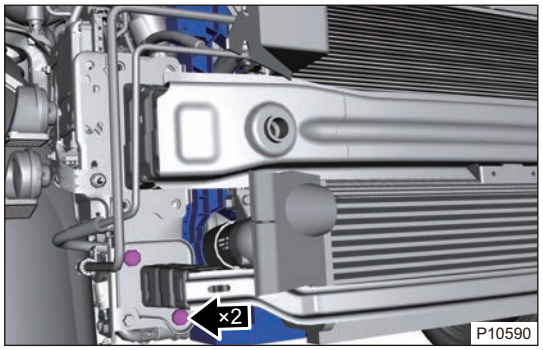


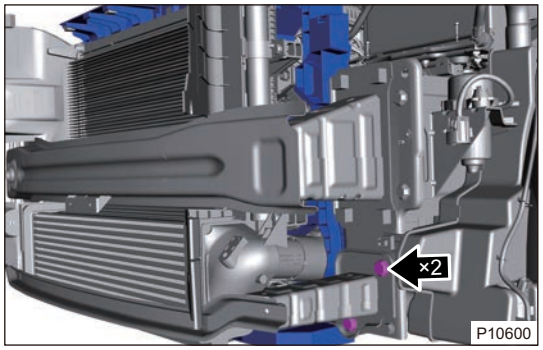
(28) Remove 8 fixing nuts from front upper impact beam.





(29) Remove 4 fixing bolts from lower support beam.



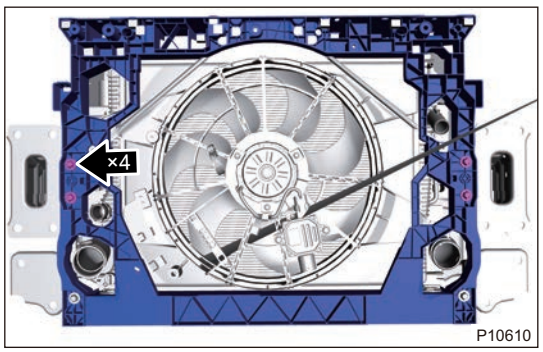


(30) Remove the front end structure assembly carefully.

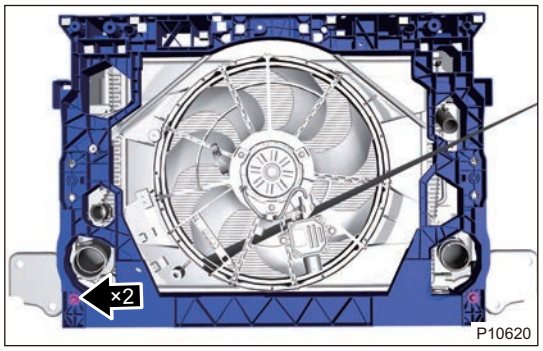
⚠ Caution

- **Because the front end structure assembly is heavy, it needs to be removed carefully with the cooperation of many people, and be careful when operating to avoid accidents.**

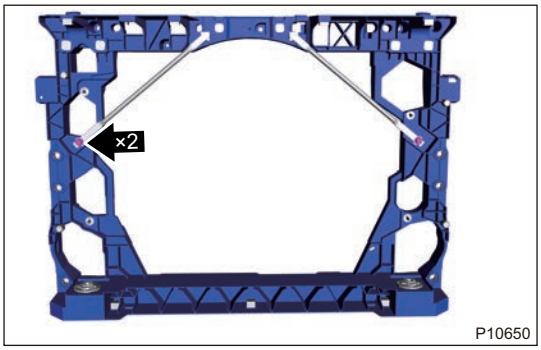
(31) Remove 4 fixing bolts between front upper impact beam assembly and front plastic end.



(32) Remove 2 fixing bolts between lower support beam assembly and front plastic end.



(33) Remove the front plastic end assembly carefully. Remove 2 fixing bolt from front left/right end bracket reinforcement lever.



■ **Installation**

(1) Install 2 fixing bolts to front left/right end bracket reinforcement lever.
(2) Install 2 bolts between lower support beam assembly and front plastic end.
(3) Install 4 bolts between front upper impact beam assembly and front plastic end.
(4) Align the front upper impact beam mounting hole with left/right side rail stud, and fix 8 nuts.

Torque: 38 ± 3.8 N·m

(5) Connect intercooler pipeline.
(6) Connect radiator pipeline.
(7) Install 4 fixing bolts to radiator mounting bracket.

Torque: 12 ± 1 N·m

(8) Install the upper air deflector.
(9) Fix each wire harness/connector.
(10) Connect the cooling fan module connector.
(11) Install the outside temperature sensor.
(12) Install the condenser pipeline.
(13) Install 2 fixing bolts to microwave radar bracket.
(14) Install cooler upper bracket assembly.
(15) Install the left and right headlight crossmember assembly separately.
(16) Install the left and right headlight assembly separately.
(17) Install the front bumper assembly.
(18) Install the A/C filter assembly.
(19) Add the coolant.
(20) Vacuum pumping/refrigerant recharging
(21) Install the engine compartment trim cover assembly.

5.10 Radiator Assembly

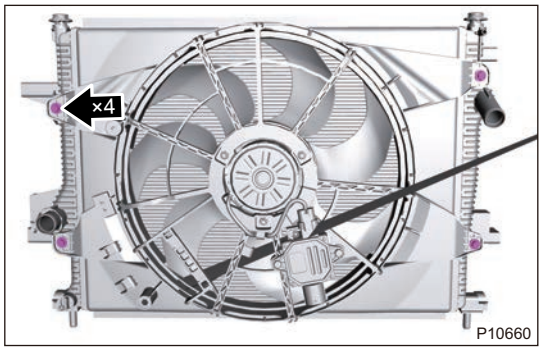
■ **Removal**

⚠ Warning

- **Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing radiator assembly.**
- **Appropriate force should be applied, when removing the radiator assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the front bumper assembly.
(6) Remove the right headlight assembly.
(7) Remove the left headlight assembly.
(8) Remove the right headlight crossmember assembly.
(9) Remove the left headlight crossmember assembly.
(10) Remove cooler upper bracket assembly.
(11) Drain the coolant.
(12) Recover the refrigerant.
(13) Remove the plastic structure assembly.
(14) Remove the front upper impact beam assembly.
(15) Remove the lower support beam assembly.
(16) Remove the front plastic end assembly.
(17) Remove the left air deflector assembly.
(18) Remove the right air deflector assembly.
(19) Remove the intercooler assembly.

(20) Remove 4 fixing bolts from cooling fan assembly and radiator assembly, and remove cooling fan assembly.



■ Inspection

(1) Appearance inspection: Radiator is not allowed to be impacted and damaged, the fins are not allowed to be lodged and deformed. No residue is allowed inside the assembly and its section should smooth and flat.

(2) Sealing inspection: Block water inlet and water outlet with expansion rubber plug, inject 30 - 80 KP compressed air to radiator. Soak radiator assembly into water tank, if there are bubbles, it indicates there is leakage in radiator assembly.

■ **Installation**

(1) Remove 4 fixing bolts to cooling fan assembly.
Torque: 5 ± 1 N·m

(2) Install the intercooler assembly.
(3) Install the front plastic end assembly.
(4) Install the left and right air deflector assembly.
(5) Install the lower support beam assembly.
(6) Install the front upper impact beam assembly.
(7) Install the front end structure assembly.
(8) Install cooler upper bracket assembly.
(9) Install the left and right headlight crossmember assembly separately.
(10) Install the left and right headlight assembly separately.
(11) Install the front bumper assembly.
(12) Install the A/C filter assembly.
(13) Add the coolant.
(14) Vacuum pumping/refrigerant recharging
(15) Install the engine compartment trim cover assembly.

5.11 Cooling Fan Assembly

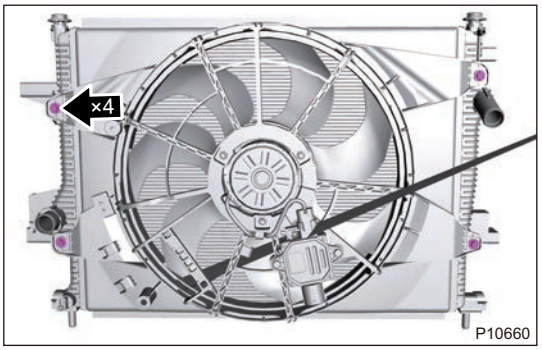
■ **Removal**

⚠ Warning

- **Temperature in engine compartment is very high when engine is running. Before removal, you must make sure that engine has shut off, and engine compartment has cooled down sufficiently, otherwise, there is a risk of scald injury.**
- **Be sure to wear safety equipment to prevent accidents, when removing cooling fan assembly.**
- **Appropriate force should be applied, when removing cooling fan assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the air filter assembly.
(5) Remove the front bumper assembly.
(6) Remove the right headlight assembly.
(7) Remove the left headlight assembly.
(8) Remove the right headlight crossmember assembly.
(9) Remove the left headlight crossmember assembly.
(10) Remove cooler upper bracket assembly.
(11) Drain the coolant.
(12) Recover the refrigerant.
(13) Remove the plastic structure assembly.
(14) Remove the front upper impact beam assembly.
(15) Remove the lower support beam assembly.
(16) Remove the front plastic end assembly.
(17) Remove the left air deflector assembly.
(18) Remove the right air deflector assembly.
(19) Remove the intercooler assembly.

(20) Remove 4 fixing bolts from cooling fan assembly and radiator assembly, and remove cooling fan assembly.



■ **Installation**

(1) Remove 4 fixing bolts to cooling fan assembly.
Torque: 5 ± 1 N·m

(2) Install the intercooler assembly.
(3) Install the front plastic end assembly.
(4) Install the left and right air deflector assembly.
(5) Install the lower support beam assembly.
(6) Install the front upper impact beam assembly.
(7) Install the front end structure assembly.
(8) Install cooler upper bracket assembly.
(9) Install the left and right headlight crossmember assembly separately.
(10) Install the left and right headlight assembly separately.
(11) Install the front bumper assembly.
(12) Install the A/C filter assembly.
(13) Add the coolant.
(14) Vacuum pumping/refrigerant recharging
(15) Install the engine compartment trim cover assembly.

5.12 Water Pump Module Assembly

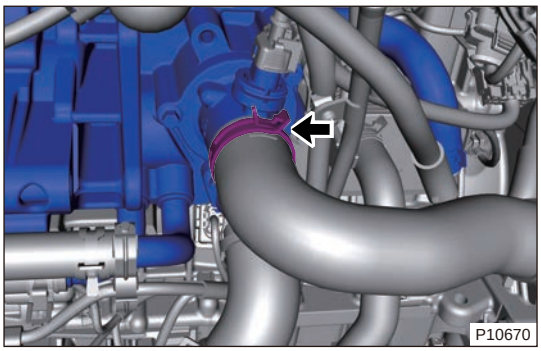
■ **Removal**

⚠ Warning

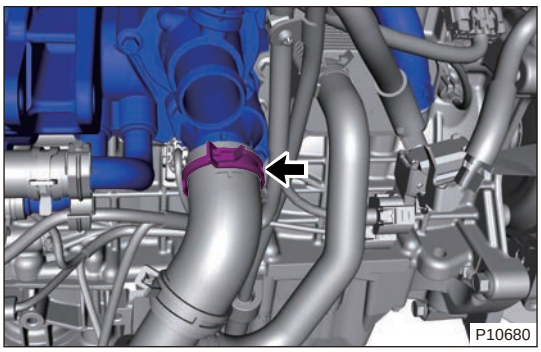
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing water pump module.**
- **Appropriate force should be applied when removing water pump module. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the engine compartment lower protector assembly.
(5) Remove the engine accessory belt.
(6) Drain the coolant.
(7) Remove the alternator assembly.
(8) Remove the oil dipstick tube assembly.

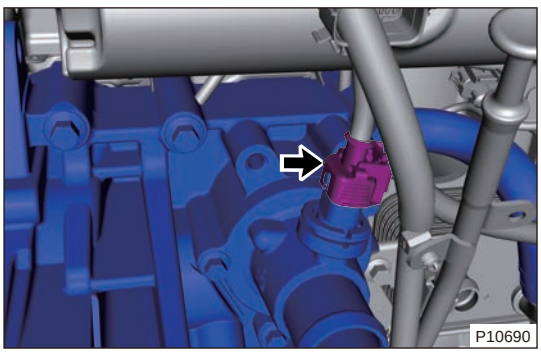
(9) Loosen the elastic clamp and disconnect the connection between water pump module assembly and engine inlet pipe.



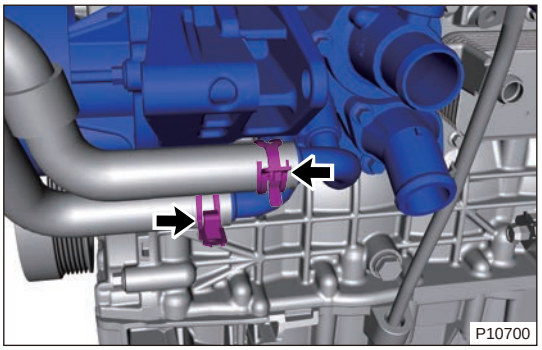
(10) Loosen elastic clamp and disconnect connection between water pump module assembly and engine outlet pipe.



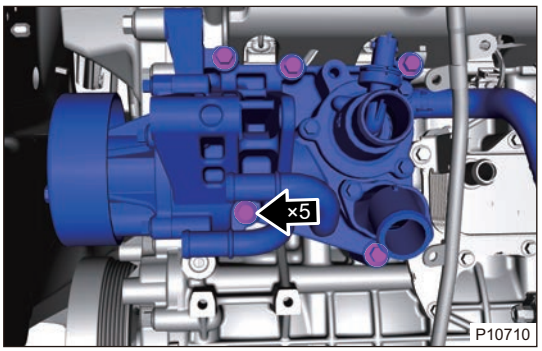
(11) Disconnect the electronic thermostat connector.



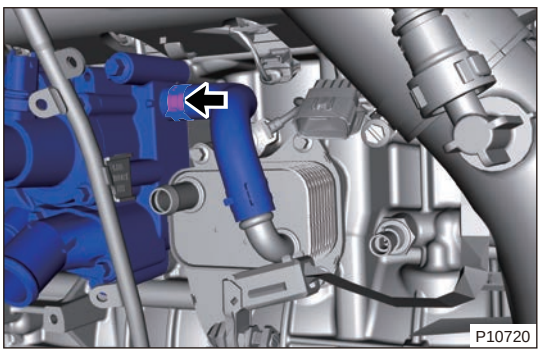
(12) Loosen elastic clamp and disconnect connection between water pump module assembly and inlet pipe.



(13) Remove 5 fixing bolts from water pump module.



(14) Loosen clamping ring and disconnect connection between water pump module assembly and oil filter module inlet pipe.



(15) Remove water pump module assembly carefully.

■ Installation

(1) Connect the oil filter module inlet pipe to water pump module, and tighten the clamping ring.

(2) Install the water pump module assembly to cylinder block installation surface, and install 5 bolts at the corresponding positions,first pretighten the water pump module so that it can be pressed tightly, and then tighten it to the specified torque.

Torque: 20 + 5 N•m

(3) Connect the inlet pipe to water pump module, and install elastic clamp.
(4) Connect the engine outlet pipe to water pump module, and install elastic clamp.
(5) Connect the engine inlet pipe to water pump module, and install elastic clamp.
(6) Connect the electronic thermostat connector.
(7) Install the oil dipstick tube assembly.
(8) Install the alternator assembly.
(9) Add the coolant.

5.13 Electronic Thermostat Assembly

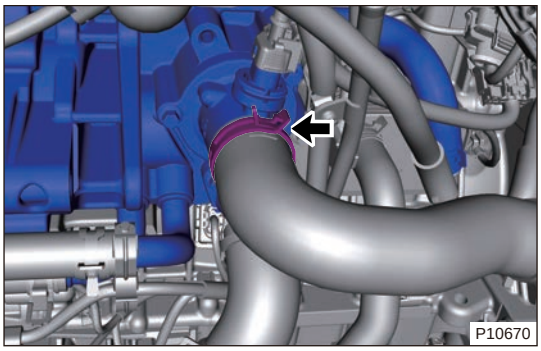
■ Removal

⚠ Warning

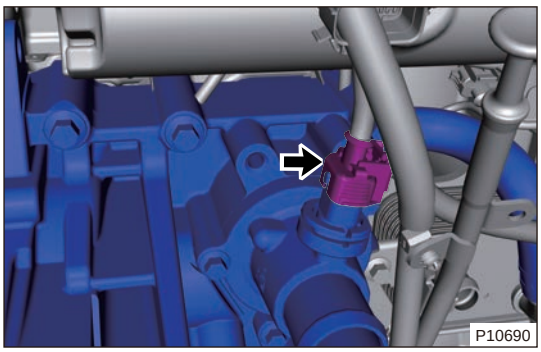
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing water pump module.**
- **Appropriate force should be applied when removing water pump module. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

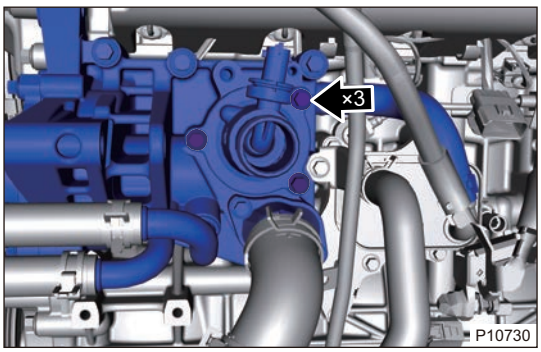
(5) Loosen the elastic clamp and disconnect the connection between water pump module assembly and engine inlet pipe.


P10670

(6) Disconnect the electronic thermostat connector.


P10690

(7) Remove 3 fixing bolts from electronic thermostat.



P10730

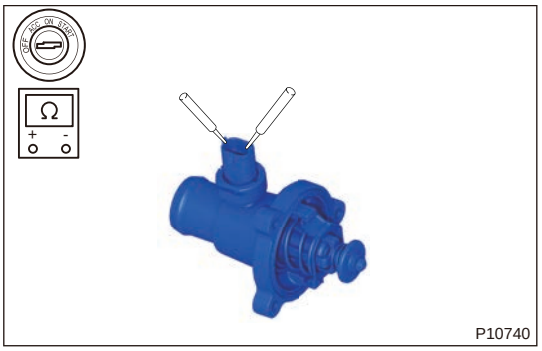
(8) Remove the electronic thermostat.

■ Inspection

(1) Check electronic thermostat assembly grommet for damage.

(2) As shown in illustration, check the electronic thermostat heating resistance with ohm band of multimeter.

Multimeter Connection	Specified value (Ω)
Terminal 1 - Terminal 2	15.3



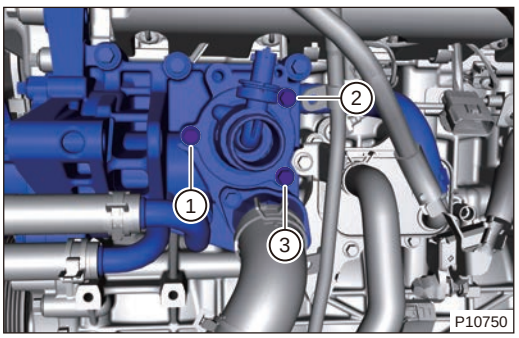
⚠ Caution

- **If resistance is not as specified, replace the electronic thermostat.**

■ Installation

(1) Install the electronic thermostat to water pump module, pre-install 3 fixing bolts and tighten them with tool, then tighten them in the order shown in illustration (1-2-3-1).

Torque: 8 + 3 N•m



(2) Connect the engine inlet pipe to water pump module, and install elastic clamp.
(3) Connect the electronic thermostat connector.
(4) Add the coolant.

5.14 Engine Outlet Port Cover Assembly

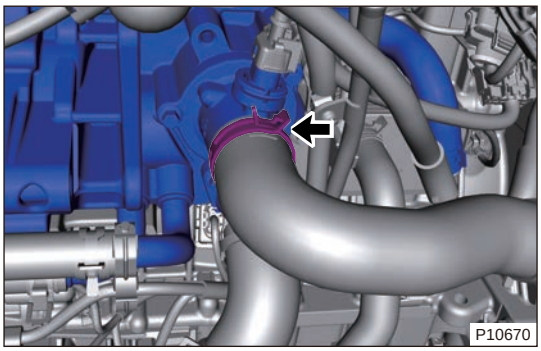
■ Removal

⚠ Warning

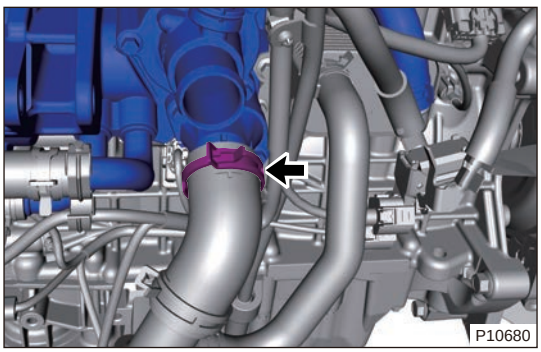
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear safety equipment to prevent accidents, when removing engine outlet port cover.**
- **Appropriate force should be applied, when removing engine outlet port cover. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

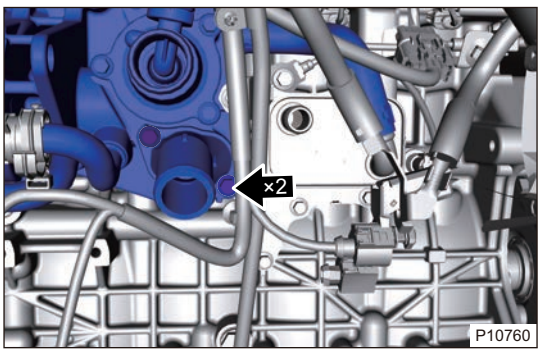
(5) Loosen the elastic clamp and disconnect the connection between water pump module assembly and engine inlet pipe.



(6) Loosen elastic clamp and disconnect connection between water pump module assembly and engine outlet pipe.



(7) Remove 2 fixing bolts from engine outlet port cover.



(8) Remove the engine outlet port cover.

■ Inspection

(1) Check engine outlet port cover grommet for damage.
(2) Install the grommet to engine outlet port cover and check if it is installed in place.

■ Installation

(1) Install engine outlet port cover to water pump module, pretighten 2 fixing bolts and then tighten them.

Torque: 8 + 3 N•m

(2) Connect the engine outlet pipe to water pump module, and install elastic clamp.
(3) Connect the engine inlet pipe to water pump module, and install elastic clamp.
(4) Add the coolant.
(5) Install the engine compartment trim cover assembly.

5.15 Coolant Temperature Sensor

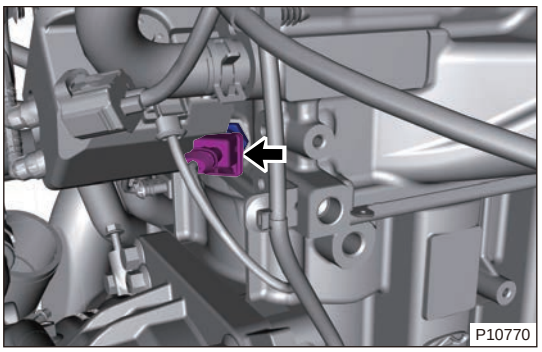
■ Removal

⚠ Warning

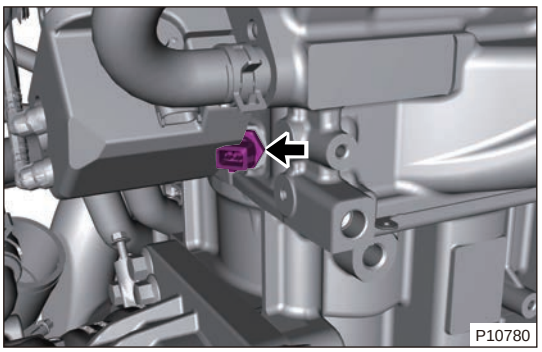
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing coolant sensor Ⅰ.**
- **Appropriate force should be applied when removing coolant temperature sensor Ⅰ. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the intake hose assembly.
(5) Remove inter-cooling intake pipe Ⅱ.
(6) Drain the coolant.

(7) Disconnect the coolant temperature sensor connector.



(8) Remove the coolant temperature sensor.



■ **Installation**

(1) Install the coolant temperature sensor.

Torque: 15 ± 1 N·m.

Seal gum: Loctite 577

(2) Connect the coolant sensor connector.
(3) Install intercooler inlet pipe Ⅱ.
(4) Install the intake hose assembly.
(5) Add the coolant.
(6) Install the engine compartment trim cover assembly.

5.16 Coolant Temperature Sensor

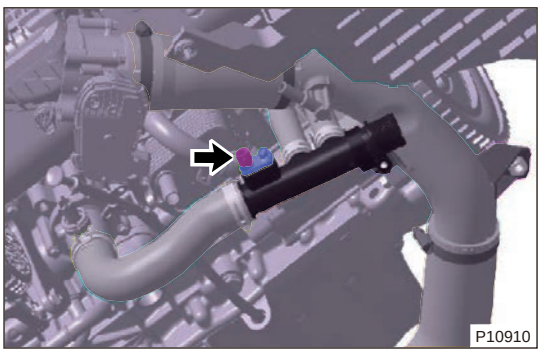
■ **Removal**

⚠ Warning

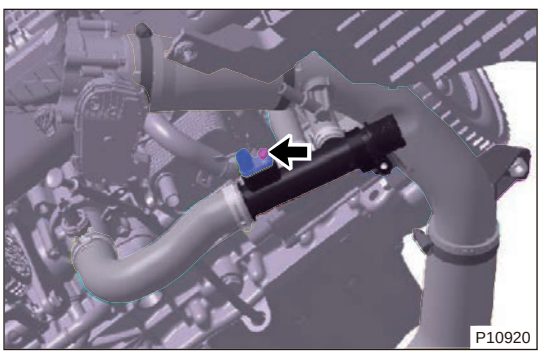
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing coolant sensor Ⅱ.**
- **Appropriate force should be applied when removing coolant temperature sensor Ⅱ. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

(5) Disconnect the coolant temperature sensor connector.



(6) Remove 1 fixing bolt of coolant temperature sensor from engine inlet pipe.



(7) Remove the coolant temperature sensor carefully.

■ **Installation**

(1) Install the coolant temperature sensor.
Torque: 9 ± 1.5 N·m

(2) Connect the coolant temperature sensor connector.
(3) Add the coolant.
(4) Install the engine compartment trim cover assembly.

5.17 Rear Heater Outlet Pipe Assembly Ⅰ (If equipped with rear heater)

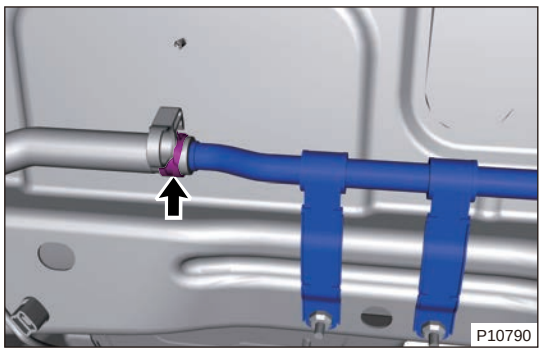
■ **Removal**

⚠ Warning

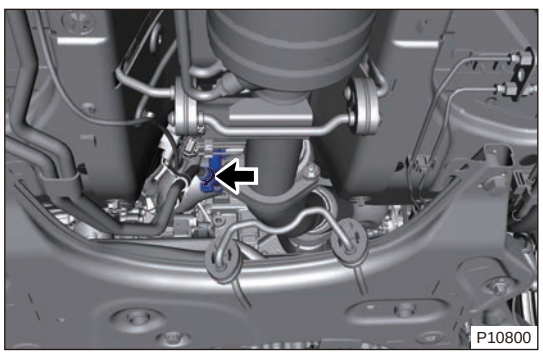
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear safety equipment to prevent accidents, when removing rear heater outlet pipe assembly.**
- **Appropriate force should be applied, when removing rear heater outlet pipe assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

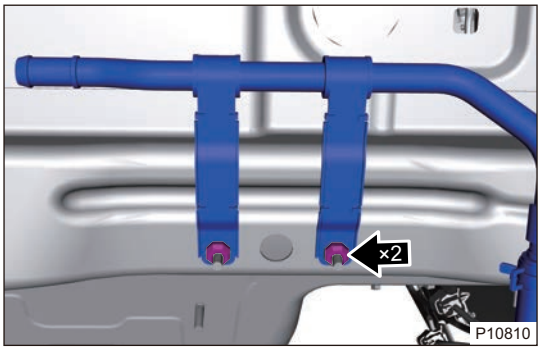
(5) Loosen elastic clamps and disconnect the connection between inlet pipe and rear heater outlet pipe.



(6) Loosen elastic clamps and disconnect the connection between rear heater inlet / outlet pipe Ⅱ and rear heater outlet pipe.



(7) Remove 2 fixing nuts from rear heater outlet pipe.



(8) Remove the rear heater outlet pipe assembly carefully.

■ **Installation**

(1) Install 2 fixing nuts to rear heater outlet pipe.
(2) Connect the rear heater inlet and outlet pipe Ⅱ to rear heater outlet pipe and install elastic clamp.
(3) Connect the inlet pipe to rear heater outlet pipe and install elastic clamps.
(4) Add the coolant.
(5) Install the engine compartment trim cover assembly.

5.18 Rear Heater Inlet and Outlet Pipe Assembly Ⅱ (If equipped with rear heater)

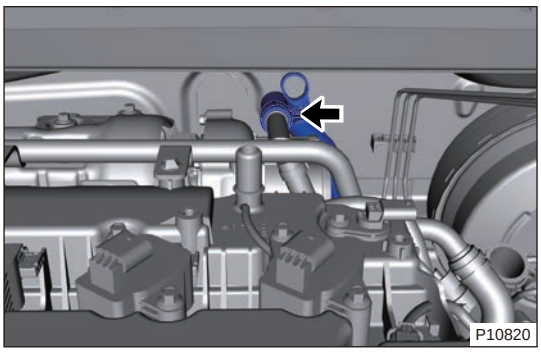
■ **Removal**

⚠ Warning

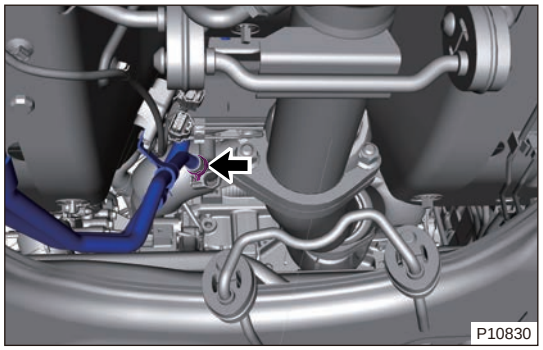
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear safety equipment to prevent accidents, when removing rear heater inlet and outlet pipe assembly Ⅱ.**
- **Appropriate force should be applied, when removing rear heater inlet and outlet pipe assembly Ⅱ. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

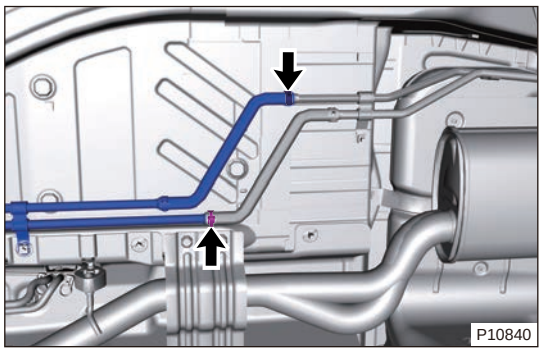
(5) Loosen elastic clamps and disconnect the connection between heater inlet pipe Ⅰ and rear heater inlet and outlet pipe Ⅱ.



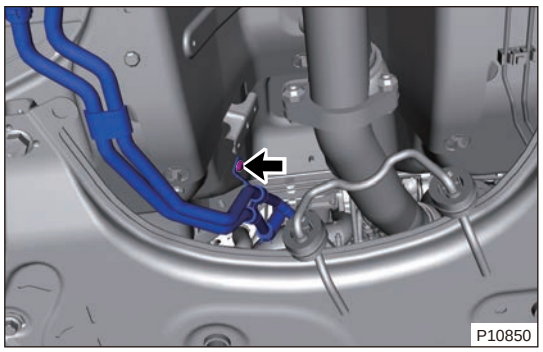
(6) Loosen elastic clamps and disconnect the connection between heater outlet pipe and rear heater inlet and outlet pipe Ⅱ.

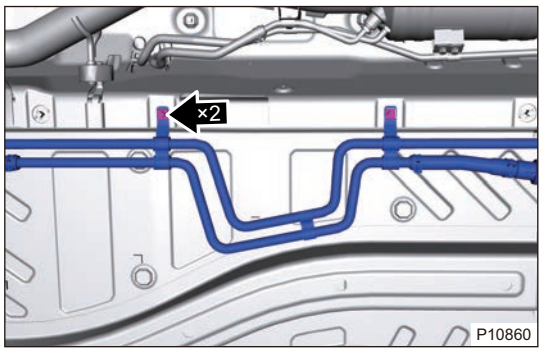


(7) Loosen elastic clamps and disconnect the connection between rear heater inlet/outlet pipe Ⅲ and rear heater inlet/outlet pipe Ⅱ.



(8) Remove 3 fixing nuts from rear heater inlet and outlet pipe Ⅱ.





(9) Remove the rear heater inlet and outlet pipe assembly carefully.

■ **Installation**

(1) Install 3 fixing nuts to rear heater inlet and outlet pipe Ⅱ.
(2) Connect rear heater inlet and outlet pipe Ⅲ to rear heater inlet and outlet pipe Ⅱ and install elastic clamp.
(3) Connect heater outlet pipe to rear heater inlet and outlet pipe and install elastic clamp.
(4) Connect heater inlet pipe Ⅰ to rear heater inlet and outlet pipe Ⅱ and install elastic clamp.
(5) Add the coolant.
(6) Install the engine compartment trim cover assembly.

5.19 Rear Heater Inlet and Outlet Pipe Assembly Ⅲ (If Equipped with Rear Heater)

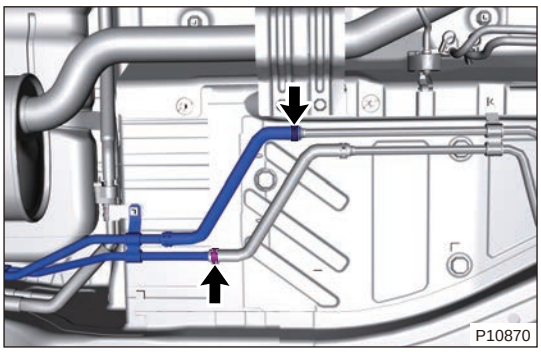
■ **Removal**

⚠ Warning

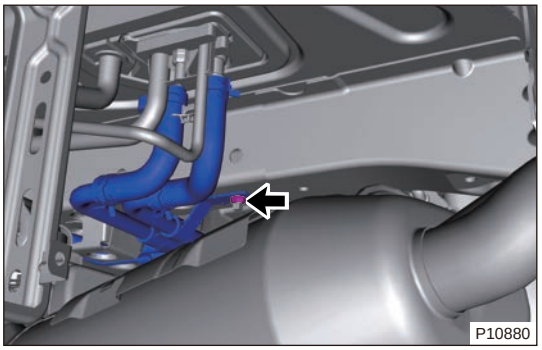
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear safety equipment to prevent accidents, when removing rear heater inlet and outlet pipe assembly Ⅲ.**
- **Appropriate force should be applied, when removing rear heater inlet and outlet pipe assembly Ⅲ. Be careful not to operate roughly.**

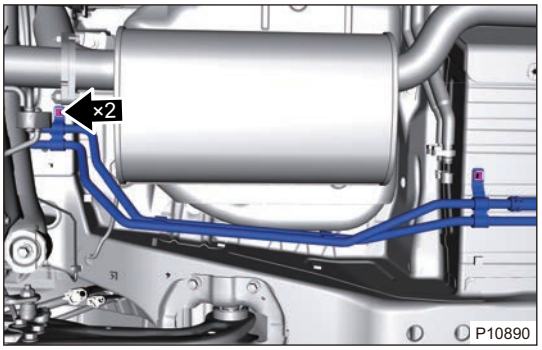
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Drain the coolant.

(5) Loosen elastic clamps and disconnect the connection between rear heater inlet/outlet pipe Ⅱ and rear heater inlet/outlet pipe Ⅲ.

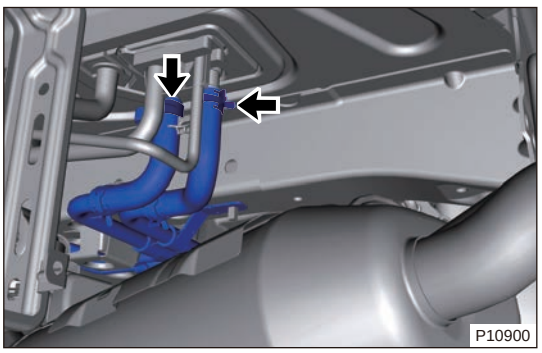


(6) Remove 3 fixing nuts from rear heater inlet and outlet pipe Ⅲ.





(7) Loosen elastic clamps and disconnect the connection between rear HVAC assembly and rear heater inlet/outlet pipe Ⅲ.



(8) Remove the rear heater inlet and outlet pipe assembly carefully.

■ Installation

(1) Install 3 fixing nuts to rear heater inlet and outlet pipe Ⅲ.
(2) Connect HVAC assembly to rear heater inlet and outlet pipe Ⅲ and install elastic clamp.
(3) Connect heater inlet/outlet pipe Ⅱ to rear heater inlet/outlet pipe Ⅲ and install elastic clamp.
(4) Add the coolant.
(5) Install the engine compartment trim cover assembly.

4.8 LUBRICATION SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Prolonged and repeated contact with engine oil will result in the removal of natural oils from skin, leading to dryness, irritation and dermatitis. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer.

(2) Wear protective clothing and gloves.

(3) Wash your skin thoroughly with soap and water, or use waterless hand cleaner to remove any used engine oil.

(4) Never use gasoline, thinners or solvents.

(5) Before performing the operation. Wait for the engine to cool down completely.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) Wasted engine oil should be handled by specialized department according to local laws and regulations. Never discard it at will.

(2) DO NOT use inferior engine oil.

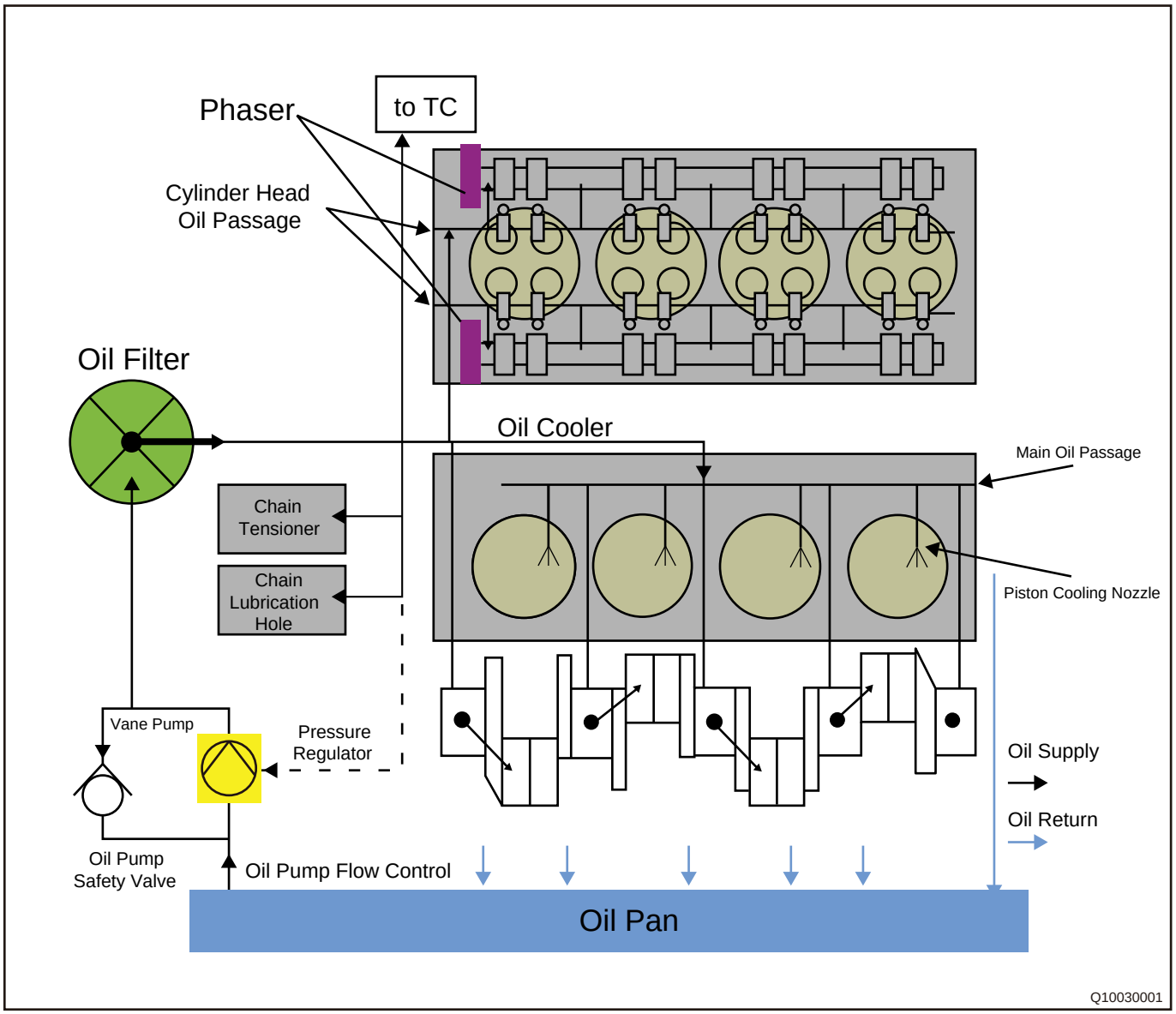
(3) DO NOT mix different types of engine oil.

2 System Overview

2.1 System Description

When engine is operating, an oil pump driven by crankshaft chain, sucks oil from oil pan and pumps it at pressure through an oil filter. This filtered oil then flows through oil passages, to moving surfaces of all engine drive parts and forms oil films between moving surfaces to reduce friction and finally returns to the oil pan, thus reducing friction resistance between drive parts, power consumption and increasing reliability and durability of engine operation.Oil pump of SQRF4J20 engine is installed in oil pan. Crankshaft transmits power to it through chain. Oil pump is a two-stage variable displacement pump, the oil pressure adjustment solenoid valve is controlled by the ECU to change the displacement.

2.2 System Schematic Diagram



Crankshaft drives oil pump to sucks oil from oil pan. The oil is filtered by oil filter and delivered to crankshaft connecting rod mechanism and cam valve mechanism, including some accessories such as turbocharger through main oil passage.

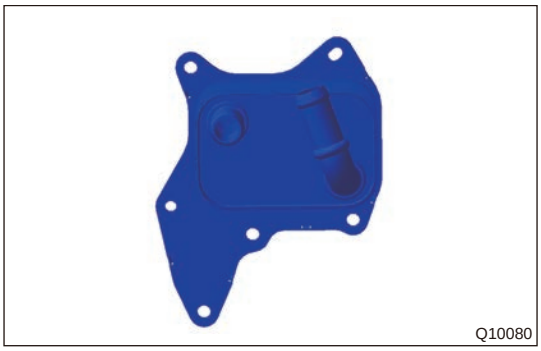
2.3 System Components Description

■ Oil Pump Assembly

Oil pump of SQRF4J20 engine is installed in oil pan. Crankshaft transmits power to it through chain. Oil pump is a two-stage variable displacement pump, and its displacement is controlled by ECU through oil pressure regulating solenoid valve. Oil pump adopts vane type variable displacement structure, and main structure is stator and rotor; There are two oil pressure chambers on the outer ring of stator to apply pressure control to the stator, so that it can deflect clockwise or counterclockwise around the fulcrum, changing the eccentricity ratio of vane pump and adjusting displacement.

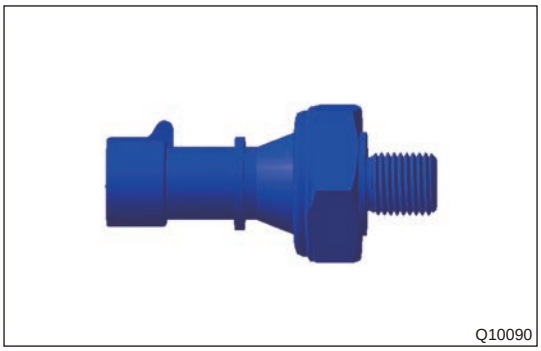
■ Oil Cooler Assembly

Oil cooler is on the circulation oil passage of lubrication system. During engine running, as oil viscosity becomes lean with temperature increasing , lubricating ability is reduced. Oil cooler is used to cool the lubricant, keep the oil temperature within normal operating range, reduce oil temperature and maintain a certain viscosity of lubricant.



■ Oil Pressure Switch

Oil pressure switch is installed on the main oil passage of engine block and used to detect the value of engine oil pressure. When the value is lower than the specified value, oil pressure warning light is turned on.



■ Oil Filter

It is used to remove impurities such as dust, metal particles, carbon deposits and soot particles in oil to protect the engine.

■ Oil Collector

In order to make oil pump work well, filter large particle impurities in lubricant before entering oil pump.

3 DIAGNOSIS & TESTING

3.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Lubrication System

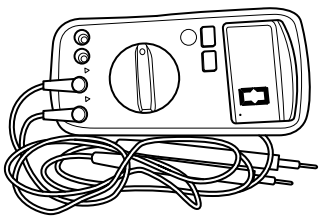
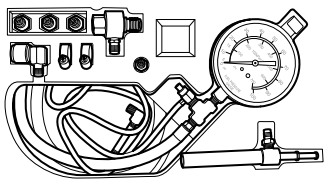
Symptom	Possible Cause
Low pressure in lubrication system	Oil pan (dirty, leaky)

Symptom	Possible Cause
	Oil collector (mesh dirty, blocked)
	Spark plug
	Line blocked
High pressure in lubrication system	Oil with high viscosity
	Oil passage blocked
	Oil pump (non-variable displacement)
Mix oil with water	Oil filter module assembly internal leakage
	Cylinder head gasket improperly sealed
	Cylinder block cracks
High oil consumption	Engine oil (excessive filling capacity)
	Oil filter module assembly (leaky)
	Crankshaft front oil seal (damaged)
	Crankshaft rear oil seal (damaged)
	Oil pressure switch (leaky)
	Oil drain plug (leaky)
	Oil pan (leaked)
	Cylinder head gasket (damaged)
	Piston ring (damaged)
	Each engine seal surface leakage
Oil pressure warning light comes on	Engine oil (insufficient oil, low oil viscosity)
	Oil filter element (blocked)
	Oil strainer (blocked)
	Crankshaft front oil seal (damaged)
	Crankshaft rear oil seal (damaged)
	Oil pressure switch (damaged)
	Instrument cluster (oil pressure warning light)
	Cylinder block (cracks occur in water jacket, resulting in coolant leaking into oil pan, which will cause oil dilution)
	Line (blocked)

4 ON-VEHICLE SERVICE

4.1 Tool

■ General Tool

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Oil Pressure Tester	 S00035

■ Lubrication Areas on Engine

No.	Lubrication Area	Lubricant Type	Note
1	Oil Collector O-ring	Same type as engine oil	
2	Oil Filter O-ring	Same type as engine oil	Operation during maintenance
4	Dipstick Tube O-ring	Same type as engine oil	
5	Dipstick Handle O-ring	Same type as engine oil	
6	Oil Pump Rotor Cavity	Same type as engine oil	
7	Oil Filter Inlet Port	Same type as engine oil	

■ Seal Gum Application Areas on Engine

No.	Area with Seal Gum Applied	Seal Gum Type	Note
1	Mounting Flange Face between Oil Pan and Cylinder Block, Timing Chain Cover	Loctite 5900H	
2	Oil Pressure Switch Thread	Loctite 577	
3	Oil Pump Mounting Bolt	Loctite 243	
4	Collector Mounting Bolt	Loctite 243	
5	Oil Cooler Mounting Bolt	Loctite 243	

4.2 Engine Oil Draining, Adding and Inspection

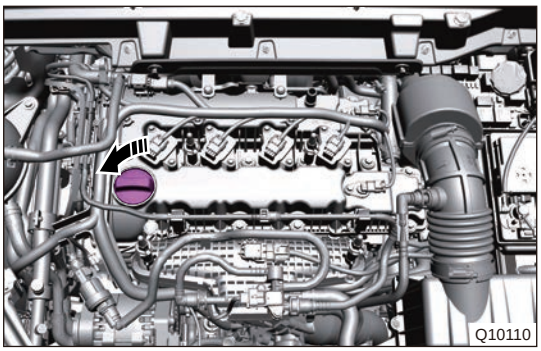
■ Engine Oil Draining

⚠ Warning

- **Wait for the engine cool down completely before operation.**
- **Prolonged and repeated contact with engine oil will result in the removal of natural oils from skin, leading to dryness, irritation and dermatitis. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service. Be sure to take appropriate skin protection measures.**

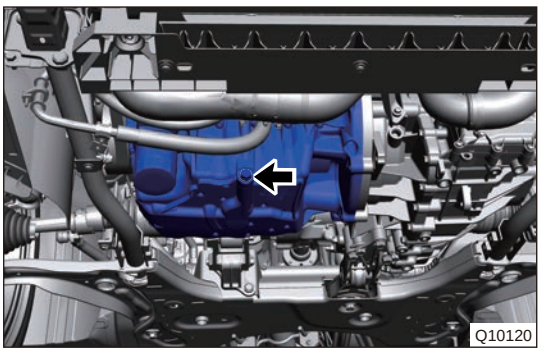
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.

(4) Turn the oil filler door counterclockwise to open.



(5) Raise the vehicle to a proper position.

(6) Remove drain plug (17# socket wrench) and drain the oil into a container.



⚠ Caution

- **Apply a certain pushing force to drain plug while loosening the plug by hand, and have the drain plug attached to thread tightly to prevent oil from overflowing in advance. Move away your hand quickly to prevent burn by oil with a certain temperature.**
- **Wasted engine oil should be handled by specialized department according to local laws and regulations. Never discard it at will.**

(7) Wipe off the drain plug and tighten it.

Torque: 35 ± 3 N•m

⚠ Caution

- **The drain plug gasket must be replaced each time the drain plug is removed.**

■ **Engine Oil Adding**

⚠ Caution
• **DO NOT use inferior engine oil.** • **DO NOT mix different types of engine oil.** • **Be careful not to spill engine oil on any part of the engine when adding engine oil.**

(1) It is recommended to add lubricant to upper center of dipstick, there are several situations:

	Engine Status	Recommended Value
Charging Capacity	Status without oil (apply to the first adding after assembling such as engine production and major maintenance)	4.6 ± 0.2
	Replace oil filter assembly and lubricant at same time	3.8 ~ 4.1
	Do not replace oil filter assembly, only replace lubricant	3.5 ± 0.2
Oil Type	C5 0W - 20	
Others	1. If lubricant needs to be added during maintenance, it is recommended to add to upper center of dipstick measurement part. 2. Do not exceed upper line of dipstick while adding lubricant, or it will affect the engine performance.	

(2) Start engine, and check the vehicle for leakage after replacing oil.

■ **Inspection Method of Lubricant Level**

(1) Park the vehicle in a relatively horizontal position.

(2) Keep engine running at least 2 minutes and leave is stopped for 3 ~ 5 minutes.

(3) Pull out the dipstick, wipe off the measurement part and insert it into dipstick tube, then leave it for 3 ~ 5 s.

(4) Pull out the dipstick steady and place the measurement part horizontally. Visually check that oil level of measurement part is within upper mark and lower mark, it indicates oil level is normal.

⚠ Caution
• **Do not start the engine during the measurement.**

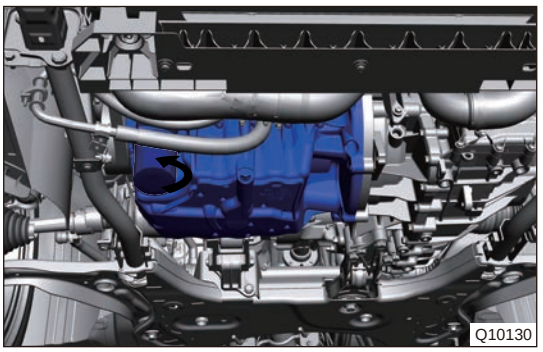
4.3 Oil Filter

■ **Removal**

⚠ Warning
• **DO NOT remove oil filter until engine cools down, avoiding being burned by high temperature lubricant and parts.** • **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine lower protector assembly.
(4) Drain engine oil.

(5) Use a special tool to rotate counterclockwise until the oil filter is removed.



(6) After oil filter is removed, there may be remaining oil in the oil filter. After removal it, the oil filter port should be upward, and dispose of used oil filter in an environmentally friendly way.

■ **Installation**

⚠ Caution

- **Before installation, check whether there is any foreign matter on the installation surface of oil pan, such as the seal ring of used oil filter.**
- **Check oil filter seal ring for defect or foreign matter. When assembling, seal ring needs to be lubricated.**

(1) Re-tighten the pipe joint with tool.

Torque: 50 ± 5 N·m

(2) Clean the mounting surface of oil filter, add a proper amount (recommended: 5 mL) of oil to oil filter, and evenly coat a little lubricant on the seal ring of the oil filter mounting surface.

(3) Manually install the oil filter until the seal ring is in contact with the mounting surface, and then use a special wrench tool to rotate and tighten.

Torque: 22 ~ 25 N·m

(4) After installation, add lubricant to engine according to the recommended.

4.4 Oil Pressure Switch

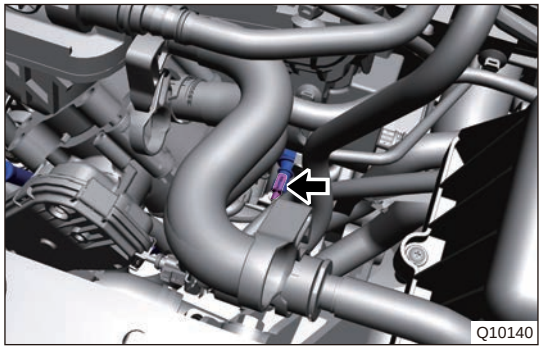
■ **Removal**

⚠ Caution

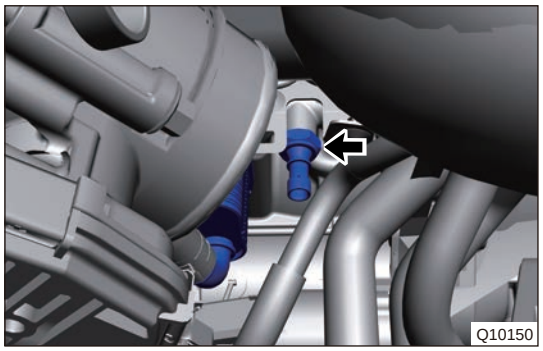
- **DO NOT remove oil pressure switch until engine cools down, avoiding being burnt by high temperature lubricant and parts.**
- **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover.
(3) Disconnect the negative battery cable.
(4) Disconnect the connection between intercooler outlet pipe assembly Ⅱ and electronic throttle.

(5) Disconnect the oil pressure switch connector.



(6) Remove the oil pressure switch.

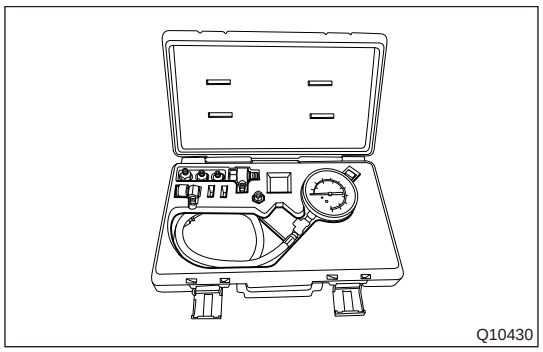


■ Inspection

⚠ Caution

- **Before inspecting oil pressure switch, please make sure that oil level is proper and coolant temperature is above 90℃, and that oil filter is used within 5000 Km.**

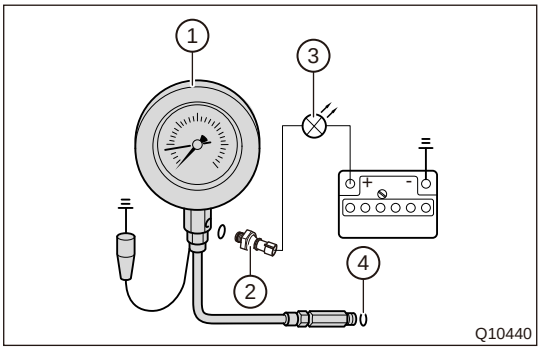
(1) Use an oil pressure gauge as shown in the illustration.



(2) Install the oil pressure gauge into the threaded hole (4) of oil pressure switch as shown in the illustration.

(3) Install the oil pressure switch (2) to the gauge (1), and connect the LED light (3).

(4) When engine is not started, observe the pressure reading on gauge. Oil pressure alarm value is 30 - 50 kPa.



■ **Installation**

⚠ Caution

- **Apply seal gum (Loctite 577) to threads when assembling oil pressure switch.**

(1) Apply a ring of sealant evenly to the threads head of oil pressure switch (2nd to 5th teeth).

(2) Install the oil pressure switch on cylinder block and tighten it with an extended socket tool.

Torque: 12 ~ 15 N·m

4.5 Oil Pan Assembly

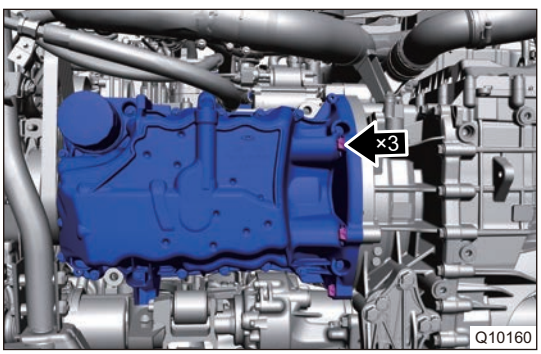
■ **Removal**

⚠ Warning

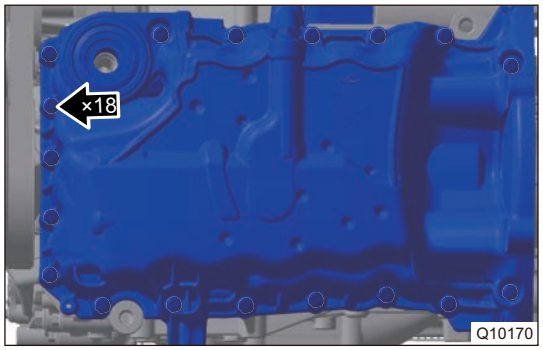
- **DO NOT drain oil and remove oil pan until engine cools down.**
- **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Drain engine oil.
(4) Remove the engine compartment lower protector assembly.
(5) Remove the engine accessory belt.
(6) Remove fixing bolts from the compressor assembly, and move compressor assembly to a proper position.
(7) Remove the oil filter assembly.
(8) Remove the pipe joint.

(9) Remove 3 fixing bolts between oil pan and transmission assembly.



(10) Remove 18 fixing bolts from all around oil pan.



(11) Clamp the oil pan special tool into joint, and tap all around oil pan slightly with a rubber hammer to remove oil pan assembly.

⚠ Caution

- **Because the seal gum is sealed between oil pan and cylinder block, never use hard objects, such as a hammer, to tap it during removal, but it can be tapped slowly from left and right with a rubber hammer.**
- **A transmission carrier can be used to support the oil pan during removal, to prevent personal injury from sudden dropping of oil pan.**
- **DO NOT damage or miss dowel pin when removing oil pan.**

(12) Remove the residual seal gum on oil pan and engine frame with flat scraper.

⚠ Caution

- **Remove residue of seal gum on installation surface between oil pan and engine frame. Threaded hole can be cleaned with cleaner properly.**

■ Inspection

(1) Check the appearance of oil pan assembly for damage.
(2) Check if the oil pan installation surface is within the specified range.

■ Installation

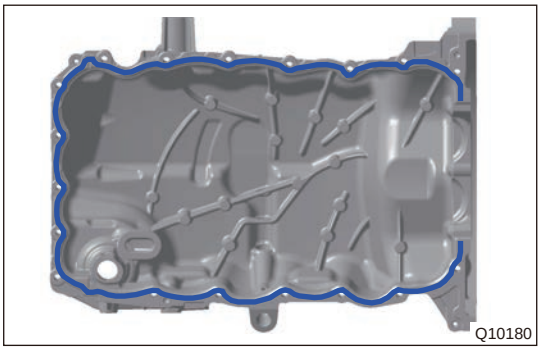
⚠ Caution

- **When applying seal gum, check the type and expiration date of seal gum.**
- **Check installation surface for impact or damage.**
- **Remove impurities, iron chips and residue of seal gum on oil pan.**
- **Remove oil stain and residue of seal gum on the threaded hole of cylinder block and oil pan.**
- **Seal gum should not be applied too thick; otherwise it will overflow into oil pan due to squeezing, which will block the oil collector.**
- **Add engine oil until seal gum solidifies after installing oil pan.**

(1) As shown in illustration, apply seal gum to inside of oil pan installation bolt hole evenly.

Recommended seal gum: Loctite 5900H

Seal gum line diameter: 2 - 3 mm



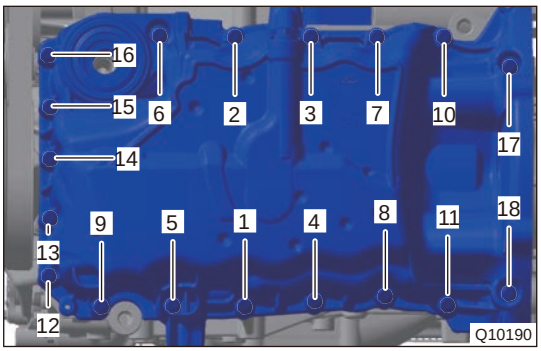
⚠ Caution

- **The applied gum line should be continuous without broken.**
- **The assembly of oil pan must be finished within 10 minutes after applying gum.**

(2) Align oil pan with frame dowel pin, assemble oil pan and tap it slightly to fit it with frame closely.

(3) As shown in illustration, pre-tighten oil pan fixing bolts until oil pan is pressed tightly. Then tighten bolts in order.

Torque: 8 + 3 N·m



(4) Install the pipe joint assembly.
(5) Install the oil filter assembly.
(6) Install 1 fixing bolt to oil pan and drive shaft bracket.
(7) Install 3 fixing bolts between oil pan and transmission assembly.
(8) Install the compressor assembly.
(9) Install the engine lower protector assembly.
(10) Add engine oil to specified value.

4.6 Oil Collector

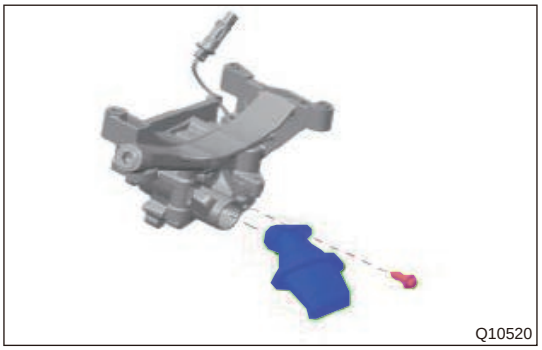
■ Removal

⚠ Warning

- **DO NOT drain oil and remove oil pan until engine cools down.**
- **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Drain engine oil.
(4) Remove the oil pan assembly.

(5) Remove 1 fixing bolt from oil collector.



(6) Remove the oil collector carefully.

■ **Inspection**

(1) Check collector O-ring for damage or cracks.
(2) Check oil collector for dirty or blockage, and clean or replace it as necessary.

■ **Installation**

⚠ Caution

- **Add a certain amount of lubricant to oil collector mounting hole of oil pump before installing, so that oil pump rotor cavity can be lubricated. Recommended adding amount is: 5 mL.**

(1) Apply a small amount of lubricant to O-ring surface of the oil collector.

(2) Install oil collector to oil pump mounting hole, and align the fixing bolt hole.

(3) Apply a circle of lock adhesive to fixing bolt threads head evenly. Ensure application amount for (3 - 5) teeth. Insert it to bolt hole and tighten.

Recommended lock adhesive: Loctite 243

Torque: 8 + 3 N·m

(4) Install the oil pan assembly.

(5) Add engine oil to specified value.

4.7 Oil Pump Assembly

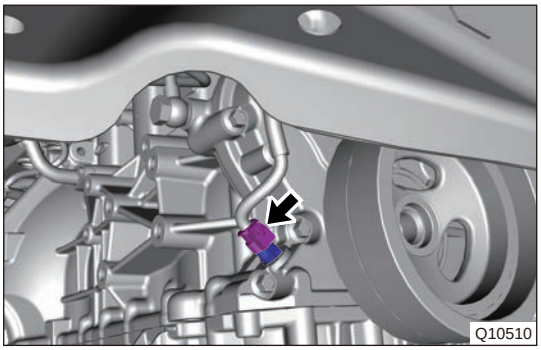
■ **Removal**

⚠ Warning

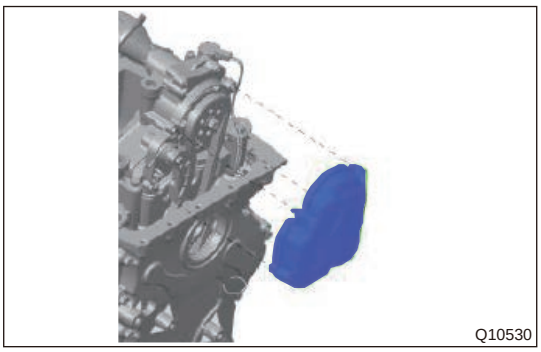
- **DO NOT drain oil and remove oil pan until engine cools down.**
- **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**

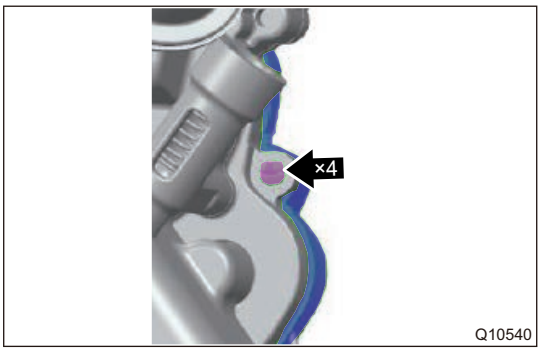
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Drain engine oil.
(4) Remove the oil pan assembly.
(5) Remove the oil collector assembly.

(6) Disconnect the oil pump solenoid valve connector.



(7) Use a flat tip screwdriver to push all the four buckles of sprocket cover into the mounting holes, and then pull them out smoothly.

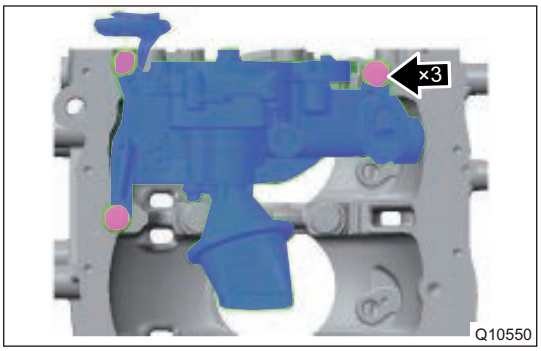




⚠ Caution

- **When installing and removing, the insertion and extraction directions of the sprocket cover buckle should be as far as possible along the mounting hole axis. When the sprocket cover buckles are seriously tilted, it will be difficult to install and even damage the buckles.**

(8) Remove 3 fixing bolts from oil pump assembly, carefully push out the lock buckle of connector, and remove the connector.



(9) Push chain movable rail, move away chain from oil pump assembly, remove oil pump assembly carefully.

■ **Inspection**

(1) Rotate oil pump shaft, check if rotation of oil pump is smooth.

■ **Installation**

⚠ Caution

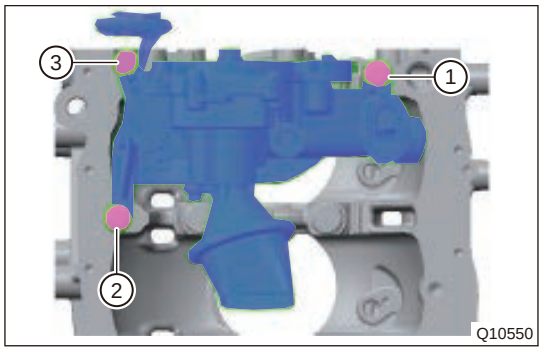
- **Wasted engine oil pump assembly should be handled by specialized department according to local laws and regulations. Never discard it at will.**

(1) Align the oil pump set sleeve with the positioning hole on cylinder block and insert it so that the oil pump mounting surface and the cylinder block mounting surface fit together, and put the oil pump solenoid valve connector to outside.

(2) Apply a circle of lock adhesive to 3 bolt threads heads evenly. Ensure application amount for (3 - 5) teeth. Insert it to bolt hole and tighten bolt in the order shown in illustration.

Recommended lock adhesive: Loctite 243

Torque: 20 + 5 N·m



(3) Insert the solenoid valve connector into the mating hole from inside to outside through the cover inside. After inserting, hear the "click" sound or see that the lock buckle has been stuck on the outer edge of the mounting hole. The surface assembly is completed.

(4) Push chain movable rail, and hang the chain on the sprocket of the oil pump. Slowly loosen the movable rail until the chain is in tension status.

(5) Align the four buckles on sprocket cover with the buckle holes of oil pump, and insert them into the holes smoothly and forcefully until a “click” is heard, indicating assemble in place.

⚠ Caution

- **Complete assembly until the four buckles are inserted in place, and check whether the sprocket cover and oil pump fit properly.**

(6) Install oil collector.
(7) Install the oil pan assembly.
(8) Connect the oil pump solenoid valve connector.
(9) Add engine oil to specified value.

4.8 Oil Dipstick Tube (Dipstick) Assembly

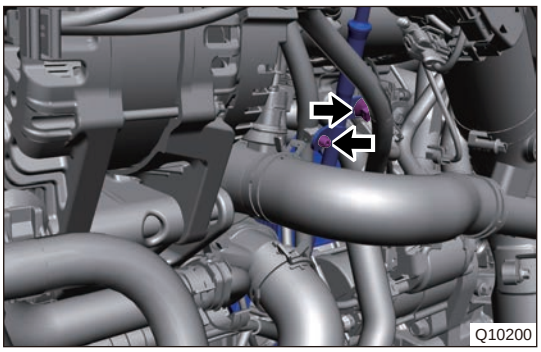
■ **Removal**

⚠ Warning

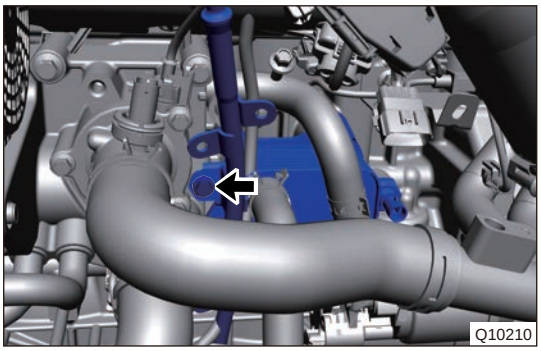
- **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.
(4) Remove the engine trim cover assembly.

(5) Remove the wire harness clip from oil dipstick tube.



(6) Remove 1 fixing bolt between oil dipstick tube and water pump module mounting hole.



(7) Remove the oil dipstick tube assembly carefully.

■ Installation

⚠ Caution

- **Check O-ring before assembly to make sure it is not damaged, otherwise replace with a new one.**
- **Apply a small amount of lubricant to dipstick tube and dipstick handle O-ring before assembly.**
- **When inserting dipstick tube into timing chain cover mounting hole, insert lower end as far as possible along shaft line direction. If it tilts, it may be difficult to assemble O-ring, even damage O-ring.**

(1) Insert the dipstick tube into the mounting hole of oil pan along the axis of mounting hole.

(2) Install 1 fixing bolt between oil dipstick tube and water pump module mounting hole.
Torque: 8 + 3 N·m

(3) Fix wire harness clip to oil dipstick tube.
(4) Install the engine compartment trim cover.

4.9 Oil Cooler Assembly

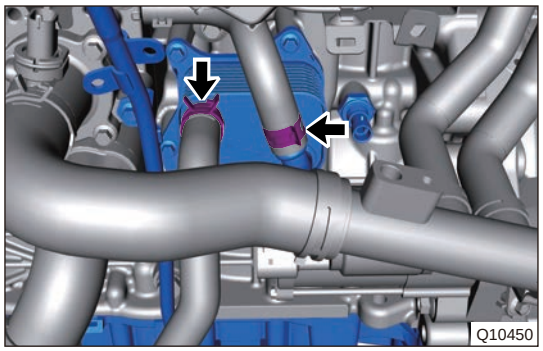
■ Removal

⚠ Warning

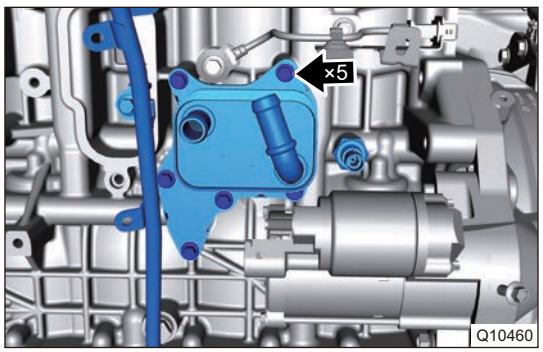
- **DO NOT remove oil cooler assembly until engine cools down.**
- **Prolonged and repeated contact with engine oil will be harmful to your skin. If engine oil spills on your skin, wash it off immediately with water. In addition, the used engine oil contains potentially harmful contaminants, which may cause skin cancer. Therefore, always take proper skin protection measures when performing vehicle service.**
- **Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.**
- **If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.**
- **Be sure to wear safety equipment to prevent accidents, when removing oil cooler assembly.**
- **Appropriate force should be applied, when removing the oil cooler assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the starter assembly.
(5) Remove the engine lower protector assembly.
(6) Drain the coolant.

(7) Loosen the elastic clamps and clamping ring, and disconnect the outlet pipe and inlet pipe from the oil cooler assembly.



(8) Remove 5 fixing bolts from oil cooler assembly.

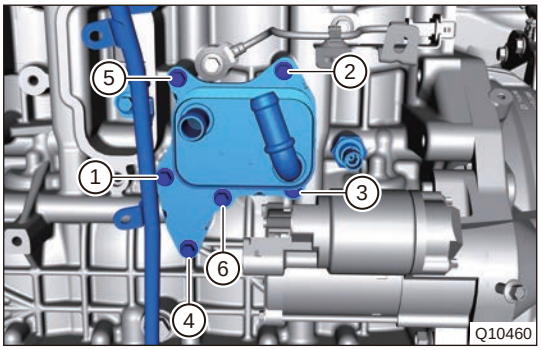


(9) Remove the oil cooler assembly carefully.

■ Installation

(1) Align the mounting holes of oil cooler bolt with the corresponding bolt holes on cylinder block, install 5 fixing bolts, and tighten the bolts in the order shown in illustration.

Torque: 8 + 3 N·m



(2) Connect the outlet pipe and inlet pipe to oil cooler assembly.
(3) Install the starter assembly.
(4) Add the coolant.
(5) Add oil to proper position.

4.9 STARTING AND CHARGING SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Battery acid is highly corrosive, so it is necessary to wear protective gloves and goggles when working.

(2) Do not dump the battery, because acid may spill from vent hole.

(3) Never throw the used battery into household garbage. There is risk of explosion.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) Deliver the used battery to designated recycling site.

(2) Never allow the children approaching acid and battery.

2 System Overview

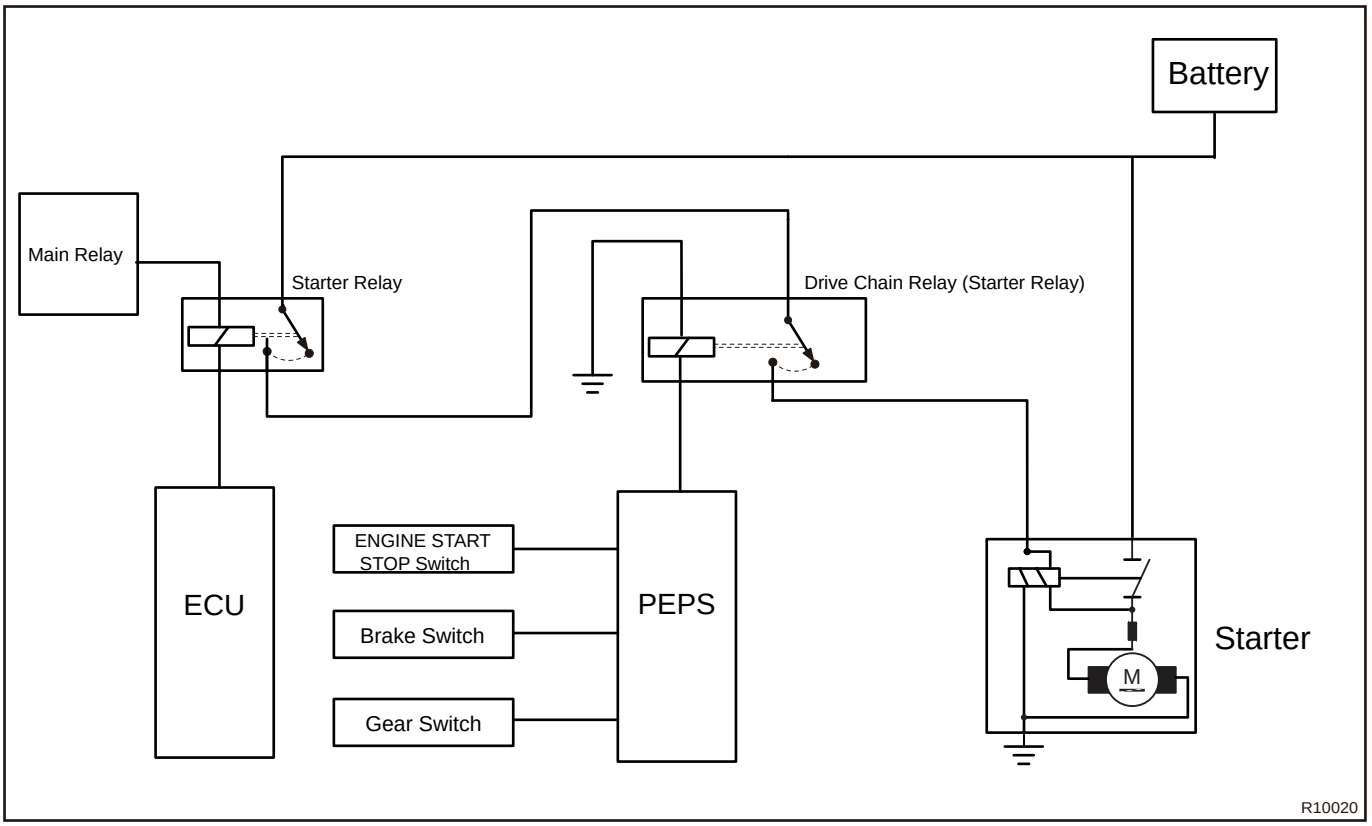
2.1 System Description

Starting system consists of battery, starting switch and starter, etc. Starting system converts electrical energy from battery into mechanical energy, allowing engine to crank initially, and disconnects power transmission between starter and engine when engine starts successfully.Charging system is consist of battery, alternator and charging state indicator device. Alternator is the main power supply component while vehicle is operating. It is used to supply power to all the electric equipment (except for the starting system) and charge the battery. Since alternator is rotated through drive belt which is driven by the engine, voltage will changes depending on engine speed. To meet electric device power supply and battery charging requirements, voltage regulator is equipped in charging system (inside alternator). The voltage regulator maintains voltage output stability of alternator by adjusting exciting current in alternator while engine speed and load is changing. Charging state indicator is used to show the charging system operation and indicate whether the battery is in a charging or discharging state.

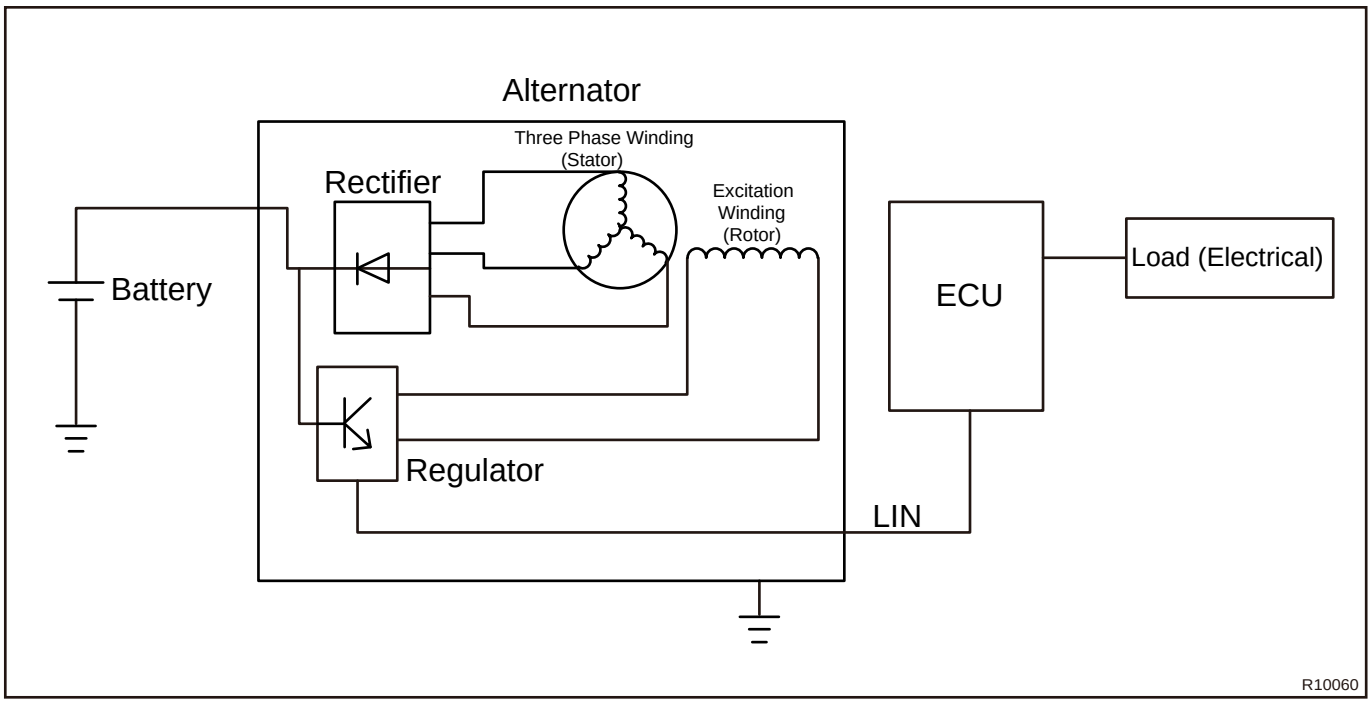
2.2 System Components Diagram

1	ENGINE START STOP Switch	4	Starter Assembly
2	Engine Compartment Fuse and Relay Box	5	Alternator Assembly
3	Main Fuse Box	6	Battery Assembly

2.3 System Schematic Diagram



When battery voltage is normal starting voltage and transmission is in P position, press ENGINE START STOP switch while depressing brake pedal. When PEPS receives signal, it controls the starter relay to engage, then the starter runs normally.



Three-phase alternating current generated by alternator is converted to direct current from alternating current by rectifier, and direct current is transmitted to the vehicle electrical system and battery.

2.4 Components Description

■ Battery Assembly

Main Function

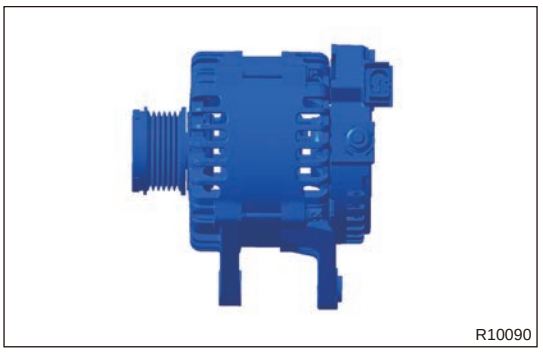
When starting the engine, it is responsible for providing the working current required by the starter; When engine is running, it can help alternator to supply power to electric device; When engine is stationary, it can supply power to electric device separately; Moreover, battery is a large capacity capacitor which protects vehicle electrical device.

Battery

Model	Specification
Sail AGM	12V 70AH

■ Alternator Assembly

Alternator is a silicon rectifying alternator, which mainly consists of rotor, stator and rectifier.
When excitation direct current flows to rotor winding, rotor winding establishes a magnetic field and magnetizes the rotor claw poles, forming the corresponding poles.
The three-phase stator coil is installed on the outside of rotor, which is secured together with the front and rear end covers of alternator.
When the rotor of the generator is rotated by the drive belt, the magnetic pole lines cut the stator winding, causing a change in the magnetic flux in the stator winding, and an alternating induced electromotive force is generated in the stator winding, thereby generating alternating current. The generated three-phase alternating current is converted to direct current by rectifier, and direct current is transmitted to the vehicle electrical system and battery by further adjusting by regulator.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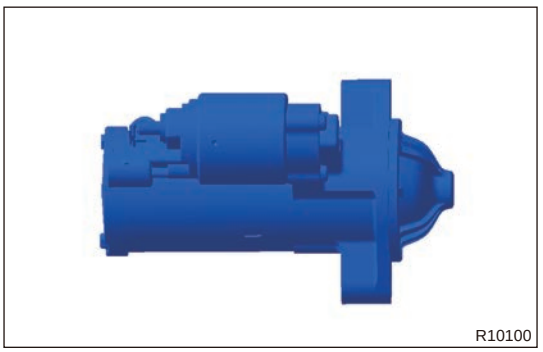
■ Starter Assembly

Starter consists of three parts: control mechanism, drive train mechanism and DC motor.
Control mechanism (solenoid switch): Controls engagement and disengagement between starter drive gear and engine flywheel gear and switches on/off the DC circuit.
Drive train mechanism: When engine starts, it engages starter drive gear with flywheel gear ring and transmits starter torque to the engine crankshaft; after engine starts, drive gear will automatically disengage from the flywheel gear, so that engine cannot drive starter at high speed, avoiding damage to the starter.
DC motor: Converts electrical energy from battery into electromagnetic moment.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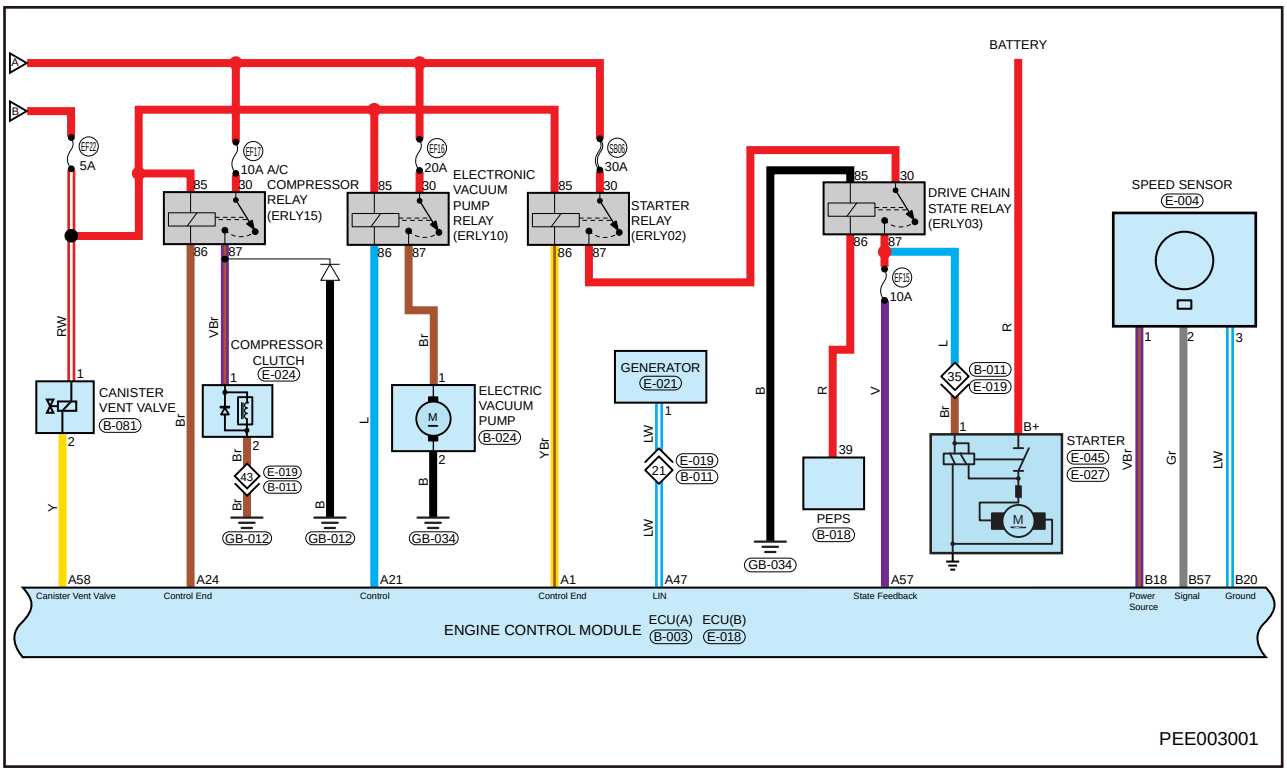
3 System Circuit Diagram

3.1 Circuit Diagram



4 DIAGNOSIS & TESTING

4.1 Problem Symptoms Table

Hint:

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Starting and Charging system

Symptom	Possible Cause
Housing is cracked	Housing cracked is the most serious and destructive malfunction. When vehicle is subjected to strong vibration, lead acid battery overheating, too high pressure or electrolyte frozen expansion, the housing of lead acid battery will be damaged. For such malfunction, replacing battery is the sole way for treatment.
Electrode is loose	The cause of loosen electrode is that excessive force is applied during removal and installation of wire harness and inspection of contact. It is necessary to replace the battery assembly.
Connecting part of electrode is corroded or burnt	Check if the generated electricity is normal and if the charging voltage is too high.
Battery swells	The causes are that battery is aging and resistance is excessively high. It is necessary to replace the battery.

4.2 Common Trouble Diagnosis

Operation Content	Operation Description
Appearance inspection: Confirm if there is any washer fluid, coolant, oil, sludge and other foreign matters adhered.	If the washer fluid, coolant, oil enters rotor slip ring, brush holder, it will cause oxidization to alternator rotor slip ring and poor contact to brush, resulting in charging light remaining on or flashing.
Turn over the center of alternator belt by hand and observe if the max. turning angle is over 90°。	Loose belt will cause low alternator speed, resulting in low electric energy production or failing to generate energy; if the angle is over 90°，check the belt tension.
Measure battery voltage with a multimeter.	Confirm if the battery is depleted (more than 12 V). If so, unplug the generator excitation coil connector and retest the battery voltage (more than 12 V). If such condition still exists, charge the battery.
Confirm if there is any looseness, short circuit, dirt on alternator B+, excitation end, battery pile line and ground line and also confirm if the connectors are connected firmly.	Confirm if the wire harness is connected normally. Poor contact will cause that the alternator voltage is high, the indicator light doesn’t come on, remains on or flashes. If there is any looseness, please tighten it firmly.

Charging indicator light remains on (do not generate electricity or power is low, vehicle cannot start, etc.)	
Operation Content	Operation Description
Unplug the alternator connector, start the engine and depress the accelerator (engine speed is above 1500rpm), turn off the vehicle load, measure B+ voltage to ground with multimeter and observe 2-3 minutes.	If B+ voltage is about 13.8 V, the alternator is normal. If B+ voltage is the battery voltage, it indicates alternator malfunction. Replace the alternator.
If the alternator operates normally, reconnect the alternator connector, start the engine and keep it idling, turn on some electrical load on vehicle, such as A/C, headlight, etc. Meanwhile, depress the accelerator pedal or decelerate the vehicle. Measure B+ voltage to ground with multimeter and observe 2 - 3 minutes.	When vehicle load or speed changes, the alternator normal voltage should change within 10.6 - 16 V. If the charging indicator remains on, check if communication is normal with an oscilloscope or other test software.

Charging indicator (unstable electricity generation)	
Operation Content	Operation Description
Start the engine and keep it idling, remove alternator excitation coil and observe if the meter indicator flashes.	If the light flashes, it indicates that some excitation coil has outer leakage and intermittently ground. Check the circuit malfunction.

Indicator does not come on during self-check	
Operation Content	Operation Description
Turn ENGINE START STOP switch to “ON” position, remove the engine excitation coil and measure the alternator excitation coil terminal voltage to ground with multimeter.	If the light flashes, it indicates that some excitation coil has outer leakage and intermittently ground. Check the circuit malfunction.

Adjusting voltage is high (headlight and other electrical appliances used on vehicle are burnt out)	
Operation Content	Operation Description
Start the engine and keep it idling, measure B+ voltage to ground with multimeter and observe 2 - 3 minutes to check if the max. value exceeds 16 V.	If so, it indicates that the regulator in alternator is damaged which causes voltage out of control. Replace the alternator.

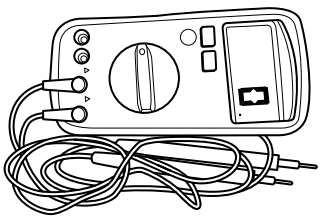
Instrument indicator or headlight dims and then goes off during vehicle driving (fail to generate energy, low electric energy production)	
Operation Content	Operation Description
Start the engine and keep it idling for 5 minutes (turn off the electrical appliances with large power, test with light load as possible), measure the alternator B+ voltage.	If the measured voltage is 13 V - 14.8 V, the alternator is normal; if not, the alternator is abnormal. Replace the alternator.

Abnormal noise occurs in alternator	
Operation Content	Operation Description
Check if the alternator mounting bolt is installed in place and tightened with specified torque.	Improper installation of bolt will cause pulley jumps as alternator operate, resulting in abnormal noise. Tighten the bolt.
Remove the alternator belt, rotate the pulley by hand. Listen and observe near the motor if there is any abnormal noise during alternator rotation.	Excessive belt tension or dirt in alternator will cause alternator baring failure or poor rotor dynamic balance which causing abnormal noise. Replace the alternator.

5 ON-VEHICLE SERVICE

5.1 Tool

■ General Tool

Tool Name	Tool Drawing
Digital Multimeter	 S00002

■ Special Tools

Tool Name	Tool Drawing
Battery Tester	 S00064

5.2 Battery Assembly

■ Check Charging System Voltage

⚠ Warning

- **Following the related specifications on appliances connected with battery, in repair manual and owner’ s manual.**
- **Battery acid is highly corrosive, so it is necessary to wear protective gloves and goggles when working.**
- **Keep away from open fire, spark, light devices without protective measures and no smoking. Never generate any sparks when operating cable/wire and electrical devices. Avoid short circuit in battery.**
- **Wear eye protective mask/glasses.**
- **Never allow the children approaching acid and battery.**
- **Deliver the used battery to designated recycling site. Never throw the used battery into household garbage.**

(1) Leave vehicle under no load test condition and idle the engine. Measure battery voltage with a digital multimeter.

Standard voltage: 13.5V - 14.8V

Hint:
If result is not as specified, replace the alternator.

(2) Leave vehicle under load test condition and idle the engine. Measure battery voltage with a digital multimeter.

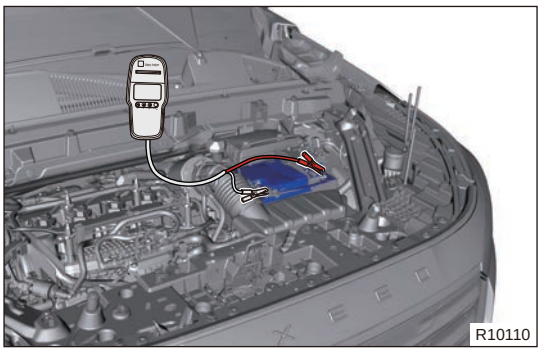
1) Set headlight to high beam.
2) Turn on blower and adjust blower speed to the highest.
3) Turn on the "A/C" switch.

Standard voltage: 13.2V - 14.8 V

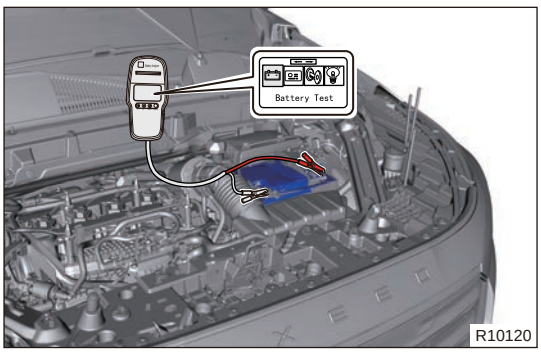
■ Usage of Battery Tester

(1) Connect the battery tester to battery.

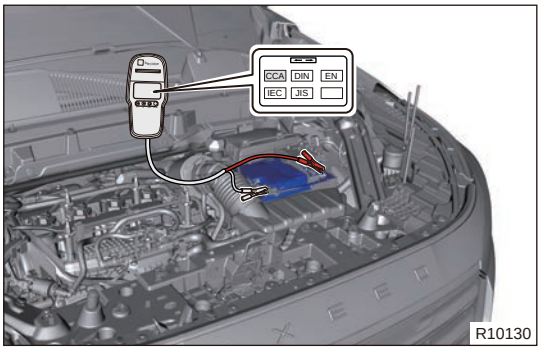
Hint:
Connect red tube clamp to battery positive terminal while black tube clamp to battery negative terminal.



(2) Operate tester to select “Battery Test” and click “Enter”.

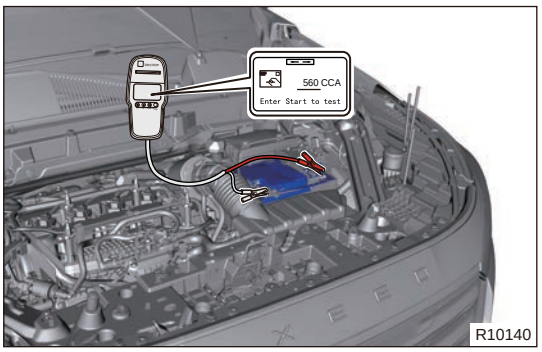


(3) Select “CCA” and click “确定”.



R10130

(4) Operate “L and R” on tester to adjust and set the battery capacity (such as 560CCA, this value indicates the battery low temperature starting performance) and click “Enter”.



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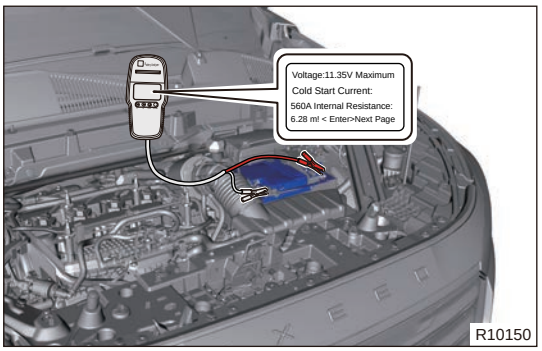

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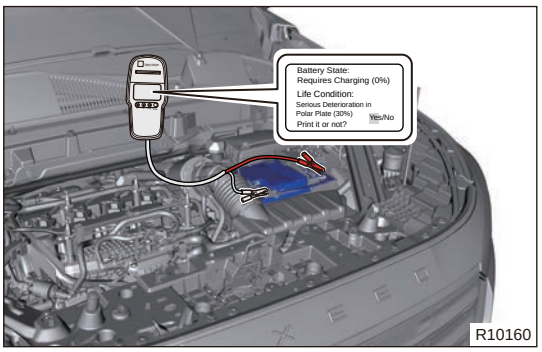
(5) The battery condition is displayed on tester.

Hint:
Recharge or replace battery according to the tested data.



R10160

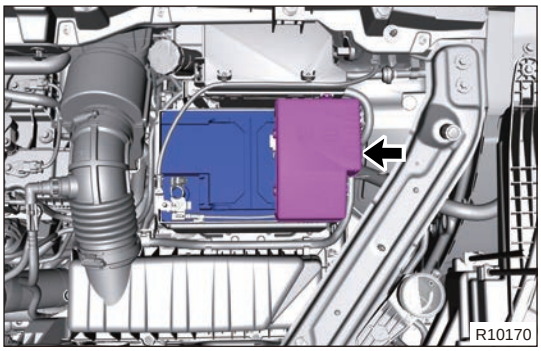
■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing battery assembly.**
- **Appropriate force should be applied, when removing battery assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.

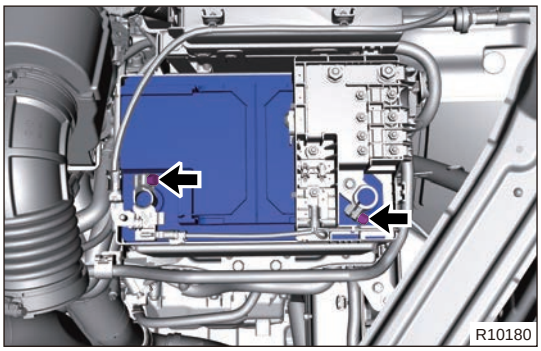
(3) Remove engine compartment fuse and relay box upper cover.



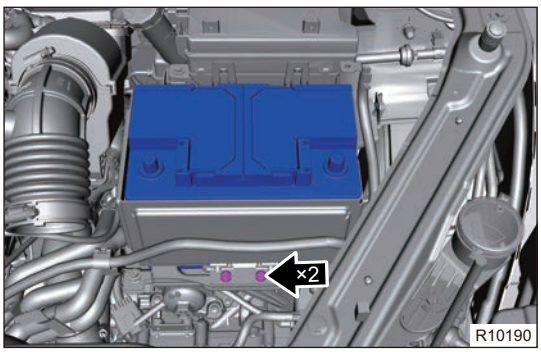
(4) Remove the air filter assembly.

(5) Loosen the locking nuts (10# socket wrench) of positive and negative battery terminals, and remove the positive and negative battery cables (1) (2).

Hint:
When removing the battery positive and negative battery terminals, remove negative terminal before positive terminal.



(6) Remove 2 fixing bolts (10# socket wrench) and battery pressure plate.



(7) Remove the battery assembly from protective cover carefully.

⚠ Caution

- **When removing battery, be careful to prevent metal tools from contacting both electrodes of battery at the same time or touching the positive electrode and vehicle body.**

■ Battery Fluid Leakage Test

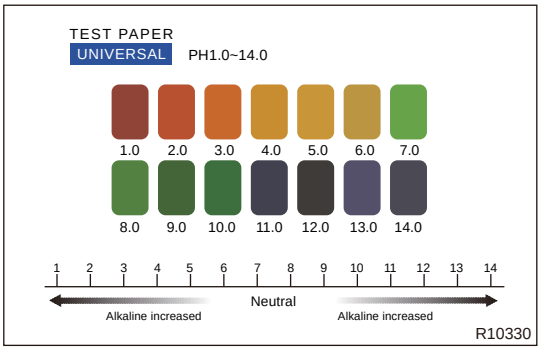
(1) PH test paper is used for judgment.

Hint:
Test paper model: PH 1 - 14.

(2) Take a piece of PH test paper (never allow it contacting with other fluid before test) to wipe the leaking area, so as to make the fluid adhere on the PH test paper. Then compare it with the color bar to judge the PH value.

(3) If the PH value is less than 7, it is an acidic liquid, which indicates battery leakage.

(4) If the PH value is 7 or higher, it is non-acidic liquid (-neutral or alkaline) which indicates "Petroleum jelly" fluid or other fluids leakage on battery surface.



■ Battery (Off-Vehicle) Charging

(1) Because the battery has the characteristic of self-discharging, even if the battery is not in use, it is necessary to perform regular charging maintenance. When the discharging ratio for battery capacity is lower than 50%, the capacity cannot restore to 100% if charging with small current while the battery temperature increases and the plate active material will fall off easily if charging with large current, affecting the performance and life of battery.

- Charging with constant voltage: Voltage is limited at 14.40 V. During charging, make sure the charger is connected to the maximum charging current so as to get the preset voltage value (14.40 V) according to the current battery status and temperature. After the voltage reaches the limiting value, the charging current will drop gradually until it closes to 0 A (maintain the condition charging current).

■ Battery (On-vehicle) External Power Supply Charging

(1) If battery external power supply charging is necessary, it' s important to keep external charger is properly connected. If charging process is not correct, the sensor cannot recognize the charging current, and SOC value cannot be calculated correctly. Positive clamp of external charging device must clamp positive terminal of battery, and negative clamp must be ground instead of negative terminal of battery. Battery sensor only properly balances the charge when there is a continuous current through it.

■ Installation

⚠ Caution

- **Replace battery with a new one which conforms to the specifications.**
- **During installation, make sure the directions of positive and negative terminals are correct.**
- **Used battery contains sulfuric acid and lead, so never discard it at will. Please dispose of it at a qualified local waste treatment station.**
- **When installing the battery positive and negative battery terminals, install negative terminal before positive terminal.**

(1) Place the battery into battery tray carefully.

(2) Install 2 fixing bolts to battery pressure plate.

Torque: 10 ± 1 N·m.

(3) Install and tighten battery positive and negative battery terminals.

Torque: 5 ± 1 N·m.

(4) Install engine compartment fuse and relay box upper cover.

(5) Install the engine compartment trim cover assembly.

5.3 Battery Tray

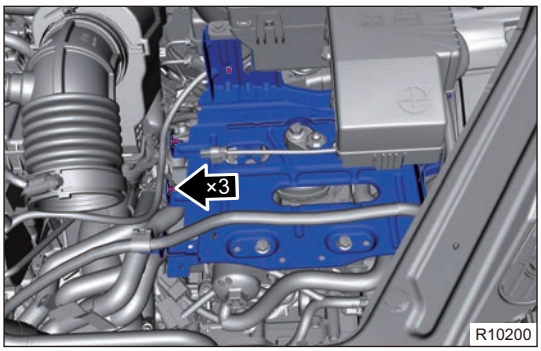
■ Removal

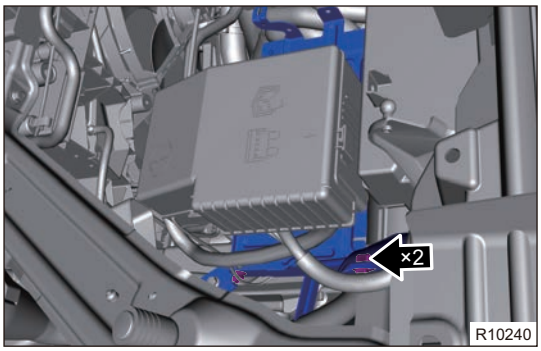
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing battery tray.**
- **Appropriate force should be applied, when removing battery tray. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the air filter assembly.
(4) Remove the battery assembly.

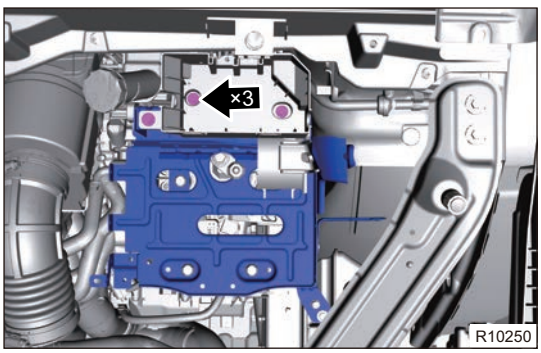
(5) Detach 5 fixing clip from battery tray wire harness



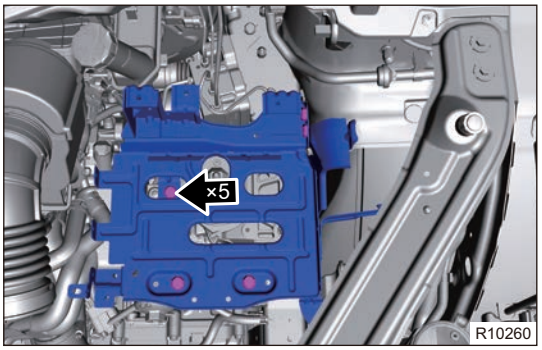


(6) Remove engine compartment fuse and relay box assembly.

(7) Remove 3 fixing bolts and engine compartment fuse and relay box lower cover.

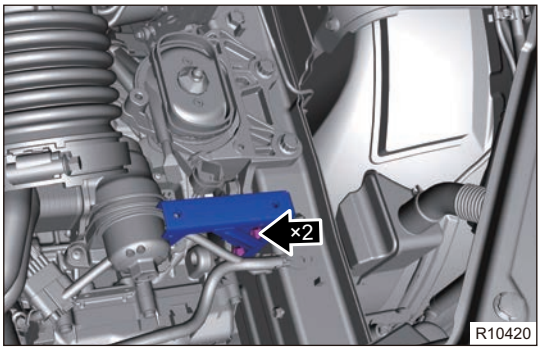


(8) Remove 5 fixing bolts from battery tray.



(9) Remove the battery tray assembly.

(10) Remove 2 fixing bolts from battery tray mounting bracket.



(11) Remove the battery tray mounting bracket.

■ Installation

(1) Install 2 fixing bolts to battery tray bracket.
Torque: 20 ± 2 N·m

(2) Install 5 fixing bolts to battery tray.
Torque: 20 ± 2 N·m

(3) Install 3 fixing bolts to lower cover of engine compartment fuse and relay box.
Torque: 20 ± 2 N·m

(4) Connect 5 wire harness clips to battery tray assembly.

(5) Install the battery assembly.

(6) Install the air filter assembly.

(7) Install the engine compartment trim cover assembly.

5.4 Alternator Assembly

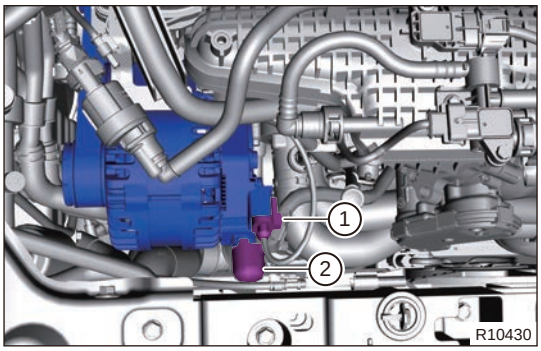
■ Removal

⚠ Warning

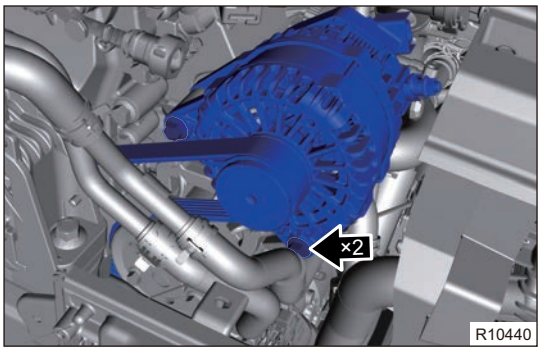
- **When removing alternator assembly, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied, when removing alternator assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the engine trim cover.
(5) Remove the engine accessory belt.

(6) Disconnect the alternator assembly connector (1) and remove alternator positive cable harness fixing nut (2).



(7) Remove 2 fixing bolts from alternator assembly.



(8) Remove the alternator assembly carefully.

■ Installation

(1) Install alternator assembly to the corresponding position on water pump module, insert 2 fixing bolts and tighten it in order after pre-tightening 2 - 3 teeth with hand.

Torque: 40 + 5 N•m

⚠ Caution

- **After alternator bolt is tightened, visually check for clearance between two sliding sleeves as well as between module sliding sleeve and the module. If clearance exists, it meets the installation requirement.**

(2) Install alternator positive wire harness port and secure the nut.

Torque: 13 ± 2 N m

(3) Connect alternator assembly connector.
(4) Install the alternator accessory belt.
(5) Install the engine compartment trim cover.

5.5 ENGINE START STOP Switch

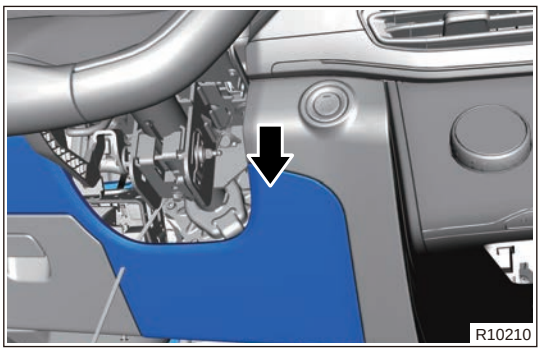
■ Removal

⚠ Warning

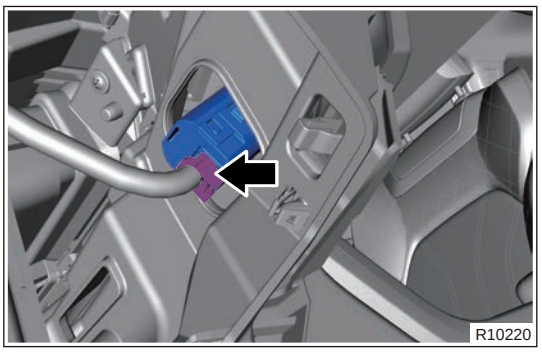
- **Be sure to wear necessary safety equipment to prevent accidents, when removing ENGINE START STOP switch.**
- **Try to prevent interior protector from being scratched during removal and installation.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.

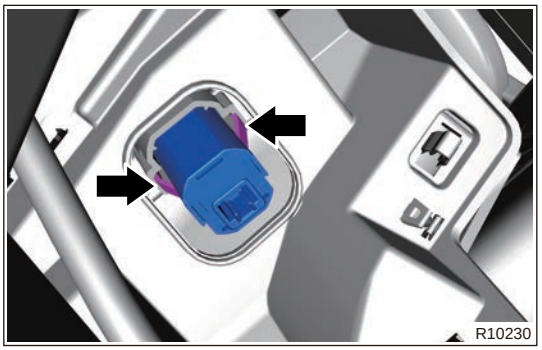
(3) Using an interior crow plate, remove the lower left protector body assembly.



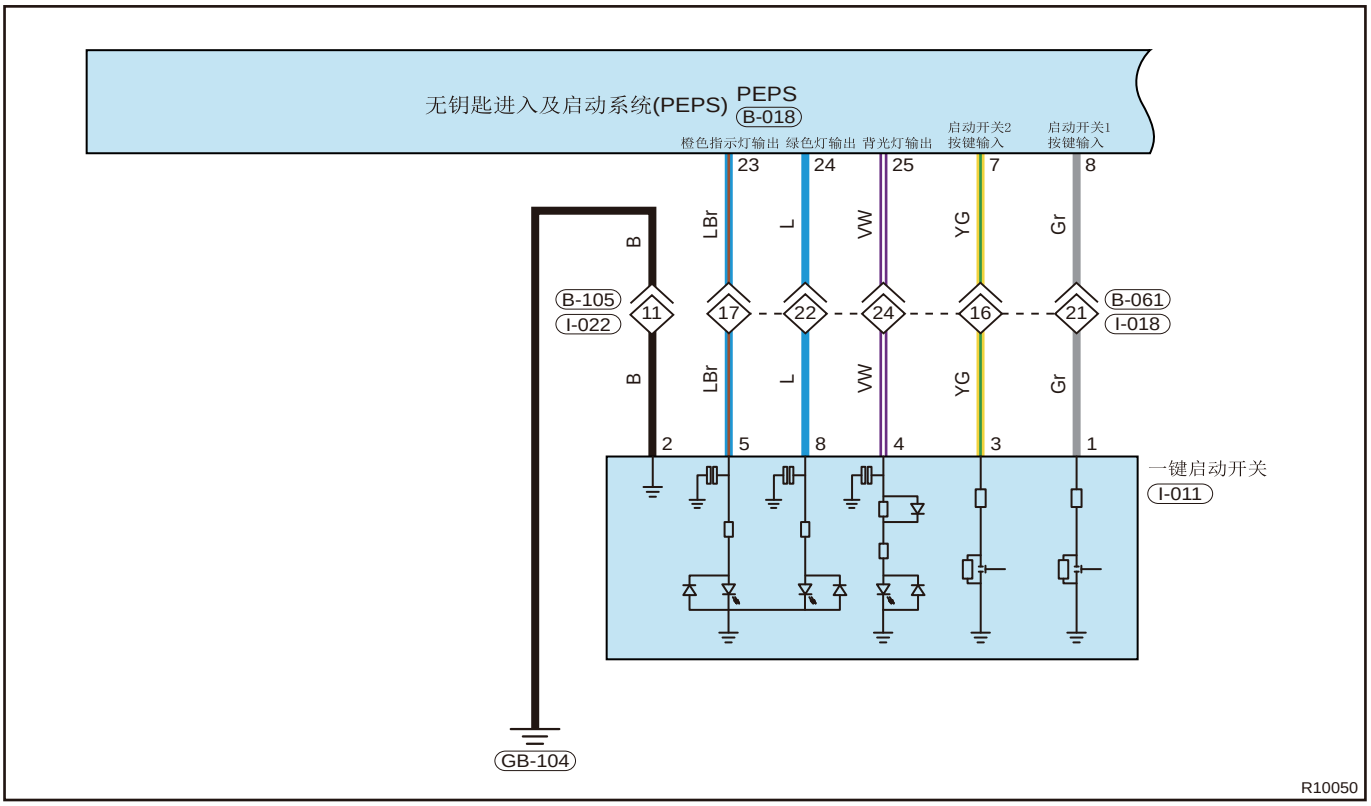
(4) Disconnect ENGINE START STOP switch connector.



(5) Press/Push fixing clips on both sides of ENGINE START STOP switch and remove ENGINE START STOP switch assembly.



■ **Inspection**



(1) Using a digital multimeter, check the continuity of ENGINE START STOP switch according to the table below.

Multimeter Connection	Switch Condition	Specified Condition
Terminal 1 - Terminal 2	Not pressed	No continuity
Terminal 3 - Terminal 2	Not pressed	No continuity
Terminal 1 - Terminal 2	Pressed	Continuity
Terminal 3 - Terminal 2	Pressed	Continuity

⚠ Caution

- **If measure result is not as specified, replace the ENGINE START STOP switch assembly.**

■ **Installation**

(1) Install ENGINE START STOP switch to lower center protector body.

(2) Connect ENGINE START STOP switch connector.

(3) Install the lower left protector body assembly.

5.6 Starter Assembly

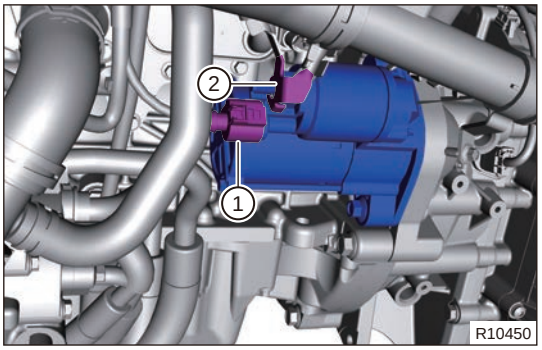
■ **Removal**

⚠ Warning

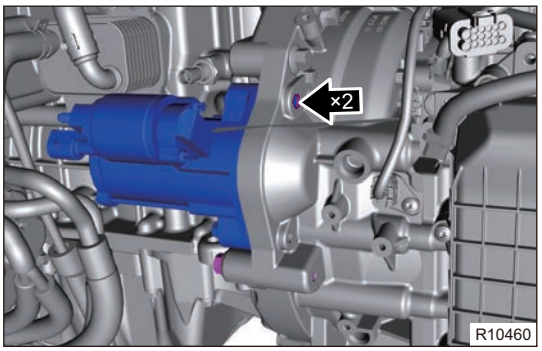
- **Be sure to wear safety equipment to prevent accidents, when removing starter assembly.**
- **Appropriate force should be applied, when removing starter assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the intercooler inlet pipe II assembly.
(5) Remove the engine lower protector assembly.
(6) Remove the intercooler outlet pipe II assembly.

(7) Disconnect the starter assembly connector (1) and remove positive cable fixing nut (2).



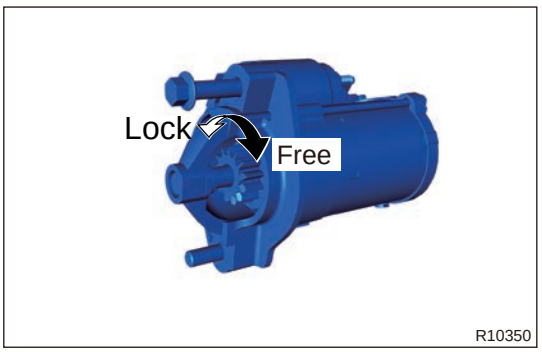
(8) Remove 2 set bolts between starter assembly and transmission case.



(9) Remove the starter assembly carefully.

■ Check the starter clutch

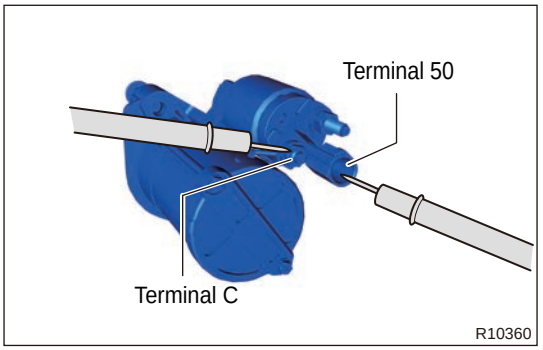
(1) Rotate the clutch pinion gear clockwise to check that it rotates freely. Rotate the clutch pinion gear counterclockwise to check that it locks. If result is not as specified, replace the starter.



■ Check the pull-in coil

(1) Measure the resistance between terminal 50 and terminal C.

Hint:
Standard resistance should be below 2Ω. If the resistance is abnormal, replace the starter assembly.



■ Check the starter assembly

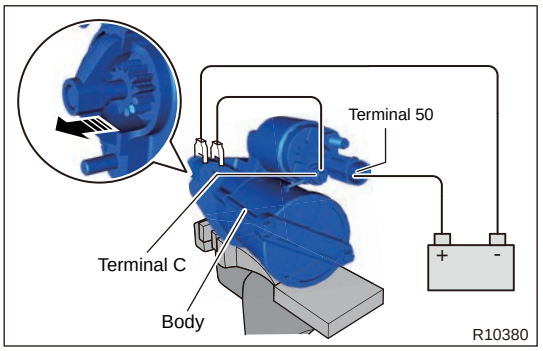
⚠ Caution

- **These measurements must be performed within 3 to 5 seconds to avoid coil burnout.**
- **Place the starter assembly onto a vise. The jaws of vise should be covered by aluminum sheet or brass plate; otherwise, the starter assembly will be easily damaged when clamping it.**

(1) Perform pull-in test.

- Remove the nut and disconnect the field coil lead from terminal C.
- As shown in illustration, connect battery to solenoid switch, and check that starter clutch pinion sticks out normally.

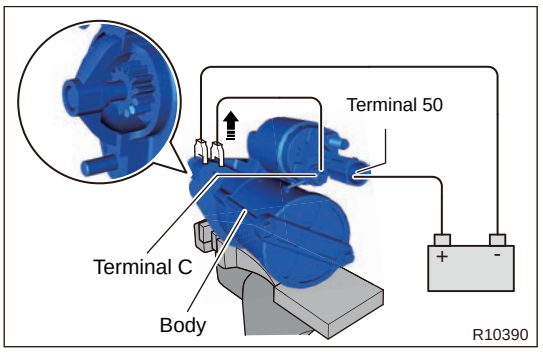
Hint:
If starter clutch pinion does not move, replace the starter assembly.



(2) Perform pull-in test.

- Keep the starter clutch pinion sticking out and the connection condition of battery mentioned above, and disconnect the negative battery cable from terminal C.
- Check if starter clutch pinion keeps sticking out.

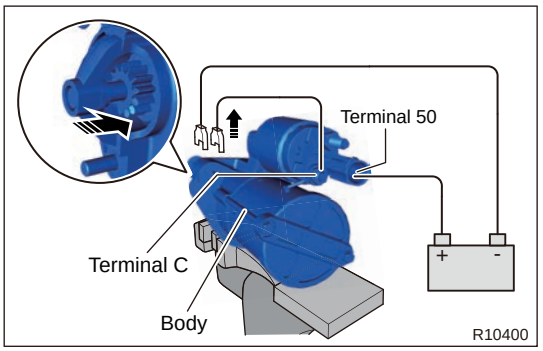
Hint:
If starter clutch pinion moves inward, replace the starter assembly.



(3) Check if starter clutch pinion returns back.

- Disconnect negative battery cable from starter body and check that starter clutch pinion returns back.

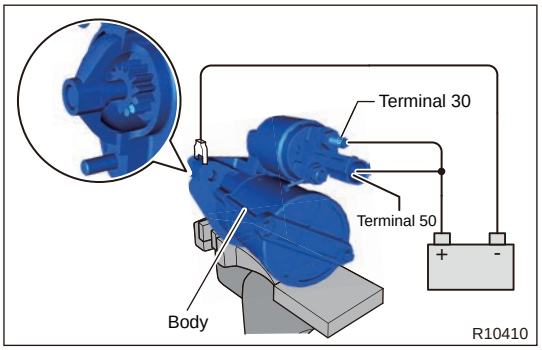
Hint:
If starter clutch pinion moves inward, replace the starter assembly.



(4) Check if starter rotates smoothly.

- Connect the field coil lead to terminal C, and tighten it with a nut.
- As shown in illustration, connect battery to starter; And check that starter rotates smoothly when the starter clutch pinion moves outward.

Hint:
The lead to be connected should avoid the pinion side to prevent lead stuck as pinion rotates.
If result is not as specified, replace the starter assembly.



■ Installation

(1) Align starter with the corresponding holes on transmission, install 2 bolts and tighten it in order after pre-tightening 2-3 teeth with hand.

Torque: 40 + 5 N•m

(2) Install positive wire harness port and secure the nut.

Torque: 13 ± 2 N m

(3) Connect starter assembly connector.
(4) Install intercooler inlet pipe Ⅱ assembly.
(5) Install the air filter assembly.
(6) Install engine lower protector assembly.
(7) Install intercooler outlet pipe Ⅱ assembly.

4.10 FUEL SYSTEM

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) As the pressure of high pressure fuel system is high, the pressure must be released before removal.

(2) During removal, make sure the areas near stored parts are clean and free of dirt.

(3) Perform removal after engine cools down.

(4) Operation staff should wear protective glasses and rubber gloves during repair and avoid inhaling much fuel gas.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) If fuel leakage occurs when operating the fuel supply system, please handle the leaked fuel in time.

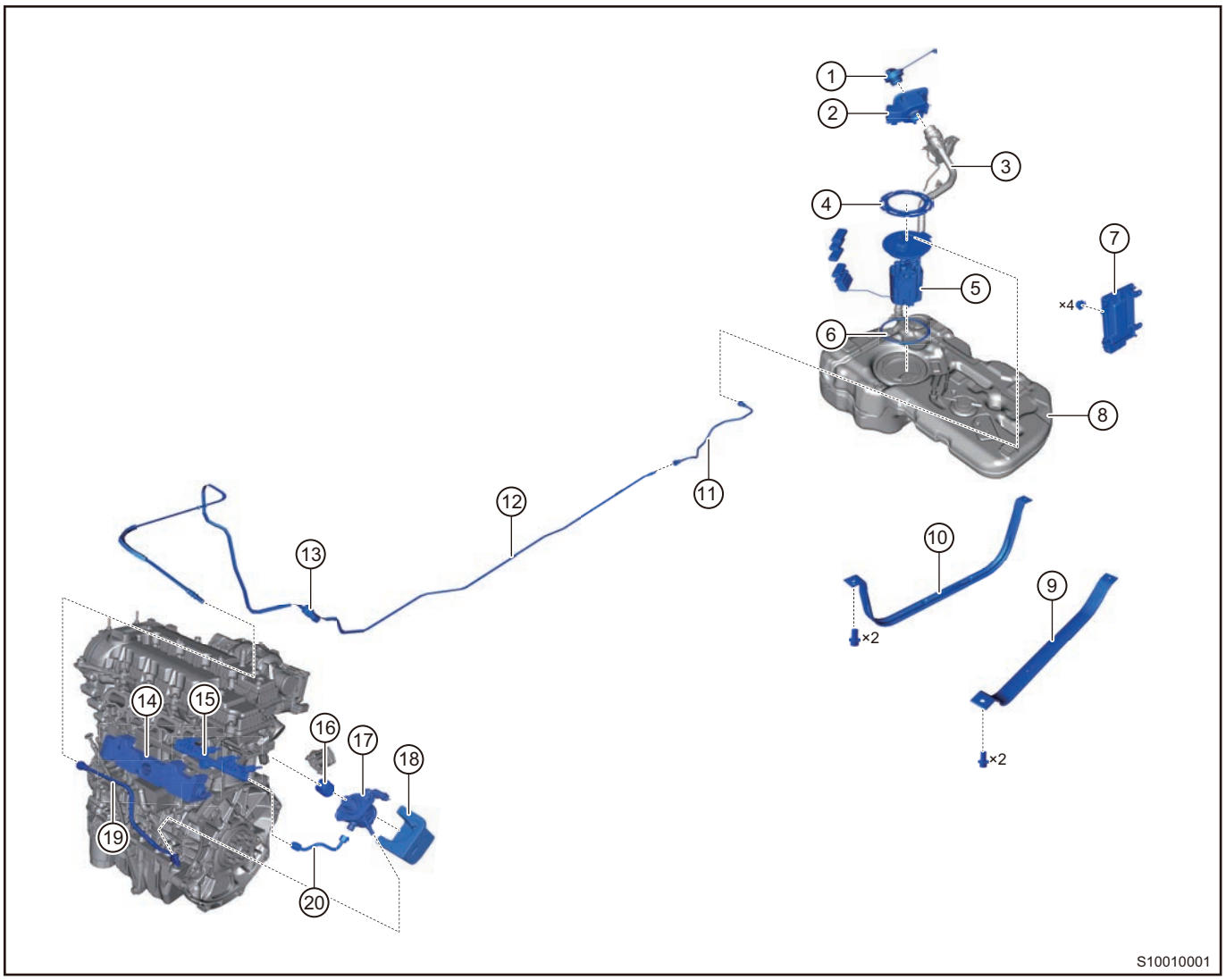
(2) When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.

2 System Overview

2.1 System Description

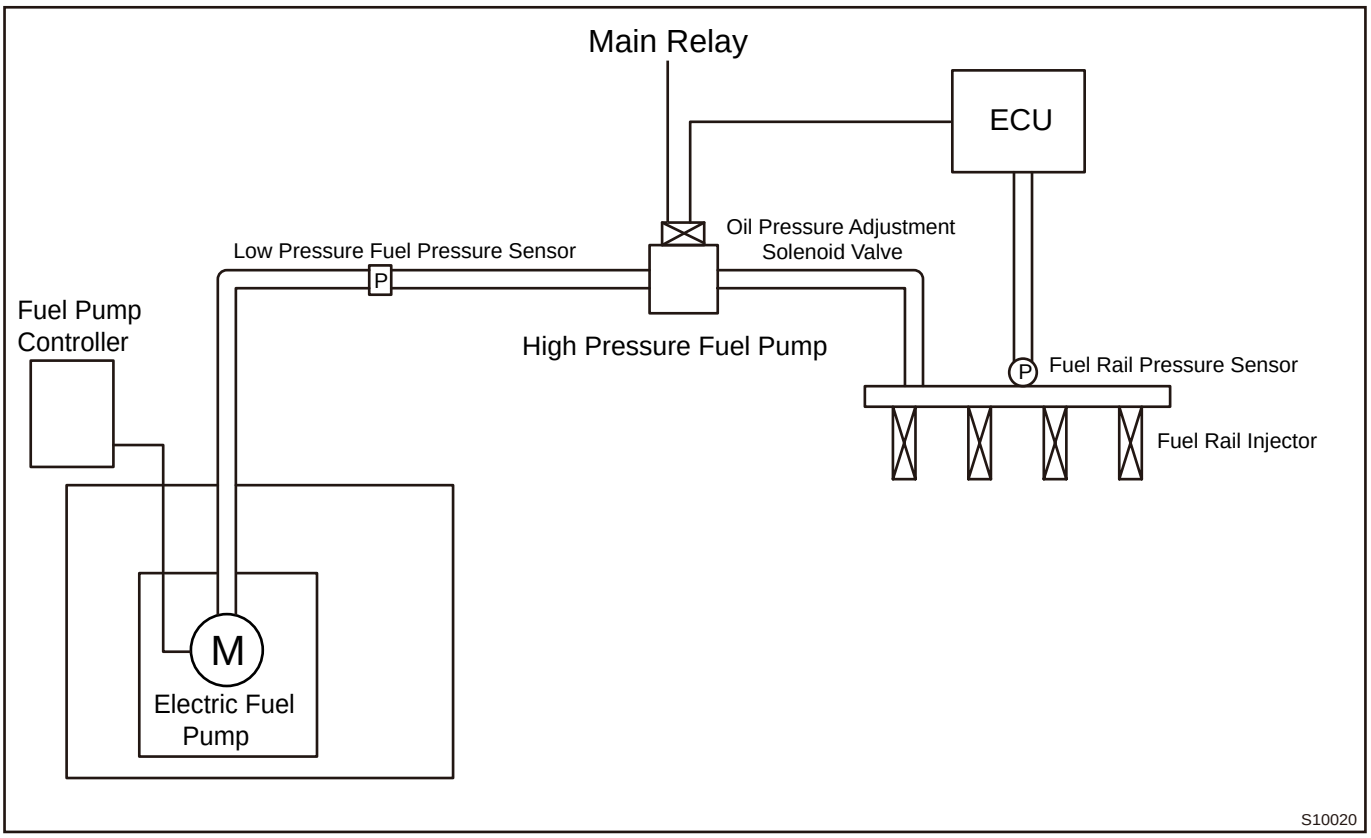
Fuel supply system uses direct injection in cylinder. The high pressure fuel pump is driven by square cam on intake camshaft, thus sucking fuel from the low-pressure end for compression and boosting, and the pressure can be raised up to 200 bar. ECU monitors fuel rail pressure through oil pressure sensor. Fuel is sent to fuel rail after further adjustment by the fuel pressure regulator. The vehicle adopts a direct injection system with Bosch 4-hole nozzle and a side nozzle layout; According to the control signal of ECU, fuel is injected into the combustion chamber and mixed with gas for combustion.In low pressure fuel system, fuel pump is controlled by individual fuel pump control module by means of duty ratio control, and monitors the low-pressure end pressure through low pressure fuel pressure sensor realizing closed-loop control.

2.2 System Components Diagram



1	Fuel Filler Cap	11	Fuel Pump Inlet Pipe to Outlet Pipe Assembly
2	Fuel Tank Cap Assembly	12	Inlet Pipe Ⅰ - Outlet Pipe Assembly to Vehicle Body
3	Fuel Filler Pipe Assembly	13	Low Pressure Fuel Pressure Sensor
4	Fuel Pump Locking Ring	14	Fuel Rail Injector Sound Insulator
5	Fuel Pump Assembly	15	Fuel Rail Injector Assembly
6	Fuel Tank Seal Ring	16	Roller Tappet
7	Fuel Pump Control Module	17	High Pressure Fuel Pump
8	Fuel Tank Assembly	18	High Pressure Fuel Pump Sound Insulator
9	Fuel Tank Fixing Strap Assembly Ⅰ	19	Inlet Pipe Ⅱ
10	Fuel Tank Fixing Strap Assembly Ⅱ	20	High Pressure Fuel Pipe (Fuel Pump - Fuel Rail)

2.3 System Schematic Diagram



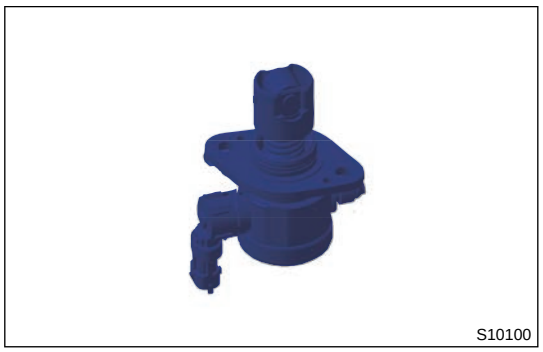
2.4 System Components Description

■ Electric Fuel Pump

Electric fuel pump consists of pump body, DC motor and housing. Its basic operation principle is that DC motor drives the rotor in pump housing to rotate at high speed after it is energized. The section at lower end of rotor shaft combines with the section at the inner hole of impeller, so that rotor shaft drives impeller to rotate as rotor rotates. During high speed rotation of impeller, the low pressure vacuum is created at the inlet part, and then the filtered fuel is sucked from the inlet of pump cover. The sucked fuel enters the pump housing after being pressurized by fuel pump impeller and then it is pushed out of outlet to provide fuel with a certain pressure for the fuel system.

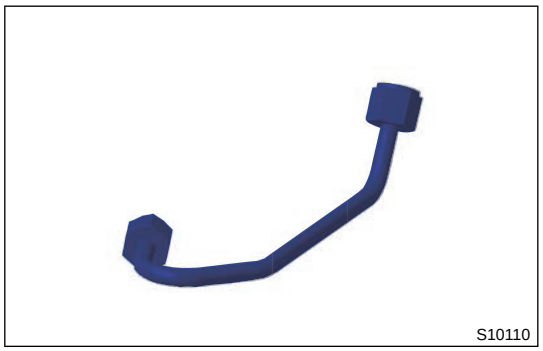
■ High Pressure Fuel Pump

High pressure fuel pump is an element specially used for direct injection engine. It functions to increase the system pressure and provide high pressure fuel for the fuel rail assembly. High pressure fuel pump supplies fuel for system as demands, thus providing a better fuel economy. It is made of stainless steel material and has a wide fuel application; also, it has the advantages of light weight, small volume, zero evaporative emission, etc.
The high pressure fuel pump uses a single plunger pump design integrated with regulator, flow control valve and pressure relief valve. Its operation principle is to drive high pressure pump plunger to move up and down by cam, thus achieving oil suction and outlet. Using the pressure sensor on fuel rail, ECU controls the flow of high pressure fuel pump through flow control valve according to the set control procedure, so as to perform closed loop control of pressure in high pressure fuel rail. Regulator functions to suppress the pressure pulsation at the low pressure end and improve the stability of system. Pressure relief valve will open when high pressure fuel rail pressure exceeds the safety limit, so as to protect the system.


S10100

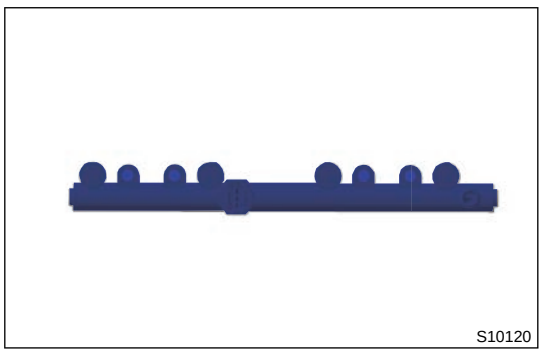
■ High Pressure Fuel Pipe

High pressure fuel pipe connects the high pressure fuel pump with the fuel rail injector assembly and delivers high pressure fuel to fuel rail injector assembly.


S10110

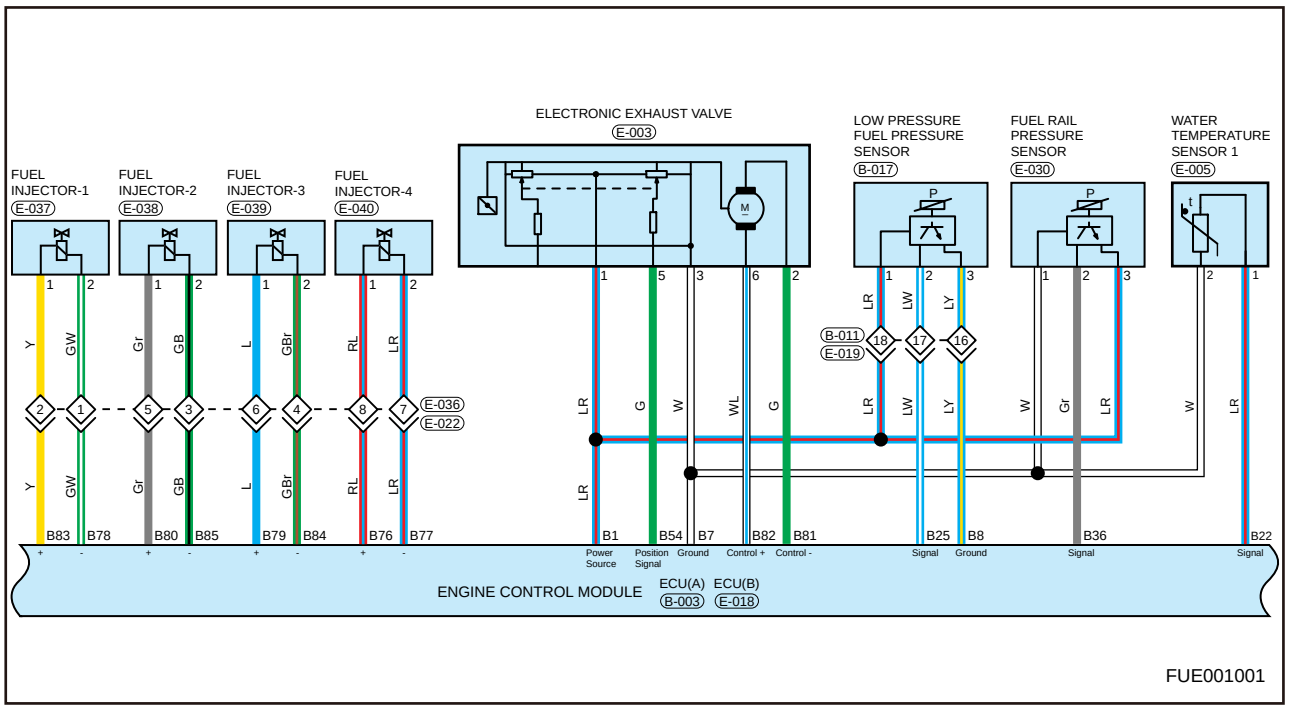
■ Fuel Rail Injector

The high pressure fuel distribution pipe assembly is integrated with high pressure fuel distribution pipe (fuel rail), high pressure fuel injector and high pressure sensor. Its operation principle is to optimize design through structure of high pressure fuel distribution pipe, the accurate fuel rail pressure signal feedback can uniformly and precisely distribute fuel for engine through injector.


S10120

3 System Circuit Diagram

3.1 Circuit Diagram



4 DIAGNOSIS & TESTING

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Fuel System

Symptom	Possible Cause
Fuel pressure in fuel supply system is too low	Electric fuel pump assembly (strainer blocked or fuel pressure regulator damaged)
	Low fuel level
Fuel pressure in fuel supply system is too high	Fuel injector (clogged)
	Electric fuel pump assembly (fuel pressure regulator damaged)
Electric fuel pump assembly has loud noise or a delay in operating	Low fuel level
	Electric fuel pump assembly
Fuel injector is clogged or leaks	Fuel injector
	Poor fuel quality
	Excessive impurities in fuel tank
Fuel injector does not work	Fuel supply system line (broken)
	Fuel injector (short in coil)

Symptom	Possible Cause
	Electric fuel pump assembly (damaged)
	Wire harness

■ **Lubrication Areas During Assembly**

Lubrication Area	Note
High Pressure Fuel Pump O-ring	Engine Oil

■ **Non-reusable Part**

Non-reusable Part	Note
High Pressure Fuel Pipe	Replacement required
Teflon Grommet of Fuel Injector	Replacement required

■ **High Pressure Fuel System Pressure Release**

(1) Method 1: Stop vehicle for 8 hours or more.

(2) Method 2: Unplug high pressure fuel pump connector, and idle the engine for 10 seconds. In this case, the malfunction light on instrument cluster of vehicle will come on. After repair, connect high pressure fuel pump connector and operate it again for a period of time, then the fault will disappear.

■ **Low Pressure Fuel System Pressure Release**

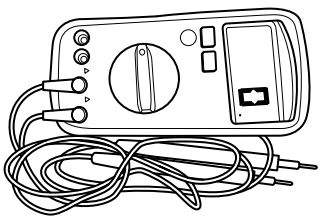
(1) Method 1: Turn ENGINE START STOP switch OFF and leave vehicle for 30 minutes.

(2) Method 2: Turn ENGINE START STOP switch OFF, remove fuel pump control module power supply fuse, start engine and make it stop automatically in Idling condition, then start engine twice or three times again, and release pressure residuals from fuel pipe by starting injection.

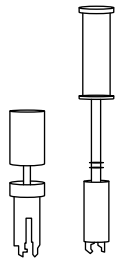
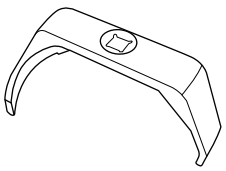
5 ON-VEHICLE SERVICE

5.1 Tool

■ **General Tool**

Tool Name	Tool Drawing
Digital Multimeter	 S00002

■ **Special Tools**

Tool Name	Part No.	Tool Drawing
Fuel Injector Remover	EPT - 0020	 S00084
Fuel Tank Pressure Cap Remover	ECH - 0006	 S00083

5.2 Fuel Rail Injector Assembly

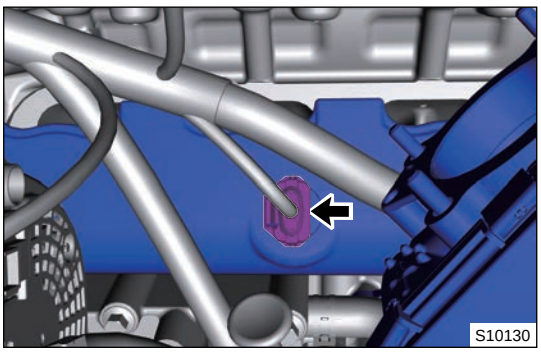
■ **Removal**

⚠ Warning

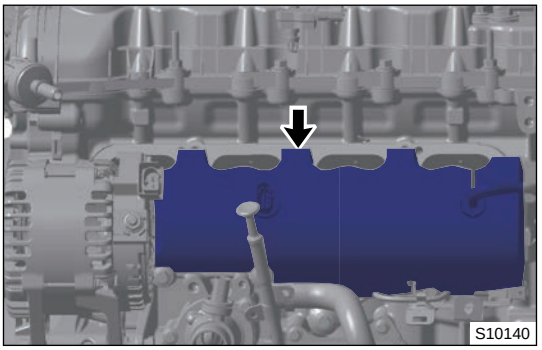
- **As the pressure of high pressure fuel system is high, the pressure must be released before removal.**
- **During removal, make sure the areas near stored parts are clean and free of dirt.**
- **Teflon grommet at injector head cannot be reused after fuel rail injector is removal, and it must be replaced with a new one during installation, therefore, be sure to confirm if removal is necessary before removal.**
- **Perform removal after engine cools down.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Remove the negative battery cable.
(4) Remove the intake manifold assembly.

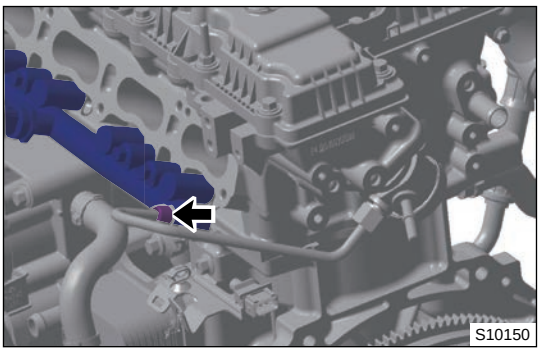
(5) Disconnect the fuel rail pressure sensor connector.


S10130

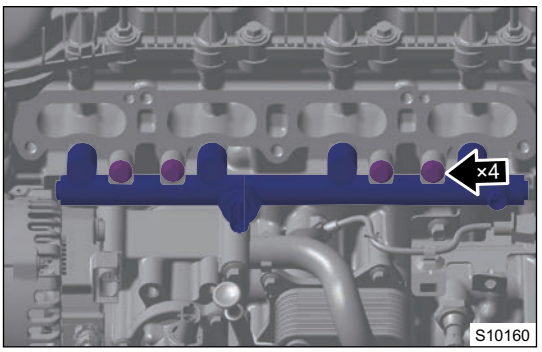
(6) Remove the fuel rail injector sound insulator.



(7) Loosen coupling nut between high pressure fuel pipe and fuel rail injector pipe joint.



(8) Remove 4 fixing bolts from fuel rail injector and remove fuel rail injector assembly carefully.



■ Inspection

(1) Check if wire harness connector of fuel rail injector assembly is abnormal.
(2) Check connecting area between fuel rail and fuel injector for fuel leakage, and check mounting hole of fuel injector for air leakage or fuel leakage.
(3) Use ohm band of multimeter to measure resistance between both pins of injector.

Normal value: 1.5 Ω ± 5 % (at 23℃)

■ **Installation**

⚠ Caution

- **If it is necessary to reassemble injector, assemble it after Teflon grommet at injector head is replaced.**
- **Make sure that engine cylinder head fuel injector mounting holes are clean and no foreign matter.**
- **Do not lubricate the sealing ring at head of fuel injector.**
- **During installation, align injector with mounting hole on cylinder head, and press it into mounting hole in axis direction of injector at a constant speed. If a press-fitting device is used, keep the force balance when pressing to prevent system from being damaged due to the unbalanced stress. The maximum pressing force should not be greater than 800N. After fuel rail is pressed into place, loosen the press-fitting device and insert bolt into the mounting hole on fuel rail injector, and screw 3-5 teeth into the screw hole on cylinder head.**
- **If no press-fitting device is available and fuel rail cannot be pressed into place, it is allowed to use a fuel rail bolt to bring it in, and tighten it several times in sequence of 3-2-4-1. It is not allowed to tighten an individual bolt directly. Tighten until fuel rail and cylinder head fit, then loosen all fuel rail bolts, and tighten fuel rail fixing bolts after fuel pipe is installed and tightened.**

(1) Pre-tighten 2 - 3 teeth of high pressure fuel pipe and fuel rail injector pipe joint.

(2) Install 4 fixing bolts to fuel rail and loosen all fuel rail bolts after fuel rail and cylinder head fit.

⚠ Caution

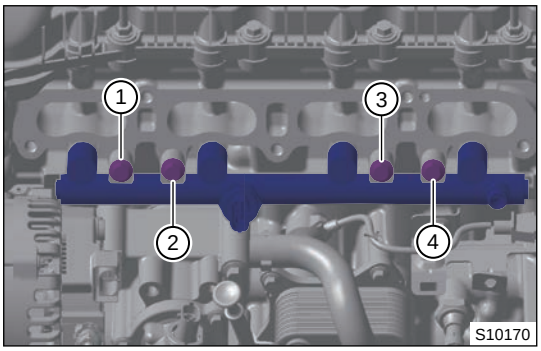
- **Tightening sequence of bolts: 3-2-4-1.**

(3) Tighten high pressure fuel pipe nuts.

Torque: 20 ± 2 N·m

(4) Tighten fuel rail fixing bolts several times in sequence of 3-2-4-1.

Torque: 25 ± 3 N·m



(5) Tighten high pressure fuel pipe nuts again.

Torque: 30 ± 2 N·m

(6) Install fuel rail injector sound insulator.
(7) Connect the fuel rail pressure sensor connector.
(8) Install the intake manifold assembly.
(9) Install the engine compartment trim cover assembly.

5.3 High Pressure Fuel Pump Assembly

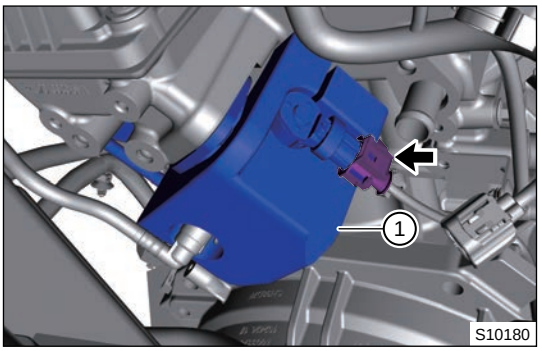
■ Removal

⚠ Warning

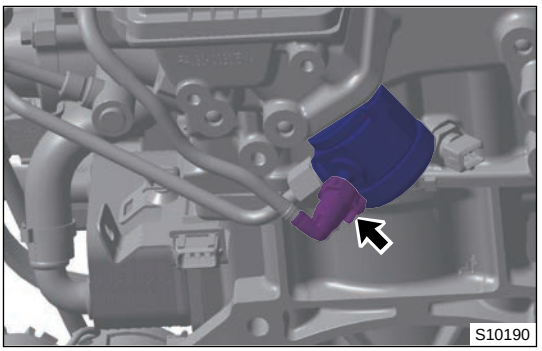
- **As the pressure of high pressure fuel system is high, the pressure must be released before removal.**
- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **During removal, make sure the areas near stored parts are clean and free of dirt.**
- **There is residual fuel in high pressure fuel pump. Please pay attention to the leakage of fuel during removal to avoid fire.**
- **Perform removal after engine cools down.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Remove the engine compartment trim cover assembly.
(3) Disconnect the negative battery cable.
(4) Remove the intake hose assembly.

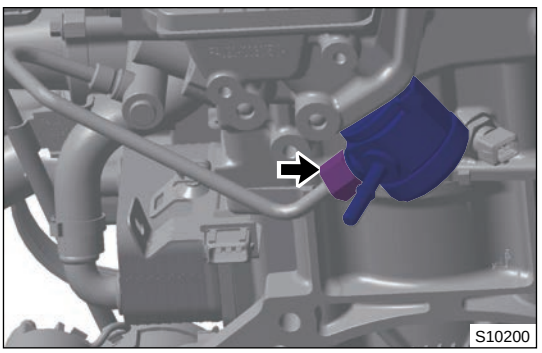
(5) Disconnect the high pressure fuel pump (fuel pressure regulating solenoid valve) connector.
(6) Remove high pressure fuel pump sound insulator (1) carefully.



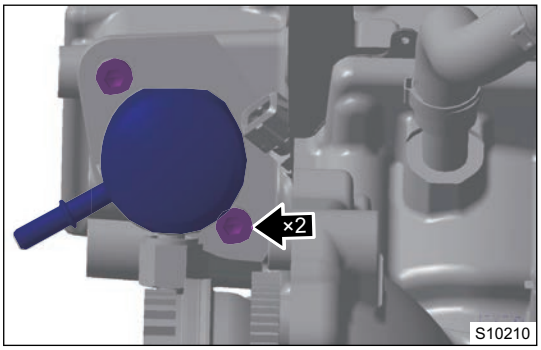
(7) Disconnect connection between inlet pipe Ⅱ and high pressure fuel pump.



(8) Loosen high pressure fuel pipe joint, and disconnect connection between high pressure fuel pipe and high pressure fuel pump.



(9) Remove 2 fixing bolts from high pressure fuel pump.



⚠ Caution

- **During removal, loosen fixing bolts in turn, and then remove bolts completely. Never remove a bolt completely in one time.**

(10) Rotate high pressure fuel pump gently and pull it outwards. Never swing high pressure fuel pump in radial direction.

⚠ Caution

- **When pulling out high pressure fuel pump, the roller tappet may fall naturally. In order to prevent damage in falling, hold it by hand when pulling out the high pressure fuel pump.**

■ Check high pressure fuel pump

(1) Check if high pressure fuel pump connector is abnormal.

(2) Check resistance between both pins of high pressure fuel pump connector.

(3) Measure resistance of high pressure fuel pump (fuel pressure regulating solenoid valve) coil.

Measurement Temperature (˚C)	Coil Resistance (0 mileage) (Ω)		Coil Resistance (after driving) (Ω)	
	Minimum	Maximum	Minimum	Maximum
- 40	0.379	0.417	0.372	0.426
20	0.495	0.545	0.485	0.556
160	0.765	0.843	0.750	0.859

■ Check the roller tappet

(1) Check if appearance of roller tappet is complete, if wear is serious, and if roller bearing can rotate smoothly.

(2) Check if roller tappet diameter is obviously out of tolerance. If it is out of tolerance, replacement is recommended. Diameter: 26 mm (- 0.020, 0.055)

Hint:
If above problems occur, replacing with a new roller tappet is recommended.

■ Installation

⚠ Caution

- **Before installation, make sure the part model of high pressure fuel pump is correct and available.**
- **Before installation, make sure sealing caps of high pressure fuel pump joint are complete. Never use high pressure fuel pump without sealing cap.**
- **High pressure fuel pump O-ring must be lubricated with lubricating oil before installation.**
- **During installation of high pressure fuel pump, never tighten a bolt firmly in one time, and they must be tightened in turn.**

(1) Apply a coat of oil to O-ring of high pressure fuel pump, install roller tappet and high pressure fuel pump and then place them into mounting hole. When replacing, be sure to align anti-rotating pin of roller tappet with anti-rotating groove in mounting hole.

(2) Pre-tighten fixing bolts of high pressure fuel pump several turns in order, and never tighten a bolt completely in one time. Do not use sharp tools or tap components during installation to avoid damaging high pressure fuel pipe.

Torque: 27 + 3 N·m

(3) Do not allow skin to contact the roller tappet directly during installation. During the operation, it is necessary to wear cleaning gloves to prevent roller tappet surface from being contaminated by sweat and foreign matters.

5.4 High Pressure Fuel Pipe

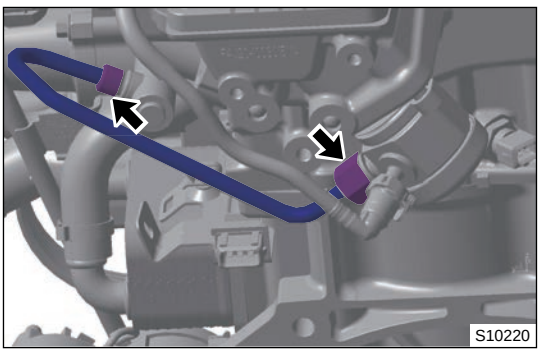
■ Removal

⚠ Warning

- **As the pressure of high pressure fuel system is high, the pressure must be released before removal.**
- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **During removal, make sure the areas near stored parts are clean and free of dirt.**
- **Perform removal after engine cools down.**

(1) Release the high pressure fuel system pressure.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Remove the intake hose assembly.
(4) Remove the high pressure fuel pump sound insulator.

(5) After pressure of high pressure fuel system is released completely, use a wrench to remove nuts on both sides of high pressure fuel pipe completely.



(6) Remove high pressure fuel pipe.

⚠ Caution

- **The removed high pressure fuel pipe should be marked with scraping marks and cannot be reused.**

■ **Installation**

⚠ Caution

- **High pressure fuel pipe is a non-reusable part, never reassemble it for a secondary use.**
- **Before installing high pressure fuel pipe, make sure that the part model is correct, the sealing caps on both ends of high pressure fuel pipe are intact. Never use any high pressure fuel pipe without sealing cap.**
- **Do not use sharp tools during installation to avoid scratching high pressure fuel pipe joint.**
- **During installation of high pressure fuel pipe, pay attention to avoid collision with the fuel rail injector joint and end of high pressure fuel pump joint.**
- **Before installing high pressure fuel pipe, confirm if fixing bolts of fuel rail injector are tightened. If they are tightened completely, loosen all of them and then install the high pressure fuel pipe.**

(1) Unplug protective cap of high pressure fuel pipe, and pre-tighten both ends of high pressure fuel pipe to high pressure fuel pump and fuel rail joint respectively in correct direction.

Torque: 20 ± 2 N•m

(2) Tighten fuel rail fixing bolts several times in sequence of 3-2-4-1.

Torque: 25 ± 3 N·m

⚠ Caution

- **Tightening sequence of bolts: 3-2-4-1.**

(3) Tighten high pressure fuel pipe nuts again.

Torque: 30 ± 2 N·m

5.5 Fuel Filler Cap Body Assembly

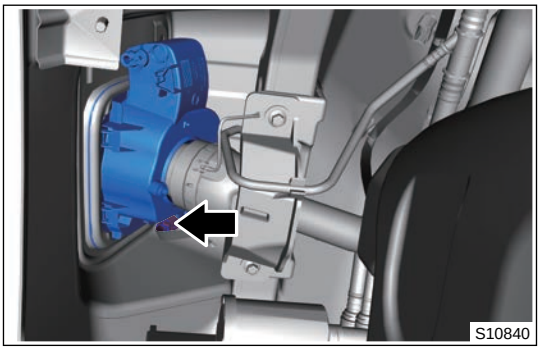
■ **Removal**

⚠ Warning

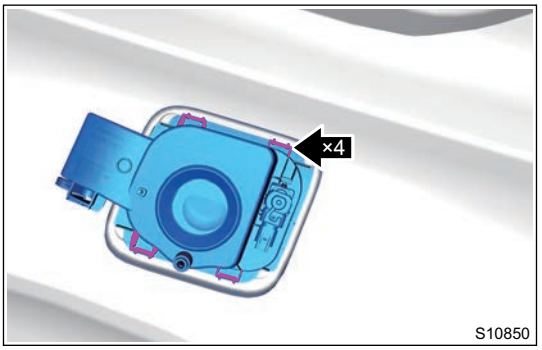
- **Before operating the fuel supply system, please touch the vehicle body to discharge static electricity; failure to do so will cause a fire, even result in an explosion.**
- **When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.**
- **If fuel leakage occurs when operating the fuel supply system, please handle the leaked fuel in time.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear right wheel.
(4) Remove the rear right wheel house protector assembly.

(5) Disconnect fuel filler cap body actuator connector.



(6) Insert hand into and press 4 fixing clips of electric fuel filler cap assembly from interior, push them out and remove fuel filler cap body assembly.



■ **Installation**

(1) Install fuel filler cap assembly, press fuel filler cap assembly to secure the clips in place.
(2) Connect fuel filler cap body actuator connector.
(3) Install rear right wheel house protector assembly.
(4) Install the rear right wheel.

5.6 Electric Fuel Pump Assembly

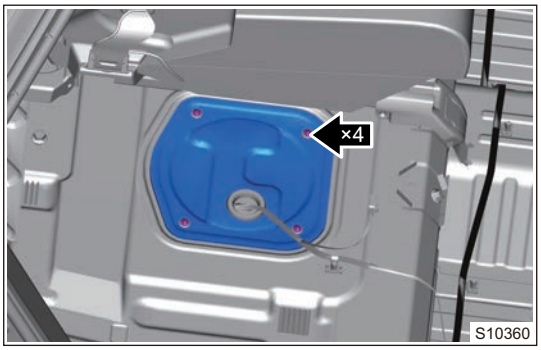
■ **Removal**

⚠ Warning

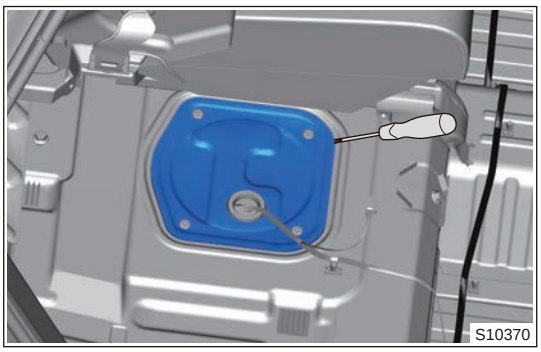
- **Before operating the fuel supply system, please touch the vehicle body to discharge static electricity; failure to do so will cause a fire, even result in an explosion.**
- **When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.**
- **If fuel leakage occurs when operating the fuel supply system, please handle the leaked fuel in time.**
- **Operation staff should wear protective glasses and rubber gloves during repair and avoid inhaling much fuel gas.**
- **Only use parts approved by Chery Automobile Co., Ltd. to replace the electric fuel pump assembly.**
- **Keep electric fuel pump assembly and work area clean when replacing electric fuel pump assembly; otherwise the electric fuel pump assembly element will be clogged.**
- **DO NOT damage the disconnected fuel system line or connectors. Cover the line joints or connectors with plastic bags or equivalent, preventing foreign matter from entering.**
- **Keep fuel tank and line clean.**

(1) Release the low pressure fuel system pressure.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the right seat assembly in middle row.

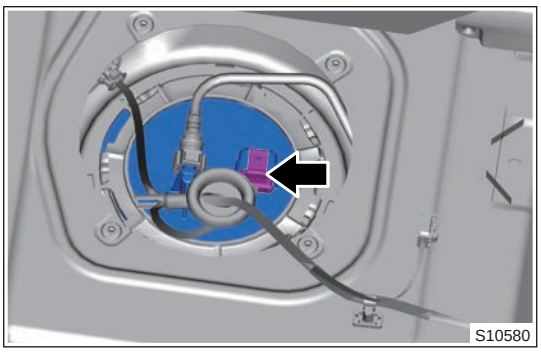
(5) Remove 4 fixing screws from electric fuel pump assembly protective cap with cross screwdriver.



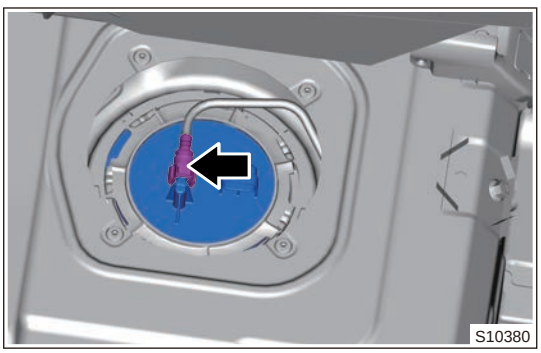
(6) Remove the electric fuel pump assembly protective cap with flat tip screwdriver.



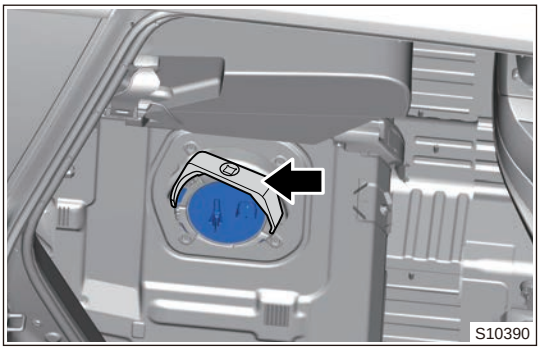
(7) Disconnect the electric fuel pump assembly connector.



(8) Disconnect connection between inlet pipe and electric fuel pump assembly.



(9) Using a fuel tank pressure cap special tool, remove fuel tank pressure cap.



(10) Remove electric fuel pump assembly from fuel tank, and dispose of fuel in electric fuel pump assembly.

⚠ Caution

- **Operate carefully when taking the electric fuel pump assembly out of fuel tank, preventing damaging lines and floats.**
- **Cover the electric fuel pump assembly completely with a plastic bag or equivalent to prevent foreign matter from entering.**
- **Electric fuel pump assembly can be put into a container and taken out of the cabin, thus preventing fuel in the pump from dropping into the cabin.**
- **It is not allowed to perform running test for electric fuel pump assembly under dry state or in water. Otherwise service life will be reduced. In addition, do not inversely connect electric fuel pump assembly positive and negative poles.**

■ **Installation**

⚠ Caution

- **Replace fuel tank seal ring with a new one when installing electric fuel pump assembly, align it with installation position of fuel tank and do not run the electric fuel pump assembly with no fuel in fuel tank, preventing damaging electric fuel pump assembly.**
- **Before connecting the hose, check if there is any damage or foreign matter on the hose or joint.**
- **During installation, push in fuel pipe connector until a click sound is heard, then check that fuel pipe joint clip is on the collar of fuel pipe joint. After installing the pipe joint clip, check that fuel pipe joint cannot be pulled out. Be careful not to damage joint. If clip is damaged, replace it.**
- **Turn ignition switch to ON (without starting engine) to apply fuel pressure to fuel supply system, and then check connections for leakage.**

(1) Using a fuel tank pressure cap special tool, install fuel tank pressure cap.

Torque: 400 N·m.

(2) Connect inlet pipe.
(3) Connect the electric fuel pump assembly connector.
(4) Install the right seat assembly of middle row.

5.7 Fuel Tank Assembly

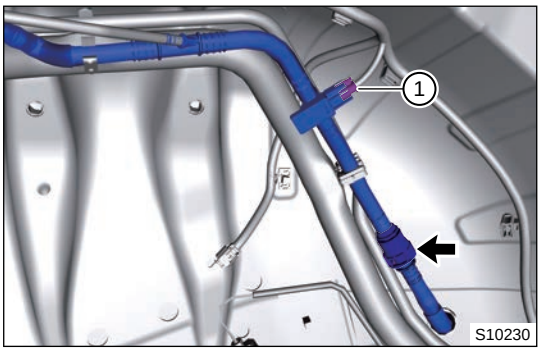
■ Removal

⚠ Warning

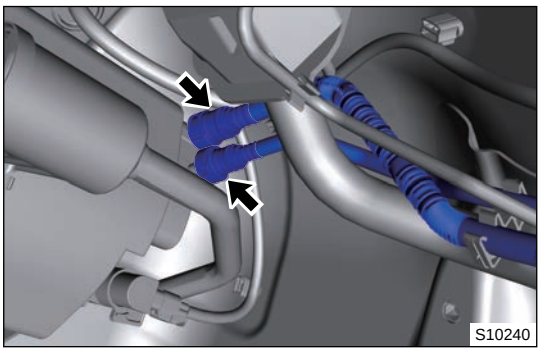
- **Before operating the fuel supply system, please touch the vehicle body to discharge static electricity; failure to do so will cause a fire, even result in an explosion.**
- **When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.**
- **If fuel leakage occurs when operating the fuel supply system, please handle the leaked fuel in time.**
- **Operation staff should wear protective glasses and rubber gloves during repair and avoid inhaling much fuel gas.**
- **DO NOT damage the disconnected fuel system line or connectors. Cover the line joints or connectors with plastic bags or equivalent, preventing foreign matter from entering.**
- **Keep fuel tank and line clean.**

(1) Release the low pressure fuel system pressure.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the intermediate propeller shaft.
(5) Remove the front muffler assembly.
(6) Remove the rear right wheel.
(7) Remove the rear right wheel house protector.

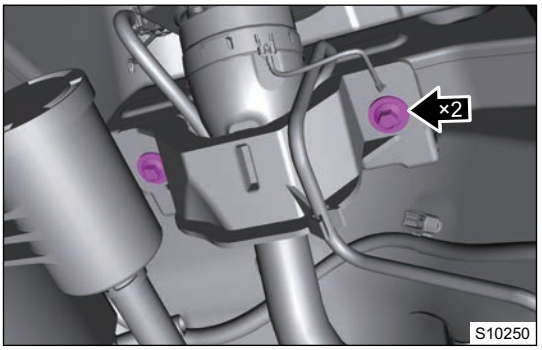
(8) Disconnect the fuel tank pressure sensor connector (1).
(9) Disconnect the fuel vapor hose pipe Ⅰ.



(10) Disconnect connection between fuel vapor hose pipe Ⅰ and charcoal canister.
(11) Disconnect the connection between fuel vapor pipe Ⅱ and charcoal canister.

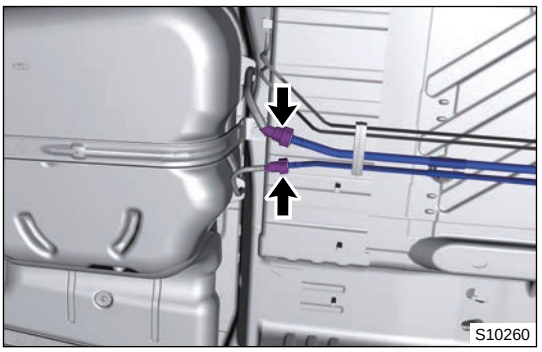


(12) Remove 2 fixing bolts from fuel filler pipemounting bracket.

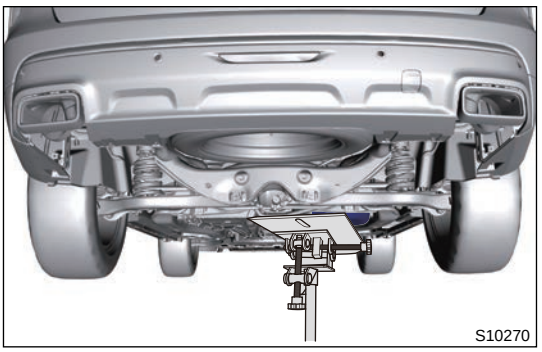


(13) Disconnect the connection between inlet pipe and inlet pipe Ⅰ.

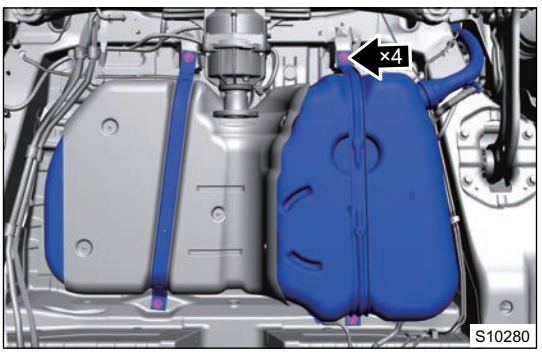
(14) Disconnect the connection between fuel vapor pipe Ⅱ and fuel vapor pipe Ⅲ.



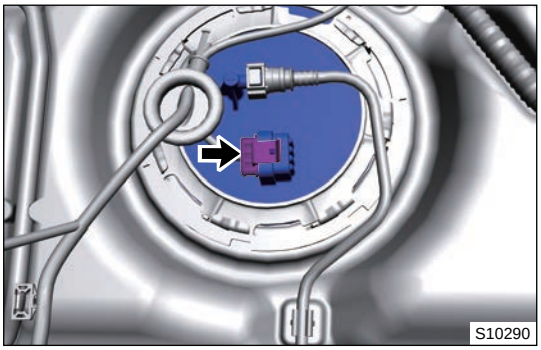
(15) Support fuel tank assembly with a transmission carrier.



(16) Remove 4 fixing bolts between fuel tank assembly fixing straps and body connection.

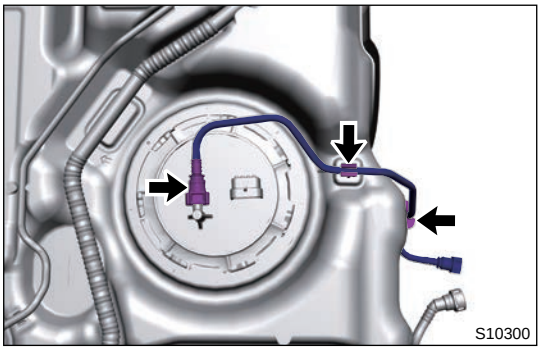


(17) Disconnect the fuel pump assembly connector carefully.

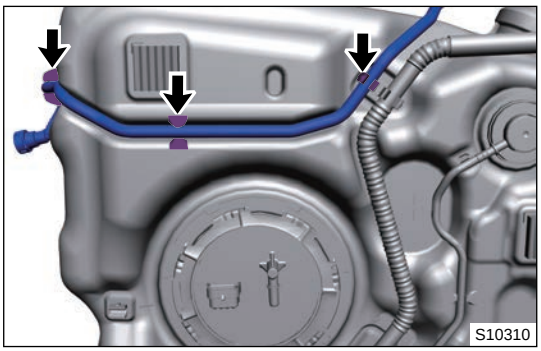


(18) Lower lift to a proper position slowly, and remove fuel tank assembly carefully.

(19) Disconnect the connection between fuel pump and inlet pipe and remove the inlet pipe from fuel tank fixing clip.

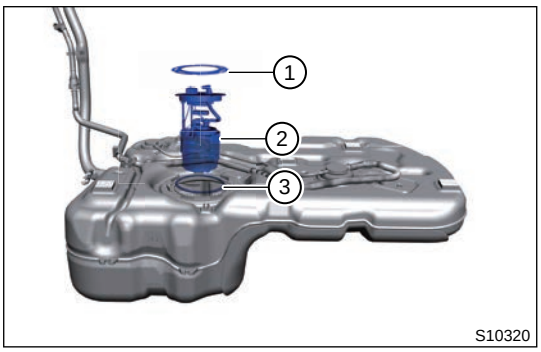


(20) Remove the fuel vapor pipe II from fuel tank fixing clip.



(21) Using a special tool, remove electric fuel pump pressure cap (1).

(22) Remove electric fuel pump assembly (2) and seal ring (3) from fuel tank assembly.



■ **Installation**

⚠ Caution

- **Before connecting the hose, check if there is any damage or foreign matter on the hose or joint.**
- **During installation, push in fuel pipe connector until a click sound is heard, then check that fuel pipe joint clip is on the collar of fuel pipe joint. After installing the pipe joint clip, check that fuel pipe joint cannot be pulled out. Be careful not to damage joint. If clip is damaged, replace it.**
- **Turn ENGINE START STOP switch to ON (without starting engine) to apply fuel pressure to fuel supply system, and then check connections for leakage.**

(1) Install electric fuel pump assembly and tighten fuel tank pressure cap.

Torque: 400 N·m.

(2) Fix the fuel vapor pipe Ⅱ and inlet pipe to fuel tank assembly clip. Connect the inlet pipe to electric fuel pump.
(3) Connect the electric fuel pump assembly connector.
(4) Install 4 fixing bolts to fuel tank assembly fixing strap.

Torque: 23 ± 2.5 N·m

(5) Connect the fuel tank pressure sensor connector.
(6) Connect each pipeline to corresponding joint.
(7) Install rear right wheel house protector.
(8) Install the rear right wheel.
(9) Install the intermediate propeller shaft (If equipped).
(10) Install the front muffler assembly.

5.8 Fuel Pump Control Module

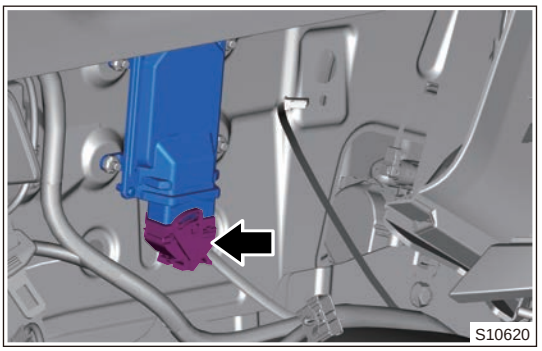
■ **Removal**

⚠ Warning

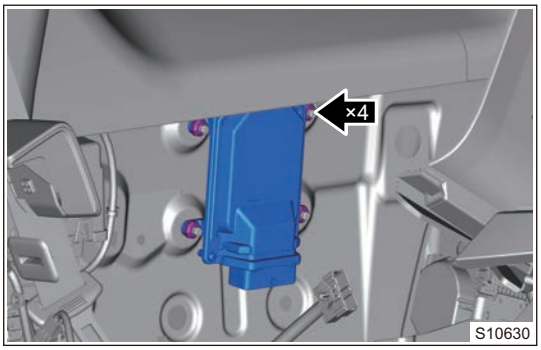
- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **Try to prevent body interior from being scratched during removal and installation.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the left luggage compartment protector body.

(4) Disconnect the fuel pump control module connector.



(5) Remove 4 fixing nuts from fuel pump control module.



(6) Remove the fuel pump control module.

■ **Installation**

(1) Install 4 fixing nuts to fuel pump control module.
Torque: 7 ± 1 N·m.

(2) Connect the fuel pump control module connector.
(3) Install the left luggage compartment protector body.

5.9 Fuel Rail Pressure Sensor

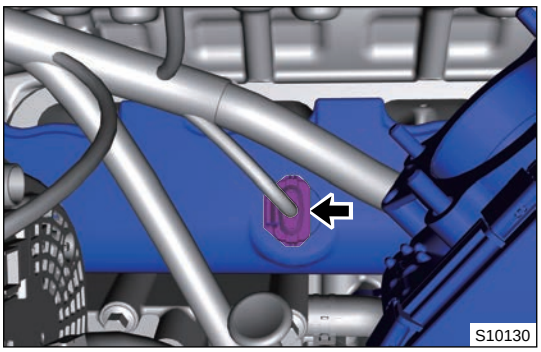
■ **Removal**

⚠ Warning

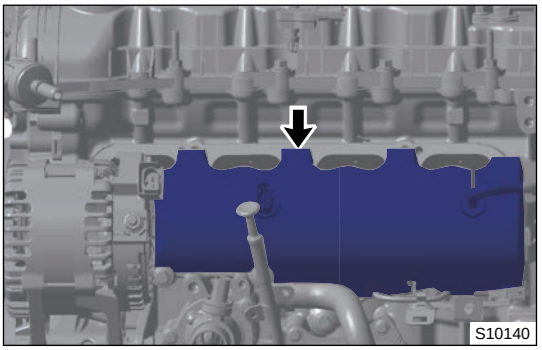
- **Before operating the fuel supply system, please touch the vehicle body to discharge static electricity; failure to do so will cause a fire, even result in an explosion.**
- **When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.**

(1) Release the high pressure fuel system pressure.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the intake manifold assembly.

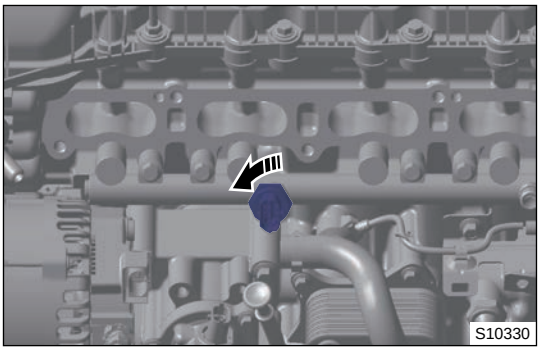
(5) Disconnect the fuel rail pressure sensor connector.



(6) Remove the fuel rail injector sound insulator.



(7) Remove fuel rail pressure sensor counterclockwise in direction of arrow as shown in illustration.



■ **Inspection**

Use ohm band of multimeter to measure resistance among 3 pins of fuel rail pressure sensor (pay attention to the positive and negative orders).

Sensor Pin (corresponding to positive and negative poles of multimeter in front-and-rear sequence)	Normal Value
1 - 2	301 ± 100 kΩ
1 - 3	24 ± 1 kΩ
2 - 1	∞
2 - 3	∞
3 - 1	24 ± 1 kΩ
3 - 2	301 ± 100 kΩ

■ **Installation**

(1) Install fuel rail pressure sensor.
(2) Install fuel rail injector sound insulator.
(3) Install the intake manifold assembly.

5.10 Low Pressure Fuel Pressure Sensor

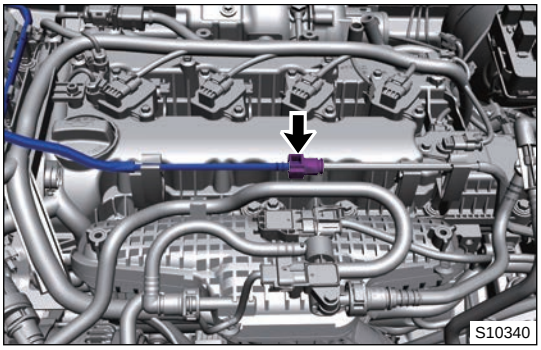
■ **Removal**

⚠ Warning

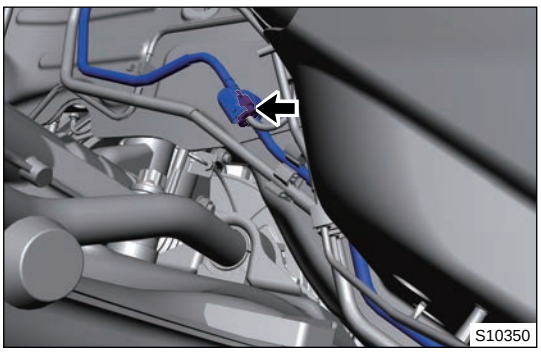
- **Before operating the fuel supply system, please touch the vehicle body to discharge static electricity; failure to do so will cause a fire, even result in an explosion.**
- **When operating the fuel supply system, work area should be in good ventilation and keep fire sources or open flames away from the work area, in which fire extinguisher should be equipped.**

(1) Release the high pressure fuel system pressure.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.

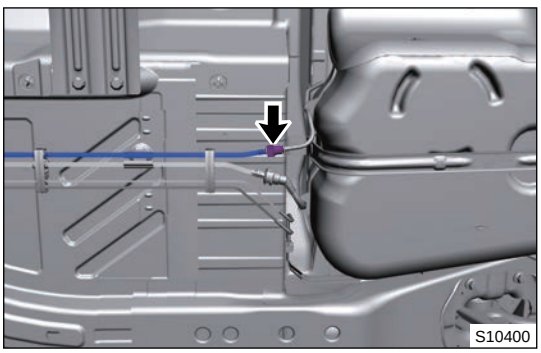
(4) Disconnect the connection between inlet pipe Ⅱ and inlet pipe Ⅰ.



(5) Disconnect the low pressure fuel pressure sensor connector.



(6) Disconnect the connection between inlet pipe and inlet pipe Ⅰ.



(7) Remove inlet pipe Ⅰ assembly from double groove pipe clamp carefully.

■ Installation

(1) Fix inlet pipe Ⅰ to double groove pipe clamp.
(2) Connect the low pressure fuel pressure sensor connector.
(3) Connect pipe joints to inlet pipe and inlet pipe Ⅱ.

738DHA TRANSMISSION

738DHA TRANSMISSION

5.1 TRANSMISSION CONTROL SYSTEM

1 Warnings and Precautions

1.1 Warnings

■ In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Vehicles equipped with 738DHA transmission must be towed with front wheels raised off the ground!

(2) The required oil must be used, use of other oil may cause transmission damage, and our company rejects the warranty claim.

1.2 Precautions

■ In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Bolts should be installed carefully so as to avoid falling into the transmission.

(2) When assembling HCU, pay attention to adjust the position of transmission internal wire harness, so as not to knock and damage to the transmission internal wire harness.

(3) After adjustment and repair or replacement of parts, please make sure to clear DTCs with diagnostic tester to avoid misdiagnosis next time. Because TCU will always memory the diagnostic trouble codes even if the battery is disconnected.

(4) After replacing the dual clutch transmission or TCU, be sure to use a diagnostic tester to read the shifting and valve body characteristics data of the dual clutch transmission. As the data stored in the original TCU only matches the original dual clutch transmission, and it does not match the newly replaced dual clutch transmission.

(5) TCU can store a maximum of 20 DTCs. If the storage space for DTCs is used up, the new DTCs will substitute the historical faults with the lowest priorities.

(6) Clutch/transmission overheat failure (P2787/P1849) is overheat protection measures of transmission/clutch hardware. Usually, after overheat prompt appears, simply stop the vehicle for a rest, then it can work normally. Try to avoid repeated starting with accelerator pedal depressed firmly, which is easy to make oil temperature rise too fast.

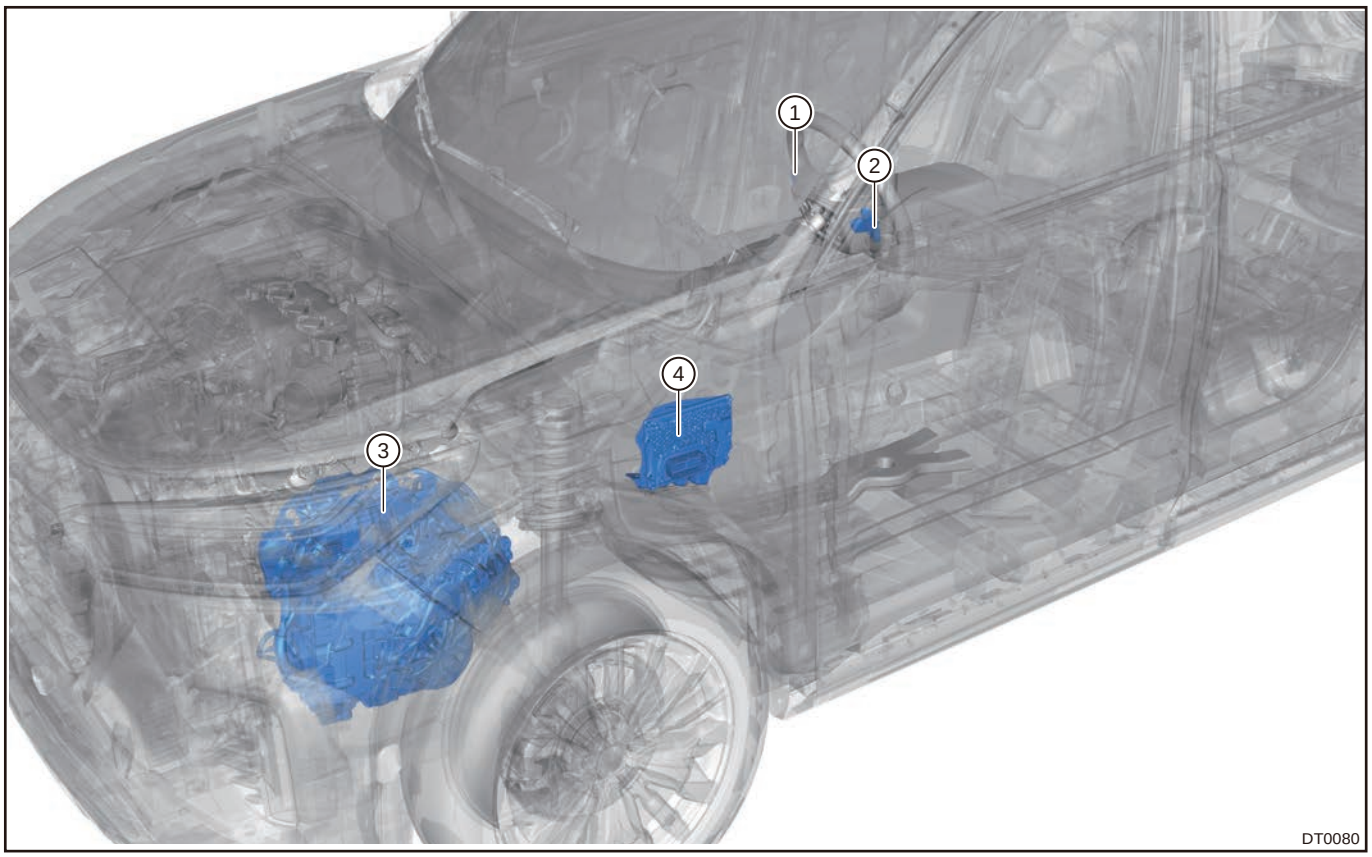
2 General Description

2.1 System Description

DCT (Dual Clutch Transmission) has two clutches, one is related to even gears and reverse gear, and the other is related to odd gears. It is a combination of manual transmission and automatic transmission. It integrates the advantages of manual transmission and automatic transmission.
Advantages:

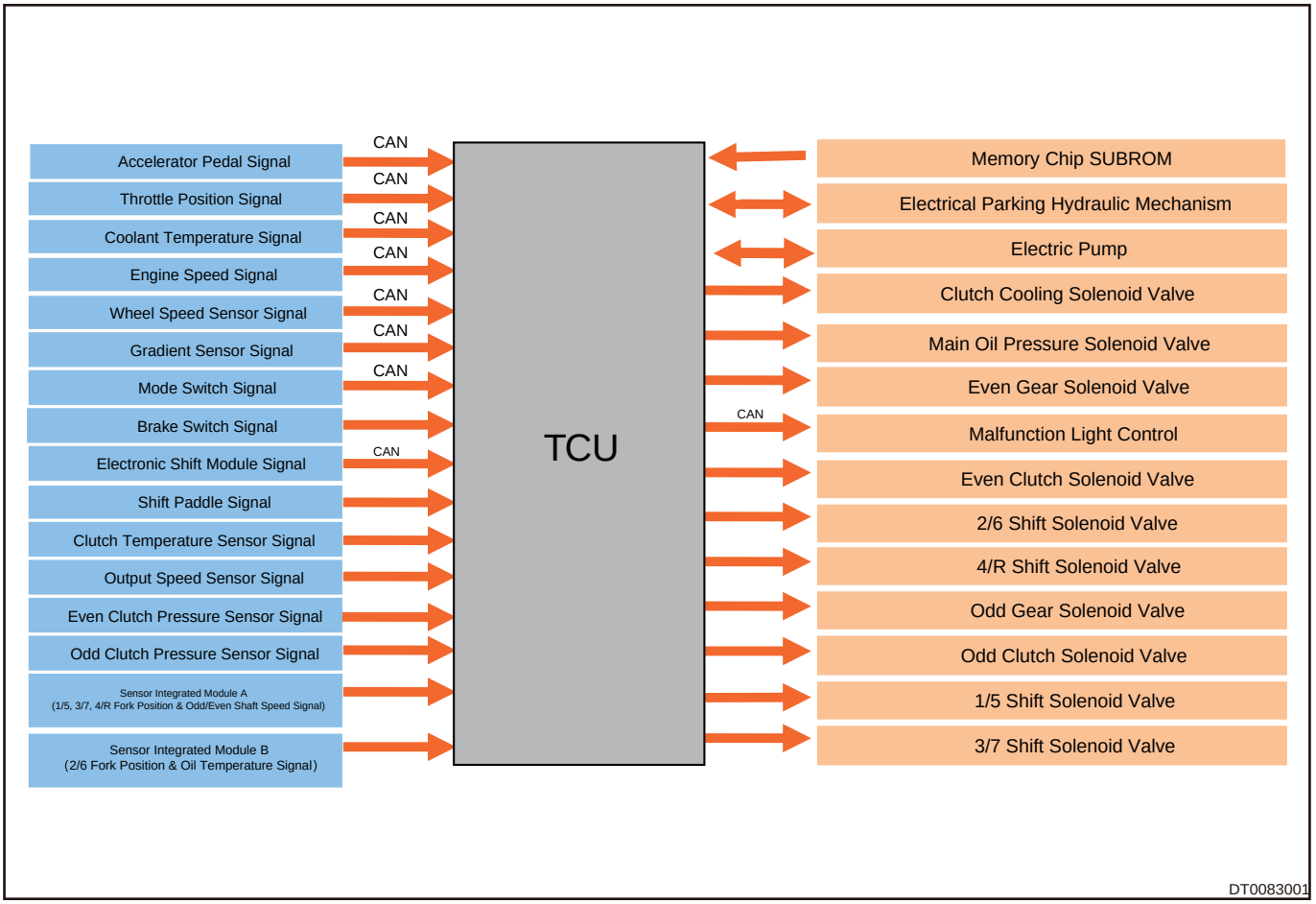
- The maximum input torque is 380 Nm.
- Net weight:81 kg (excluding weight of dual mass flywheel).
- Wet dual clutch.
- It provides 7+R gears, and speed ratio range is greater than 6.89.
- Compact layout, improved efficiency, optimized shift sticking.
- Quick response, smooth shifting.
- Efficiency is improved.
- Support start and stop function and extended coasting function (additional hardware support is not required).
- Reverse shaft is canceled, making a more compact structure.
- A set of clutches are connected to gear 1/R respectively.
- Standard front column rear ball bearing arrangement, improving efficiency and contributing to platform collinearity.
- Common control for flow valve/pressure valve.
- Protect hydraulic parking, and vehicle can easily achieve gear control.

2.2 System Components Diagram



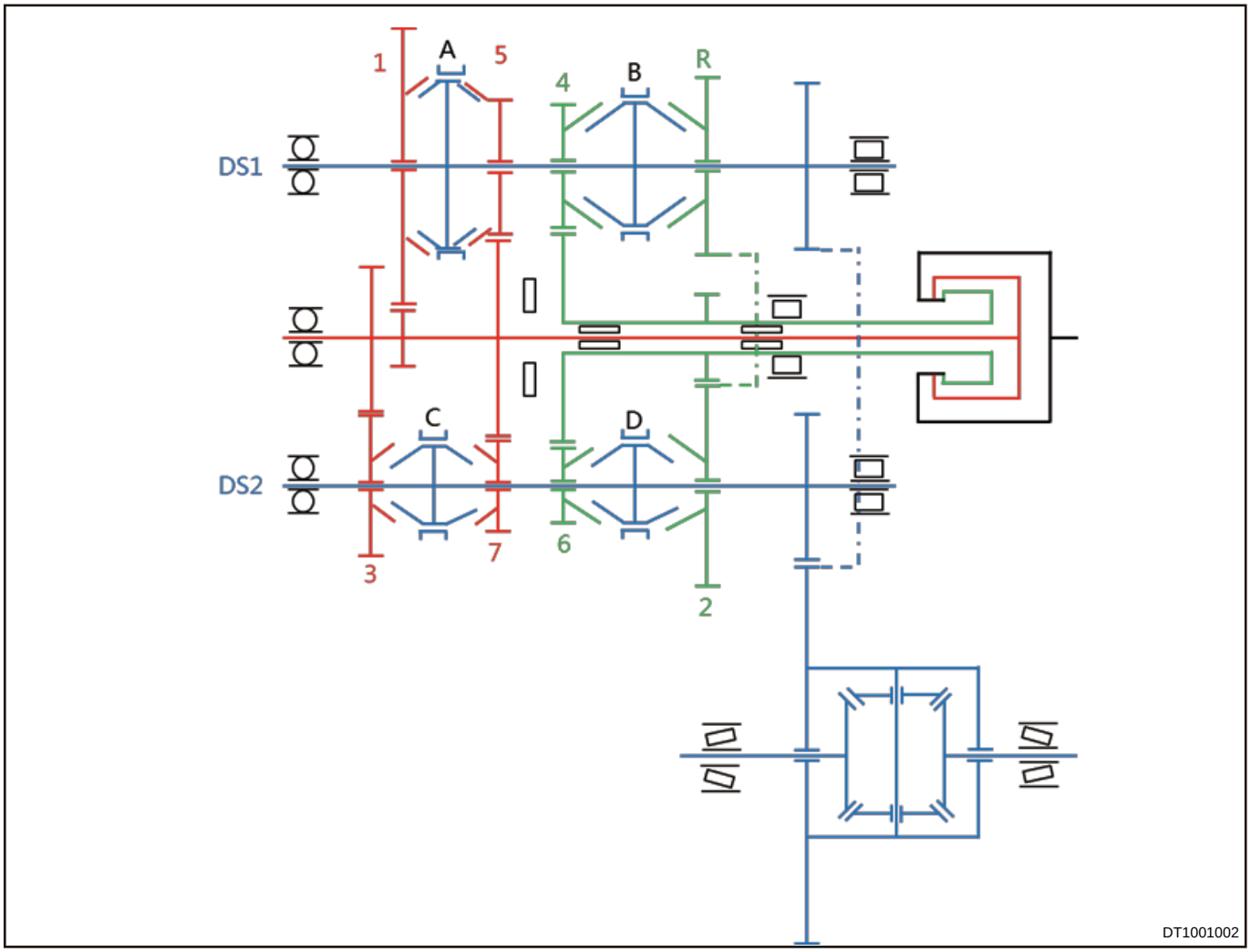
1	Right Shift Paddle	3	Transmission Assembly
2	Left Shift Paddle	4	Transmission Control Module

2.3 System Schematic Diagram



- According to the driver’s driving command and each signal data sent by each sensor on transmission, 738DHA transmission control module (TCU) performs calculation to control engagement or separation of transmission and clutch, and switching of gears while combining signals received from other modules on vehicle via CAN line.
  - The upshift/downshift signal of shift paddle is transmitted through multi-function steering wheel connector to central gateway module via LIN network, and then the central gateway module transmits the signal to TCU module via CAN network.
  - Sensor integration module A collects 1\5, 3\7, 4\R fork position sensor signals, even shaft speed signals and odd shaft speed signals.
  - Sensor integration module B collects 2\6 fork position sensor signals and transmission oil temperature signal.
  - The application of memory chip SUBROM in transmission makes up for the difference of transmission characteristics caused by the difference of components and assembly, and provides guarantee for the normal and safe operation of hydraulic system. At the same time, drive efficiency of transmission and driving comfort are improved. In addition to store the hydraulic characteristic data of solenoid valve, SUBROM can also store some important calibration parameters of transmission, so as to optimize the transmission performance, and further improve product quality and market competitiveness.

■ Internal Principle



The dual clutch transmission uses two clutches (odd/even) that are controlled by electronic system and hydraulic system. For 738DHA, one clutch controls odd gears (1st, 3rd, 5th, and 7th) , and the other clutch controls even gears (2nd, 4th, 6th, and reverse).

- Features: During the whole shifting operation, two sets of clutches operate in turn to ensure that at least one set of gear is outputting power, so as to avoid power interruption condition.

■ System Layout

- The 1st gear and R gear are controlled by two different clutches to avoid the risk of sticking caused by shifting operation in cold start.
- Reverse shaft is canceled to reduce weight and length of assembly.
- The whole platform adopts deep groove ball + short cylindrical bearing to reduce the towing torque.
- Basic speed ratio range of all platforms is more than 7.

2.4 System Function Description

■ Gear Position Introduction

During operation, automatic mode (P, R, N, D) and manual mode M (+, -) can be selected by driver. The corresponding selected gear information will be displayed in display area of instrument cluster.

- Automatic mode: When transmission is in D position, manual upshift/downshift operation is not required, and automatic upshift/downshift operation will be achieved by vehicle according to vehicle speed.
- Manual mode: When transmission is in D position, push it to right/left to enter manual mode, and push it forward to raise one gear, and push it backward to lower one gear.

■ Driving Mode

When engine starts, system is in NORMAL mode by default. Driving mode switches once every time the driving mode switch is pressed. You can select NORMAL/SPORT/ECO mode based on the different road conditions.

- NORMAL mode is the standard mode, and ECO mode is the economic mode, which can improve the fuel economy of vehicle.
- SPORT mode is the sport mode, which can improve the maneuverability, controllability and power performance of vehicle. You can select it according to different road conditions.

⚠ Caution

- **When driving mode is switched, instrument cluster will switch the corresponding theme color.**
- **Adaptive Cruise Control System (ACC) makes acceleration become gentle in ECO mode, and Adaptive Cruise Control System (ACC) makes acceleration become quick in SPORT mode.**

■ Fail-safe Mode

When transmission system fails, fail-safe mode is activated automatically, and the yellow indicator on instrument cluster remains on. The transmission will not operate properly and vehicle speed will gradually decrease and vehicle drives at low speed.

■ Automatically Shifting to P

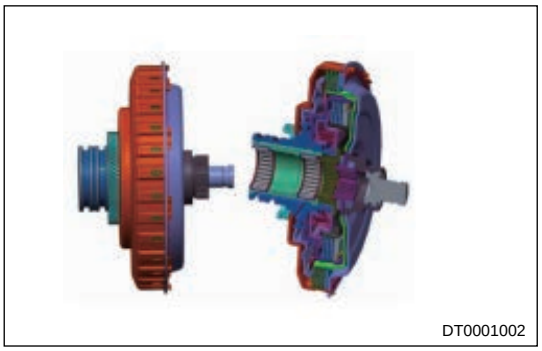
When vehicle speed changes from more than 15km/h to 0 (stop), if transmission is in R or D position and driver side door is opened and brake pedal is not depressed, system will shift to P position automatically. If driver side door cannot be closed due to damage, driver can shift the shift lever to R or D position after system shifts to P position automatically, and vehicle can be driven normally.

2.5 System Components Description

■ Technical Characteristics

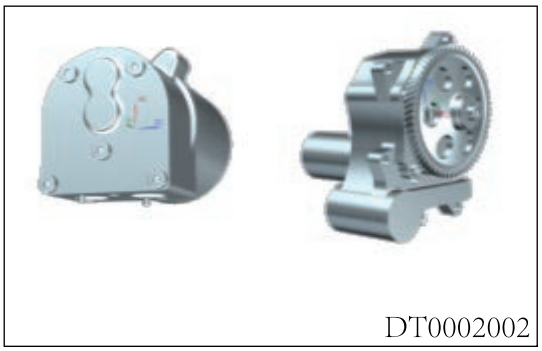
New generation of wet dual clutch.

- It is considered to adopt BW-CCF series dual clutch;
- Non-high pressure system is more reliable;
- Compact structure, contributing to platform collinearity;
- Special mold costs are not required.


DT0001002

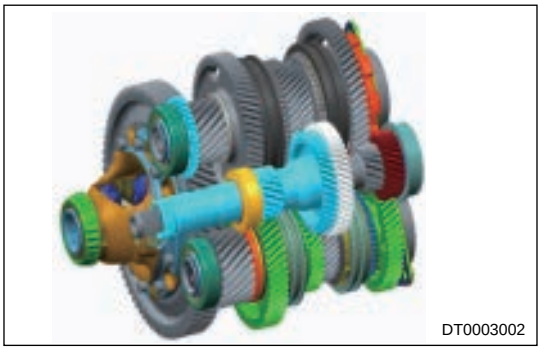
Mixing pump technology. Combination use of mechanical pump and electronic pump can reduce the displacement of mechanical pump and improve the efficiency of system.

- Amount of transmission oil is reduced;
- Start and stop during driving is supported;
- Efficiency is improved.


DT0002002

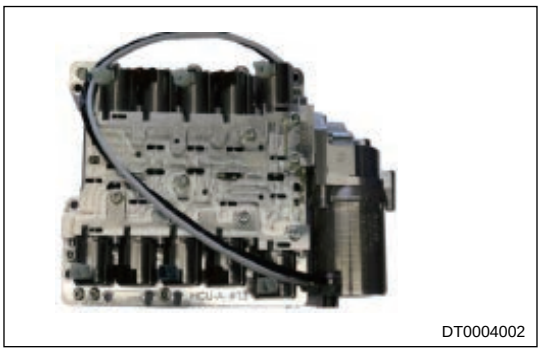
Optimized shaft train arrangement.

- Reverse shaft is canceled, making a more compact structure
- A set of clutches are connected to gear 1/R respectively
- Standard front column rear ball bearing arrangement, improving efficiency and contributing to platform collinearity.


DT0003002

New generation of HCU system.

- Quick response, smooth shifting;
- Protect hydraulic parking, and vehicle can easily achieve gear control;
- Low leaking hydraulic system, high precision solenoid valve, shift actuator separation, universal platform;
- Double control for shift control circuit by flow valve and pressure valve.


DT0004002

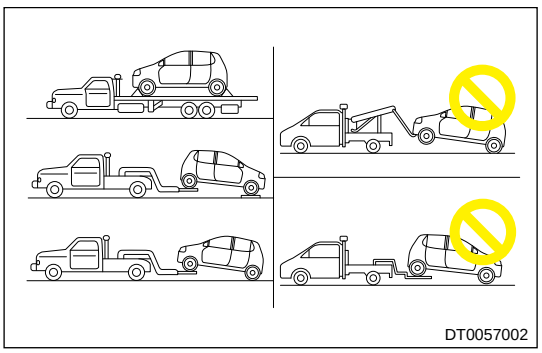
■ Parking Mechanism

- It is arranged on the output shaft to reduce the weight of parking mechanism and improve the robustness of system (In addition to parking gear, other parts are universal to all platforms).
- It also includes integrated hydraulic automatic parking.

2.6 Vehicle Towing

(1) Towing using the correct method can avoid unnecessary secondary damage to the vehicle.

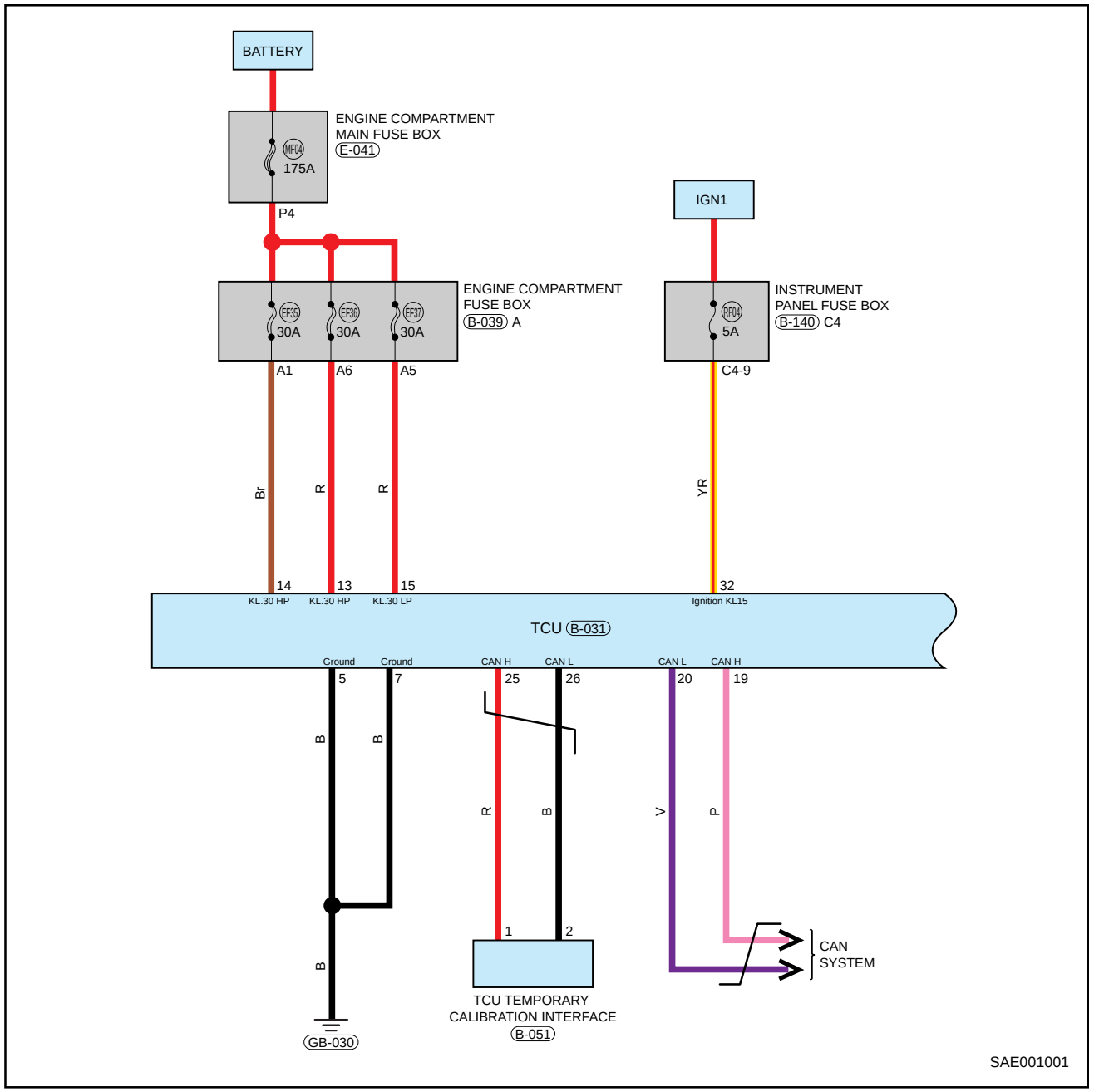
1) Use flatbed truck or large flatbed trolley to tow the vehicle after it is fully supported.
2) Use hard traction to lift the non-drive wheel while using a small flatbed (ground wheel) to lift the drive wheel and transport it
3) Use hard traction to lift the drive wheel and transport it.


DT0057002

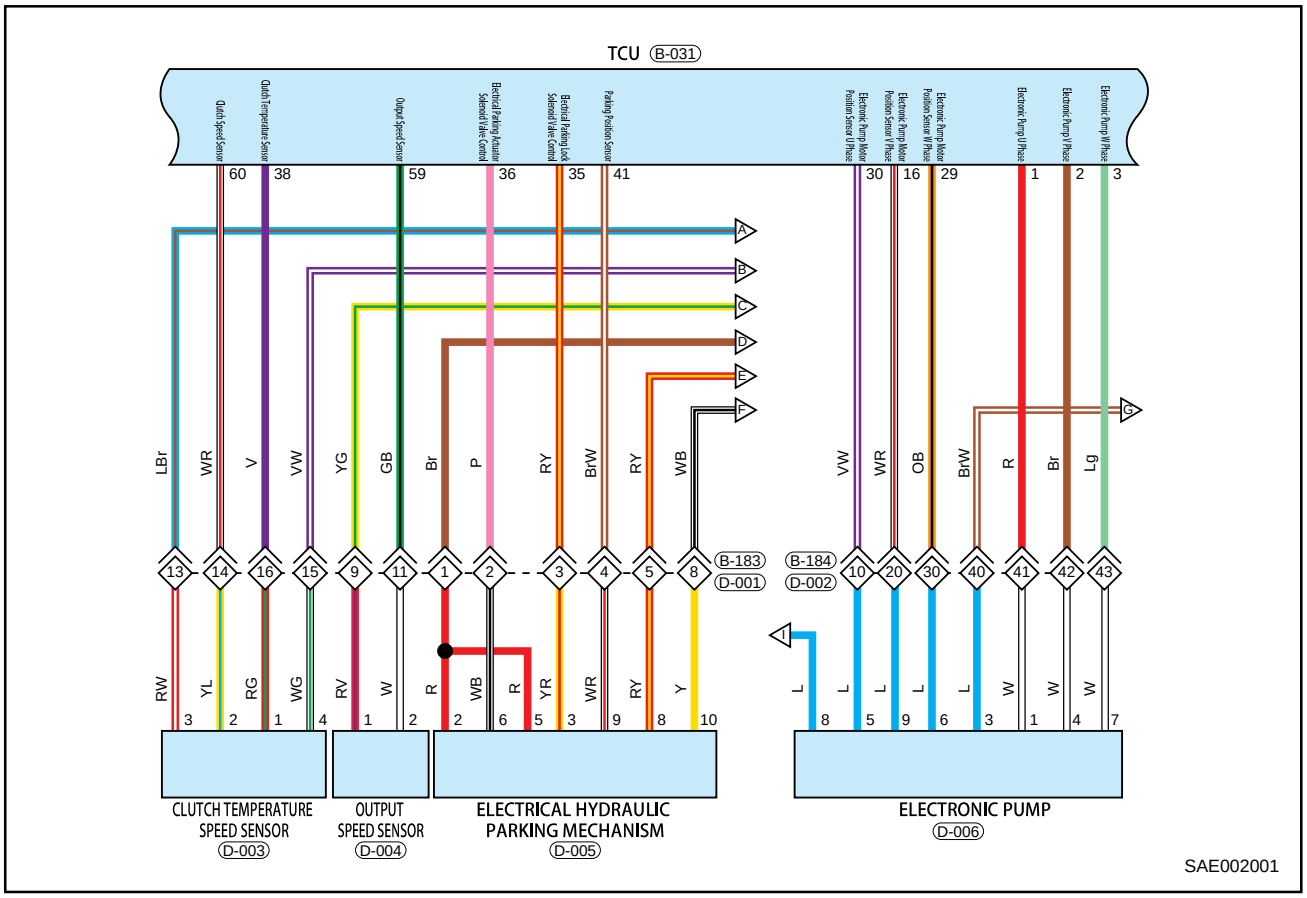
3 System Circuit Diagram

3.1 Circuit Diagram

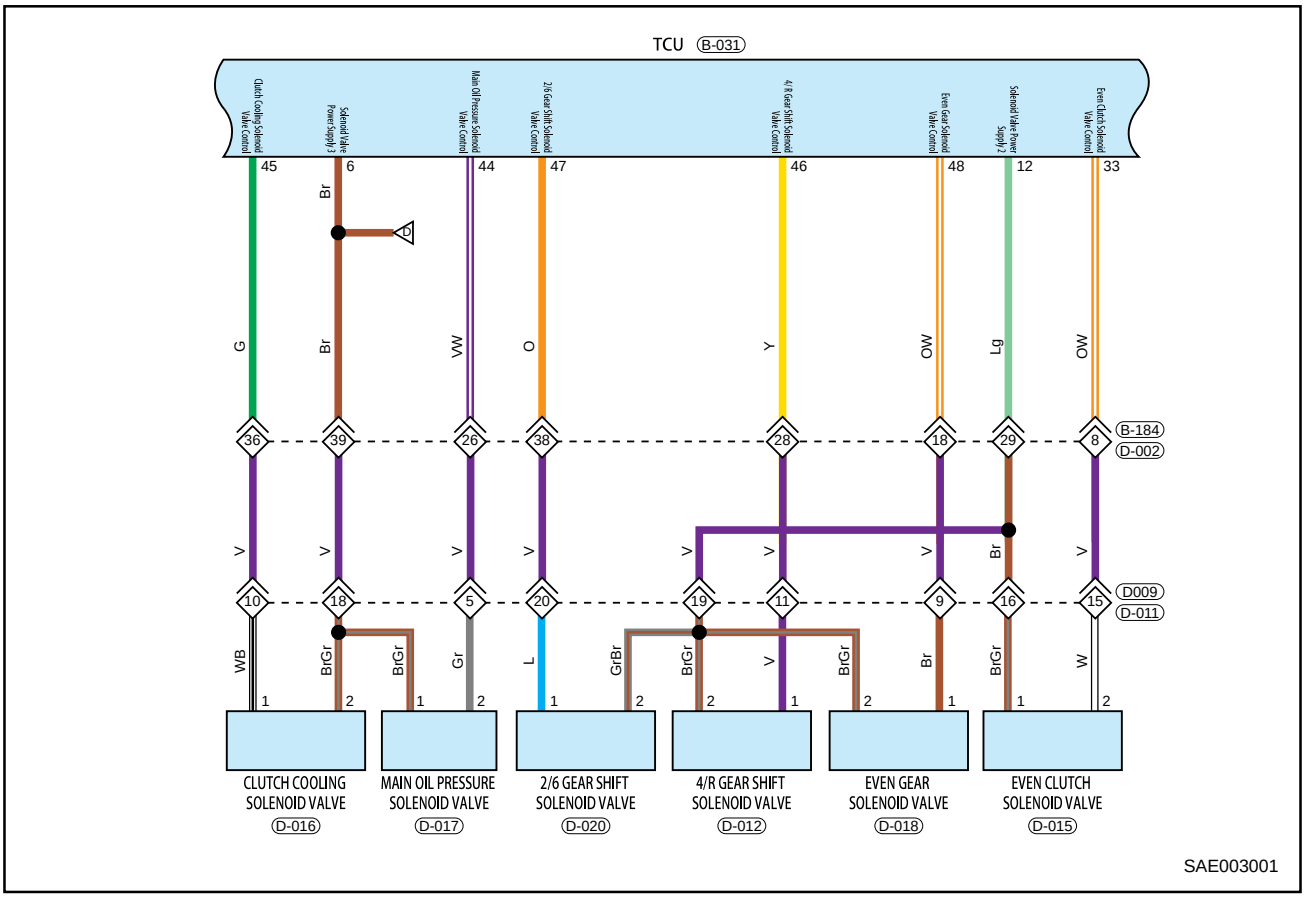
■ Transmission Control System Circuit Diagram 1



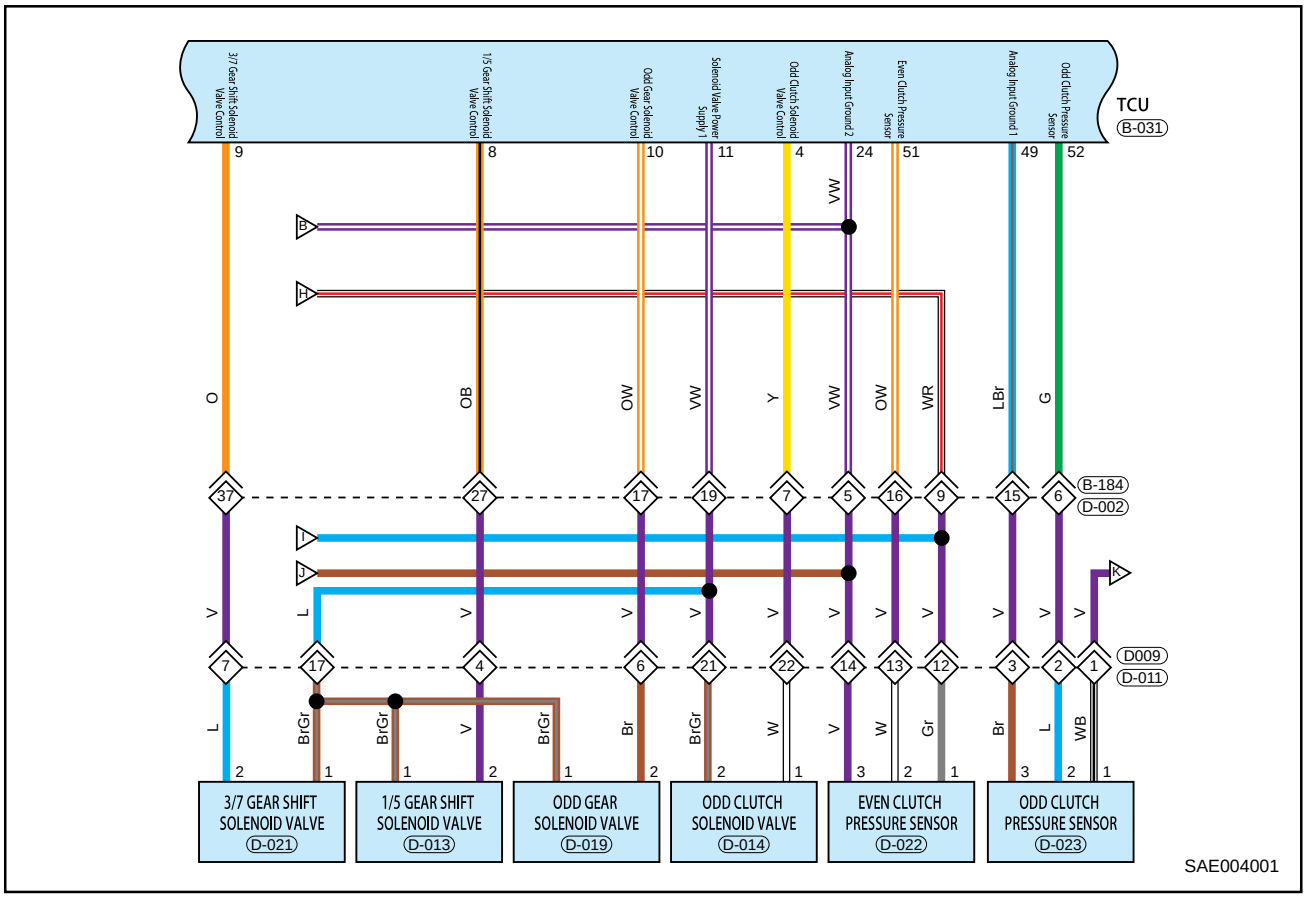
■ Transmission Control System Circuit Diagram 2



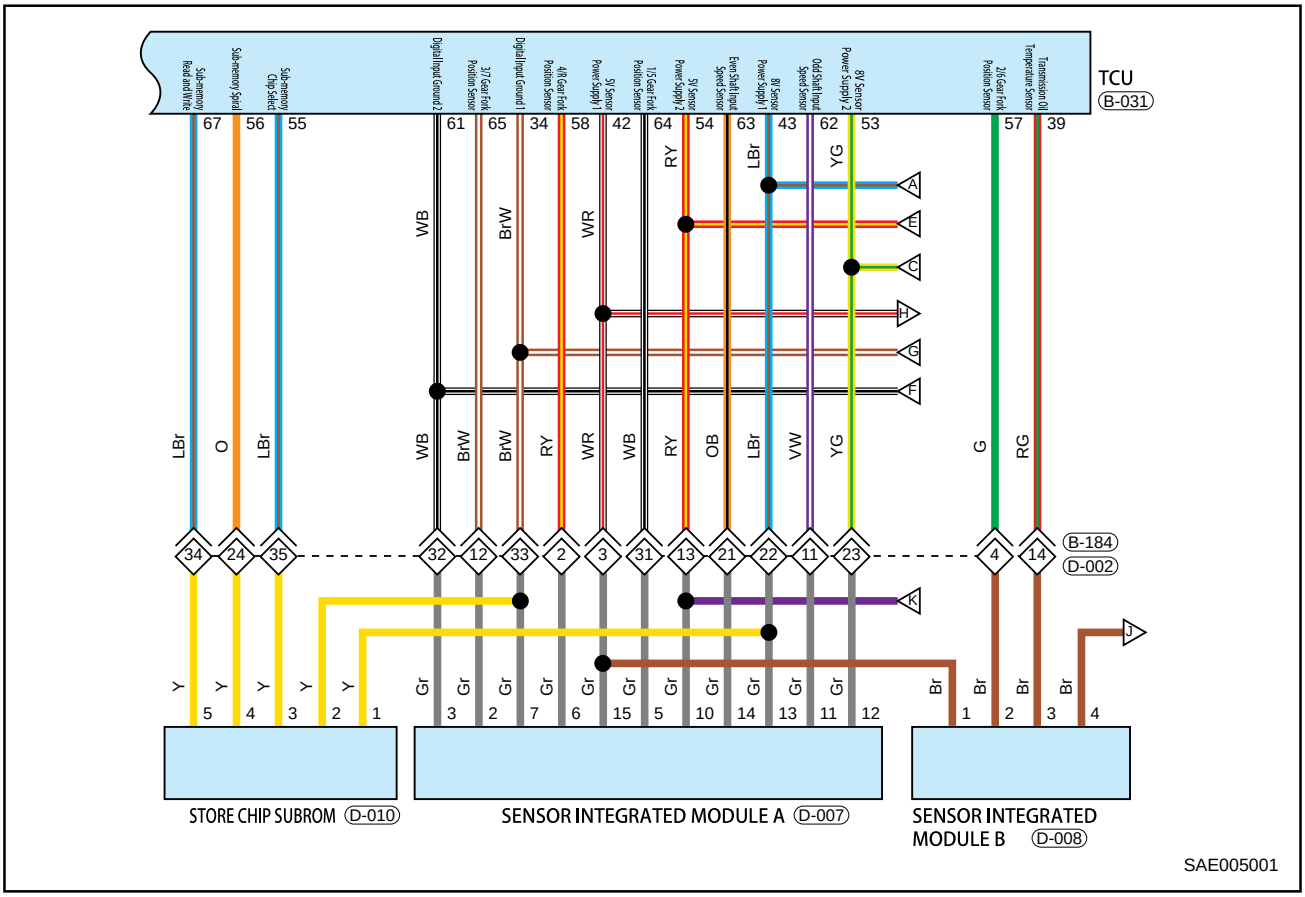
■ Transmission Control System Circuit Diagram 3



■ Transmission Control System Circuit Diagram 4



■ **Transmission Control System Circuit Diagram 5**



4 Diagnostic Information and Steps

4.1 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.2 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Check transmission control system components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.

- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.3 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.4 Matching Learning

■ Matching Learning

Hint:
Before performing matching and learning of vehicle module, be sure to carefully read the related precautions and perform the operation strictly according to standard working procedures.
For matching learning required by transmission control system (dual clutch transmission) (DCT) module under different situations, see table below:

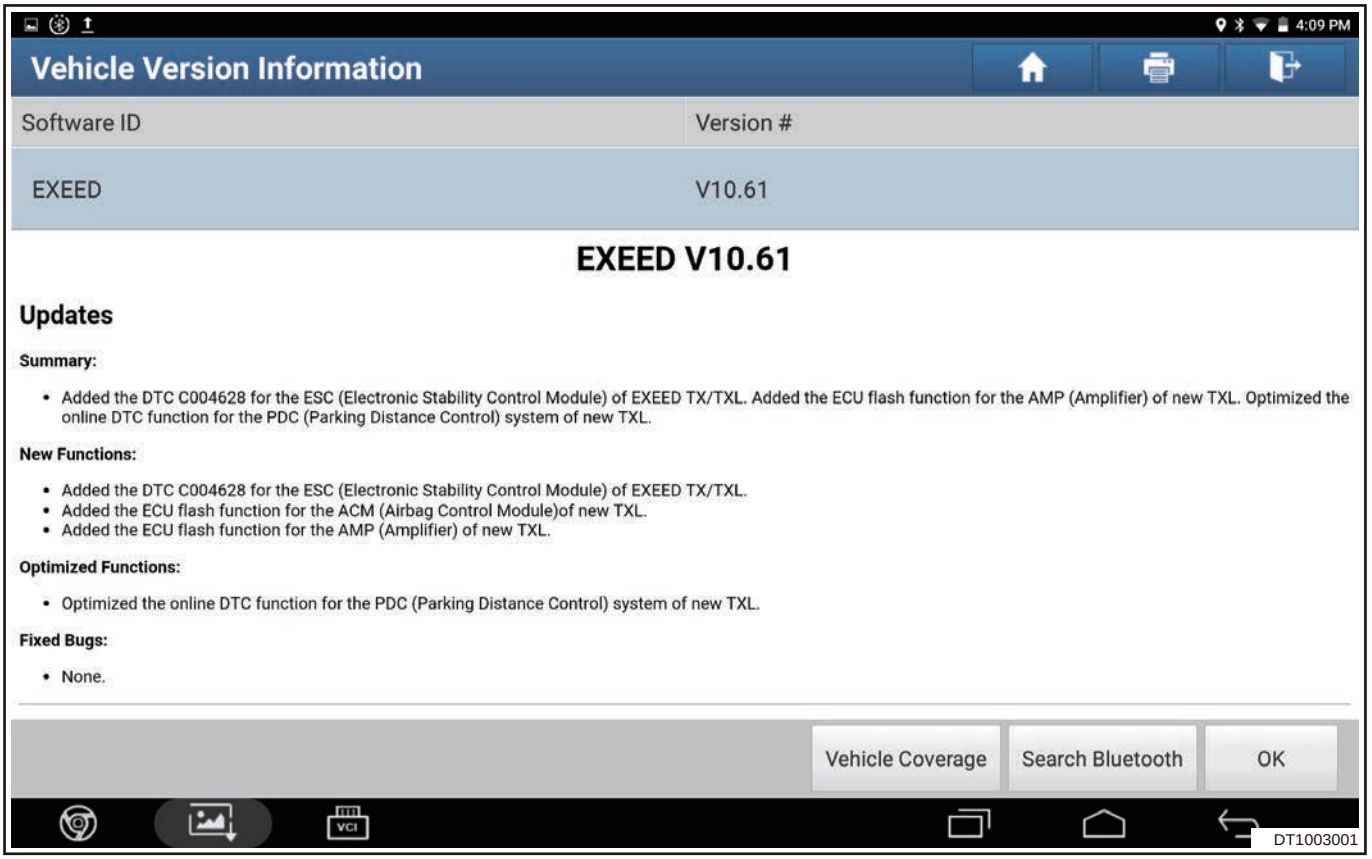
Items	Applicable Situations	Actions Required by Diagnostic Tester	Note
Module replacement	• Module damage • Module failure	Memory reset	If the provided spare parts are naked spare part (-without basic program data), perform software upgrading after VIN code is written
		Read transmission stored data	
		Write VIN code	
Software upgrading	• Low software version • Software error	Controller software refreshing	Refresh data can be requested from EXEED after-sales service department
Calibration	/	/	/
Write VIN code	Replace module	Write VIN code	/
Read transmission stored data	• Transmission case is replaced • Transmission controller is replaced • Transmission hydraulic system is replaced	Read transmission stored data	After the data is successfully read, the vehicle needs to be powered off for 55 seconds to ensure a complete data storage
Memory reset	• Transmission case is replaced • Transmission controller is replaced • Transmission hydraulic system is replaced	Memory reset	/

Items	Applicable Situations	Actions Required by Diagnostic Tester	Note
	• Transmission clutch assembly is replaced		
Clutch solenoid valve wash	Solenoid valve stuck fault is reported	Clutch solenoid valve wash	After clutch solenoid valve is washed, if fault is still not eliminated, troubleshoot the hardware
Clutch TP point self-learning	• Transmission clutch assembly is replaced • Transmission clutch related components are replaced • Transmission hydraulic system is replaced • Fork related components are replaced	Clutch TP point self-learning	Transmission offline (EOL) related self-learning has been performed, it is unnecessary to perform self-learning if parts are not changed
Clutch TC curve self-learning		Clutch TC curve self-learning	
Fork position self-learning		Fork position self-learning	

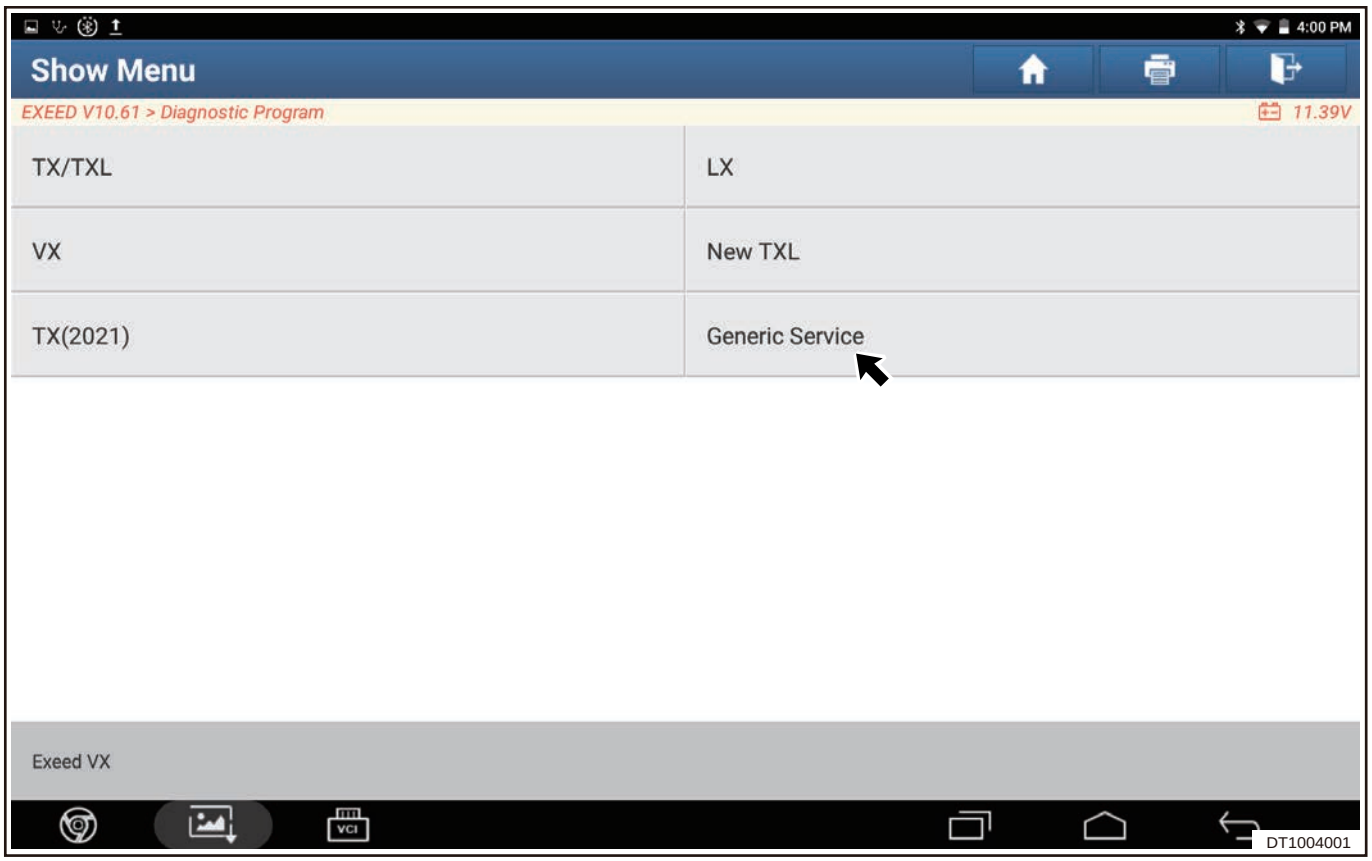
■ **Controller Software Refreshing**

(1) Use diagnostic tester to select Traditional Diagnosis.
(2) Select EXEED on diagnostic tester.

(3) Click “OK” on Vehicle Version Information screen.

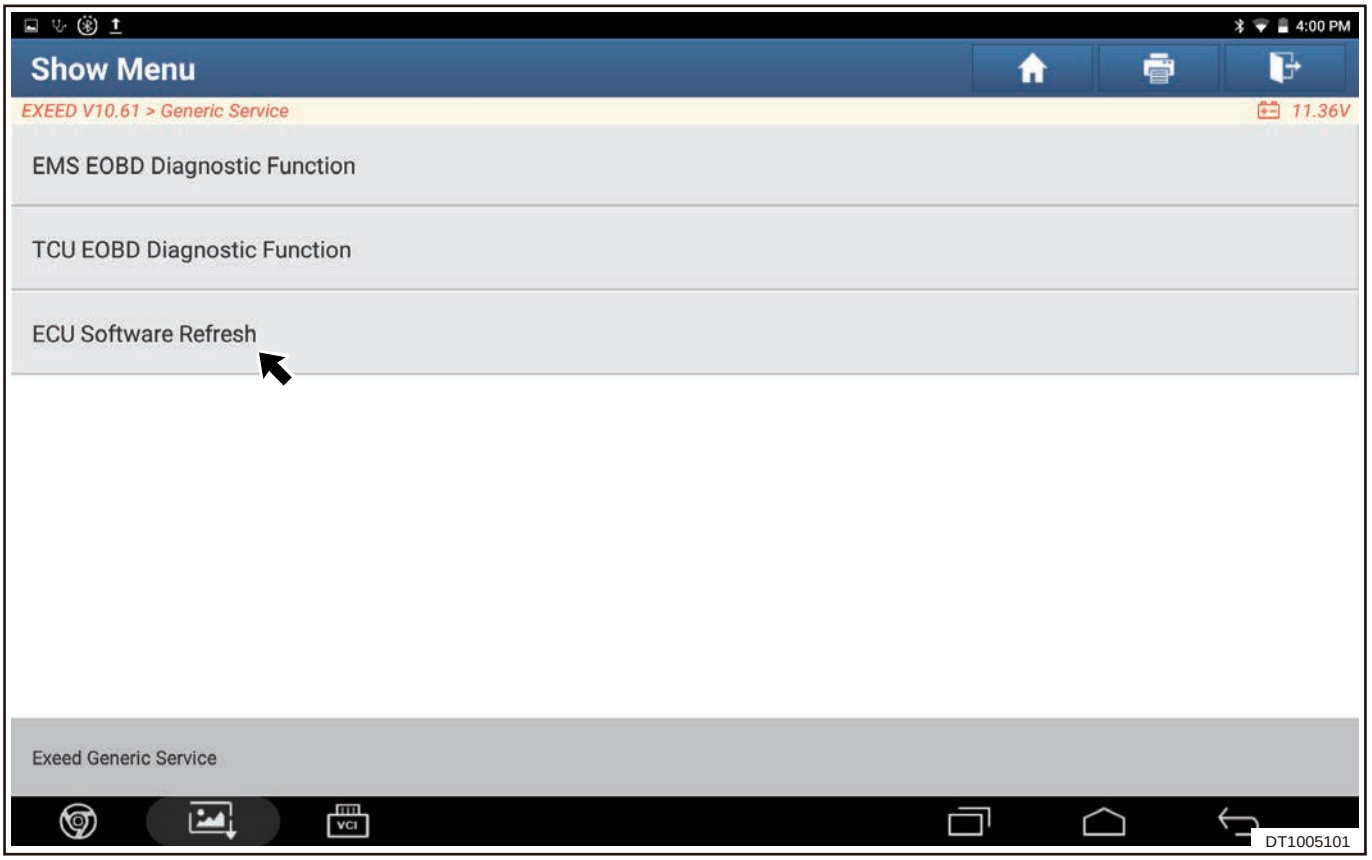


(4) Select “Generic Service” on diagnostic tester.

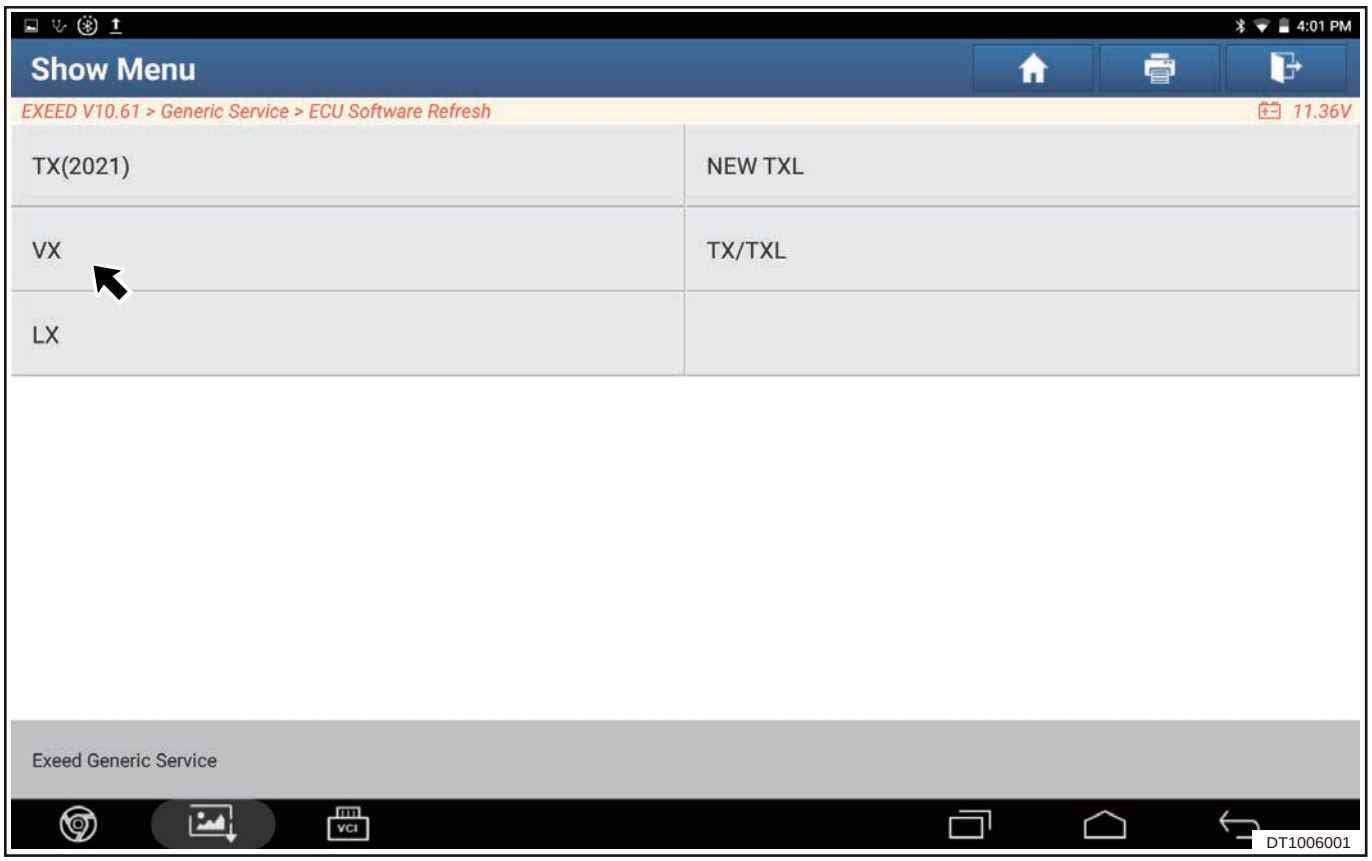


(5) Select “ECU Online Programming” on diagnostic tester.

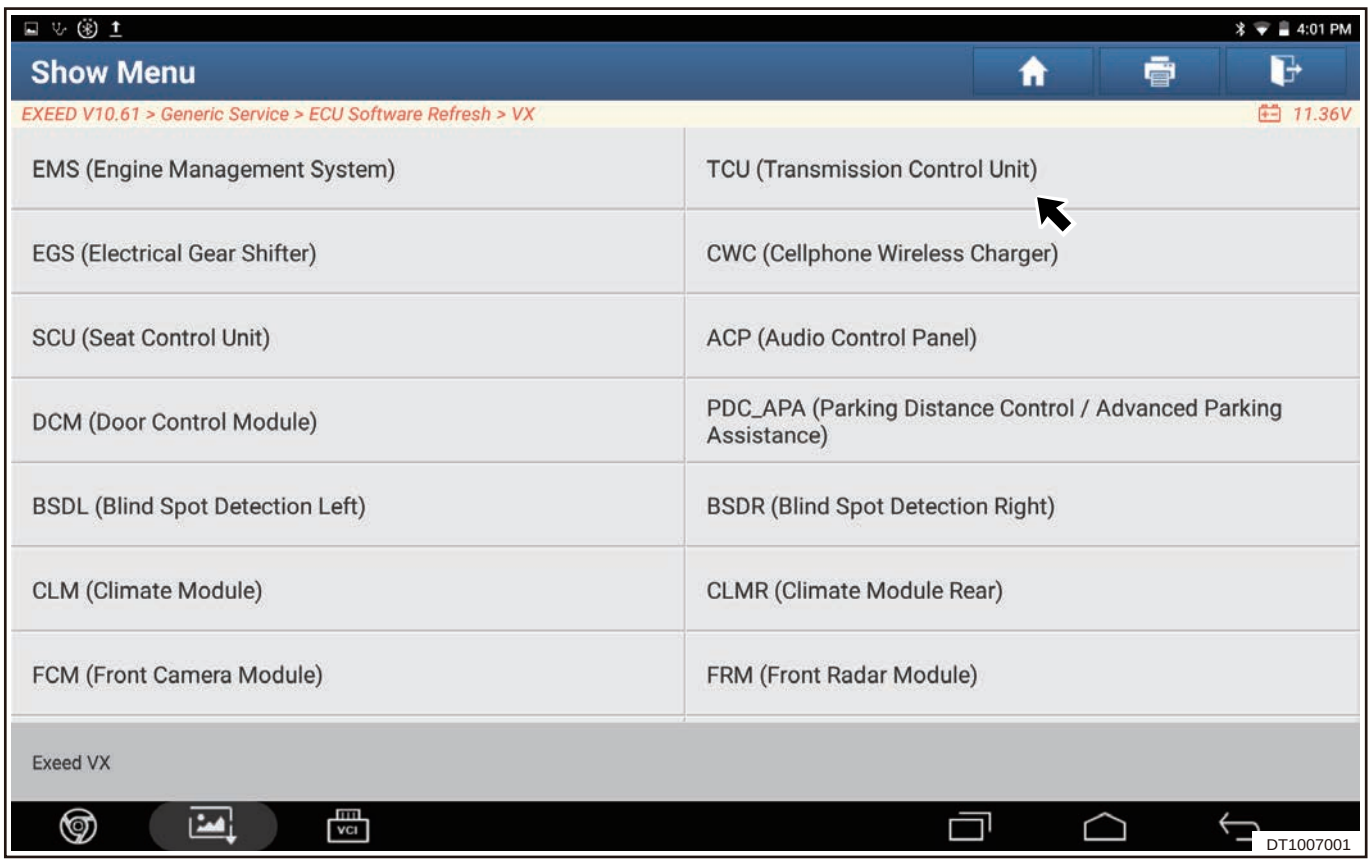
(6) Select “ECU Software Refresh” on diagnostic tester.



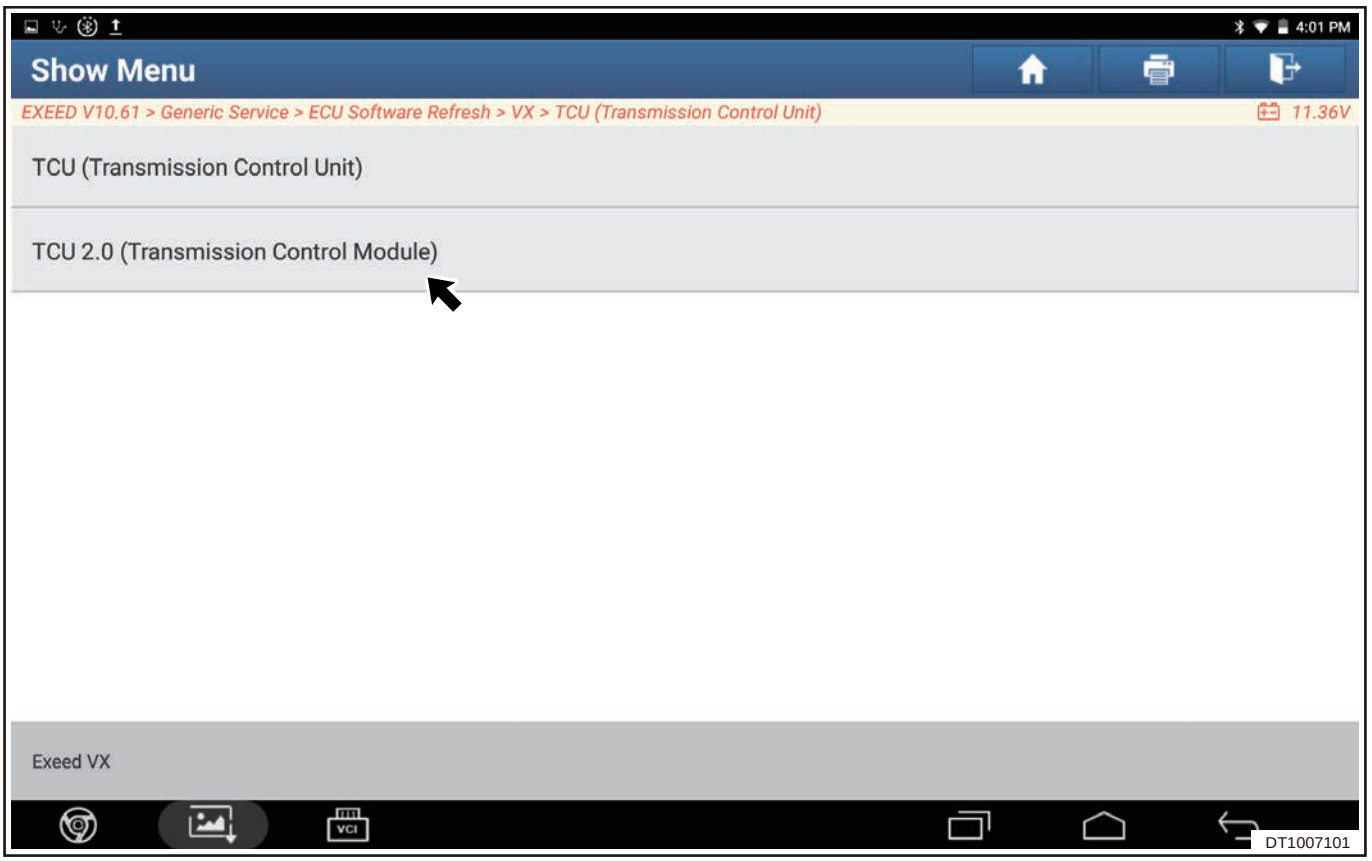
(7) Select “VX” on diagnostic tester.



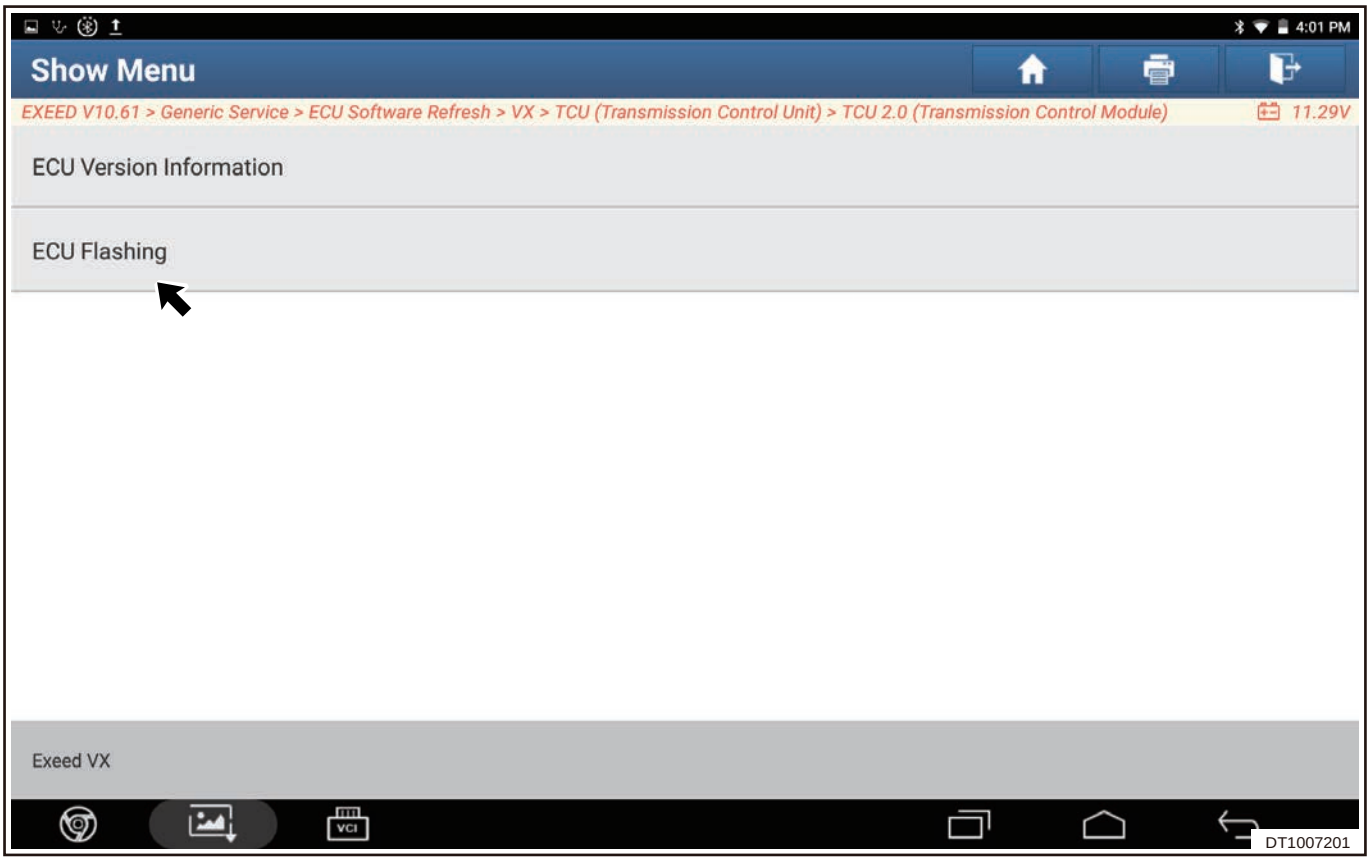
(8) Select "TCU (Transmission Control Unit)" on diagnostic tester.



(9) Select "TCU 2.0 (Transmission Control Module)" on diagnostic tester.



(10) Select “ECU Flashing” on diagnostic tester.



(11) Select “OK” on diagnostic tester.

(12) Select “Select Refresh File in Order” on diagnostic tester.

(13) Select “Start Refreshing” on diagnostic tester.

⚠ Caution

- **The picture is for reference only. The selection order of TCU writing package is subject to the latest writing package released by the manufacturer.**

(14) “Please wait” is displayed on diagnostic tester interface.

⚠ Warning

- **Power should not be cut during writing.**

(15) “Writing is successful” is displayed on diagnostic tester interface.

(16) The version information must be read for confirmation after writing.

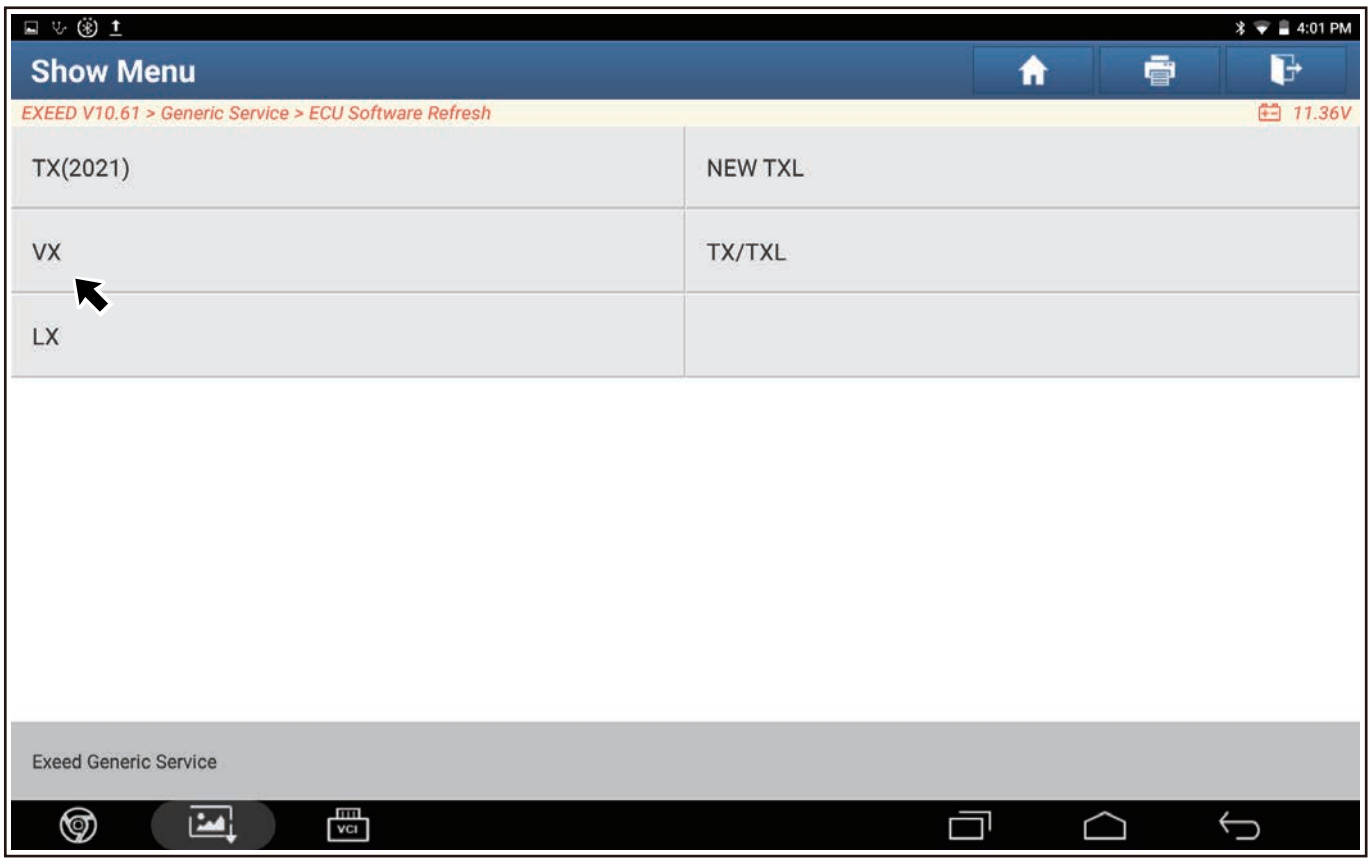
⚠ Caution

- **The picture is for reference only. Actual version number is subject to the latest writing package released by the manufacturer.**

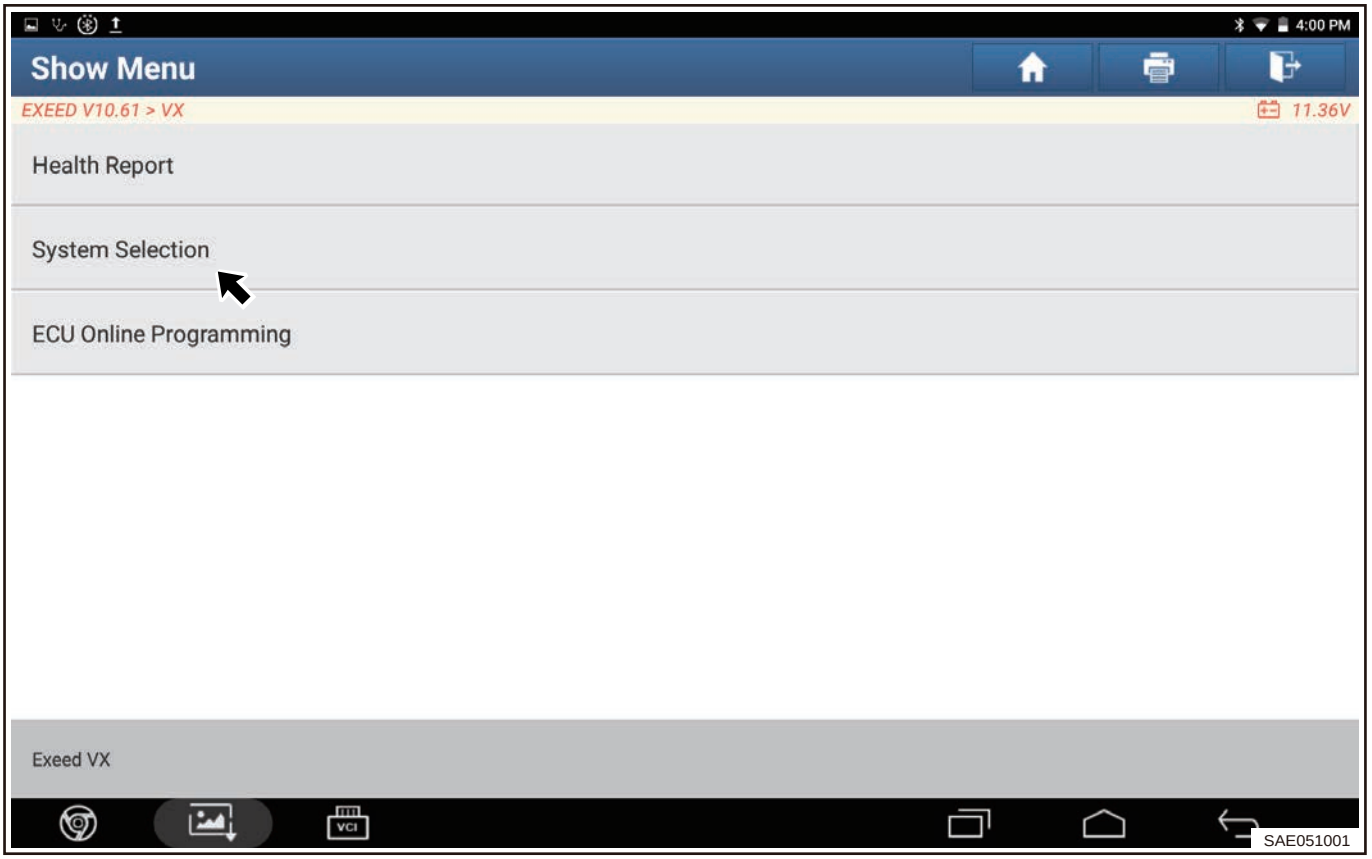
■ Writing VIN Code

(1) Connect diagnostic tester, turn ENGINE START STOP switch to ON.

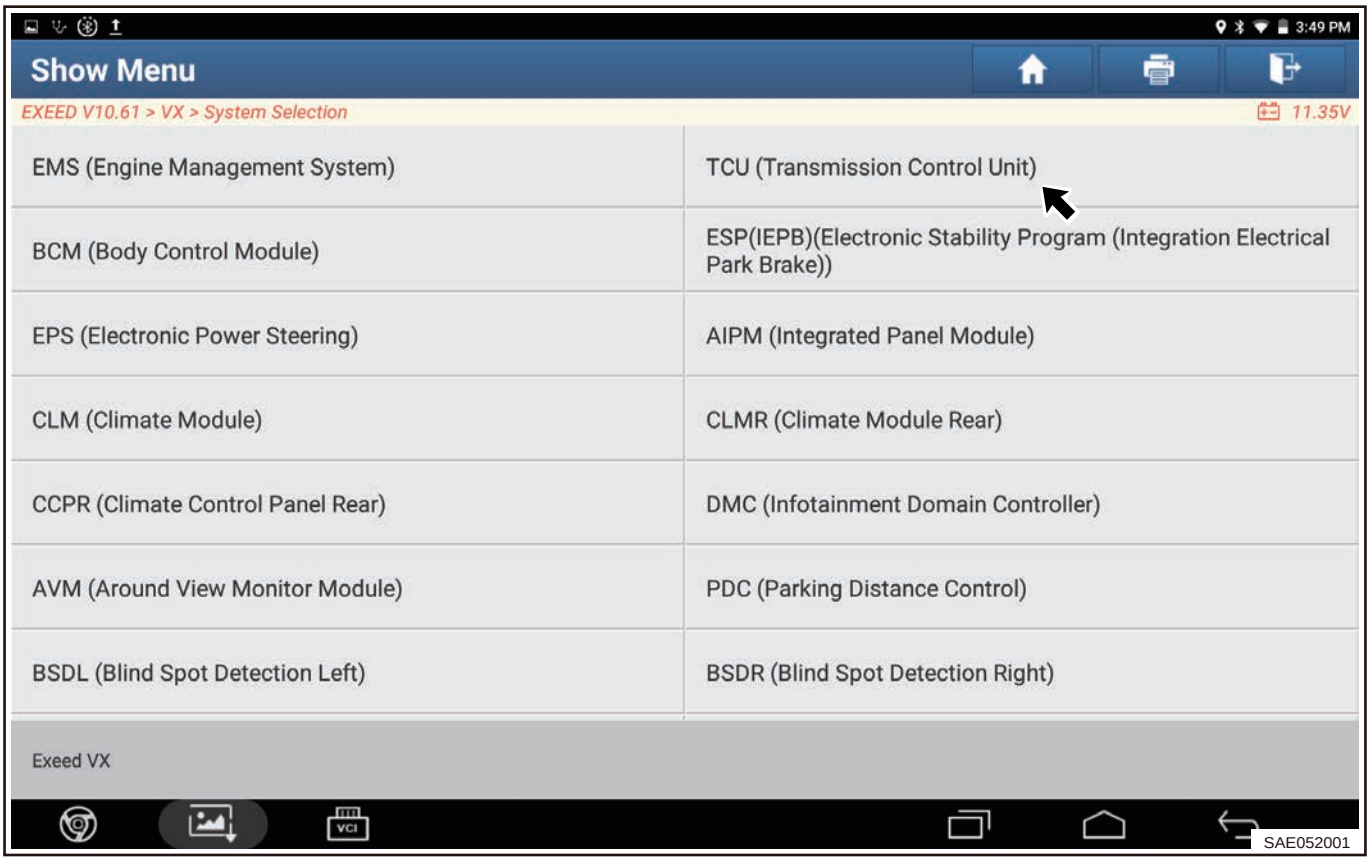
(2) Select “VX” model.



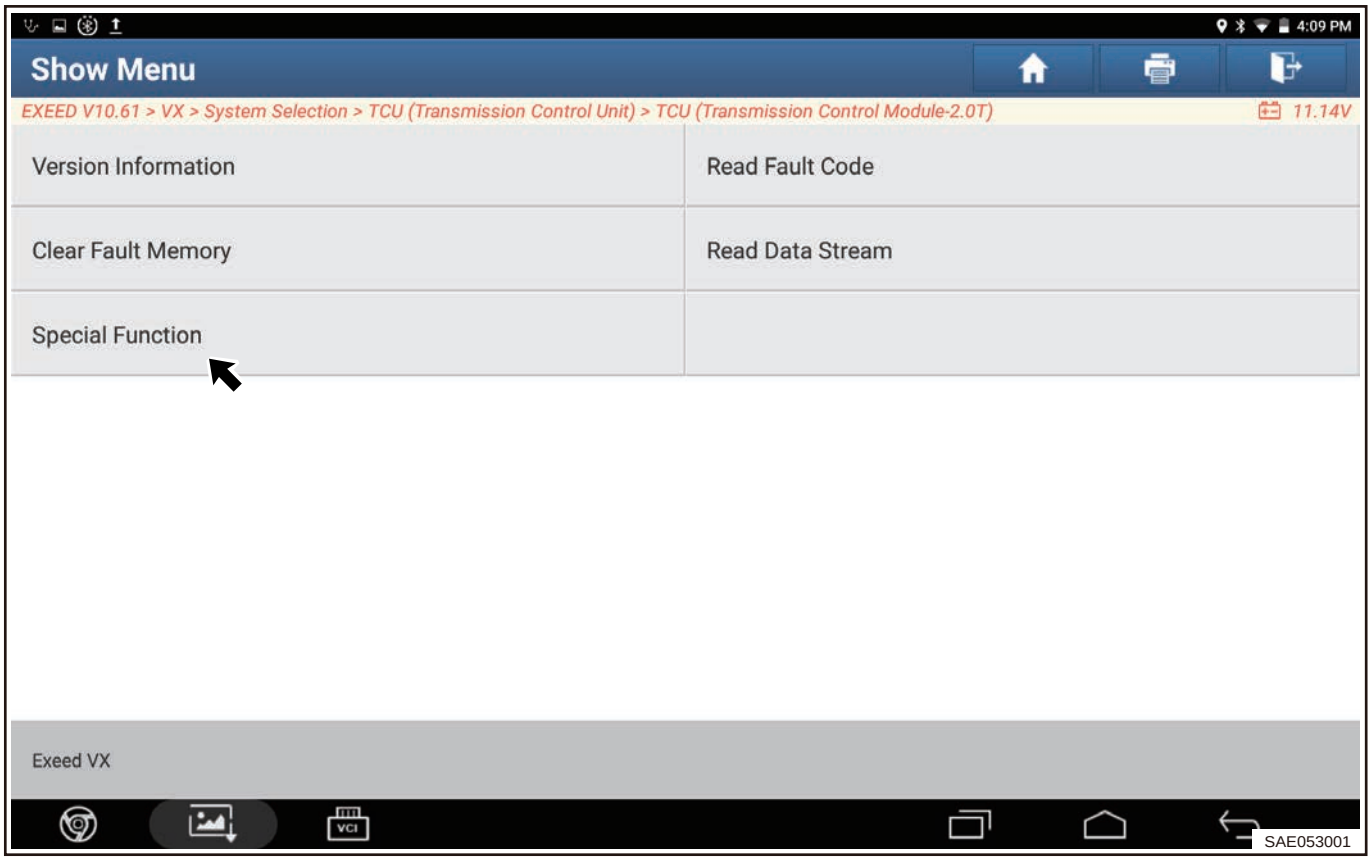
(3) Enter next screen and click “System Selection”.



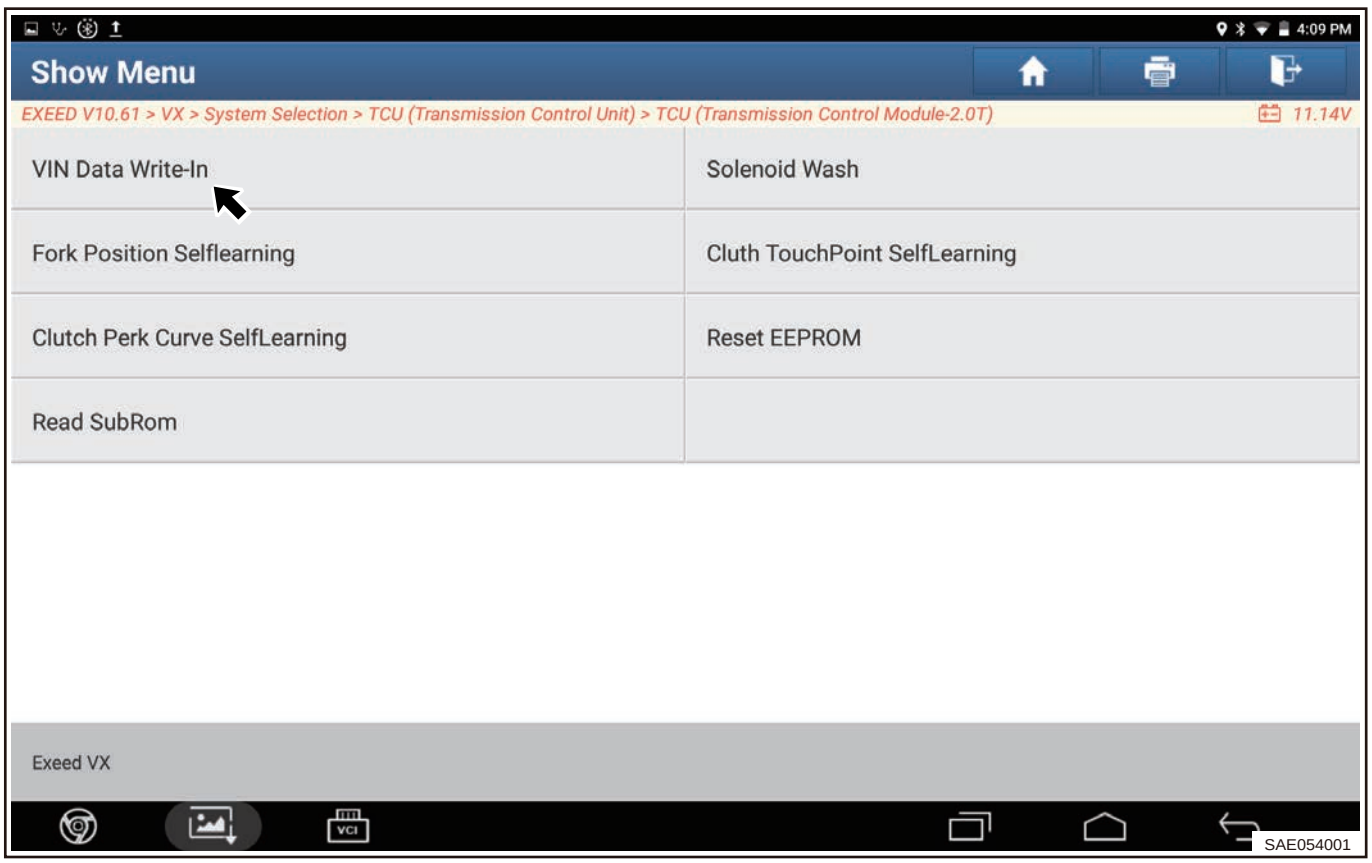
(4) Enter next screen and click “TCU (Transmission Control Unit)”.



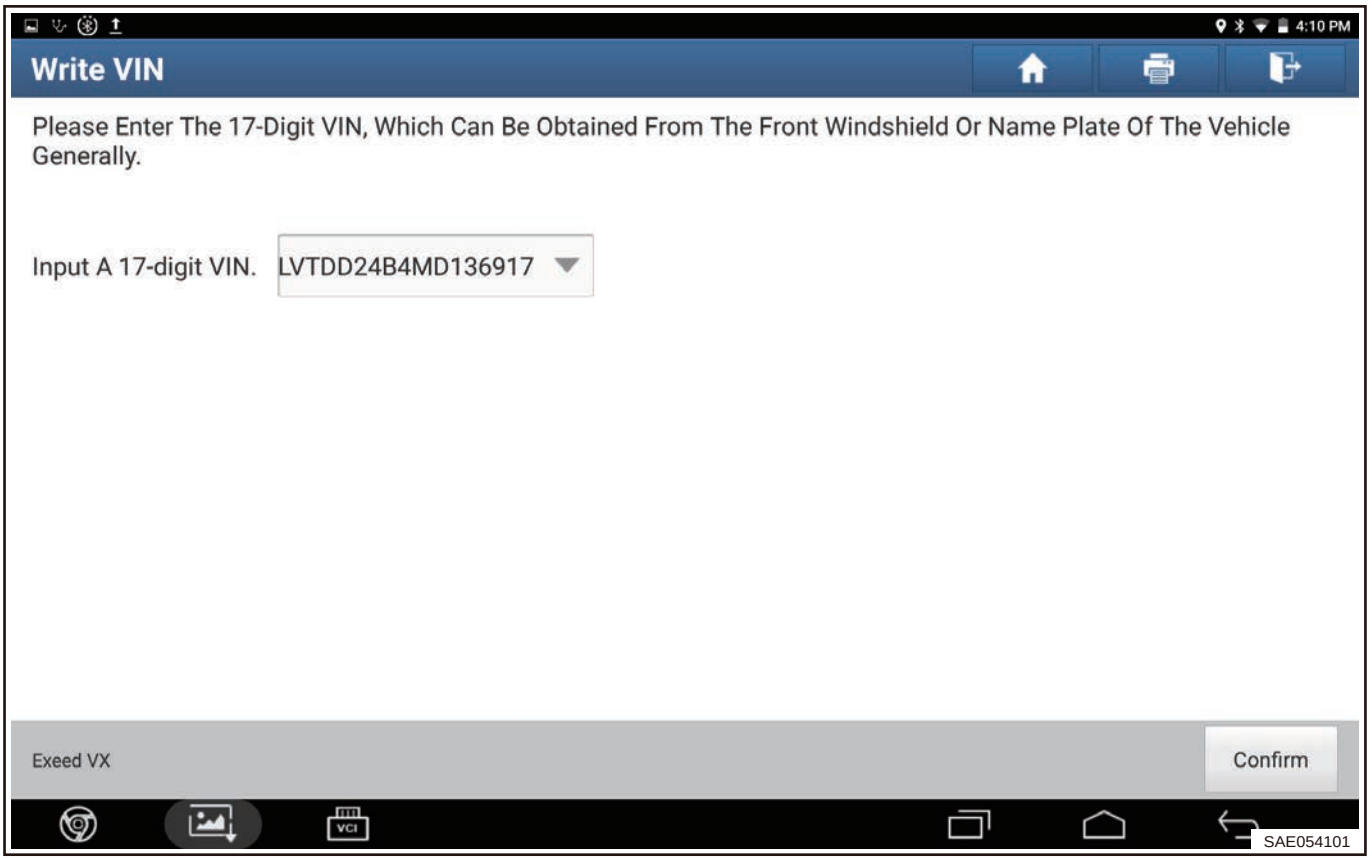
(5) Enter next screen and click “Special Function”.



(6) Enter next screen and click “VIN Data Write-in”.



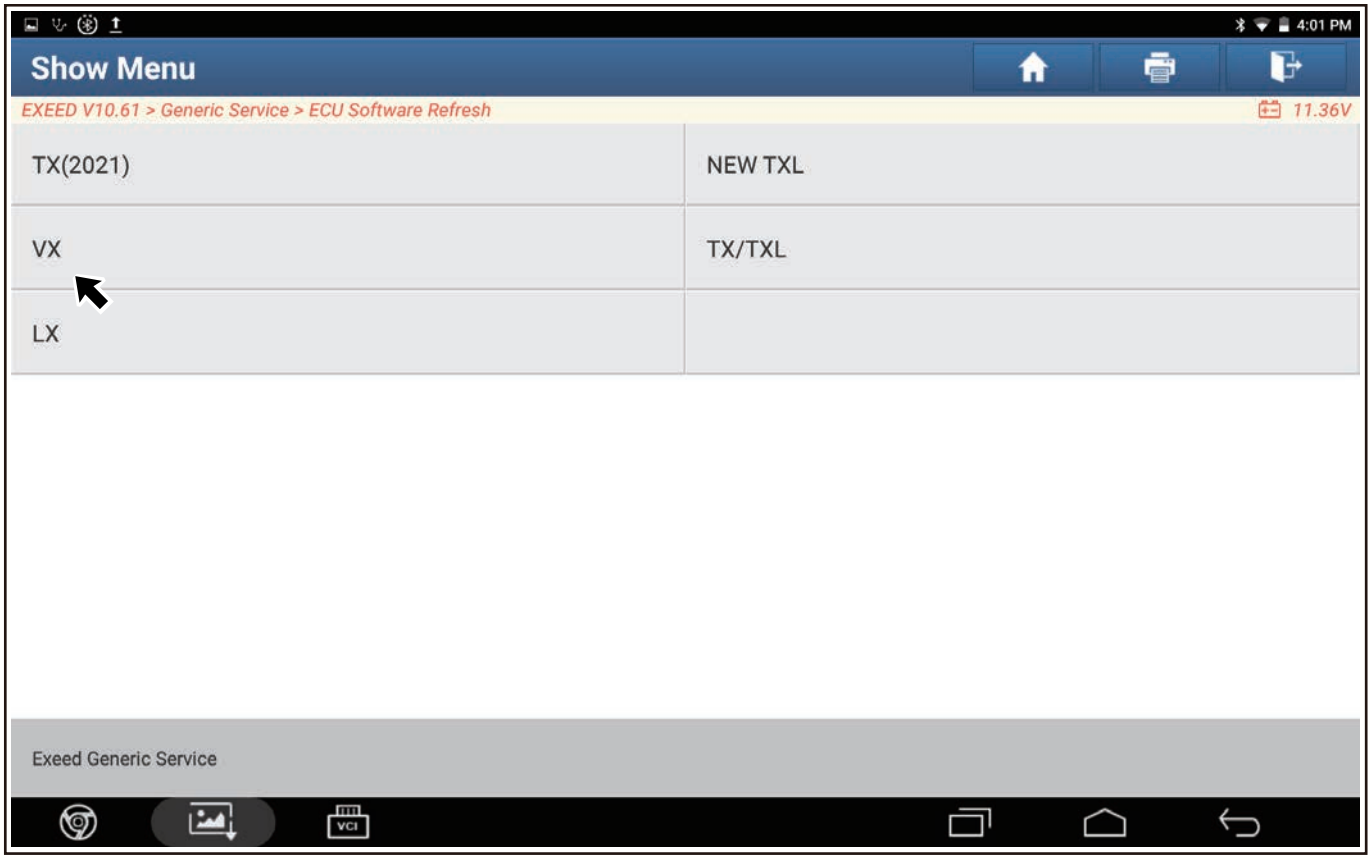
(7) Input a 17-digit VIN code.



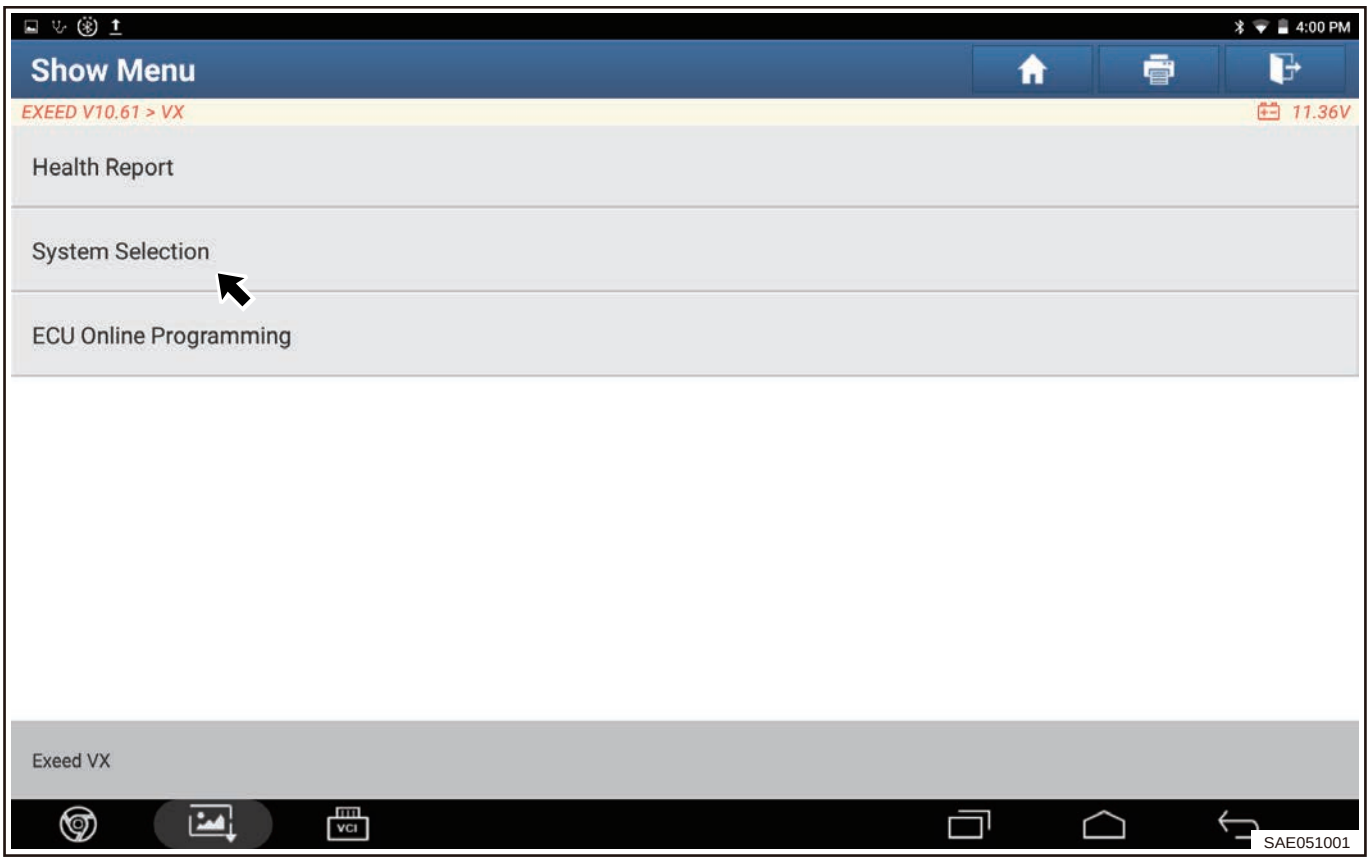
■ **Fork Position Self-learning**

(1) Connect diagnostic tester, turn ENGINE START STOP switch to ON.

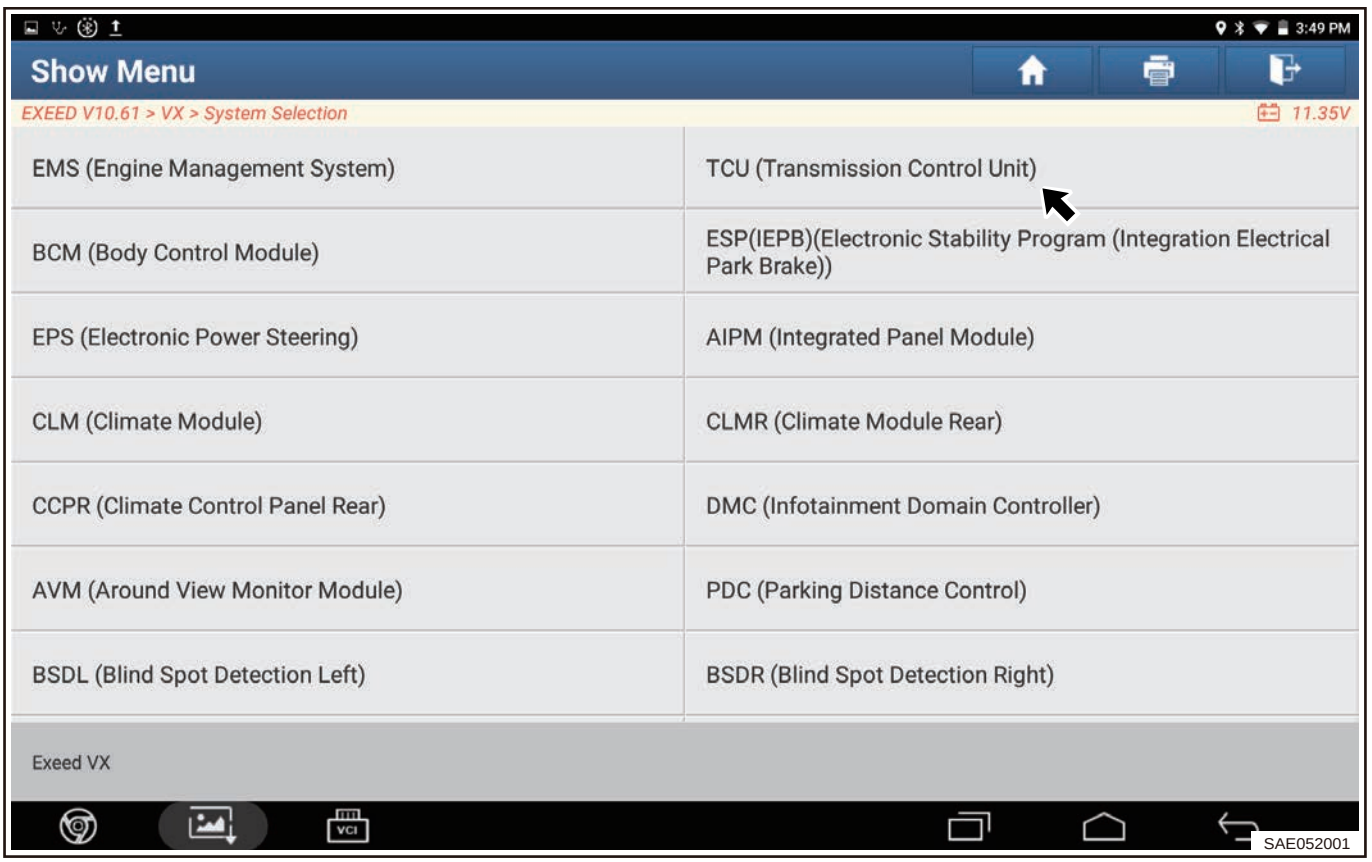
(2) Select “VX” model.



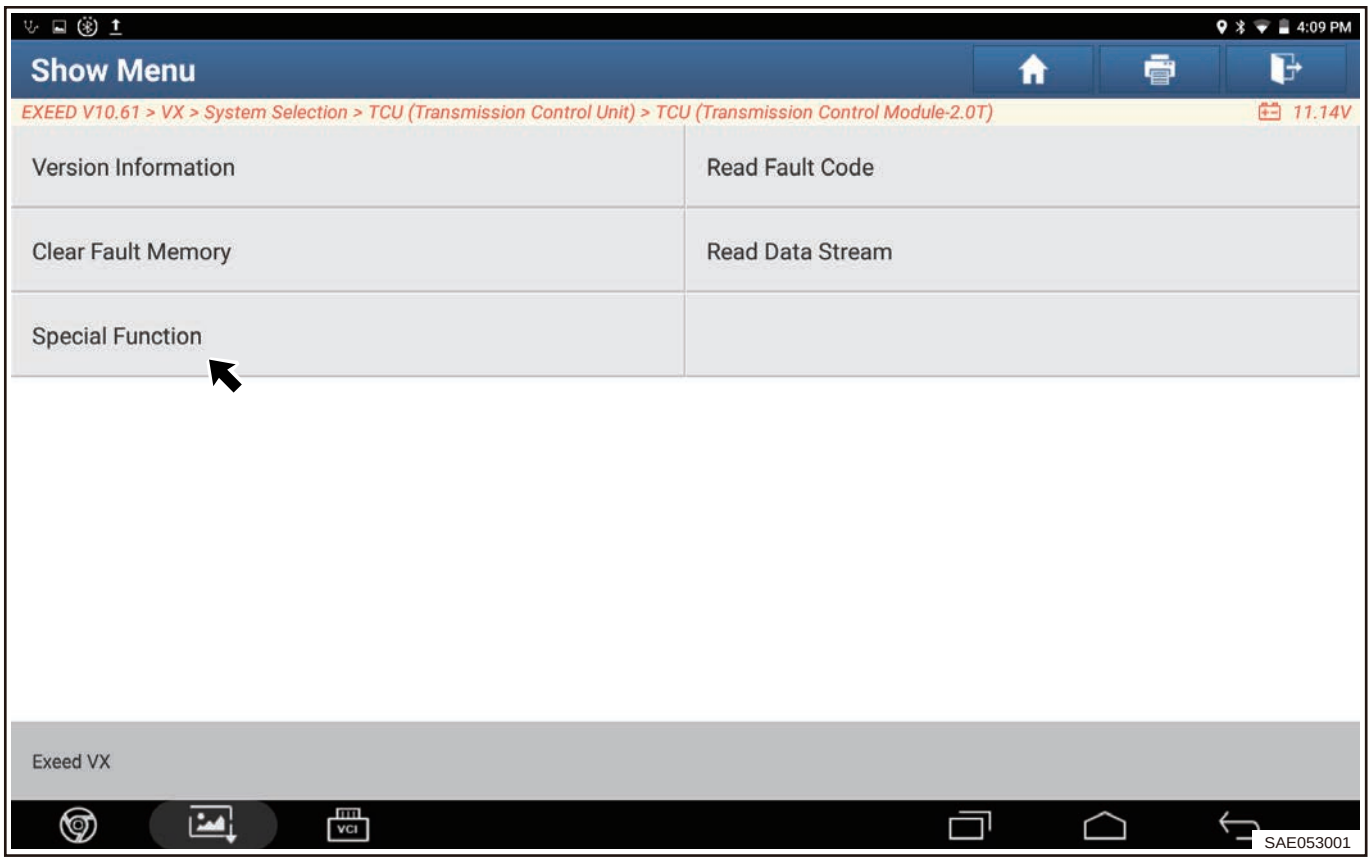
(3) Enter next screen and click “System Selection”.



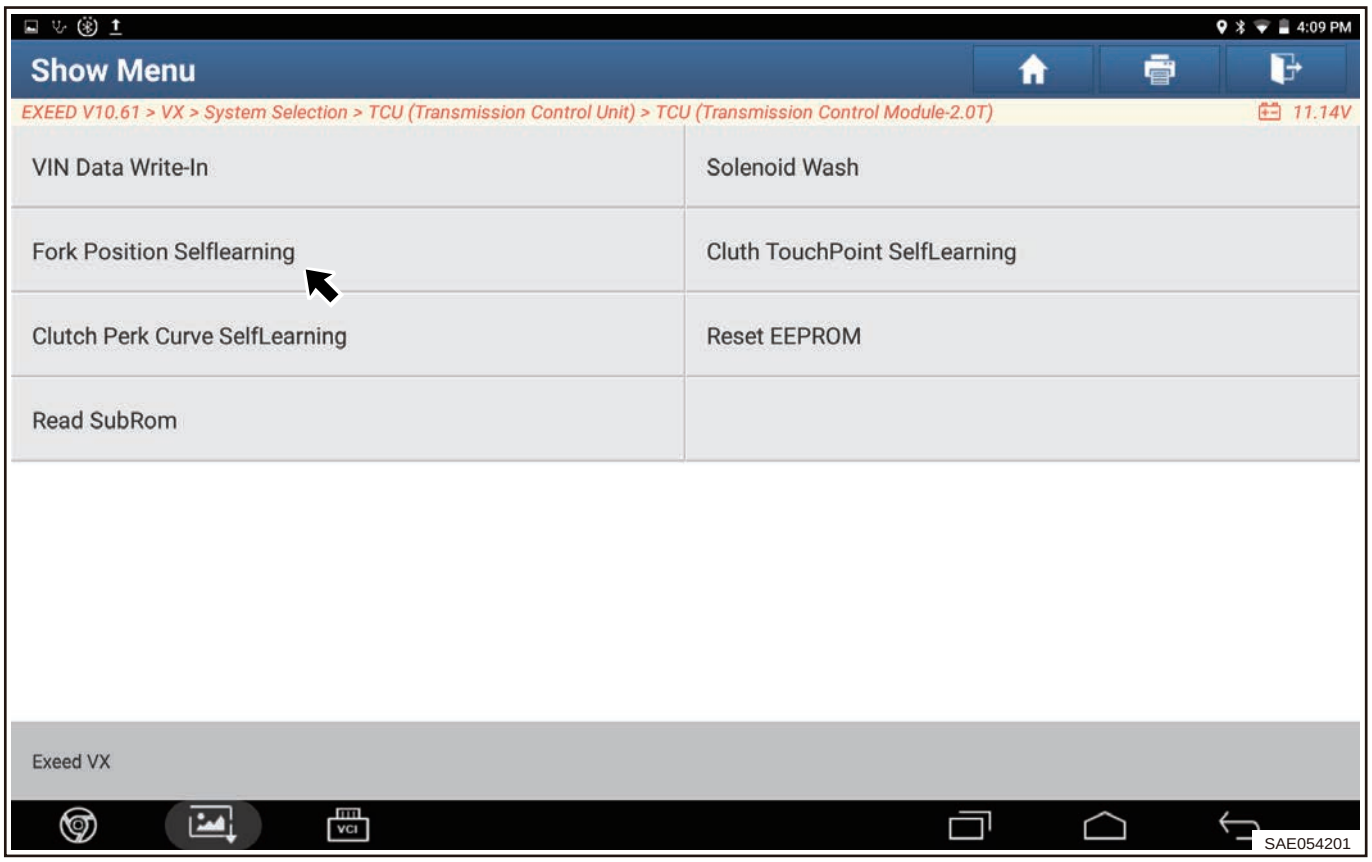
(4) Enter next screen and click “TCU (Transmission Control Unit)”.



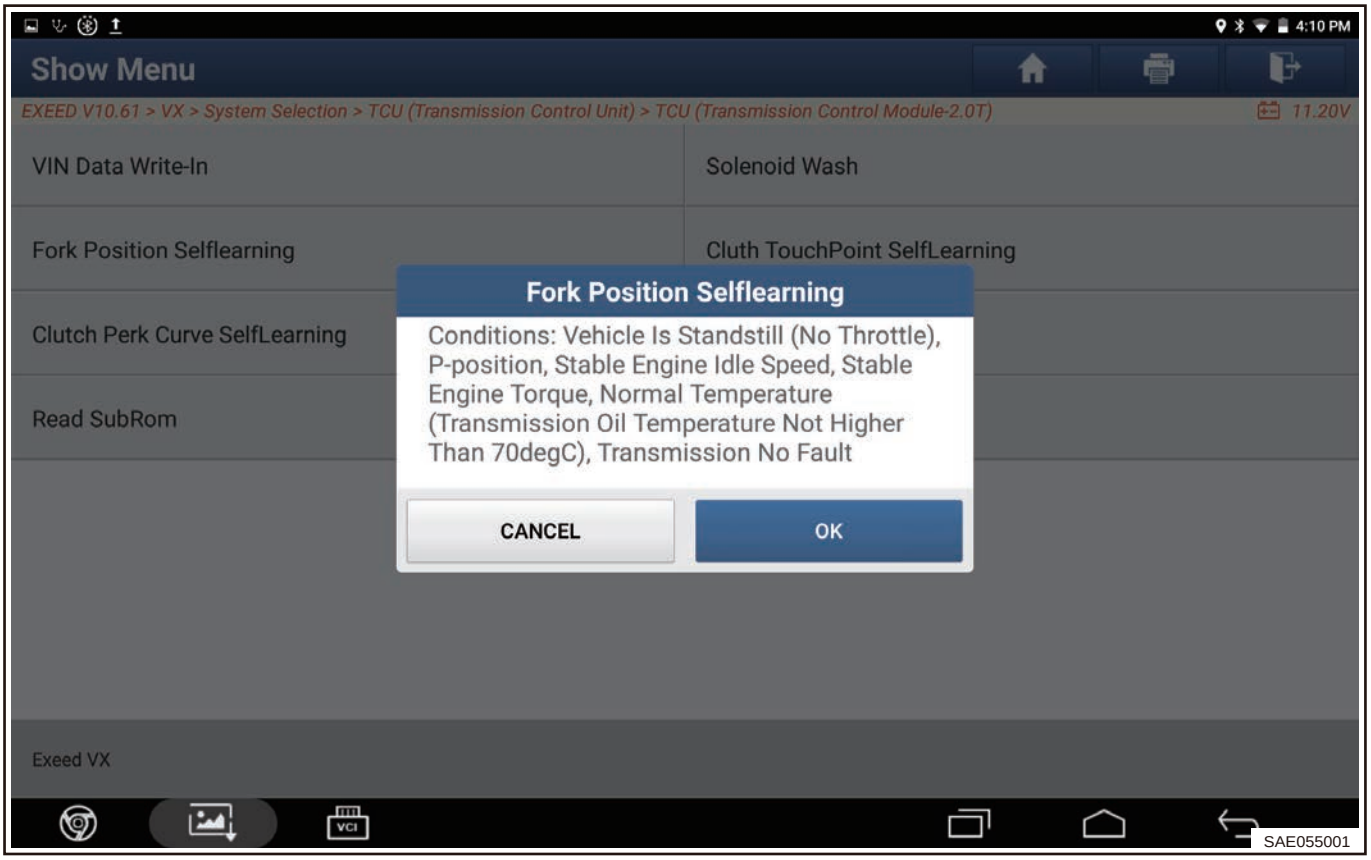
(5) Enter next screen and click “Special Function”.



(6) Enter next screen and click “Fork Position Selflearning”.



(7) Learn the conditions.

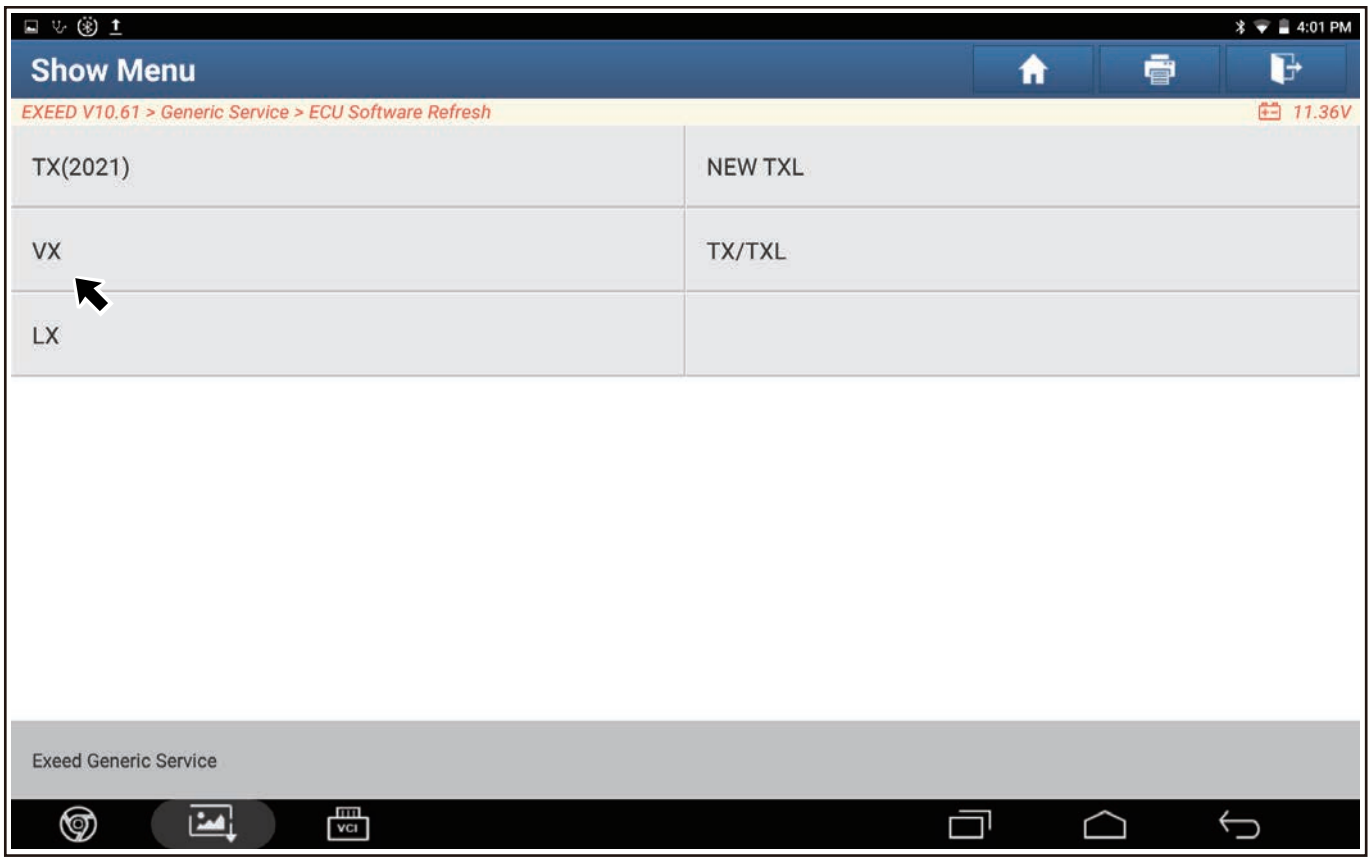


(8) Click “OK” to perform fork position self-learning.

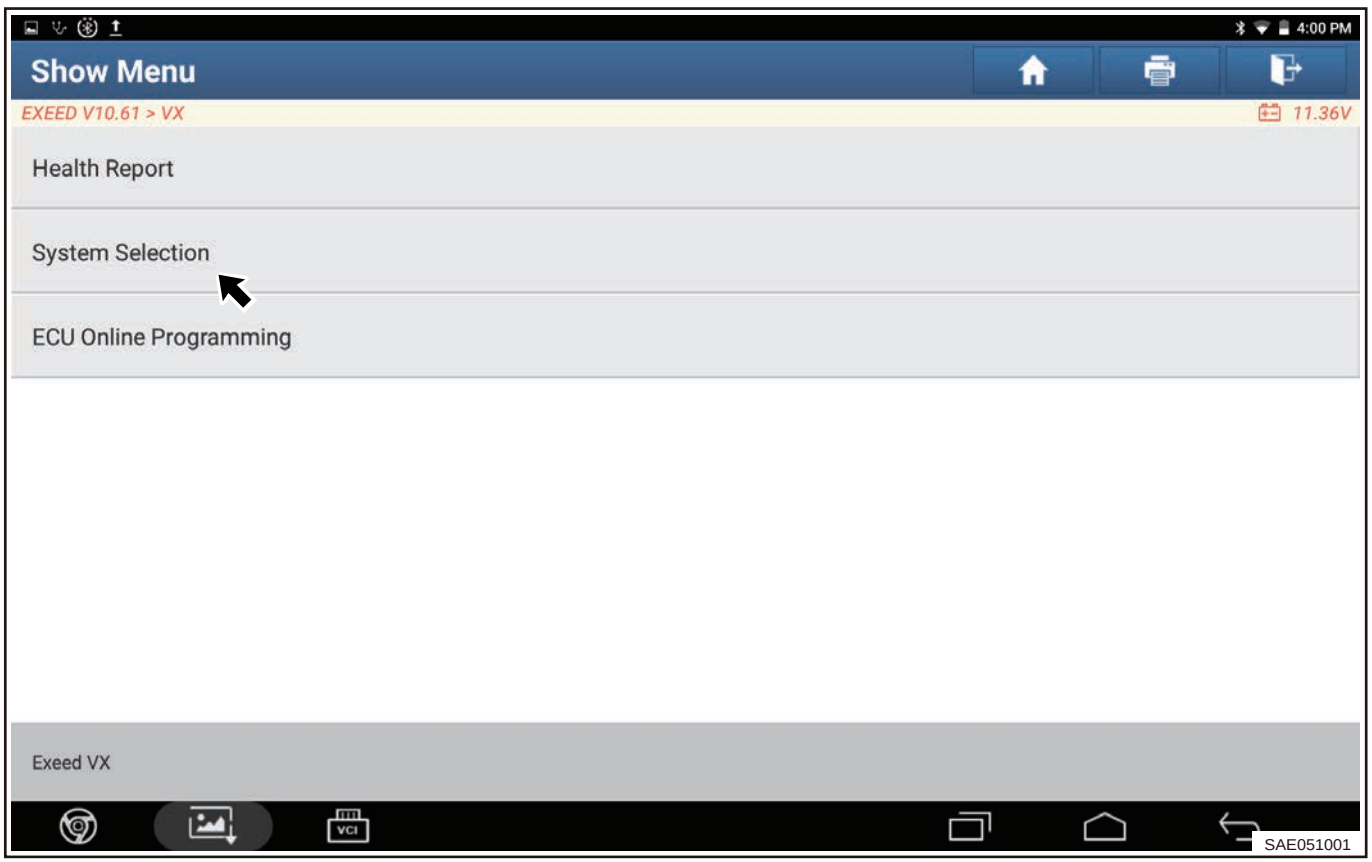
■ Clutch PC Curve Self-learning

(1) Connect diagnostic tester, turn ENGINE START STOP switch to ON.

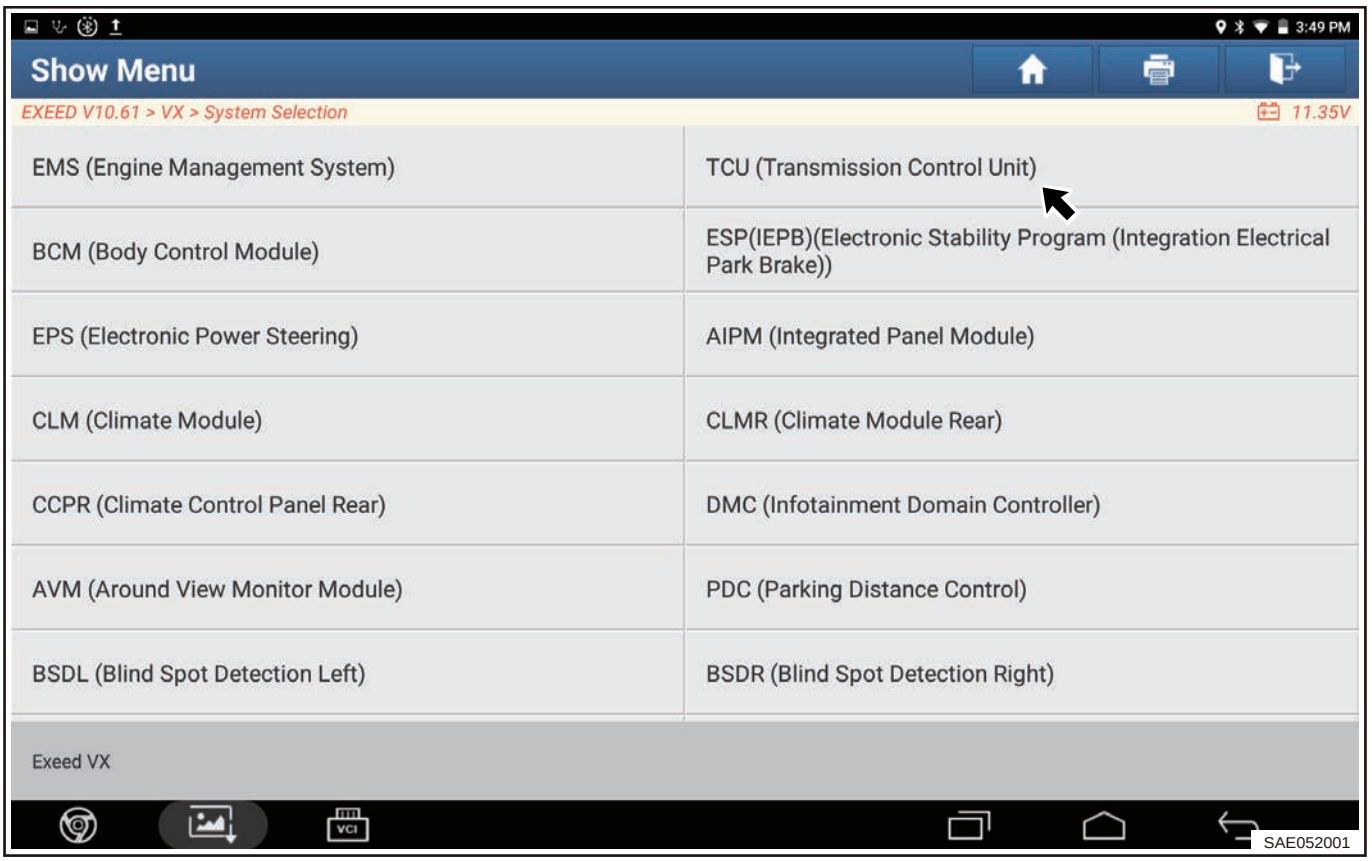
(2) Select “VX” model.



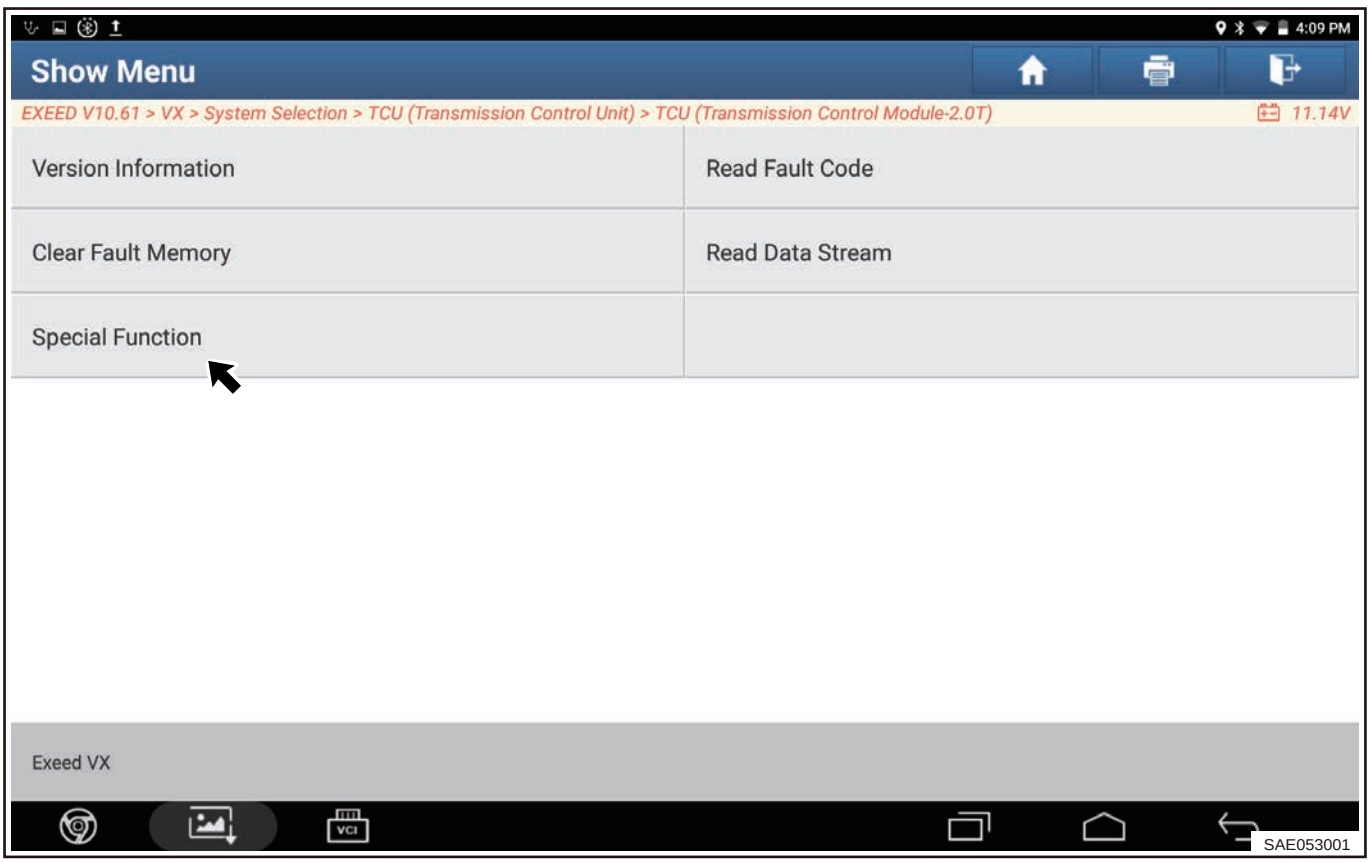
(3) Enter next screen and click “System Selection”.



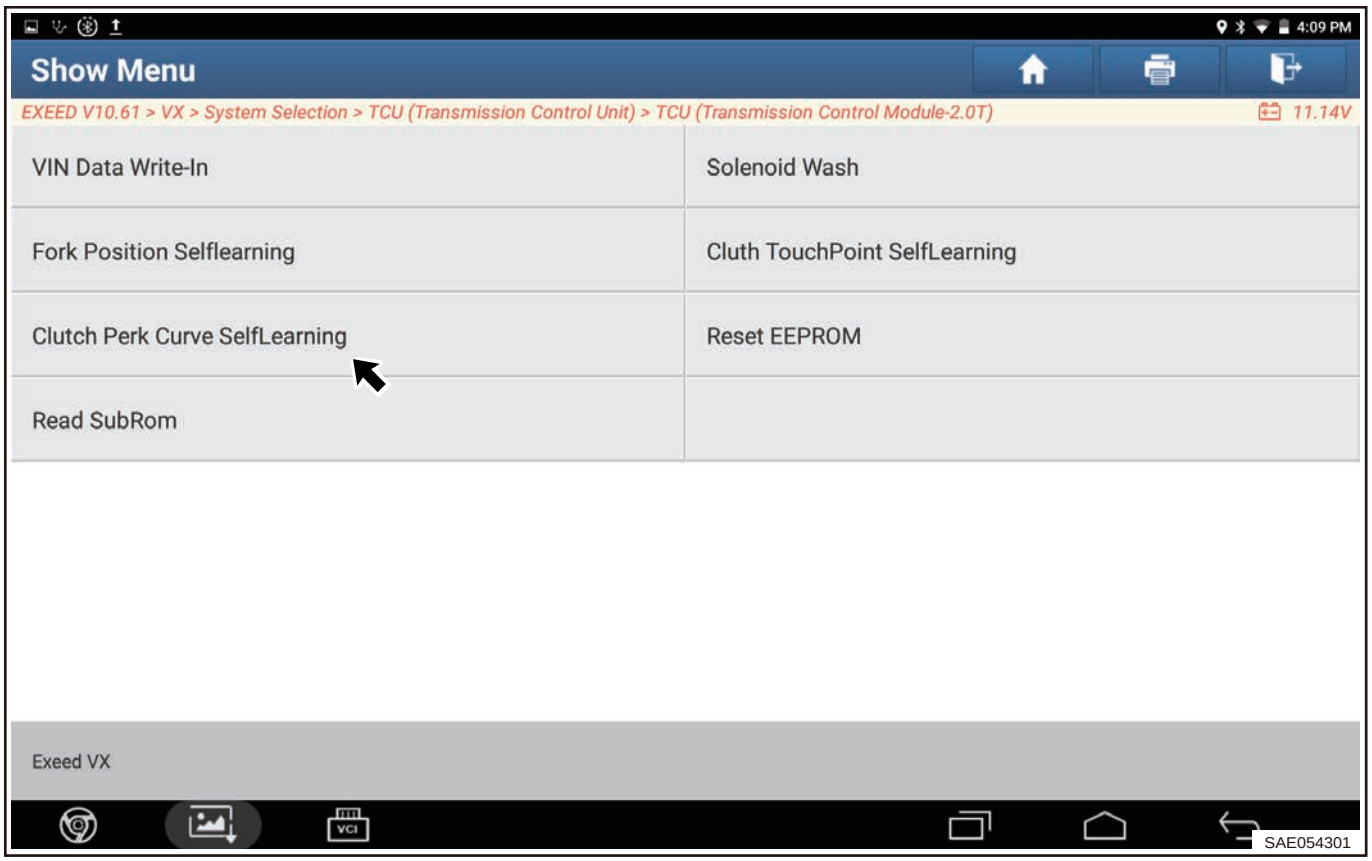
(4) Enter next screen and click “TCU (Transmission Control Unit)”.



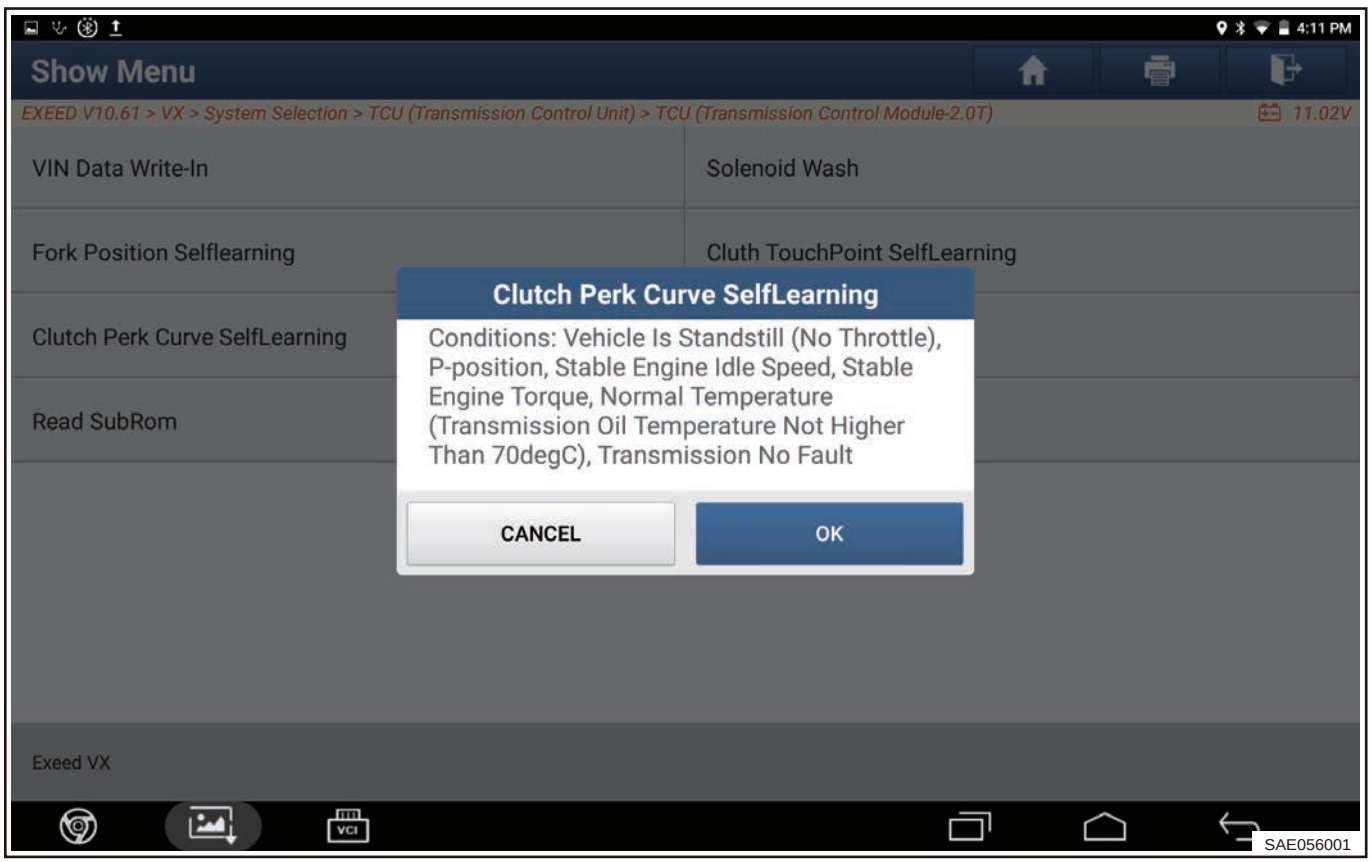
(5) Enter next screen and click “Special Function”.



(6) Enter next screen and click “Clutch Perk Curve SelfLearning”.



(7) Learn the conditions.



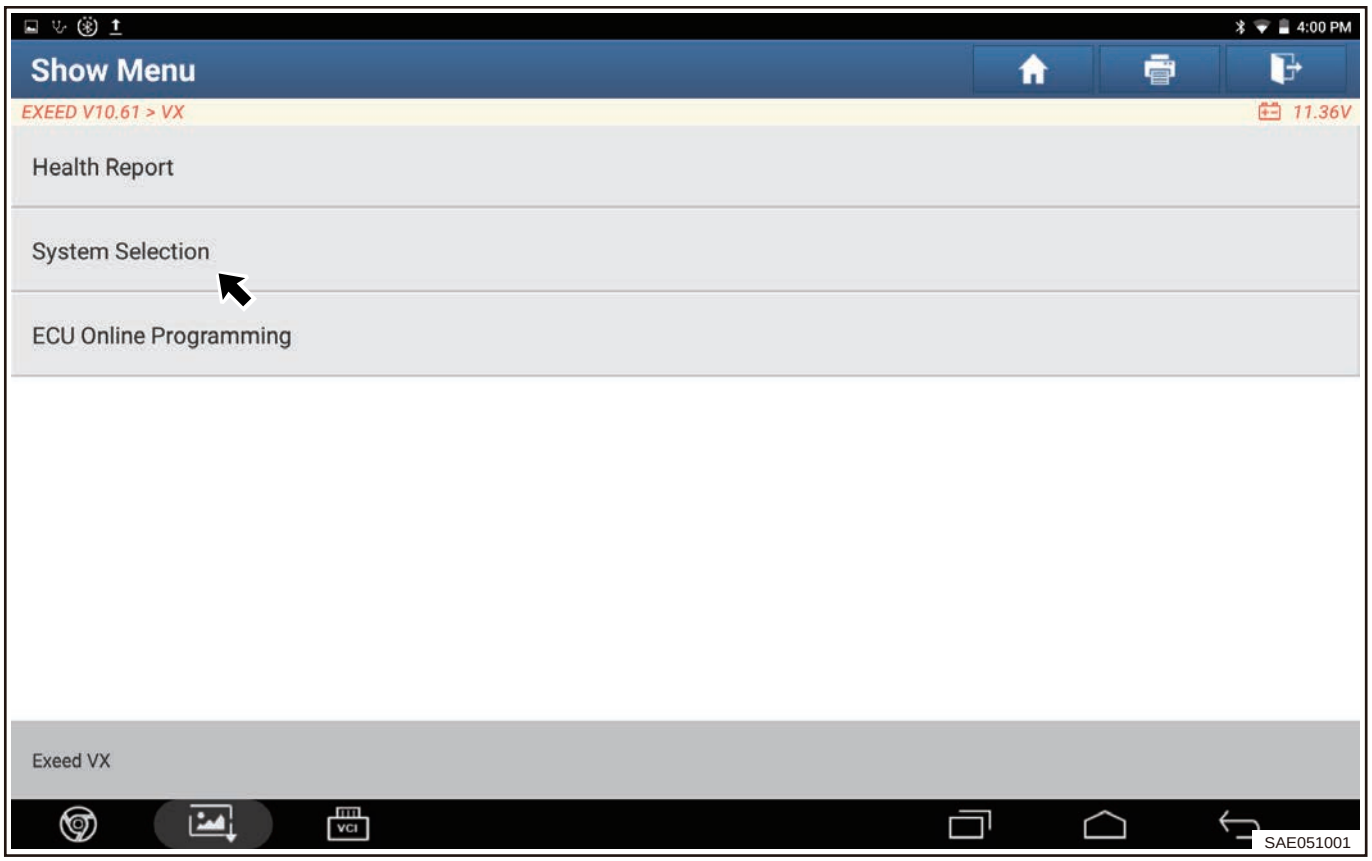
(8) Click “OK” to perform clutch PC curve self-learning.

■ **Clutch TP Point Self-learning**

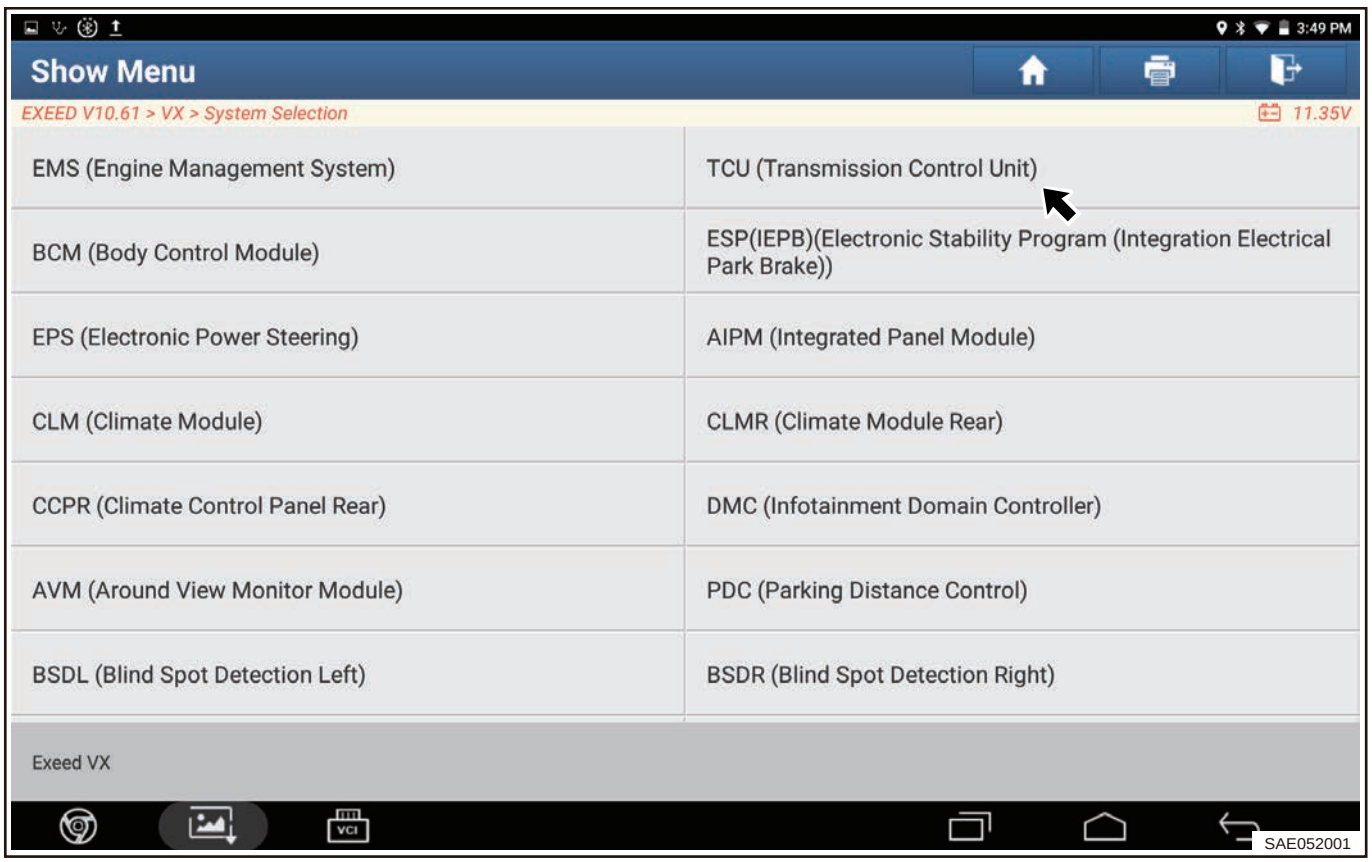
(1) Connect diagnostic tester, turn ENGINE START STOP switch to ON.

(2) Select “VX” model.

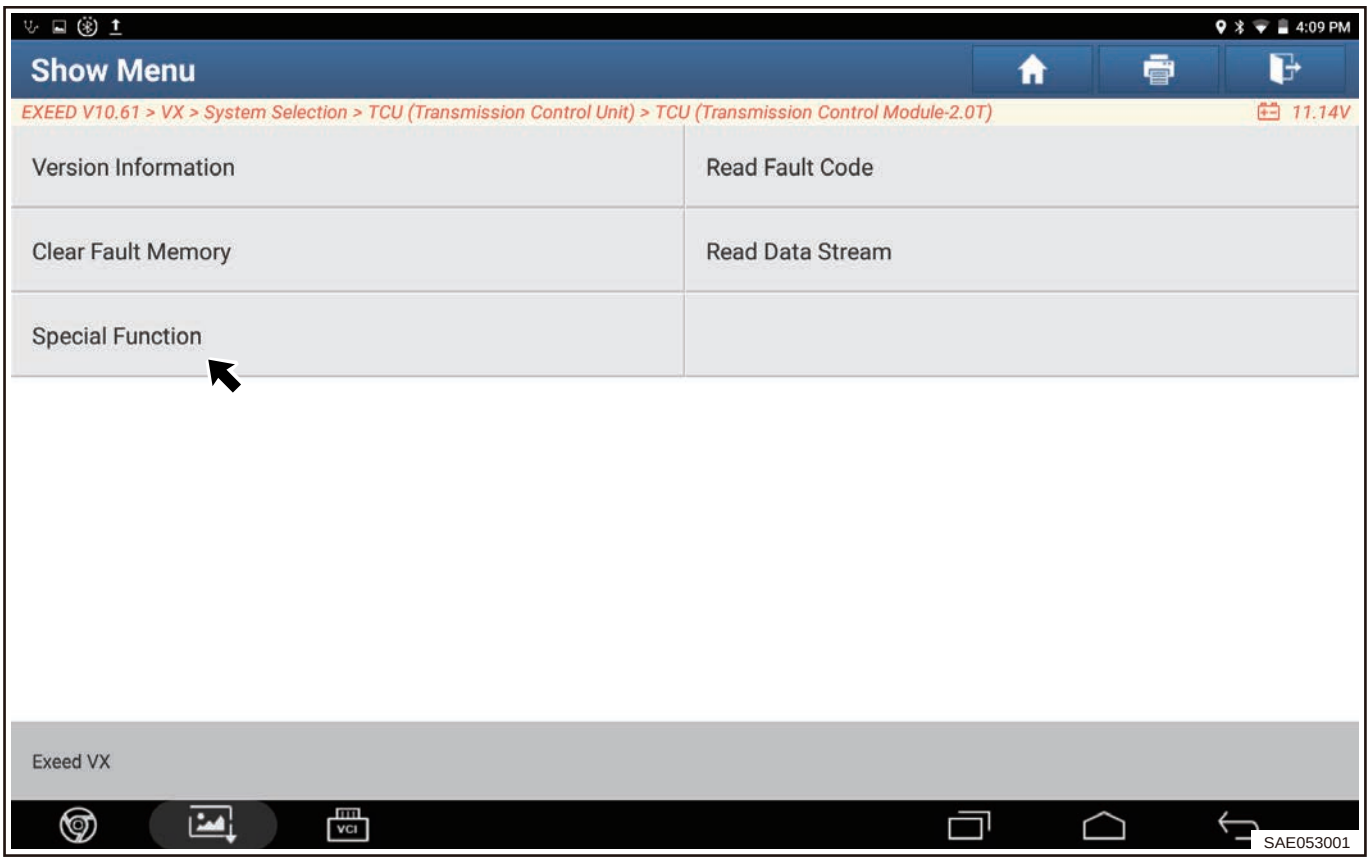
(3) Enter next screen and click “System Selection”.



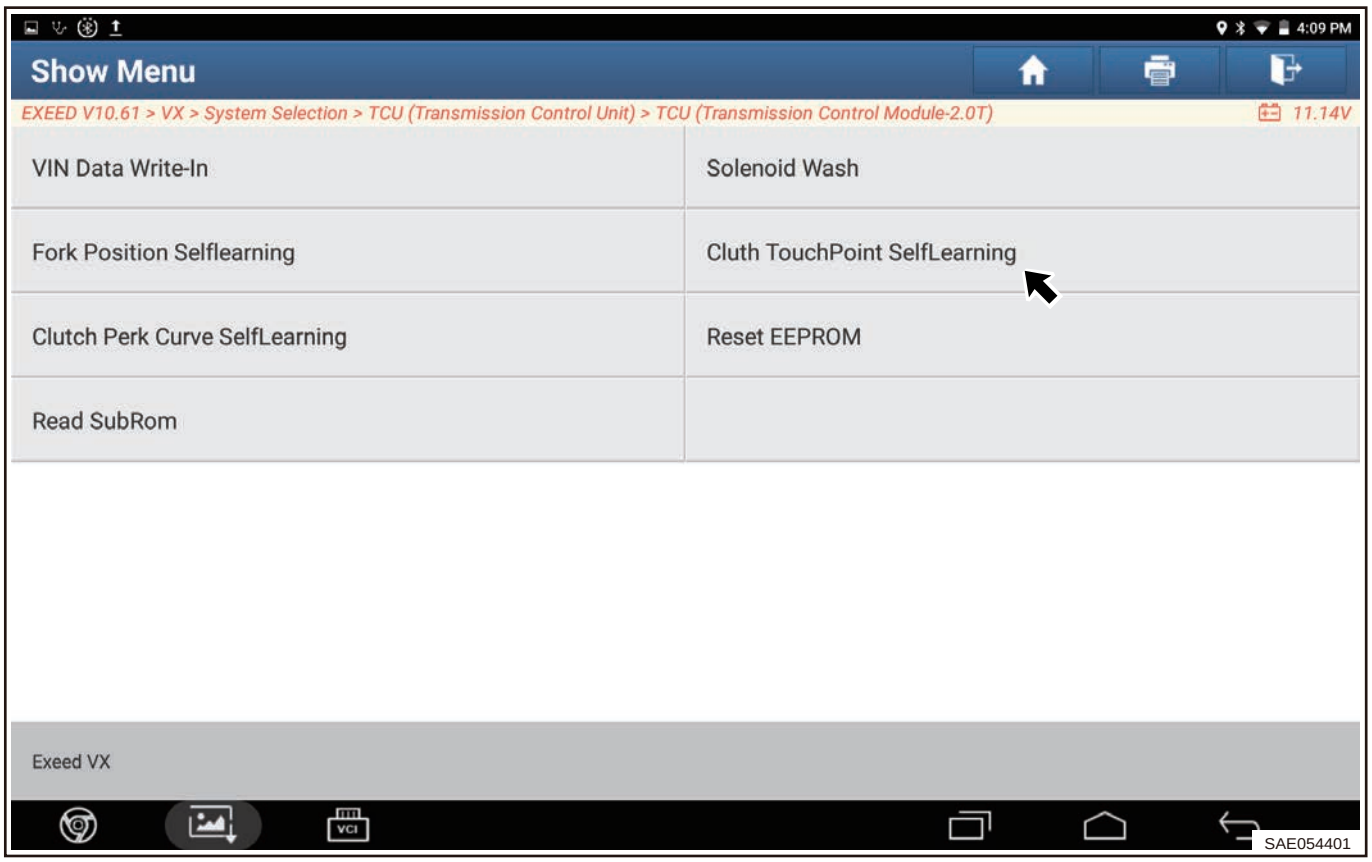
(4) Enter next screen and click “TCU (Transmission Control Unit)”.



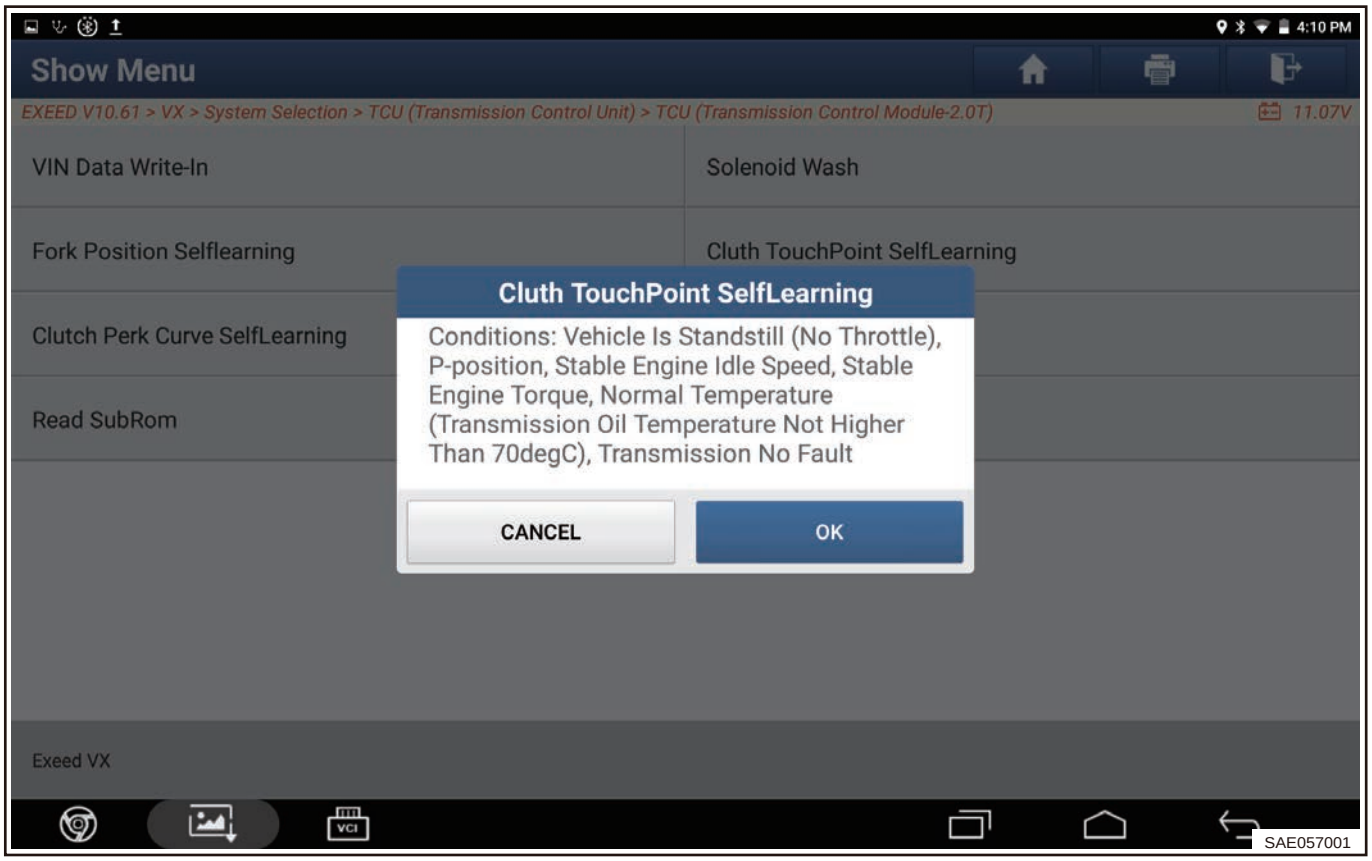
(5) Enter next screen and click “Special Function”.


4:09 PM
Show Menu
EXEED V10.61 > VX > System Selection > TCU (Transmission Control Unit) > TCU (Transmission Control Module-2.0T)
11.14V
Version Information
Read Fault Code
Clear Fault Memory
Read Data Stream
Special Function
Exeed VX
VCI
SAE053001

(6) Enter next screen and click “Clutch TouchPoint SelfLearning”.



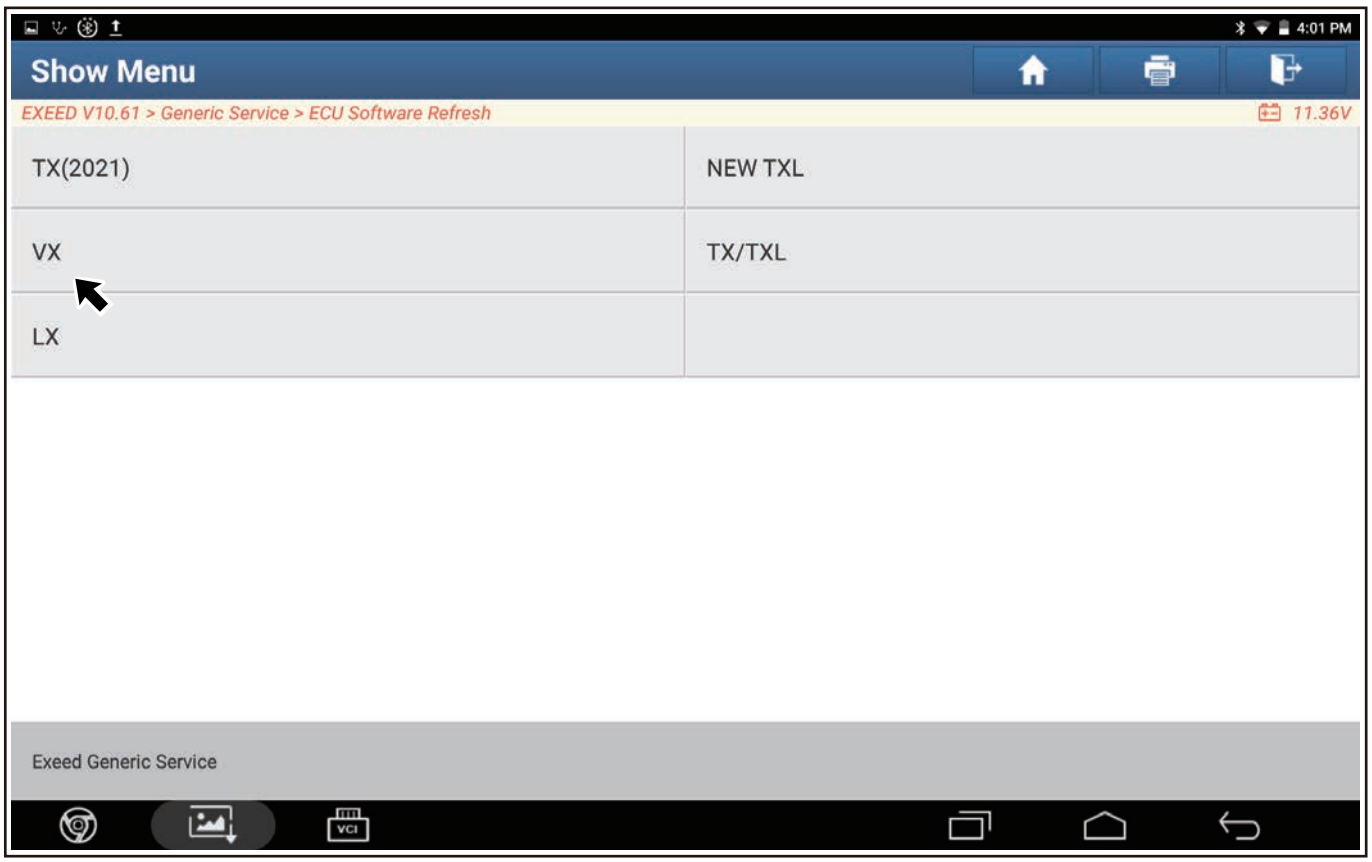
(7) Learn the conditions.



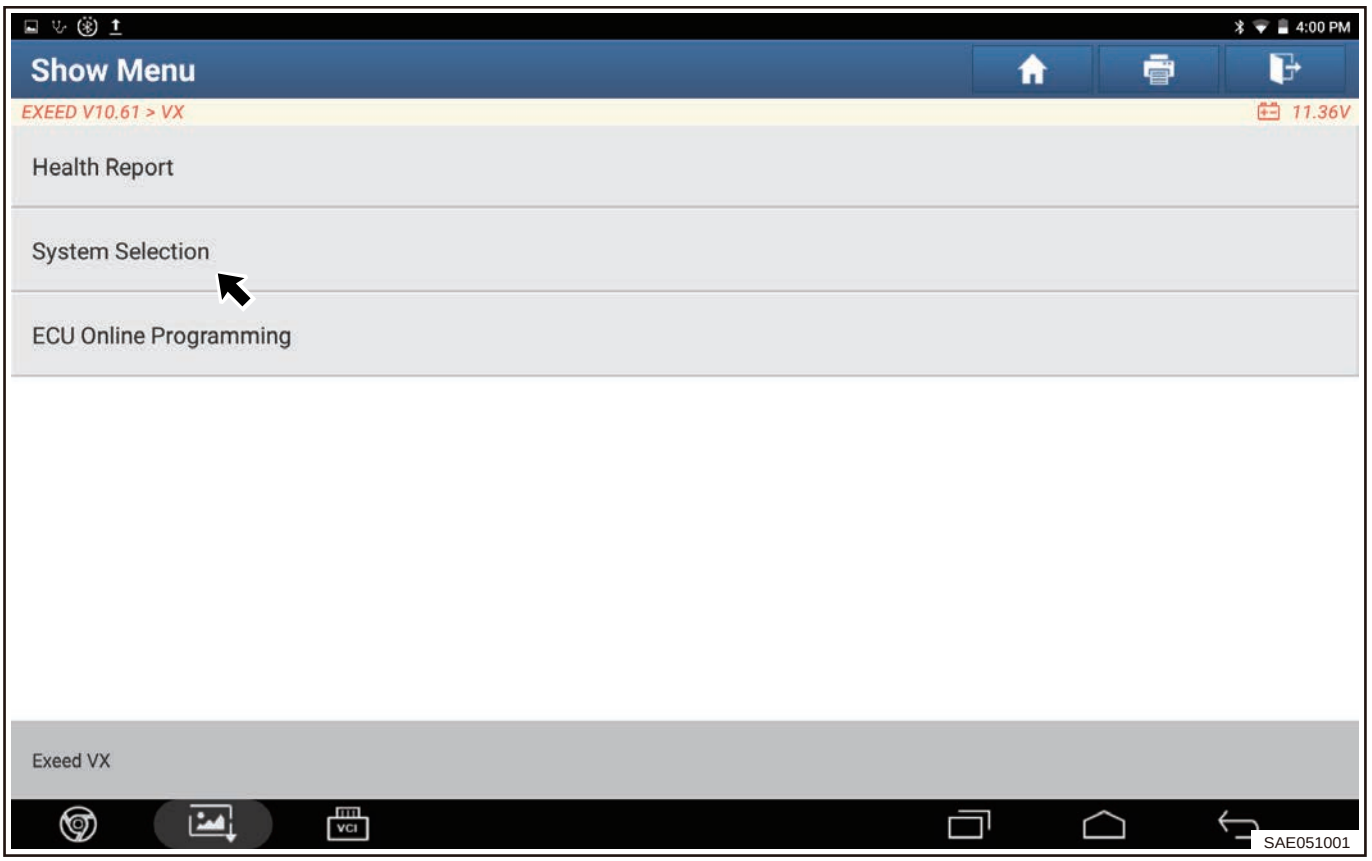
(8) Click “OK” to perform clutch TP point self-learning.

■ **Clutch Solenoid Valve Wash**

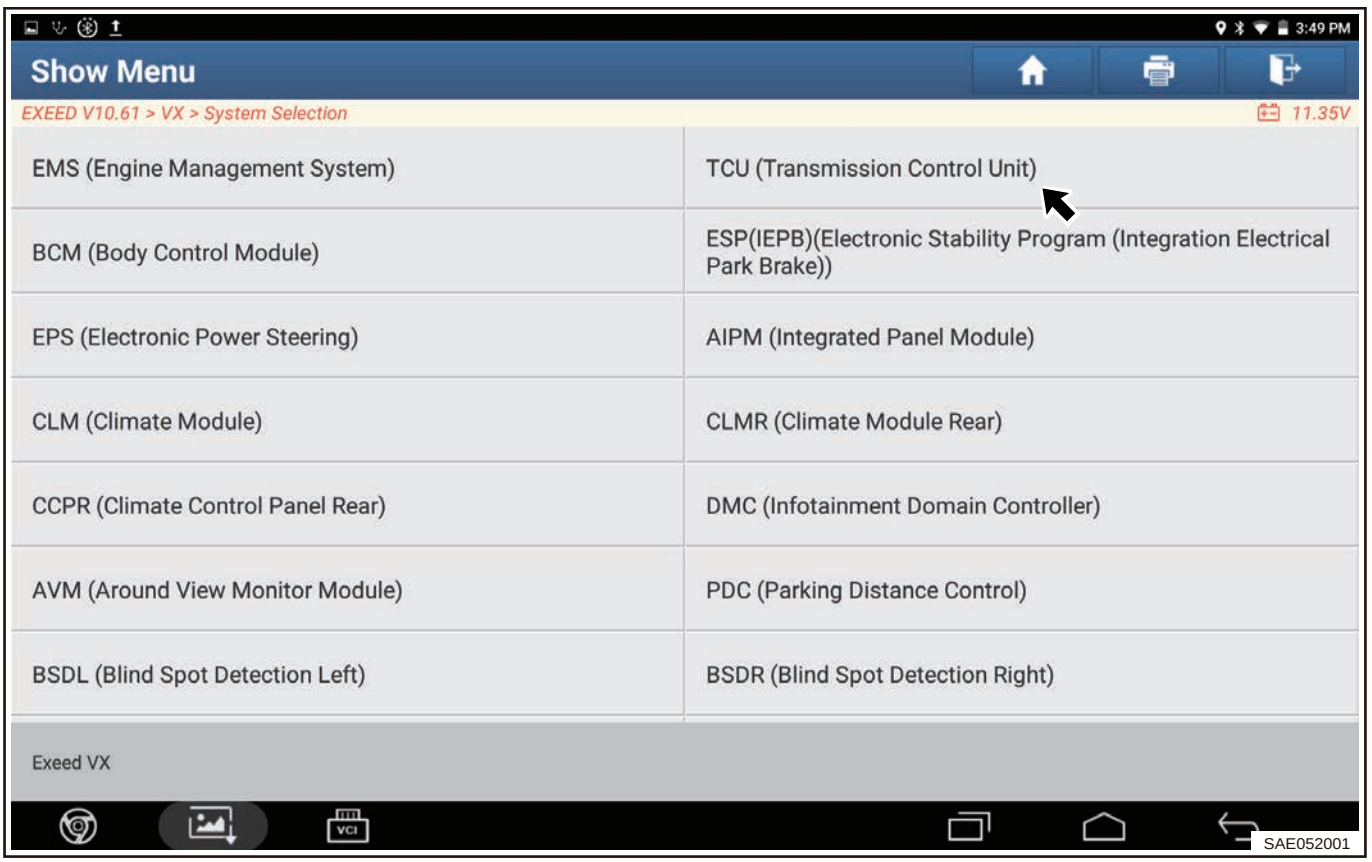
(1) Connect diagnostic tester, turn ENGINE START STOP switch to ON.
(2) Select “VX” model.



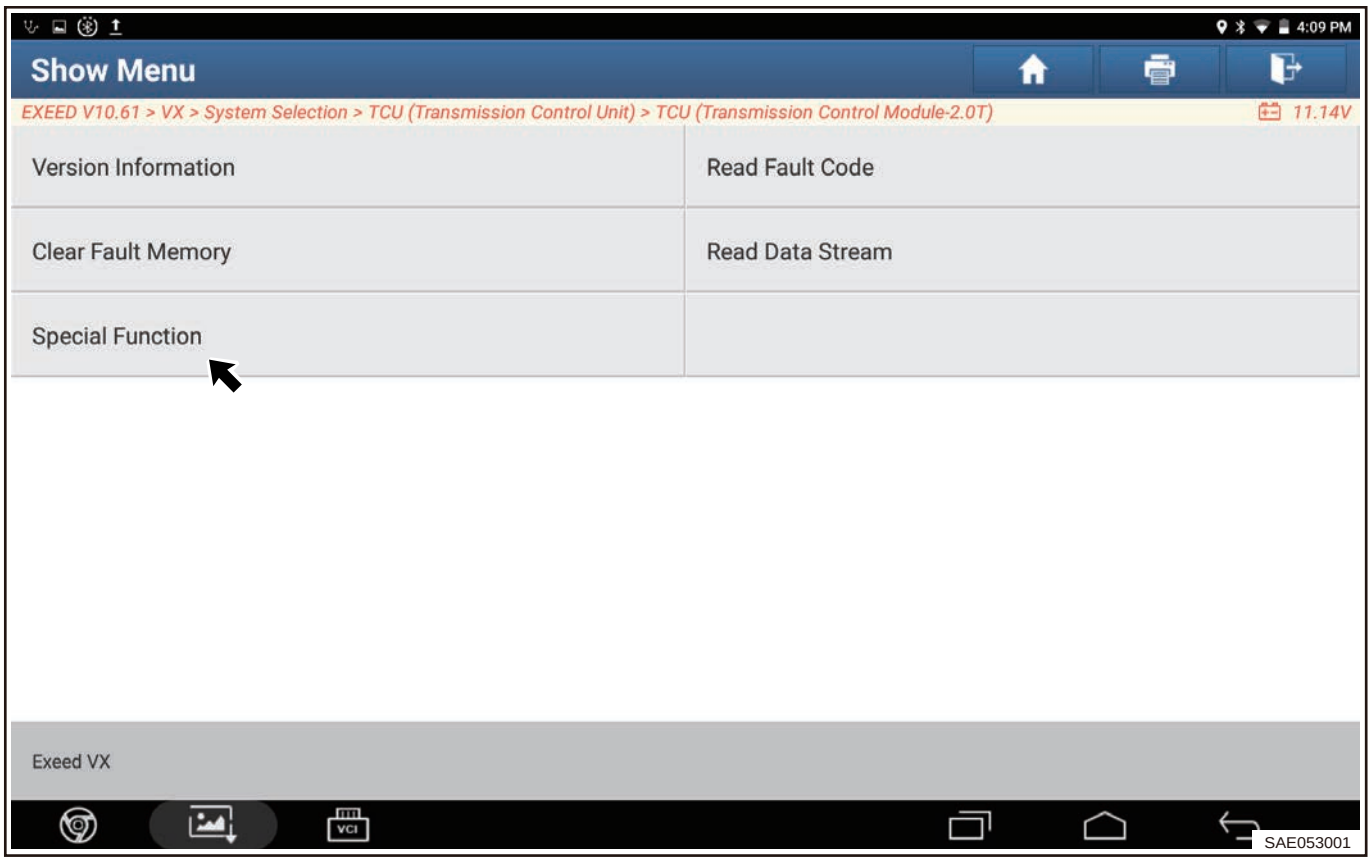
(3) Enter next screen and click “System Selection”.



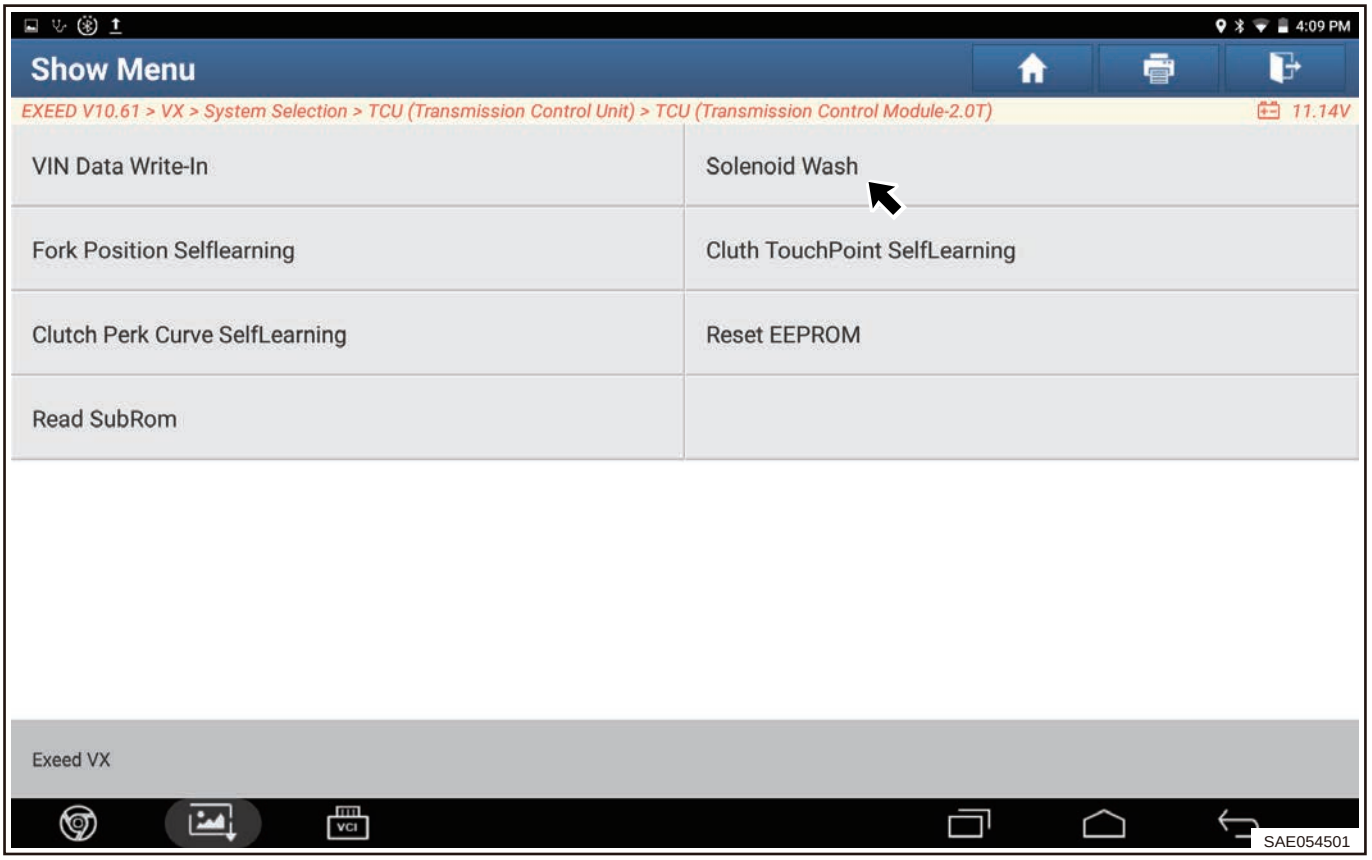
(4) Enter next screen and click “TCU (Transmission Control Unit)”.



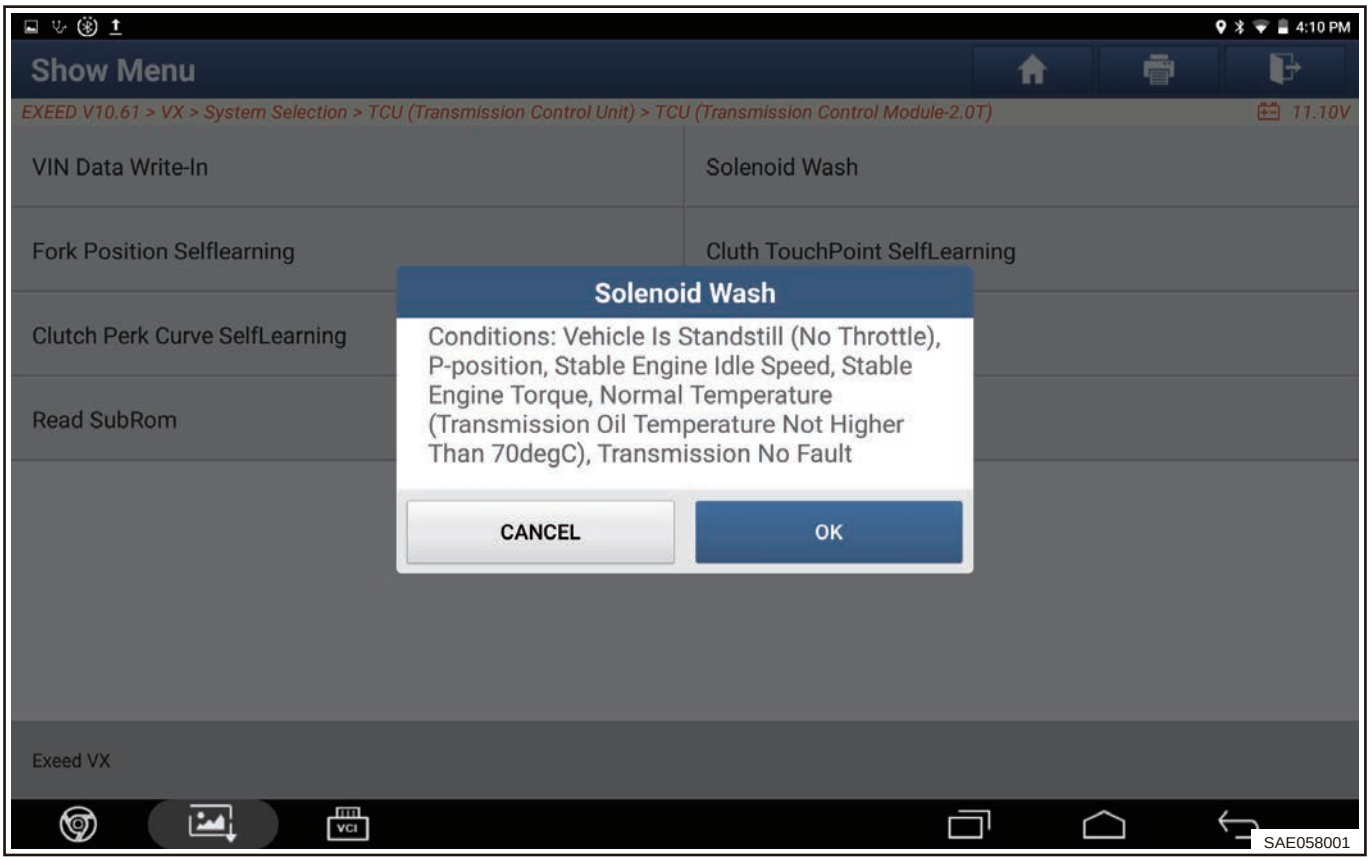
(5) Enter next screen and click “Special Function”.


4:09 PM
Show Menu
EXEED V10.61 > VX > System Selection > TCU (Transmission Control Unit) > TCU (Transmission Control Module-2.0T)
11.14V
Version Information
Read Fault Code
Clear Fault Memory
Read Data Stream
Special Function
Exeed VX
VCI
SAE053001

(6) Enter next screen and click “Solenoid Wash”.



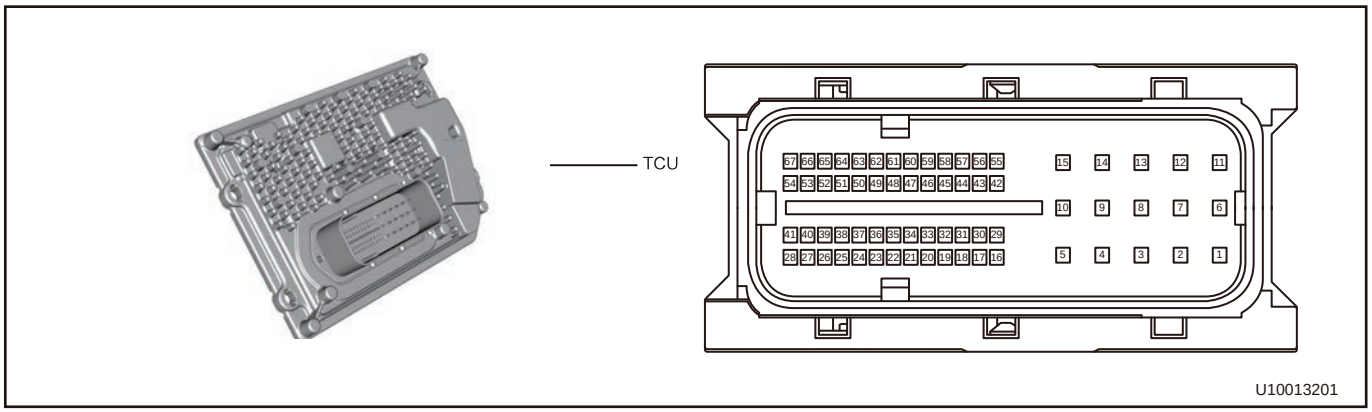
(7) Learn the conditions.



(8) Click “OK” and perform clutch solenoid valve wash.

4.5 Module Terminal Definition

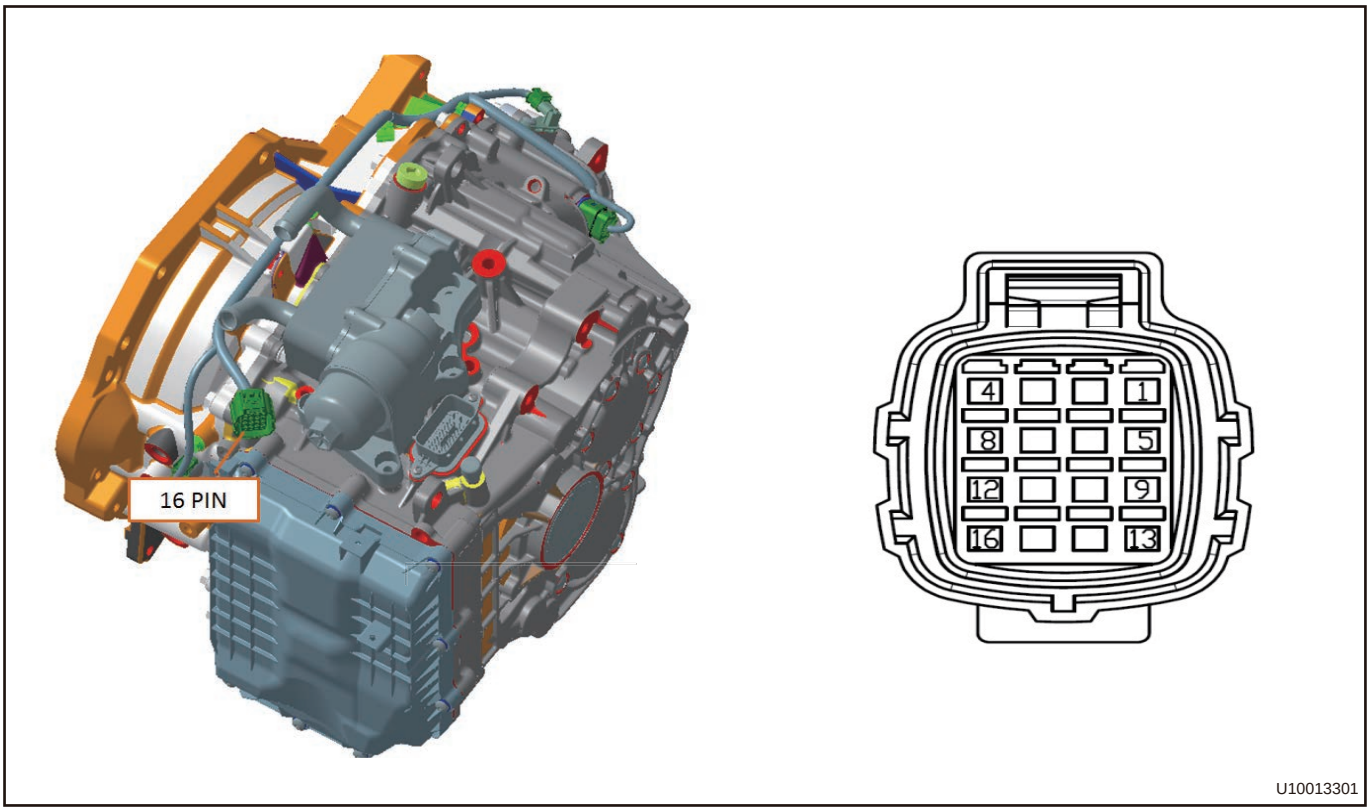
■ Transmission Control Module PIN



No.	Terminal Definition	No.	Terminal Definition
1	Electronic Pump U Phase	35	Electronic Parking Lock Electromagnet Control
2	Electronic Pump V Phase	36	Electronic Parking Actuator Solenoid Valve Control
3	Electronic Pump W Phase	37	Null
4	Odd Clutch Solenoid Valve Control	38	Clutch Temperature Sensor
5	TCU Ground KL31	39	Transmission Oil Temperature Sensor
6	Solenoid Valve Power Supply 3	40	Null
7	TCU Ground KL31	41	Parking Position Sensor
8	1st/5th Gear Shift Solenoid Valve Control	42	5V Sensor Power Supply 1
9	3rd/7th Gear Shift Solenoid Valve Control	43	8V Sensor Power Supply 1
10	Odd Gear Position Solenoid Valve Control	44	Main Oil Pressure Solenoid Valve Control
11	Solenoid Valve Power Supply 1	45	Clutch Cooling Solenoid Valve Control
12	Solenoid Valve Power Supply 2	46	4th/R Gear Shift Solenoid Valve Control
13	TCU Power Supply KL.30 HP	47	2nd/6th Gear Shift Solenoid Valve Control
14	TCU Power Supply KL.30 HP	48	Even Gear Position Solenoid Valve Control
15	TCU Power Supply KL.30 LP	49	Simulation Input Ground 1
16	Electronic Pump Motor Position Sensor V Phase	50	Null
17	Null	51	Even Clutch Pressure Sensor
18	Null	52	Odd Clutch Pressure Sensor
19	CAN1a High	53	8V Sensor Power Supply 2
20	CAN1a Low	54	5V Sensor Power Supply 2
21	Null	55	Sub Memory: Chip Selection

No.	Terminal Definition	No.	Terminal Definition
22	Null	56	Sub Memory: Clock
23	Null	57	2nd/6th Gear Fork Position Sensor
24	Simulation Input Ground 2	58	4th/R Gear Fork Position Sensor
25	CAN3 High (CAN Calibration)	59	Output Speed Sensor
26	CAN3 Low (CAN Calibration)	60	Clutch Speed Sensor
27	CAN2 High (CAN Calibration)	61	Digital Input Ground 2
28	CAN2 Low (CAN Calibration)	62	Odd Shaft Input Speed Sensor
29	Electronic Pump Motor Position Sensor W Phase	63	Even Shaft Input Speed Sensor
30	Electronic Pump Motor Position Sensor U Phase	64	1st/5th Gear Fork Position Sensor
31	Null	65	3rd/7th Gear Fork Position Sensor
32	IGN Power Supply	66	Null
33	Even Clutch Solenoid Valve Control	67	Sub Memory: Read and Write
34	Digital Input Ground 1		

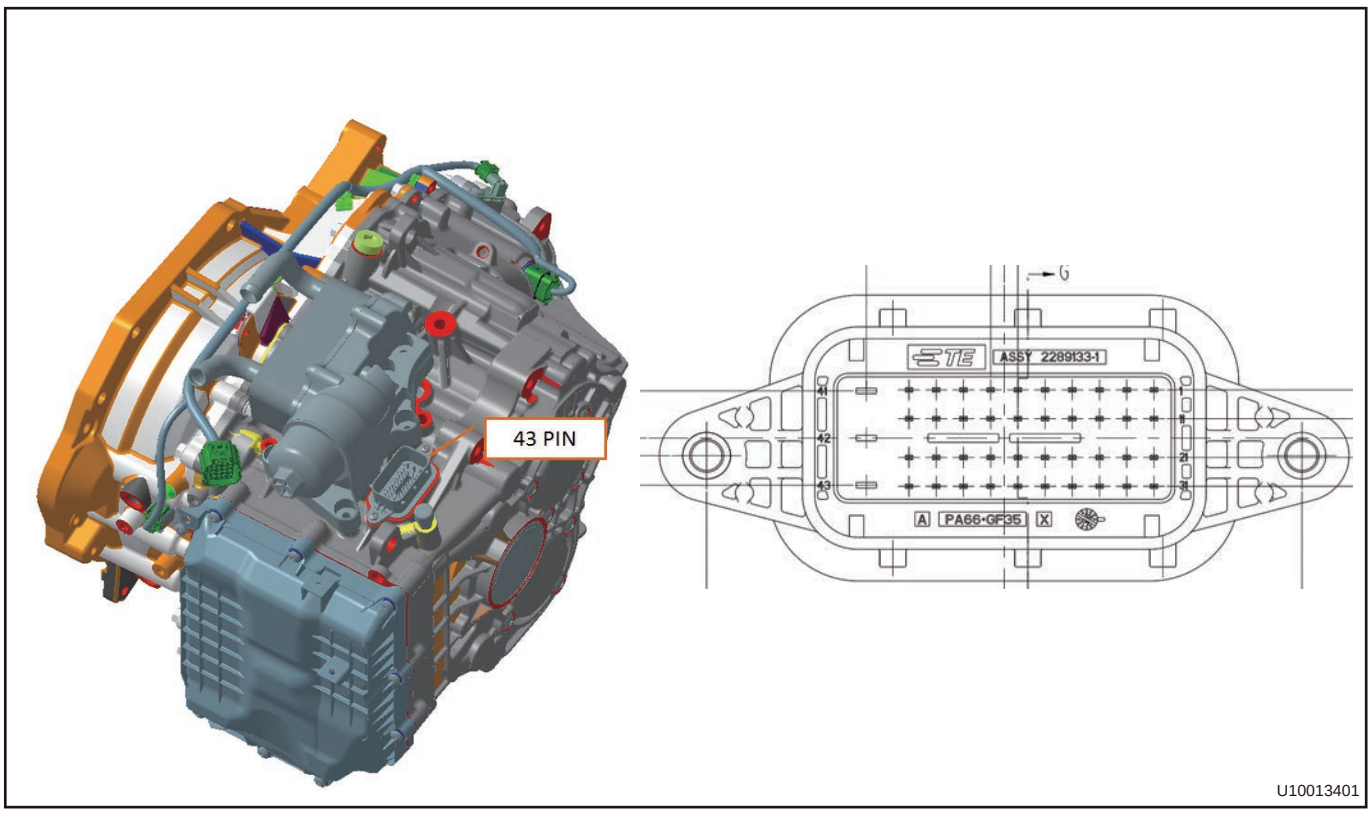
■ **16-PIN Terminal Definition**



No.	Terminal Definition	No.	Terminal Definition
1	High Side Drive 3	9	8V Power Supply 2
2	Electronic Parking Hydraulic Valve	10	/

No.	Terminal Definition	No.	Terminal Definition
3	Electronic Parking Electromagnet	11	Transmission Output Speed
4	Electronic Parking Position Signal	12	/
5	5V Power Supply 2	13	8V Power Supply 1
6	/	14	Clutch Speed
7	/	15	Sensor Simulation Ground 2
8	Sensor Digital Ground 2	16	Clutch Oil Temperature

■ **43-Pin Terminal Definition**



No.	Terminal Definition	No.	Terminal Definition
1	NA	23	8V Sensor Power Supply 2
2	4th/R Gear Fork Position Sensor	24	Sub Memory: Clock
3	5V Sensor Power Supply 1	25	NA
4	2nd/6th Gear Fork Position Sensor	26	Main Oil Pressure Solenoid Valve Control
5	Simulation Input Ground 2	27	1st/5th Gear Shift Solenoid Valve Control
6	Odd Clutch Pressure Sensor	28	4th/R Gear Shift Solenoid Valve Control
7	Odd Clutch Solenoid Valve Control	29	Solenoid Valve Power Supply 2
8	Even Clutch Solenoid Valve Control	30	Electronic Pump Motor Position Sensor W Phase
9	5V Sensor Power Supply 1	31	1st/5th Gear Fork Position Sensor

No.	Terminal Definition	No.	Terminal Definition
10	Electronic Pump Motor Position Sensor U Phase	32	Digital Input Ground 2
11	Odd Shaft Input Speed Sensor	33	Digital Input Ground 1
12	3rd/7th Gear Fork Position Sensor	34	Sub Memory: Read and Write
13	5V Sensor Power Supply 2	35	Sub Memory: Chip Selection
14	Transmission Oil Temperature Sensor	36	Clutch Cooling Solenoid Valve Control
15	Simulation Input Ground 1	37	3rd/7th Gear Shift Solenoid Valve Control
16	Even Clutch Pressure Sensor	38	2nd/6th Gear Shift Solenoid Valve Control
17	Odd Gear Position Solenoid Valve Control	39	Solenoid Valve Power Supply 3
18	Even Gear Position Solenoid Valve Control	40	Digital Input Ground 1
19	Solenoid Valve Power Supply 1	41	Electronic Pump U Phase
20	Electronic Pump Motor Position Sensor V Phase	42	Electronic Pump V Phase
21	Even Shaft Input Speed Sensor	43	Electronic Pump W Phase
22	8V Sensor Power Supply 1		

4.6 System Diagnosis Procedure

Use following procedures to troubleshoot the transmission control system.

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

Check if battery voltage is normal.

- Standard voltage: Not less than 12 V.

NG → **Replace battery**

OK

3	**Customer problem analysis**

NEXT

4	**Read fault code**

Result

No DTC → **Repair according to Problem Symptoms Table**

DTC occurs

5	Read DTCs (current DTC and history DTC)

Result

No DTC → Troubleshoot according to intermittent DTC Fault Flow

DTC occurs

6	Repair according to Diagnostic Trouble Code (DTC) chart

NEXT

7	Adjust, repair or replace

NEXT

8	Conduct test and confirm malfunction has been repaired

NEXT → End

4.7 Diagnostic Trouble Code (DTC) Chart

⚠ Caution

- **TCU can store a maximum of 20 DTCs. If the storage space for DTCs is used up, the new DTCs will substitute the historical faults with the lowest priorities.**
- **Clutch/transmission overheat failure (P2787/P1849) is overheat protection measures of transmission/ clutch hardware. Usually, after overheat prompt appears, simply stop the vehicle for a rest, then it can work normally. Try to avoid repeated starting with accelerator pedal depressed firmly, which is easy to make the oil temperature rise too fast.**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P186547	TCU Internal Malfunction	TCU cannot be reset	TCU internal malfunction	• Check TCU reset memory • Check if software is upgraded • Check or replace TCU
P186747	TCU Internal Malfunction	TCU cannot be reset	TCU internal malfunction	
P186947	TCU Internal Malfunction	TCU cannot be reset	TCU internal malfunction	
P186849	TCU Internal Malfunction	TCU chip fault	TCU chip fault	
P065912	HSD1 Power Supply Short to Power Supply	Voltage at high voltage side is more than 4 V	Voltage at high voltage side is less than 4 V	Check wire harness and connector
P267112	HSD2 Power Supply Short to Power Supply			Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P268612	HSD2 Power Supply Short to Power Supply			Check wire harness and connector
P267011	HSD1 Power Supply Short to Ground	Voltage difference between HSD1 and power supply voltage is more than 6 V, and HSD1 is less than 1.5 V	Voltage difference between HSD1 and power supply voltage is less than 6 V, and HSD1 is less than 1.5 V	Check wire harness and connector
P268511	HSD2 Power Supply Short to Ground	Voltage difference between HSD2 and power supply voltage is more than 6 V, and HSD2 is less than 1.5 V	Voltage difference between HSD2 and power supply voltage is less than 6 V, and HSD2 is less than 1.5 V	Check wire harness and connector
P065713	HSD1 Power Supply Open	It detects all lower end paths connected to this HSD1, and reports open circuit load failure.	If any of the lower end paths is connected to this HSD, there is no open circuit load failure.	Check wire harness and connector
P266913	HSD2 Power Supply Open	It detects all lower end paths connected to this HSD2, and reports open circuit load failure.	If any of the lower end paths is connected to this HSD, there is no open circuit load failure.	Check wire harness and connector
P268413	HSD3 Power Supply Open	It detects all lower end paths connected to this HSD3, and reports open circuit load failure.	If any of the lower end paths is connected to this HSD, there is no open circuit load failure.	Check wire harness and connector
P096013	Main Oil Path Solenoid Valve Open	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P096211	Main Oil Path Solenoid Valve Short to Ground	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P096312	Main Oil Path Solenoid Valve Short to Power Supply	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P188904	Main Oil Path Solenoid Valve Passage Closes Unexpectedly	Main oil path solenoid valve passage closes unexpectedly	Main oil path solenoid valve passage operates normally	Check wire harness and connector
P188A01	Main Oil Path Solenoid Valve Circuit Error	Main oil path solenoid valve circuit error	Main oil path solenoid valve circuit is normal	Check wire harness and connector
P074519	Main Oil Path Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P074818	Main Oil Path Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P096413	Lubricant Oil Path Solenoid Valve Open	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P096611	Lubricant Oil Path Solenoid Valve Short to Ground	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P096712	Lubricant Oil Path Solenoid Valve Short to Power Supply	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P188B04	Lubricant Oil Path Solenoid Valve Passage Closes Unexpectedly	Lubricant oil path solenoid valve passage closes unexpectedly	Lubricant oil path solenoid valve passage operates normally	Check wire harness and connector
P188C01	Lubricant Oil Path Solenoid Valve Circuit Error	Lubricant oil path solenoid valve circuit error occurs	Lubricant oil path solenoid valve circuit is normal	Check wire harness and connector
P077519	Lubricant Oil Path Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P077818	Lubricant Oil Path Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P097311	Odd Clutch Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P097412	Odd Clutch Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P182513	Odd Clutch Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P188D04	Odd Clutch Solenoid Valve Passage Closes Unexpectedly	Odd clutch solenoid valve passage closes unexpectedly	Odd clutch solenoid valve passage operates normally	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P188E01	Odd Clutch Solenoid Valve Circuit Error	Odd clutch solenoid valve circuit error occurs	Odd clutch solenoid valve circuit is normal	Check wire harness and connector
P075019	Odd Clutch Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P075318	Odd Clutch Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P097611	Even Clutch Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P097712	Even Clutch Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P182613	Even Clutch Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P188F04	Even Clutch Solenoid Valve Passage Closes Unexpectedly	Even clutch solenoid valve passage closes unexpectedly	Even clutch solenoid valve passage operates normally	Check wire harness and connector
P189001	Even Clutch Solenoid Valve Circuit Error	Even clutch solenoid valve circuit error	Even clutch solenoid valve circuit is normal	Check wire harness and connector
P075519	Even Clutch Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P075818	Even Clutch Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P097911	Odd Shaft Shift Pressure Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P098012	Odd Shaft Shift Pressure Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P182713	Odd Shaft Shift Pressure Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P189104	Odd Shaft Shift Pressure Solenoid Valve Passage Closes Unexpectedly	Odd shaft shift pressure solenoid valve passage closes unexpectedly	Odd shaft shift pressure solenoid valve passage operates normally	Check wire harness and connector
P189201	Odd Shaft Shift Pressure Solenoid Valve Circuit Error	Odd shaft shift pressure solenoid valve circuit error occurs	Odd shaft shift pressure solenoid valve circuit is normal	Check wire harness and connector
P076019	Odd Shaft Shift Pressure Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P076318	Odd Shaft Shift Pressure Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P098211	Even Shaft Shift Pressure Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P098312	Even Shaft Shift Pressure Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P182813	Even Shaft Shift Pressure Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P189304	Even Shaft Shift Pressure Solenoid Valve Passage Closes Unexpectedly	Even shaft shift pressure solenoid valve passage closes unexpectedly	Even shaft shift pressure solenoid valve passage operates normally	Check wire harness and connector
P189401	Even Shaft Shift Pressure Solenoid Valve Circuit Error	Even shaft shift pressure solenoid valve circuit error occurs	Even shaft shift pressure solenoid valve circuit is normal	Check wire harness and connector
P076519	Even Shaft Shift Pressure Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P076818	Even Shaft Shift Pressure Solenoid Valve	The difference between feedback current and target	The difference between feedback current and target	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Feedback Current Too Low	current is less than a certain threshold	current is more than a certain threshold	
P098511	4th/R Gear Flow Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P098612	4th/R Gear Flow Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P182913	4th/R Gear Flow Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P189504	4th/R Gear Flow Solenoid Valve Passage Closes Unexpectedly	4th/R gear flow solenoid valve passage closes unexpectedly	4th/R gear flow solenoid valve passage operates normally	Check wire harness and connector
P189601	4th/R Gear Flow Solenoid Valve Circuit Error	4th/R gear flow solenoid valve circuit error occurs	4th/R gear flow solenoid valve circuit is normal	Check wire harness and connector
P077019	4th/R Gear Flow Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P077318	4th/R Gear Flow Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P099411	2nd/6th Gear Flow Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P099512	2nd/6th Gear Flow Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P183013	2nd/6th Gear Flow Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P189704	2nd/6th Gear Flow Solenoid Valve Passage Closes Unexpectedly	2nd/6th gear flow solenoid valve passage closes unexpectedly	2nd/6th gear flow solenoid valve passage operates normally	Check wire harness and connector
P189801	2nd/6th Gear Flow Solenoid Valve Circuit Error	2nd/6th gear flow solenoid valve circuit error occurs	2nd/6th gear flow solenoid valve circuit is normal	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P270619	2nd/6th Gear Flow Solenoid Valve Feedback Current Too High	2nd/6th gear flow solenoid valve feedback current is too high	2nd/6th gear flow solenoid valve feedback current is normal	Check wire harness and connector
P270918	2nd/6th Gear Flow Solenoid Valve Feedback Current Too Low	2nd/6th gear flow solenoid valve feedback current is too low	2nd/6th gear flow solenoid valve feedback current is normal	Check wire harness and connector
P099B11	1st/5th Gear Flow Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector
P099C12	1st/5th Gear Flow Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P186213	1st/5th Gear Flow Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector
P189904	1st/5th Gear Flow Solenoid Valve Passage Closes Unexpectedly	1st/5th gear flow solenoid valve passage closes unexpectedly	1st/5th gear flow solenoid valve passage operates normally	Check wire harness and connector
P189A01	1st/5th Gear Flow Solenoid Valve Circuit Error	1st/5th gear flow solenoid valve circuit error occurs	1st/5th gear flow solenoid valve circuit is normal	Check wire harness and connector
P075A19	1st/5th Gear Flow Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P075D18	1st/5th Gear Flow Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P099E11	3rd/7th Gear Flow Solenoid Valve Open	Voltage at low voltage side is less than 2 V	Voltage at low voltage side is more than 2 V	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P099F12	3rd/7th Gear Flow Solenoid Valve Short to Ground	Current at low voltage side is more than 4 A	Current at low voltage side is less than 4 A	Check wire harness and connector
P186313	3rd/7th Gear Flow Solenoid Valve Short to Power Supply	Voltage at low voltage side is between 2 and 4 V	Voltage at low voltage side is less than 2 V or more than 4 V	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P189B04	3rd/7th Gear Flow Solenoid Valve Passage Closes Unexpectedly	3rd/7th gear flow solenoid valve passage closes unexpectedly	3rd/7th gear flow solenoid valve passage operates normally	Check wire harness and connector
P189C01	3rd/7th Gear Flow Solenoid Valve Circuit Error	3rd/7th gear flow solenoid valve circuit error occurs	3rd/7th gear flow solenoid valve circuit is normal	Check wire harness and connector
P076A19	3rd/7th Gear Flow Solenoid Valve Feedback Current Too High	The difference between feedback current and target current is more than a certain threshold	The difference between feedback current and target current is less than a certain threshold	Check wire harness and connector
P076D18	3rd/7th Gear Flow Solenoid Valve Feedback Current Too Low	The difference between feedback current and target current is less than a certain threshold	The difference between feedback current and target current is more than a certain threshold	Check wire harness and connector
P282413	E-park Hydraulic Valve Open	Voltage LSS1 is more than 1.663 V and less than 6.153 V	Voltage LSS1 is less than 1.663 V or more than 6.153 V	Check wire harness and connector
P282712	E-park Hydraulic Valve Short to Power Supply	Voltage LSS1 is more than 4.157 V	Voltage LSS1 is less than 4.157 V	Check wire harness and connector
P282611	E-park Hydraulic Valve Short to Ground	Voltage LSS1 is less than 1.663 V	Voltage LSS1 is more than 1.663 V	Check wire harness and connector
P282F11	E-park Safety Valve Short to Ground	Voltage LSS3 is less than 1.663 V	Voltage LSS3 is more than 1.663 V	Check wire harness and connector
P283012	E-park Safety Valve Short to Power Supply	Voltage LSS3 is more than 4.157 V	Voltage LSS3 is less than 4.157 V	Check wire harness and connector
P282D13	E-park Safety Valve Open	Voltage LSS3 is more than 1.663 V and less than 6.153 V	Voltage LSS3 is less than 1.663 V or more than 6.153 V	Check wire harness and connector
P279912	Motor Short to Power Supply	Short circuit is detected at any lower end by predrive ASIC and predrive ASIC error indicator low	Short circuit is not detected at all lower ends by predrive ASIC or predrive ASIC error indicator high	Check wire harness and connector
P279814	Motor Short to Ground or Open	Short circuit is detected at any higher end by predrive ASIC and predrive ASIC error indicator low	Short circuit is not detected at all higher ends by predrive ASIC or predrive ASIC error indicator high	Check wire harness and connector
P0B0019	Motor Overcurrent	Calculated motor current load is more than 100%	Calculated motor current load is less than 100%	Check brushless DC motor
P279798	Motor Overtemperatur-e	Motor temperature is too high	Motor temperature is normal	Check brushless DC motor

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P188817	Motor Overvoltage	Battery high voltage is more than 16.5 V	Battery high voltage is less than 16.5 V	Check power supply voltage
P0B0D49	Internal Motor Fault	Other faults in motor are detected by chip	Other faults in motor are not detected by chip	Check brushless DC motor

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U000188	CNA1 Busoff Fault	\	\	Check CAN transceiver wire harness
P183111	5V1 Power Supply Short to Ground	5v1 voltage is less than 2.8 V	5v1 voltage is more than 2.8 V	Check wire harness and connector
P183212	5V1 Power Supply Short to Power Supply	5v1 voltage is more than 6.8 V	5v1 voltage is less than 6.8 V	Check wire harness and connector
P183311	5V2 Power Supply Short to Ground	5V2 voltage is less than 2.8 V	5V2 voltage is more than 2.8 V	Check wire harness and connector
P183412	5V2 Power Supply Short to Power Supply	5V2 voltage is more than 6.8 V	5V2 voltage is less than 6.8 V	Check wire harness and connector
P183511	8V1 Power Supply Short to Ground	8V1 voltage is less than 1.04 V	8V1 voltage is more than 1.04 V	Check wire harness and connector
P183612	8V1 Power Supply Short to Power Supply	8V1 voltage is more than 8.78 V	8V1 voltage is less than 8.78 V	Check wire harness and connector
P183711	8V2 Power Supply Short to Ground	8V2 voltage is less than 1.04 V	8V2 voltage is more than 1.04 V	Check wire harness and connector
P183812	8V2 Power Supply Short to Power Supply	8V2 voltage is more than 8.78 V	8V2 voltage is less than 8.78 V	Check wire harness and connector
P0B0A16	Motor Hall Sensor Undervoltage	Measured Hall sensor power supply voltage is less than 4.8 V	Measured Hall sensor power supply voltage is more than 4.8 V	Check power supply voltage
P0B0B17	Motor Hall Sensor Overvoltage	Measured Hall sensor power supply voltage is more than 5.2 V	Measured Hall sensor power supply voltage is less than 5.2 V	Check power supply voltage
P189D25	Motor Hall Sensor Undefined Fault	One of three Halls has electrical malfunction or 5 V power supply of Hall is abnormal	There is no electrical malfunction in three Halls or no abnormality in 5 V power supply of Hall	Check brushless DC motor
P189E29	Motor Hall Sensor Signal Invalid	Hall mode values follow an irrational order	Hall mode values follow a reasonable order	Check hall signal
U300316	KL30 LP Overvoltage	Power supply voltage is less than 9 V	Power supply voltage is more than 9 V	Check power supply voltage

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U300317	KL30 LP Undervoltage	Power supply voltage is more than 16 V	Power supply voltage is less than 16 V	Check power supply voltage
P186616	KL30 HP Open or Short to Ground	Battery high voltage is less than 3.5 V	Battery high voltage is more than 3.5 V	Check wire harness and connector
P071714	Odd Input Shaft Speed Sensor Short to Ground or Open	Diagnostic voltage of odd input speed signal is less than 100 mV	Diagnostic voltage of odd input speed signal is more than 100 mV	Check wire harness and connector
P180112	Odd Input Shaft Speed Sensor Short to Power Supply	Diagnostic voltage of odd input speed signal is more than 3.5 V	Diagnostic voltage of odd input speed signal is less than 3.5 V	Check wire harness and connector
P276714	Even Input Shaft Speed Sensor Short to Ground or Open	Diagnostic voltage of even input speed signal is less than 100 mV	Diagnostic voltage of even input speed signal is more than 100 mV	Check wire harness and connector
P180212	Even Input Shaft Speed Sensor Short to Power Supply	Diagnostic voltage of even input speed signal is more than 3.5 V	Diagnostic voltage of even input speed signal is less than 3.5 V	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P072214	Output Shaft Speed Sensor Short to Ground or Open	Diagnostic voltage of even input speed signal is less than 100 mV	Diagnostic voltage of even input speed signal is more than 100 mV	Check wire harness and connector
P180312	Output Shaft Speed Sensor Short to Power Supply	Diagnostic voltage of even input speed signal is more than 3.5 V	Diagnostic voltage of even input speed signal is less than 3.5 V	Check wire harness and connector
P072714	Clutch Speed Sensor Short to Ground or Open	Diagnostic voltage of even input speed signal is less than 100 mV	Diagnostic voltage of even input speed signal is more than 100 mV	Check wire harness and connector
P180412	Clutch Speed Sensor Short to Power Supply	Diagnostic voltage of even input speed signal is more than 3.5 V	Diagnostic voltage of even input speed signal is less than 3.5 V	Check wire harness and connector
P084214	Odd Clutch Pressure Sensor Short to Ground or Open	Odd clutch pressure sensor voltage is less than 80 mV	Odd clutch pressure sensor voltage is more than 80 mV	Check wire harness and connector
P084312	Odd Clutch Pressure Sensor Short to Power Supply	Odd clutch pressure sensor voltage is more than 4.9 V	Odd clutch pressure sensor voltage is less than 4.9 V	Check wire harness and connector
P084714	Even Clutch Pressure Sensor Short to Ground or Open	Even clutch pressure sensor voltage is less than 80 mV	Even clutch pressure sensor voltage is more than 80 mV	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P084812	Even Clutch Pressure Sensor Short to Power Supply	Even clutch pressure sensor voltage is more than 4.9 V	Even clutch pressure sensor voltage is less than 4.9 V	Check wire harness and connector
P093911	Clutch Temperature Sensor Short to Ground	Valve temperature sensor voltage is less than 0.2 V	Valve temperature sensor voltage is more than 0.2 V	Check wire harness and connector
P094015	Clutch Temperature Sensor Short to Power Supply or Open	Clutch temperature sensor voltage is more than 4.75 V	Clutch temperature sensor voltage is less than 4.75 V	Check wire harness and connector
P071211	Valve Body Oil Temperature Sensor Short to Ground	Valve temperature sensor voltage is less than 0.2 V	Valve temperature sensor voltage is more than 0.2 V	Check wire harness and connector
P071315	Valve Body Oil Temperature Sensor Short to Power Supply or Open	Clutch temperature sensor voltage is more than 4.75 V	Clutch temperature sensor voltage is less than 4.75 V	Check wire harness and connector
P183914	1st/5th Gear Fork Position Sensor Short to Ground or Open	1st/5th gear fork pulse duty ratio is less than 5%	1st/5th gear fork pulse duty ratio is more than 5%	Check wire harness and connector
P187412	1st/5th Gear Fork Position Sensor Short to Power Supply	1st/5th gear fork pulse duty ratio is more than 95%	1st/5th gear fork pulse duty ratio is less than 95%	Check wire harness and connector
P184014	2nd/6th Gear Fork Position Sensor Short to Ground or Open	2nd/6th gear fork pulse duty ratio is less than 5%	2nd/6th gear fork pulse duty ratio is more than 5%	Check wire harness and connector
P187512	2nd/6th Gear Fork Position Sensor Short to Power Supply	2nd/6th gear fork pulse duty ratio is more than 95%	2nd/6th gear fork pulse duty ratio is less than 95%	Check wire harness and connector
P184114	3rd/7th Gear Fork Position Sensor Short to Ground or Open	3rd/7th gear fork pulse duty ratio is less than 5%	3rd/7th gear fork pulse duty ratio is more than 5%	Check wire harness and connector
P187612	3rd/7th Gear Fork Position Sensor Short to Power Supply	3rd/7th gear fork pulse duty ratio is more than 95%	3rd/7th gear fork pulse duty ratio is less than 95%	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P184214	4th/R Gear Fork Position Sensor Short to Ground or Open	4th/R gear fork pulse duty ratio is less than 5%	4th/R gear fork pulse duty ratio is more than 5%	Check wire harness and connector
P187712	4th/R Gear Fork Position Sensor Short to Power Supply	4th/R gear fork pulse duty ratio is more than 95%	4th/R gear fork pulse duty ratio is less than 95%	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P187115	E-park Position Sensor Short to Power Supply or Open	Position sensor duty ratio is more than 93%	Position sensor duty ratio is less than 93%	Check wire harness and connector
P187811	E-park Position Sensor Short to Ground	Position sensor duty ratio is less than 7%	Position sensor duty ratio is more than 7%	Check wire harness and connector
P071501	Odd Input Shaft Speed Sensor Overrange	Odd input shaft speed sensor value is more than 15000 rpm	Odd input shaft speed sensor value is less than 15000 rpm	Check wire harness and connector
P071664	Odd Input Shaft Speed Sensor Rationality Checksum Failure	Odd input shaft speed sensor rationality checksum fails	Odd input shaft speed sensor rationality checksum is successful	Check speed sensor
P276501	Even Input Shaft Speed Sensor Overrange	Odd input shaft speed sensor value is more than 15000 rpm	Odd input shaft speed sensor value is less than 15000 rpm	Check wire harness and connector
P276664	Even Input Shaft Speed Sensor Rationality Checksum Failure	Even input shaft speed sensor rationality checksum fails	Even input shaft speed sensor rationality checksum is successful	Check speed sensor
P072001	Output Shaft Speed Sensor Overrange	Transmission output speed is too high (more than 9100 rpm)	Transmission output speed is too high (less than 9100 rpm)	Check wire harness and connector
P072139	Output Shaft Speed Sensor Steering Error	Direction pulse is out of the acceptable standard range	Direction pulse is within the acceptable standard range	Check speed sensor
P072164	Output Shaft Speed Sensor Rationality Checksum Failure	Output shaft speed sensor rationality checksum fails	Output shaft speed sensor rationality checksum is successful	Check speed sensor
P072501	Clutch Speed Sensor Overrange	Clutch speed sensor value is more than 15000 rpm	Clutch speed sensor value is less than 15000 rpm	Check wire harness and connector

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P072664	Clutch Speed Sensor Rationality Checksum Failure	Clutch speed sensor rationality checksum fails	Clutch speed sensor rationality checksum is successful	Check speed sensor
P180564	Odd Shaft Gear Position Speed Ratio Matching Failure	Odd shaft gear position speed ratio matching fails	Odd shaft gear position speed ratio matching is successful	Check clutch pressure sensor
P180664	Even Shaft Gear Position Speed Ratio Matching Failure	Even shaft gear position speed ratio matching fails	Even shaft gear position speed ratio matching is successful	Check clutch pressure sensor
P084001	Odd Clutch Pressure Out of Limit	Odd clutch pressure is more than 16 bar	Odd clutch pressure is less than 16 bar	Check clutch pressure sensor
P084137	Difference Between Target and Actual Pressures of Odd Clutch Out of Range	Difference between target and actual pressures of odd clutch is more than 2 bar	Difference between target and actual pressures of odd clutch is less than 2 bar	Check clutch pressure sensor
P084136	Difference Between Target and Actual Pressures of Odd Clutch Out of Range	Difference between target and actual pressures of odd clutch is more than 2 bar	Difference between target and actual pressures of odd clutch is less than 2 bar	Check clutch pressure sensor
P084124	Odd Clutch Pressure Zero Shift	Zero shift occurs in odd clutch pressure	There is no zero shift in odd clutch pressure	Check clutch pressure sensor
P084501	Even Clutch Pressure Out of Limit	Even clutch pressure sensor signal out of range: Even clutch input pressure is less than 0 bar or more than 16 bar	Even clutch input pressure is more than 0 and less than 16 bar	Check clutch pressure sensor
P084637	Difference Between Actual and Target Pressures of Even Clutch Out of Range	Difference between target and actual pressures of even clutch is more than 2 bar	Difference between target and actual pressures of even clutch is less than 2 bar	Check clutch pressure sensor
P084636	Difference Between Target and Actual Pressures of Even Clutch Out of Range	Difference between target and actual pressures of even clutch is more than 2 bar	Difference between target and actual pressures of even clutch is less than 2 bar	Check clutch pressure sensor

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P084624	Even Clutch Pressure Zero Shift	Zero shift occurs in even clutch pressure	There is no zero shift in even clutch pressure	Check clutch pressure sensor
P071162	Difference Between Clutch Oil Temperature and Valve Body Oil Temperature Too Large	Difference between valve body oil temperature and clutch oil temperature is more than 60℃	Difference between valve body oil temperature and clutch oil temperature is less than 60℃	Check temperature sensor
P071685	Odd Input Shaft Speed Out of Upper Limit	Odd input shaft speed sensor value is more than 10000 rpm	Odd input shaft speed sensor value is less than 10000 rpm	Check speed sensor
P276685	Even Input Shaft Speed Out of Upper Limit	Even input shaft speed sensor value is more than 10000 rpm	Even input shaft speed sensor value is less than 10000 rpm	Check speed sensor
P072185	Excessive Clutch Slipping	Output speed sensor value is more than 3000 rpm	Output speed sensor value is less than 3000 rpm	Check speed sensor
P081107	Excessive Clutch Slipping	Clutch slipping is excessive	Clutch slipping is normal	Check clutch
P181077	Shifting to 1st Gear Failure	It fails to shift to 1st gear	It is successful to shit to 1st gear	Check shift lever, gear, position sensor and synchronizer
P181177	Shifting Out of 1st Gear Failure	It fails to shift out of 1st gear	It is successful to shift out of 1st gear	Check shift lever, gear, position sensor and synchronizer
P181277	Shifting to 2nd Gear Failure	It fails to shift to 2nd gear	It is successful to shift to 2nd gear	Check shift lever, gear, position sensor and synchronizer
P181377	Shifting Out of 2nd Gear Failure	It fails to shift out of 2nd gear	It is successful to shift out of 2nd gear	Check shift lever, gear, position sensor and synchronizer
P181477	Shifting to 3rd Gear Failure	It fails to shift to 3rd gear	It is successful to shift to 3rd gear	Check shift lever, gear, position sensor and synchronizer
P181577	Shifting Out of 3rd Gear Failure	It fails to shift out of 3rd gear	It is successful to shift out of 3rd gear	Check shift lever, gear, position sensor and synchronizer
P181677	Shifting to 4th Gear Failure	It fails to shift to 4th gear	It is successful to shift to 4th gear	Check shift lever, gear, position sensor and synchronizer
P181777	Shifting Out of 4th Gear Failure	It fails to shift out of 4th gear	It is successful to shift out of 4th gear	Check shift lever, gear, position sensor and synchronizer
P181877	Shifting to 5th Gear Failure	It fails to shift to 5th gear	It is successful to shift to 5th gear	Check shift lever, gear, position sensor and synchronizer

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P181977	Shifting Out of 5th Gear Failure	It fails to shift out of 5th gear	It is successful to shift out of 5th gear	Check shift lever, gear, position sensor and synchronizer
P182077	Shifting to 6th Gear Failure	It fails to shift to 6th gear	It is successful to shift to 6th gear	Check shift lever, gear, position sensor and synchronizer

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P182177	Shifting Out of 6th Gear Failure	It fails to shift out of 6th gear	It is successful to shift out of 6th gear	Check shift lever, gear, position sensor and synchronizer
P186077	Shifting to 7th Gear Failure	Engagement error occurs in gear failing to reach command position of 7th gear	Engagement error occurs in gear that can reach command position of 7th gear	Check shift lever, gear, position sensor and synchronizer
P186177	Shifting Out of 7th Gear Failure	Separation error occurs in gear failing to reach command position of 7th gear	Separation error occurs in gear that can reach command position of 7th gear	Check shift lever, gear, position sensor and synchronizer
P182277	Shifting to R Gear Failure	It fails to shift to R gear	It is successful to shift to R gear	Check shift lever, gear, position sensor and synchronizer
P181092	Shifting to 1st Gear Failure from Stationary State	It fails to shift to 1st gear from stationary state	It is successful to shift to 1st gear from stationary state	Check shift lever, gear, position sensor and synchronizer
P182292	Shifting to R Gear Failure from Stationary State	It fails to shift to R gear from stationary state	It is successful to shift to R gear from stationary state	Check shift lever, gear, position sensor and synchronizer
P182377	Shifting Out of R Gear Failure	It fails to shift out of R gear	It is successful to shift out of R gear	Check shift lever, gear, position sensor and synchronizer
P185007	Unexpected Shifting Out on Odd Shaft	Abnormal shifting out occurs on odd shaft	Upshift/downshift can be performed normally on odd shaft	Check shift lever, gear, position sensor and synchronizer
P185107	Unexpected Shifting Out on Even Shaft	Abnormal shifting out occurs on even shaft	Upshift/downshift can be performed normally on even shaft	Check shift lever, gear, position sensor and synchronizer
P185207	Engine Crankshaft Failure	Difference between engine speed and clutch speed sensor value is more than 750 rpm	Difference between engine speed and clutch speed sensor value is less than 750 rpm	Check crankshaft
P185307	Transmission Coupling Shaft or Differential Connection Failure	Difference between output shaft speed and propeller shaft speed is more than 250 rpm	Difference between output shaft speed and propeller shaft speed is less than 250 rpm	Check crankshaft
P089392	Odd Shaft Multi-gear	Odd shaft multi-gear engages	Gears engage normally on odd shaft	Check gear

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Engagement Failure			
P182492	Even Shaft Multi-gear Engagement Failure	Even shaft multi-gear engages	Gears engage normally on even shaft	Check gear
P278798	Clutch Surface Temperature Too High Failure	Clutch surface temperature is higher than 350°C	Clutch surface temperature is lower than 350°C	
P184998	Transmission Temperature Too High Failure	Valve oil temperature/(-clutch oil temperature -20℃) is higher than 140℃	Valve/(clutch -25℃) temperature signal is lower than the maximum value (140℃)	
P184592	Dual Clutch Simultaneous Engagement Failure	Simultaneous engagement failure occurs in dual clutch	Dual clutch does not engage simultaneously	Check clutch

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
P184809	SubRom Read Failure	It fails to read the sub procedure	Sub procedure is successfully read once	Check subrom
P185644	EEPROM Checksum Failure	The SubROM logical identifier compared to EE does not match properly	The SubROM logical identifier compared to EE matches properly	Read subrom
P187277	Shifting to P Gear Failure	Epark engages at wrong command position and cannot be reached after 3 times	Epark engages at wrong command position and can be reached within 3 times	Check Epark
P187377	Shifting Out of P Gear Failure	Epark separates at wrong command position and cannot be reached after 3 times	Epark separates at wrong command position and can be reached within 3 times	Check Epark
P279785	Motor Speed Out of Upper Limit	BLDC speed value is more than 3300 rpm	BLDC speed value is less than 3300 rpm	Check brush
P0A1B64	Motor Control Times Out	Motor target speed is more than 1000 rpm, and motor actual speed is less than 200 rpm	Motor target speed is less than 1000 rpm, and motor actual speed is more than 200 rpm	Check brush
P190344	TCU Memory Read Failure	TCU memory rear error occurs	It is read successfully	
P190444	TCU Memory Writing Failure	TCU memory writing error occurs	It is written successfully	
P190198	CG135 Chip Overtemperatur-e	CG135 and NTC have overtemperature	CG135 and NTC have low temperature	
P190201	CG135 Chip Temperature Error	CG135 and NTC have overtemperature	No CG135 and NTC temperature errors are detected	

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U010087	EMS Node Communication Missing	For message EMS\ U 1/ EMS\ U 2/EMS\ U 3/EMS\ U 4/EMS\ U 5/EMS\ U 7/ EMS\ U 9/EMS\ U C, TCU fails to receive message from EMS node 20 times	Once missing message is restored to normal reception	Check CAN communication
U010387	EMS Node Communication Missing	For message EGS\ U 1, TCU fails to receive message from EGS node 20 times	Once missing message is restored to normal reception	Check CAN communication
U012287	EMS Node Communication Missing	For message EPB\ U 1/ ESC\ U 2/ESC\ U 3/ESC\ U 4/ESC\ U 6/ESC\ U 7, TCU fails to receive message from ESC node 20 times	Once missing message is restored to normal reception	Check CAN communication
U014087	BCM Node Communication Missing	For message BCM\ U 1, TCU does not receive a message from BCM node 20 consecutive times	Once missing message is restored to normal reception	Check CAN communication
U015187	ACM Node Communication Missing	For message ACM\ U 1, TCU fails to receive message from ACM node for 4000 ms; For message ACM\ U 2, TCU fails to receive message from ACM node 20 times	Once missing message is restored to normal reception	Check CAN communication
U015587	IPC Node Communication Missing	For message IPC\ U 5/IPC\ U 7, TCU fails to receive message from IPC node for 4000 ms; For message IPC\ U C, TCU fails to receive message from IPC node 20 times	Once missing message is restored to normal reception	Check CAN communication
U016487	CLM Node Communication Missing	For message CLM\ U 3, TCU fails to receive message from CLM node 20 times	Once missing message is restored to normal reception	Check CAN communication
U021287	SCM Node Communication Missing	For message SCM\ U 1, TCU fails to receive message from SCM node 20 times	Once missing message is restored to normal reception	Check CAN communication
U024887	PEPS Node Communication Missing	For message PEPS\ U 4, TCU fails to receive message from PEPS node 20 times	Once missing message is restored to normal reception	Check CAN communication
U040181	EMS Node Data Invalid	Message with invalid signal content is received from EMS 10 times	Once the message with valid signal content is received from EMS node	Check CAN communication

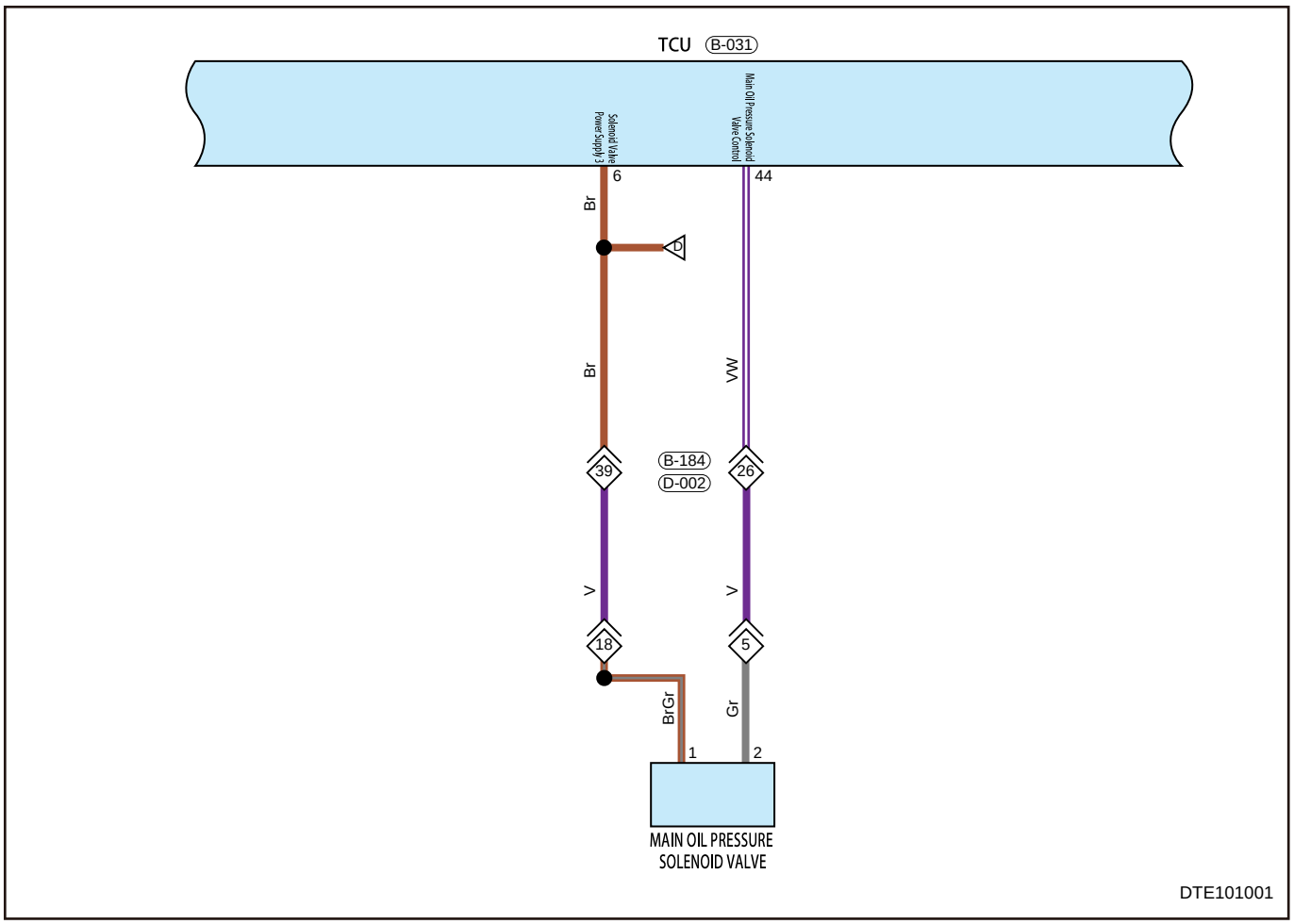
DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U040481	EGS Node Data Invalid	Message with invalid signal content is received from EGS 10 times	Once the message with valid signal content is received from EGS node	Check CAN communication
U041681	ESC Node Data Invalid	Message with invalid signal content is received from ESC 10 times	Once the message with valid signal content is received from ESC node	Check CAN communication
U042281	BCM Node Data Invalid	Message with invalid signal content is received from BCM 10 times	Once the message with valid signal content is received from BCM node	Check CAN communication
U042381	IPC Node Data Invalid	Message with invalid signal content is received from IPC 10 times	Once the message with valid signal content is received from IPC node	Check CAN communication
U042481	CLM Node Data Invalid	Message with invalid signal content is received from CLM 10 times	Once the message with valid signal content is received from CLM node	Check CAN communication
U042681	PEPS Node Data Invalid	Message with invalid signal content is received from PEPS 10 times	Once the message with valid signal content is received from PEPS node	Check CAN communication
U042981	SCM Node Data Invalid	Message with invalid signal content is received from SCM 10 times	Once the message with valid signal content is received from SCM node	Check CAN communication
U045281	ACM Node Data Invalid	Message with invalid signal content is received from ACM 10 times	Once the message with valid signal content is received from ACM node	Check CAN communication

4.8 DTC Diagnosis Procedure

■ Main Oil Path Solenoid Valve DTCs

DTC	P096013	Main Oil Path Solenoid Valve Open
DTC	P096211	Main Oil Path Solenoid Valve Short to Ground
DTC	P096312	Main Oil Path Solenoid Valve Short to Power Supply
DTC	P188904	Main Oil Path Solenoid Valve Passage Closes Unexpectedly
DTC	P188A01	Main Oil Path Solenoid Valve Circuit Error
DTC	P074519	Main Oil Path Solenoid Valve Feedback Current Too High
DTC	P074818	Main Oil Path Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.

(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	Check alternator

(a) Check the alternator.

NG → Replace alternator

OK

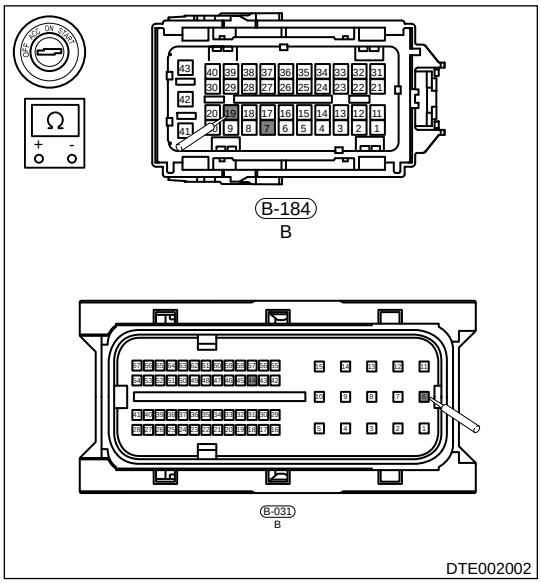
3	Check main oil path solenoid valve wire harness

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (6) - B-184 (39)	Always	Less than 1 Ω
B-031 (44) - B-184 (26)	Always	Less than 1 Ω



NG → Check and repair main oil path solenoid valve wire harness

OK

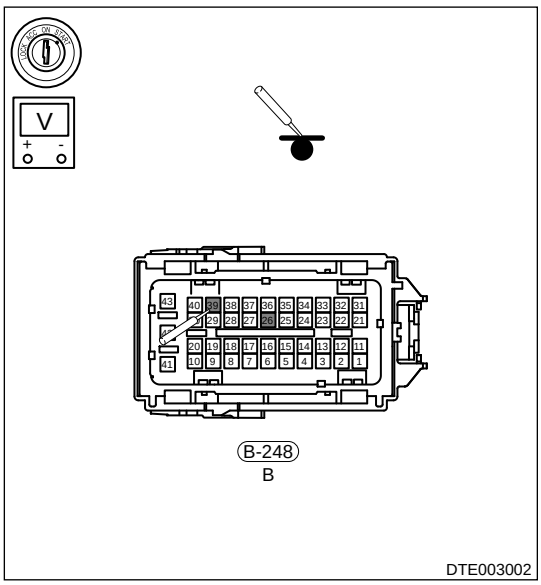
4	Check voltage of main oil path solenoid valve wire harness connector

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (39) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (26) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in main oil path solenoid valve**

OK

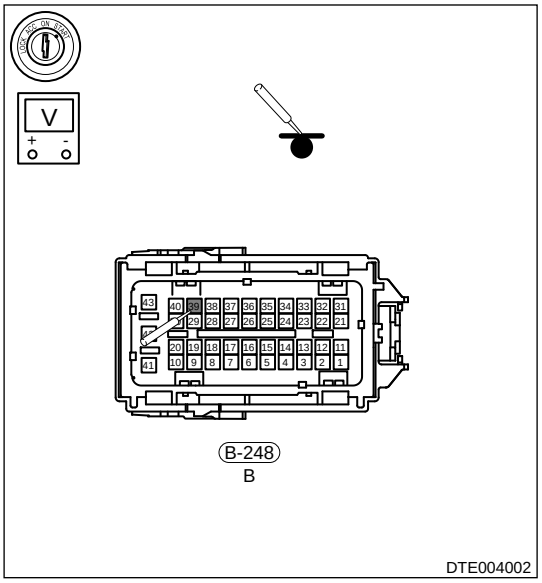
5	**Check TCU module output voltage**

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 39 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (39) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (39) and TCU**

OK

6	**Check sensor integration module B wire harness connectors D-002 and D-009.**

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.

(b) Drain the transmission oil.

(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.

(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

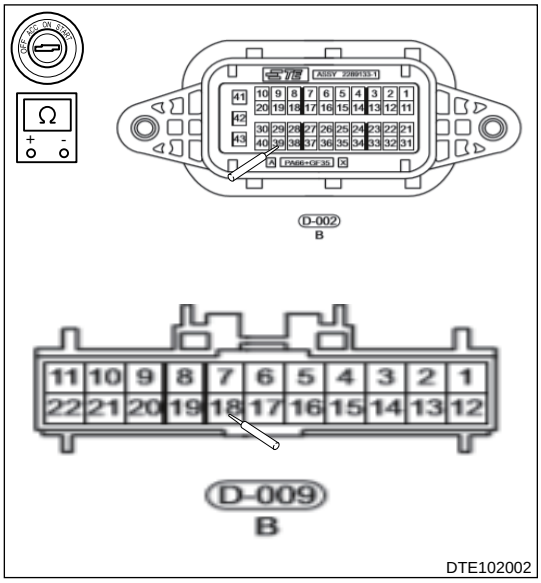
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, check for continuity between terminals 39 and 26 of connector D-002 and terminals 18 and 5 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (39) - D-009 (18)	Always	Less than 1 Ω
D-002 (26) - D-009 (5)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	Check sensor integration module B assembly

NG → **Replace sensor integration module B assembly**

OK

9	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

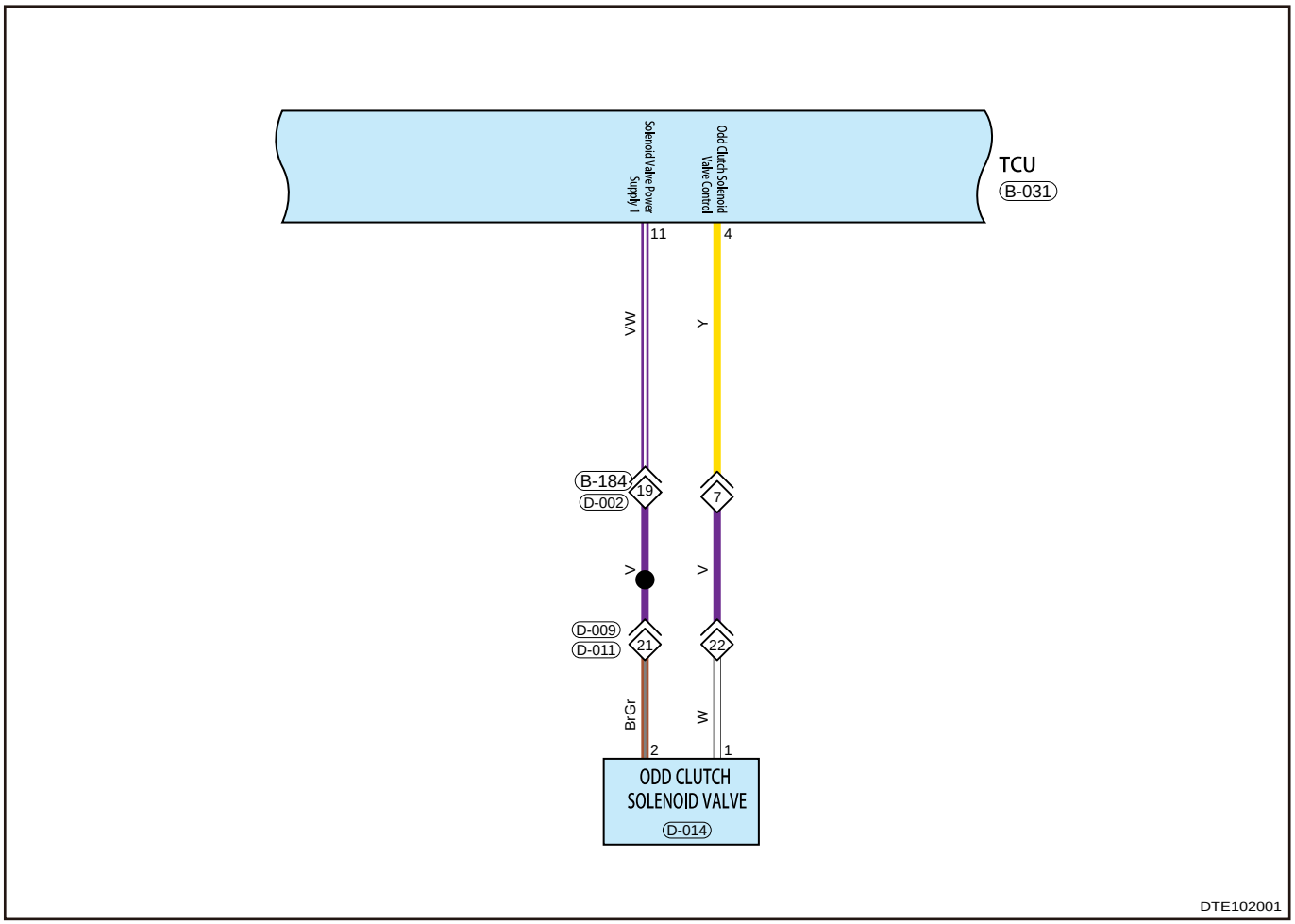
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **Odd Clutch Solenoid Valve DTCs**

DTC	P182513	Odd Clutch Solenoid Valve Open
DTC	P097311	Odd Clutch Solenoid Valve Short to Ground
DTC	P097412	Odd Clutch Solenoid Valve Short to Power Supply
DTC	P188D04	Odd Clutch Solenoid Valve Passage Closes Unexpectedly
DTC	P188E01	Odd Clutch Solenoid Valve Circuit Error
DTC	P075019	Odd Clutch Solenoid Valve Feedback Current Too High
DTC	P075318	Odd Clutch Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG	**Replace battery**

OK

2	Check alternator

(a) Check the alternator.

NG → Replace alternator

OK

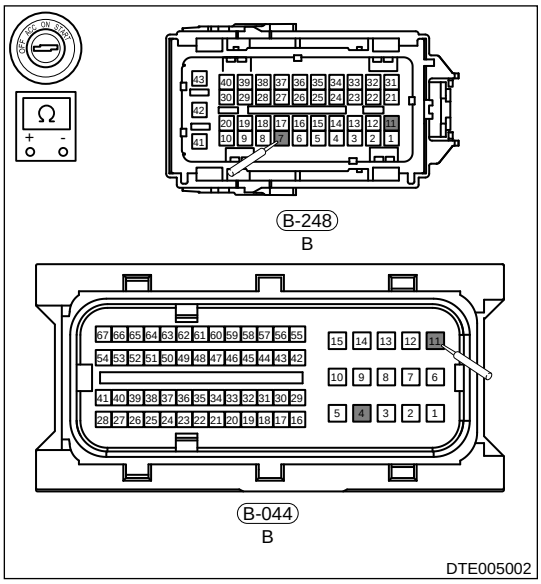
3	Check odd clutch solenoid valve wire harness

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (4) - B-184 (7)	Always	Less than 1 Ω
B-031 (11) - B-184 (19)	Always	Less than 1 Ω



NG → Check and repair odd clutch solenoid valve wire harness

OK

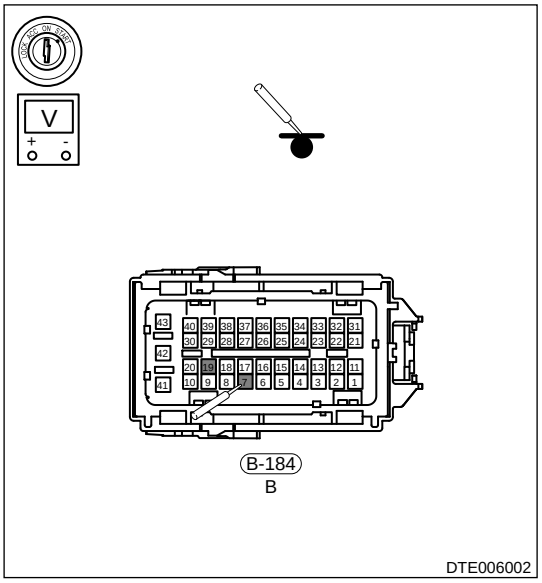
4	Check voltage of odd clutch solenoid valve wire harness connector

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (19) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (7) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in odd clutch solenoid valve wire harness**

OK

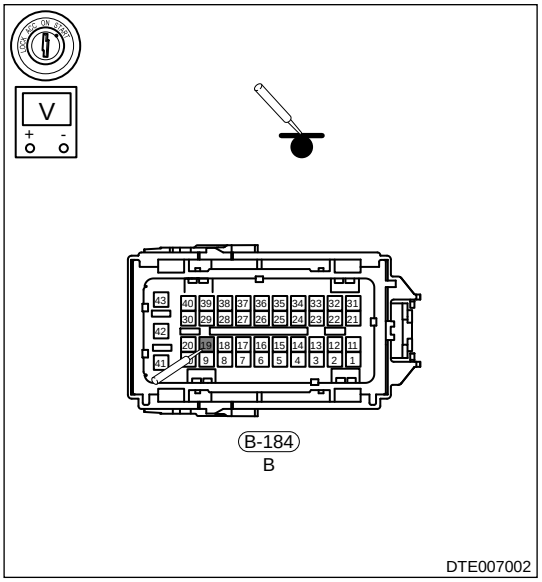
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 19 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (19) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (19) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

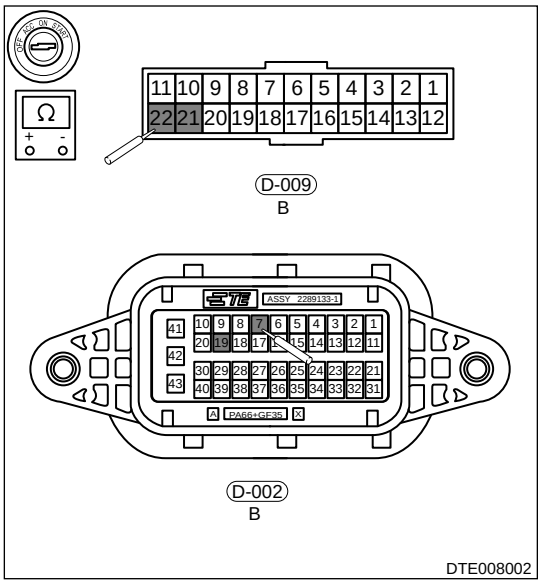
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 19 and 7 of connector D-002 and terminals 21 and 22 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (19) - D-009 (21)	Always	Less than 1 Ω
D-002 (7) - D-009 (22)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

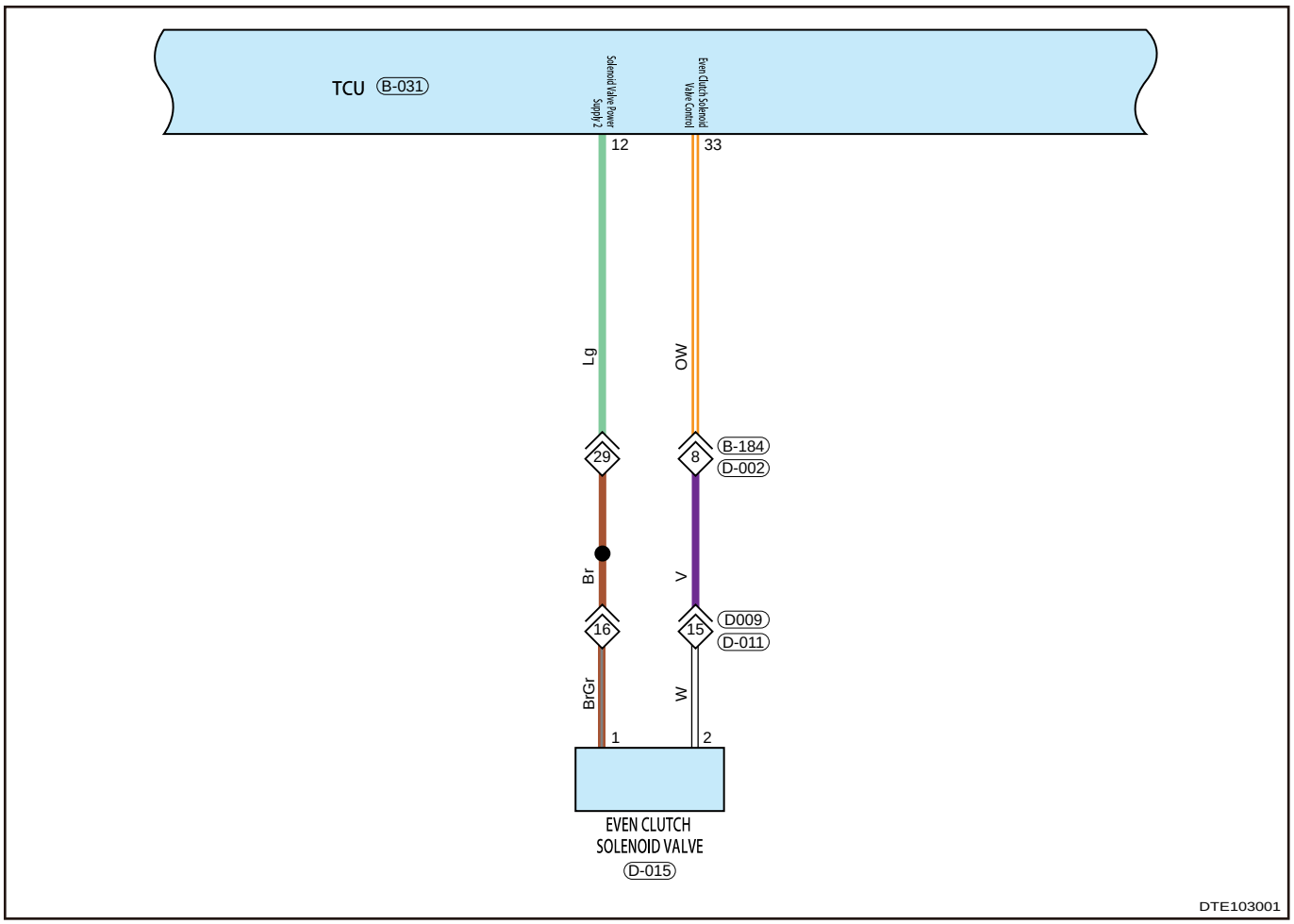
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **Even Clutch Solenoid Valve DTCs**

DTC	P182613	Even Clutch Solenoid Valve Open
DTC	P097611	Even Clutch Solenoid Valve Short to Ground
DTC	P097712	Even Clutch Solenoid Valve Short to Power Supply
DTC	P188F04	Even Clutch Solenoid Valve Passage Closes Unexpectedly
DTC	P189001	Even Clutch Solenoid Valve Circuit Error
DTC	P075519	Even Clutch Solenoid Valve Feedback Current Too High
DTC	P075818	Even Clutch Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.

- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	**Check alternator**

(a) Check generating capacity of alternator.

NG → **Replace alternator**

OK

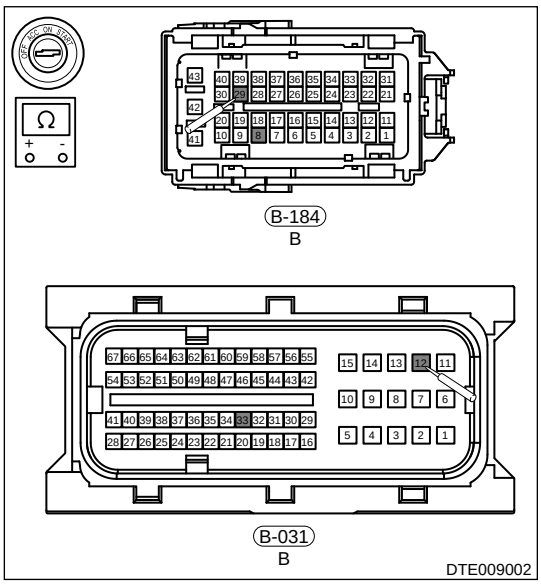
3	**Check even clutch solenoid valve wire harness**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (12) - B-184 (29)	Always	Less than 1 Ω
B-031 (33) - B-184 (8)	Always	Less than 1 Ω



NG → **Check and repair even clutch solenoid valve wire harness**

OK

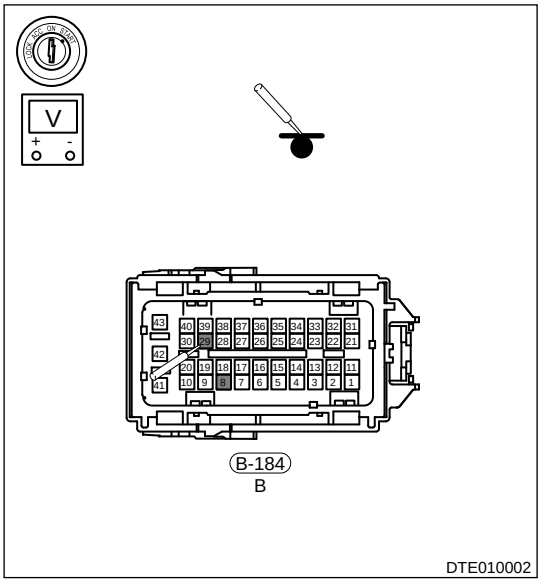
4	**Check voltage of even clutch solenoid valve wire harness connector**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (29) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (8) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in even clutch solenoid valve wire harness**

OK

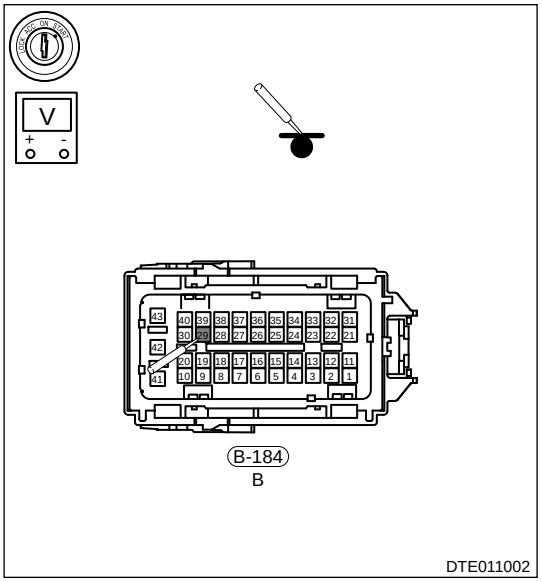
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 29 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (29) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (29) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

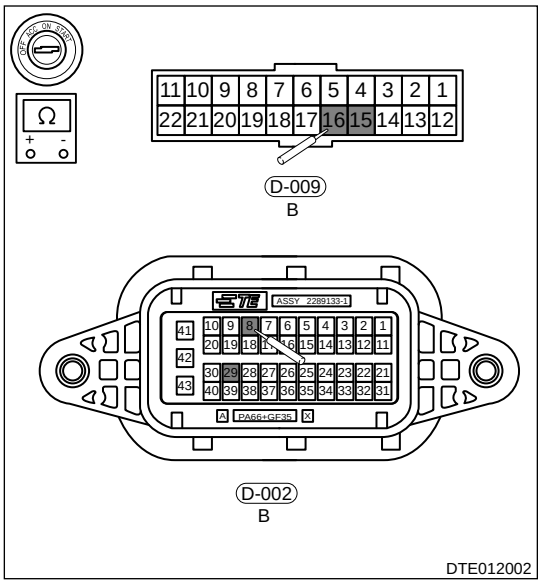
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 29 and 8 of connector D-002 and terminals 16 and 15 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (29) - D-009 (16)	Always	Less than 1 Ω
D-002 (8) - D-009 (15)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

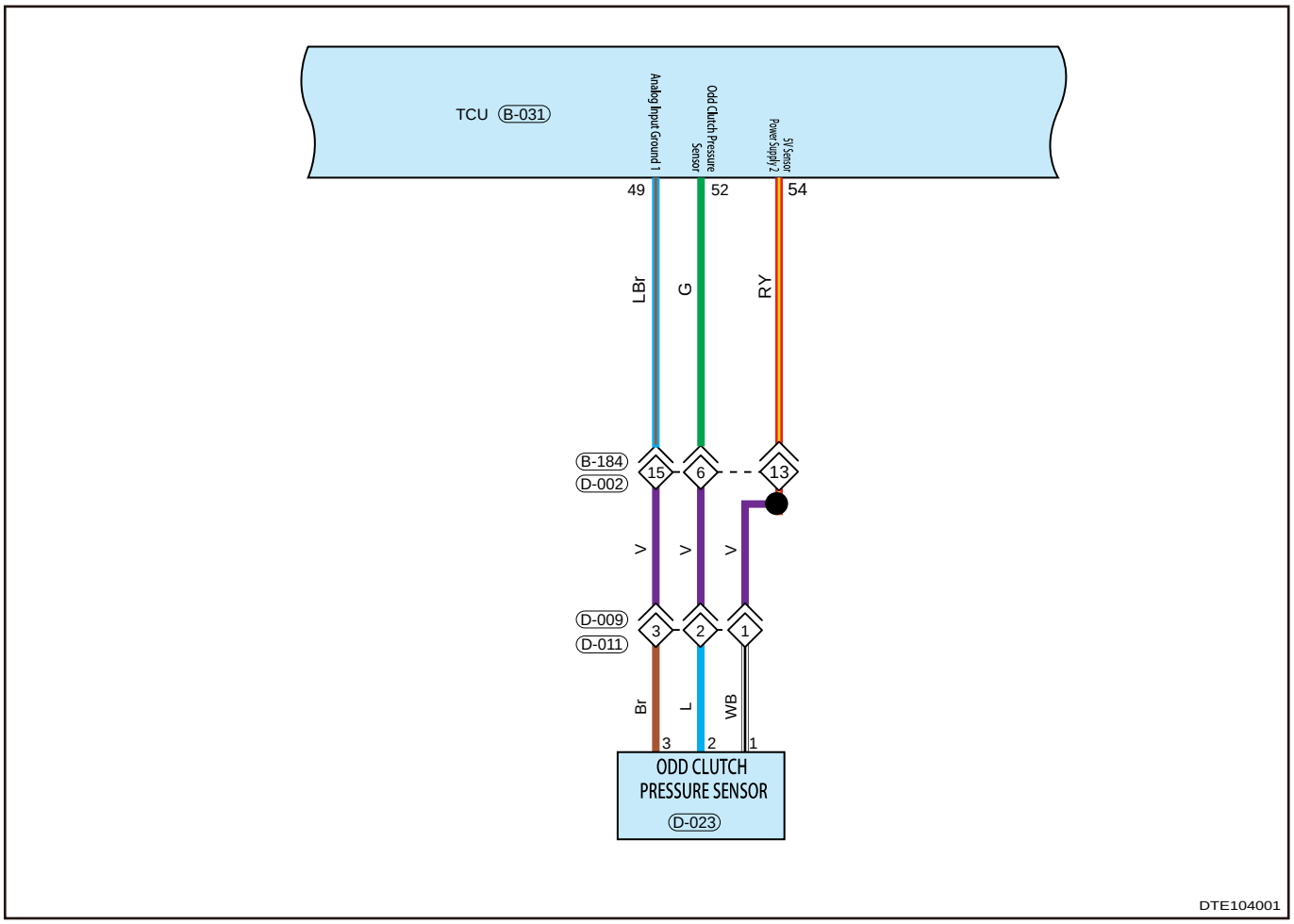
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ Odd Clutch Pressure Sensor DTCs

DTC	P084214	Odd Clutch Pressure Sensor Short to Ground or Open
DTC	P084312	Odd Clutch Pressure Sensor Short to Power Supply

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery

(a) Turn ENGINE START STOP switch to OFF.

(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → Replace battery

OK

2	Check alternator

(a) Check the alternator.

NG → Replace alternator

OK

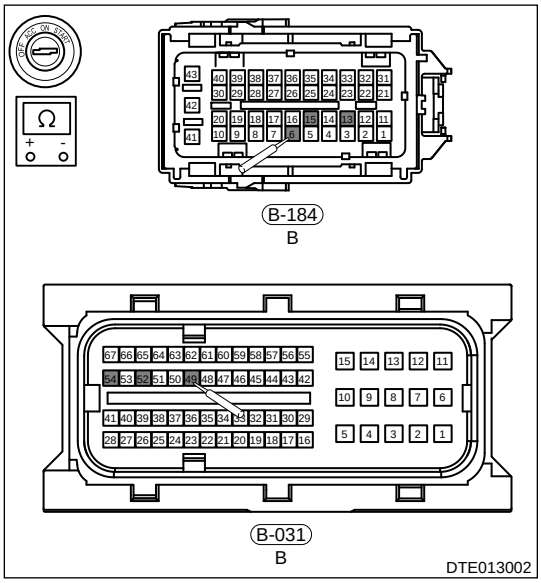
3	Check odd clutch pressure sensor wire harness

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (49) - B-184 (15)	Always	Less than 1 Ω
B-031 (52) - B-184 (6)	Always	Less than 1 Ω
B-031 (54) - B-184 (13)	Always	Less than 1 Ω



NG → Check and repair odd clutch pressure sensor wire harness

OK

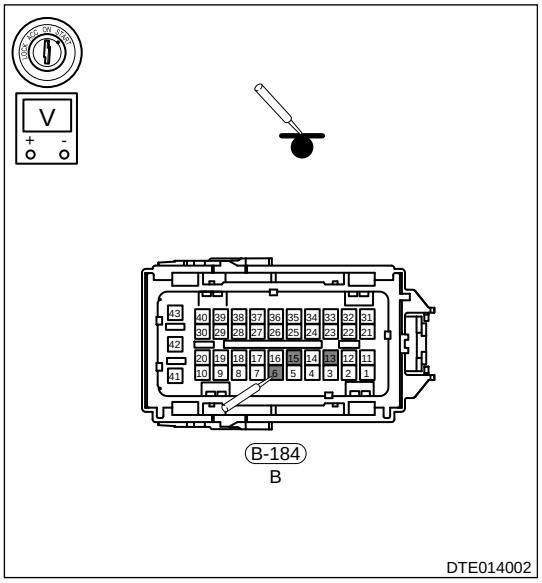
4	Check voltage of odd clutch pressure sensor wire harness connector

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (15) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (13) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (6) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in odd clutch pressure sensor wire harness**

OK

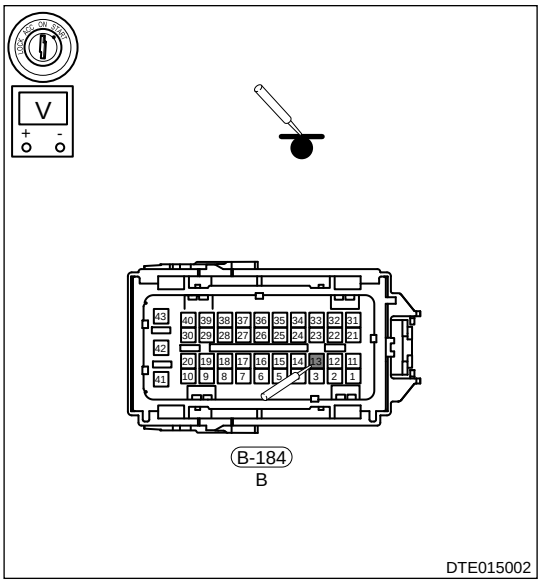
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 13 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (13) - Body ground	ENGINE START STOP switch ON	Not less than 5V



NG → **Check wire harness between B-184 (13) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

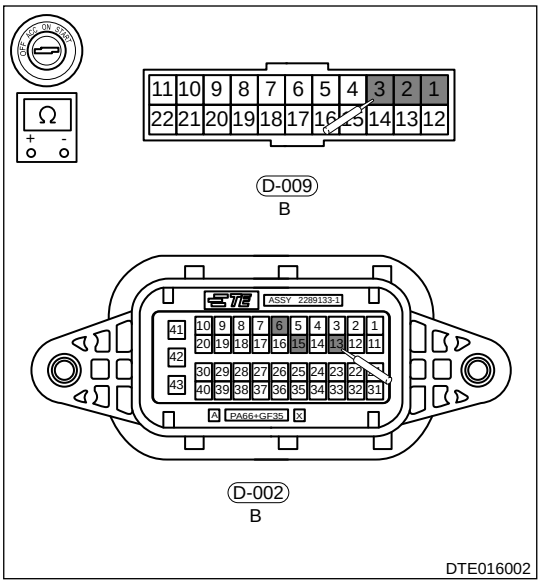
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 15, 13 and 6 of connector D-002 and terminals 3, 2 and 1 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (15) - D-009 (3)	Always	Less than 1 Ω
D-002 (6) - D-009 (2)	Always	Less than 1 Ω
D-002 (13) - D-009 (1)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

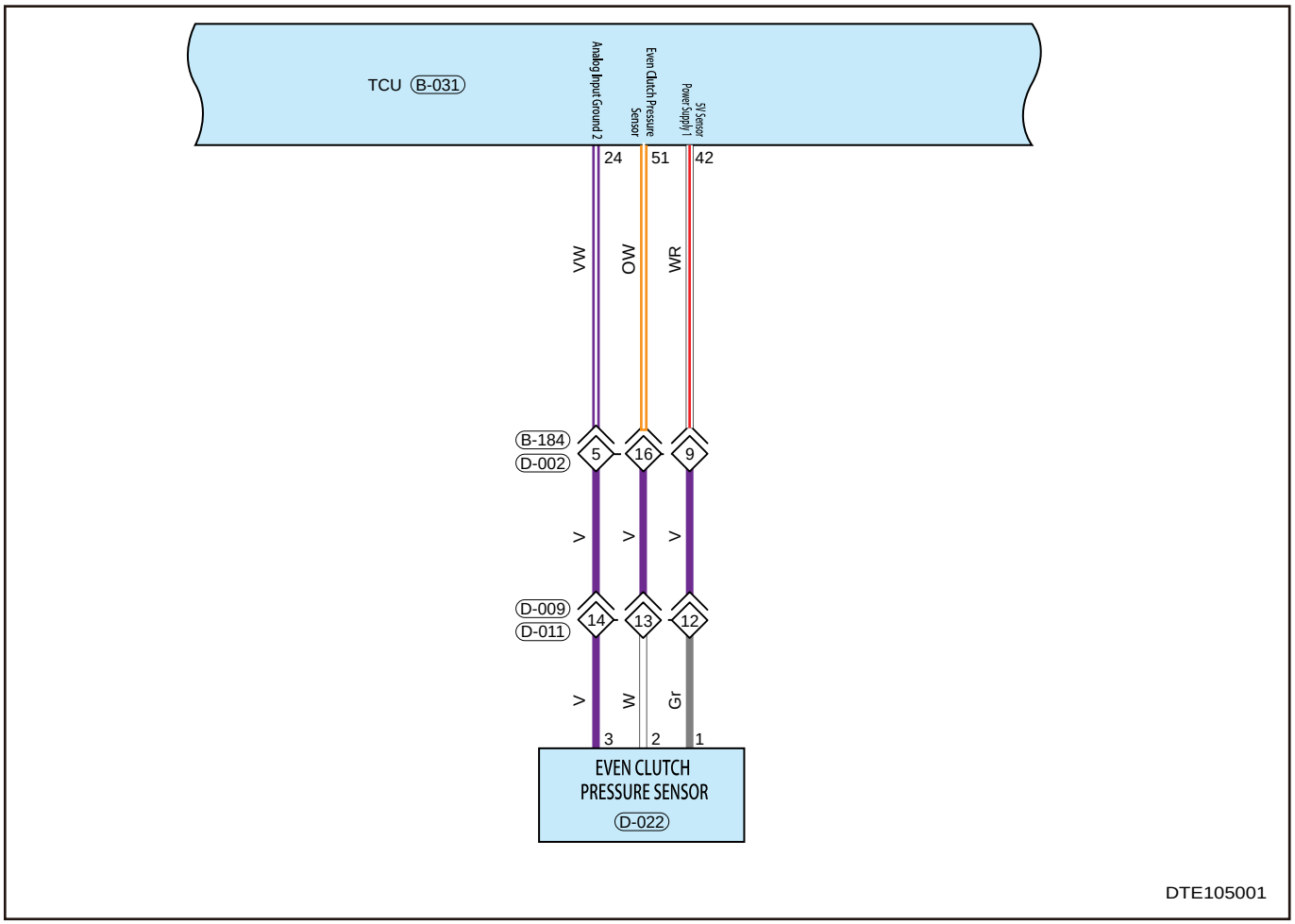
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **Even Clutch Pressure Sensor DTCs**

DTC	**P084714**	**Even Clutch Pressure Sensor Short to Ground or Open**
DTC	**P084812**	**Even Clutch Pressure Sensor Short to Power Supply**

Circuit Diagram



■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK →

2	Check alternator

(a) Check the alternator.

NG → **Replace alternator**

OK →

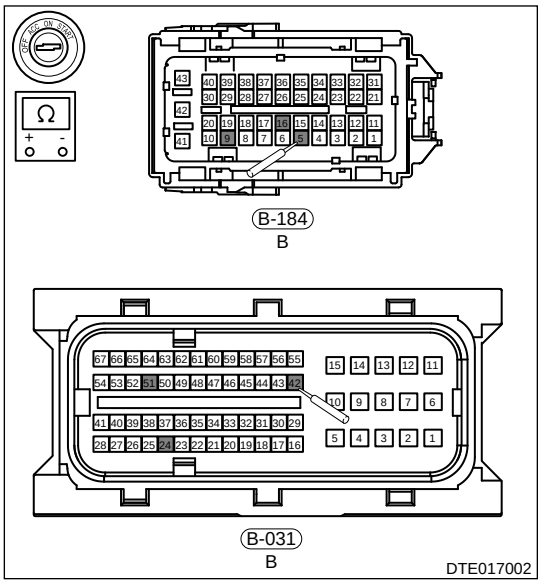
3	Check even clutch pressure sensor wire harness

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (24) - B-184 (5)	Always	Less than 1 Ω
B-031 (51) - B-184 (16)	Always	Less than 1 Ω
B-031 (42) - B-184 (9)	Always	Less than 1 Ω



NG → **Check and repair even clutch pressure sensor wire harness**

OK →

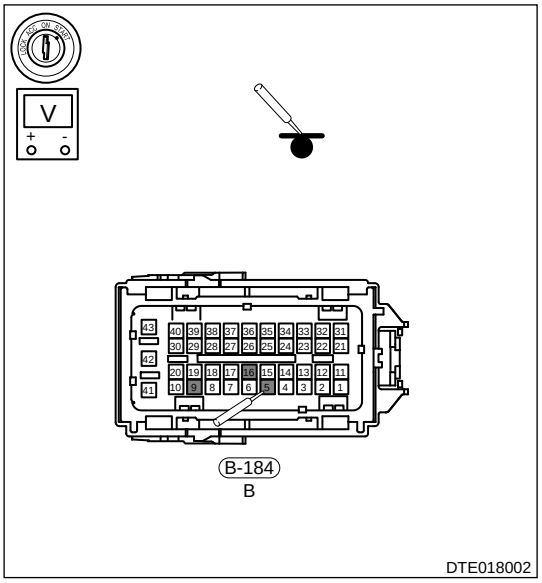
4	Check voltage of even clutch pressure sensor wire harness connector

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (16) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (9) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (5) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in even clutch pressure sensor wire harness**

OK

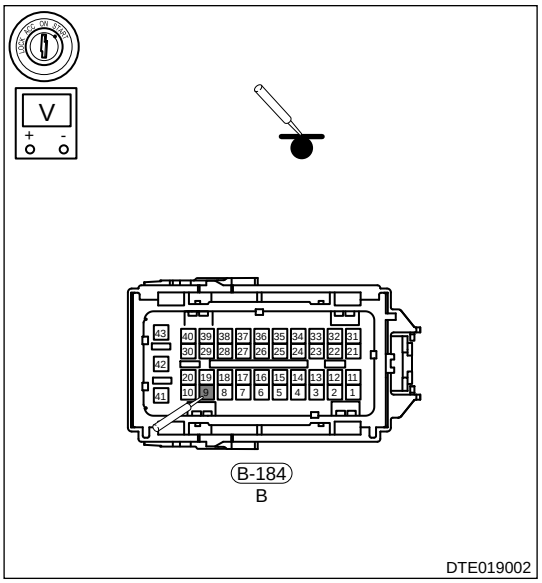
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 9 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (9) - Body ground	ENGINE START STOP switch ON	Not less than 5V



NG → **Check wire harness between B-184 (9) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

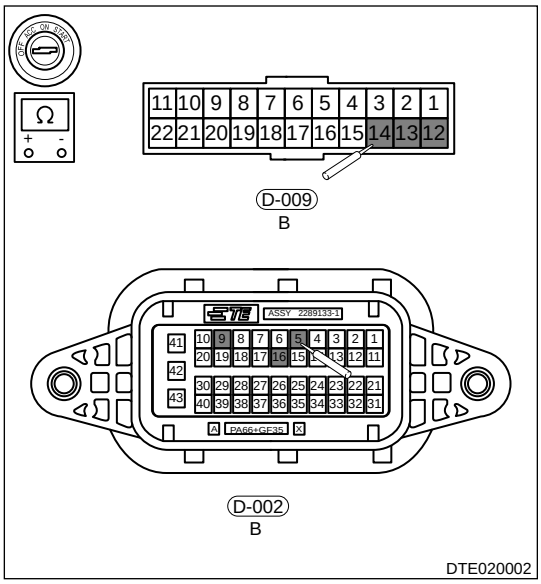
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 5, 16 and 9 of connector D-002 and terminals 14, 13 and 12 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (5) - D-009 (14)	Always	Less than 1 Ω
D-002 (16) - D-009 (13)	Always	Less than 1 Ω
D-002 (9) - D-009 (12)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

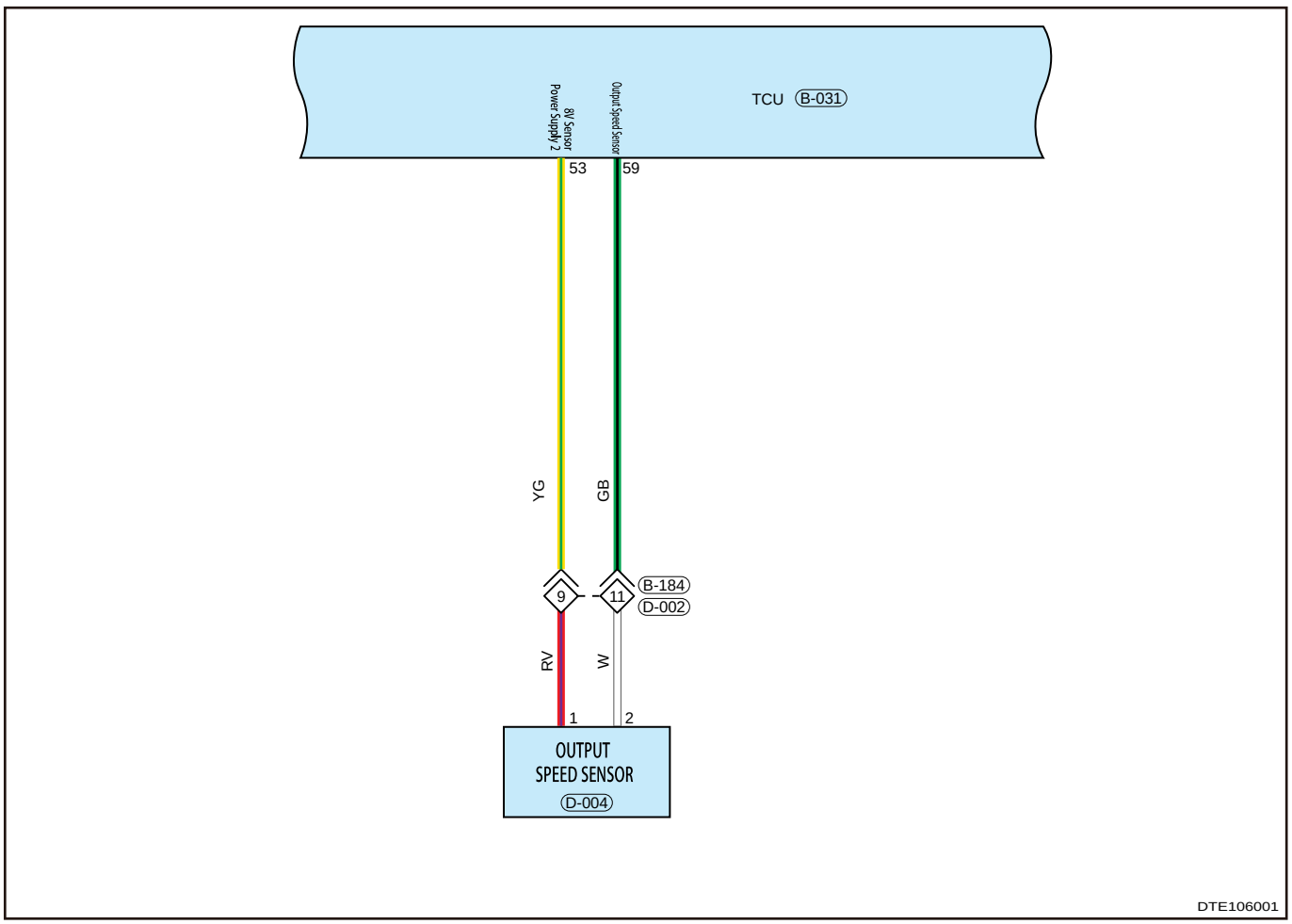
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **Output Shaft Speed Sensor DTCs**

DTC	**P072214**	**Output Shaft Speed Sensor Short to Ground or Open**
DTC	**P180312**	**Output Shaft Speed Sensor Short to Power Supply**

Circuit Diagram



■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	Check alternator

(a) Check the alternator.

NG → **Replace alternator**

OK

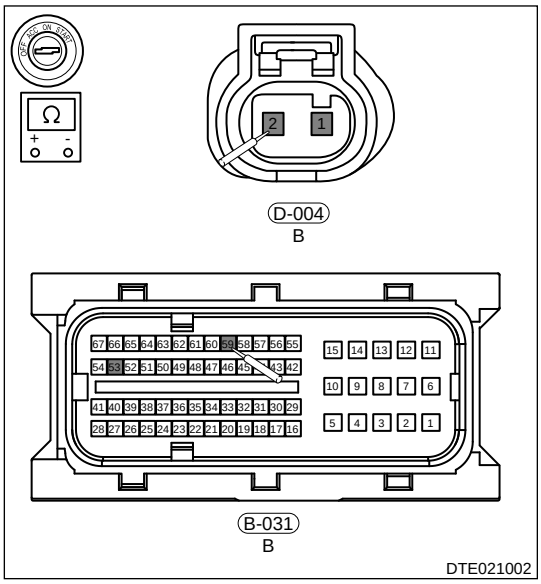
3	Check output shaft speed sensor wire harness

(a) Disconnect TCU connector, output shaft speed sensor connector and sensor integration module A.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031(59) – D-004 (2)	Always	Less than 1 Ω
B-031(53) – D-004 (1)	Always	Less than 1 Ω



NG → **Repair or replace wire harness**

OK

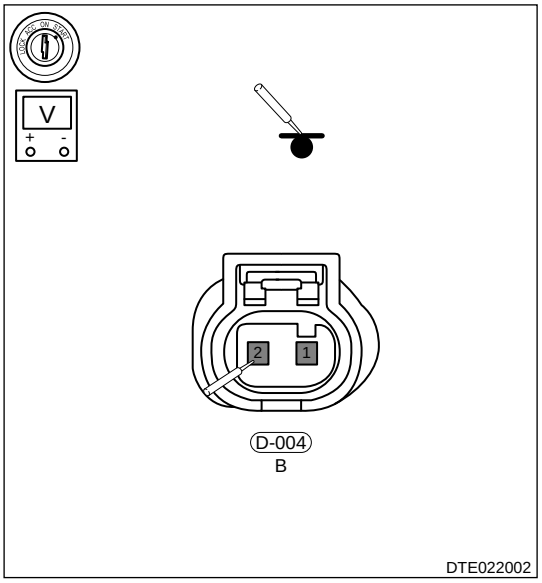
4	Check voltage of output shaft speed sensor connector

(a) Disconnect TCU connector, output shaft speed sensor connector and sensor integration module A.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
D-004 (2) - Body ground	ENGINE START STOP switch ON	0 V
D-004 (1) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in output shaft speed sensor wire harness**

OK

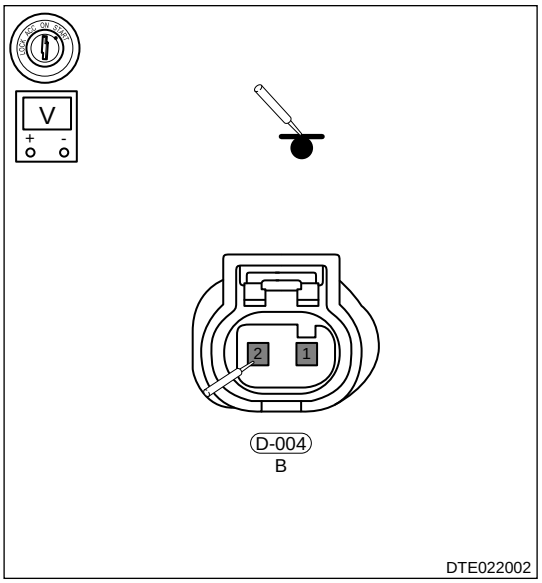
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect output shaft speed sensor connector.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 1 of output shaft speed sensor connector D-004 (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
D-004 (1) - Body ground	ENGINE START STOP switch ON	Not less than 8V



NG → **Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.**

OK

6	Check output shaft speed sensor

(a) Disconnect the output shaft speed sensor connector.
(b) Measure resistance of output shaft speed sensor with a multimeter.

NG → **Replace output shaft speed sensor**

OK

7	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

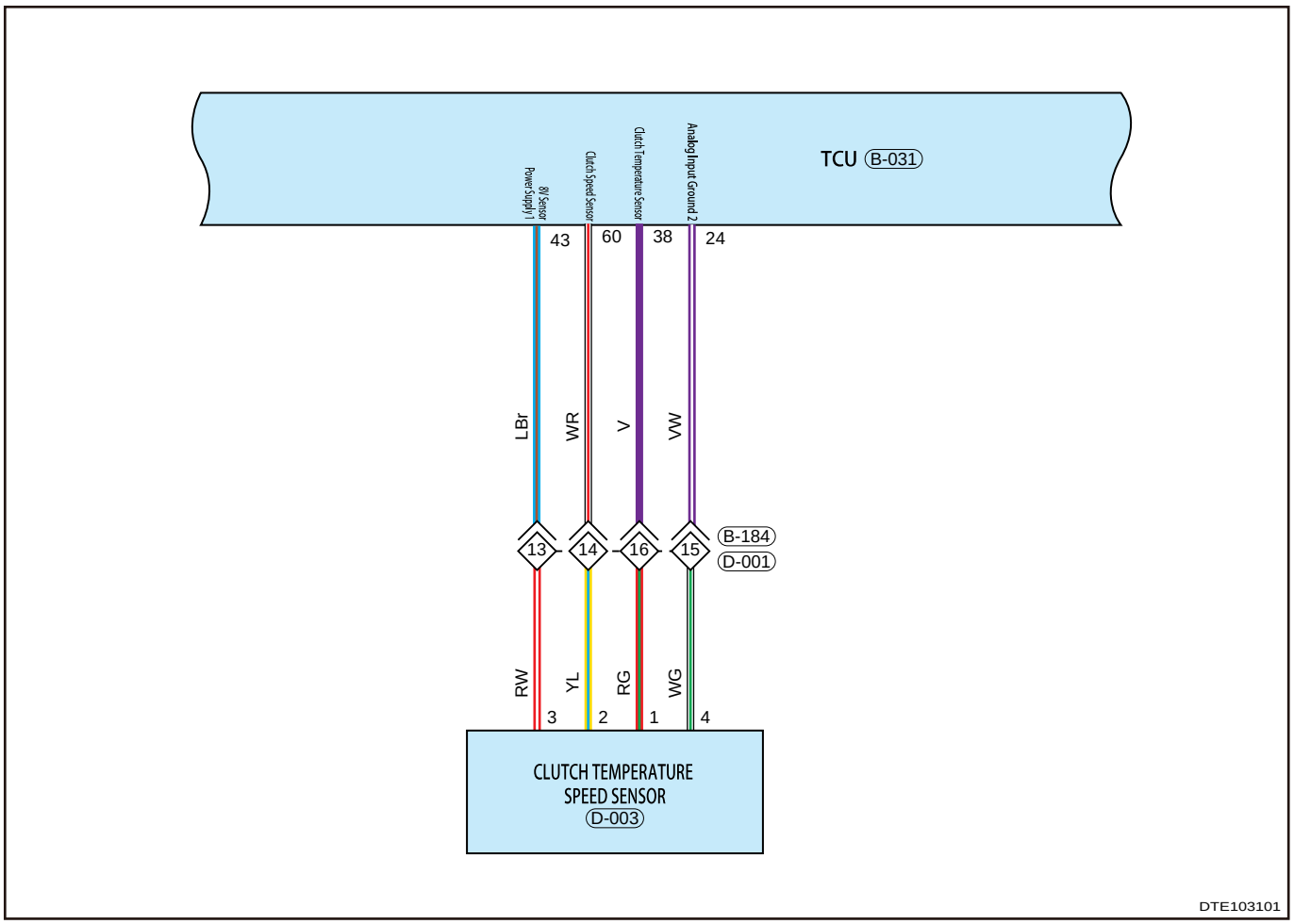
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **Clutch Temperature/Speed Sensor DTCs**

DTC	**P093911**	**Clutch Temperature Sensor Short to Ground**
DTC	**P094015**	**Clutch Temperature Sensor Short to Power Supply or Open**
DTC	**P072714**	**Clutch Speed Sensor Short to Ground or Open**
DTC	**P180412**	**Clutch Speed Sensor Short to Power Supply**

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.

(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	Check alternator

(a) Check the alternator.

NG → Replace alternator

OK

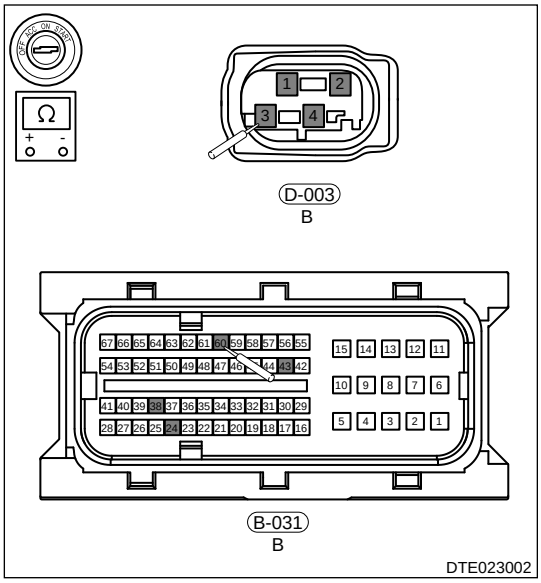
3	Check clutch temperature sensor wire harness

(a) Disconnect TCU connector, clutch temperature sensor connector and sensor integration module A.

(b) Turn ENGINE START STOP switch to OFF.

(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031(43) - D-003 (3)	Always	Less than 1 Ω
B-031(24) - D-003 (4)	Always	Less than 1 Ω
B-031(38) - D-003 (1)	Always	Less than 1 Ω
B-031(60) - D-003 (2)	Always	Less than 1 Ω



NG → Repair or replace wire harness

OK

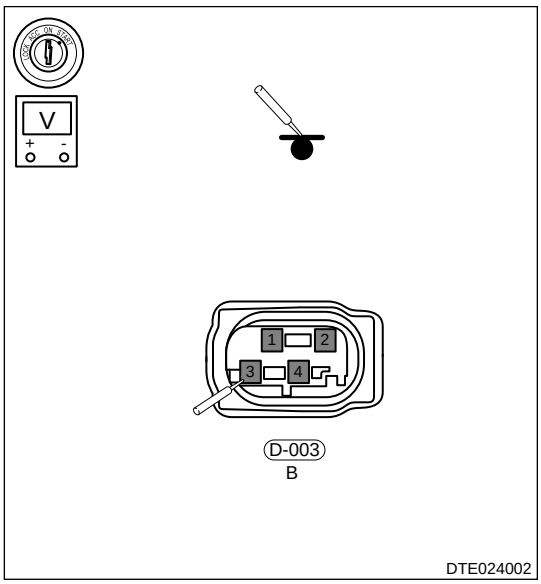
4	Check voltage of clutch temperature sensor connector

(a) Disconnect TCU connector, clutch temperature sensor connector and sensor integration module A.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
D-003 (3) - Body ground	ENGINE START STOP switch ON	0 V
D-003 (1) - Body ground	ENGINE START STOP switch ON	0 V
D-003 (4) - Body ground	ENGINE START STOP switch ON	0 V
D-003 (2) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in clutch temperature sensor wire harness**

OK

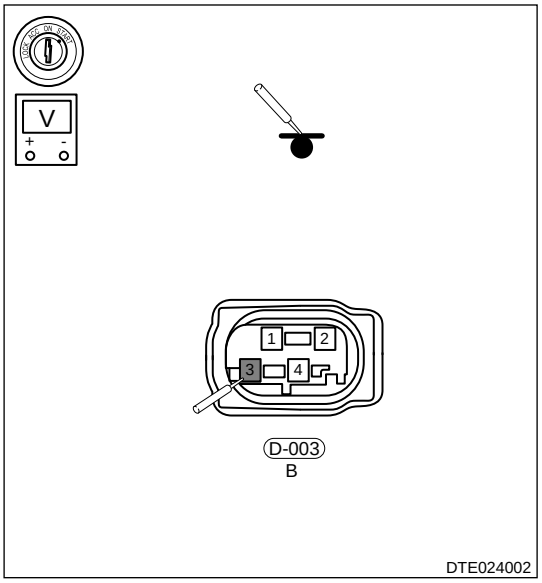
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect clutch temperature sensor connector.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 1 of clutch temperature sensor connector D-003 (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
D-003 (3) - Body ground	ENGINE START STOP switch ON	Not less than 8V



NG → **Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.**

OK

6	Check clutch temperature sensor

(a) Disconnect the clutch temperature sensor connector.

(b) Measure resistance of clutch temperature sensor with a multimeter.

NG → **Replace clutch temperature sensor**

OK

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

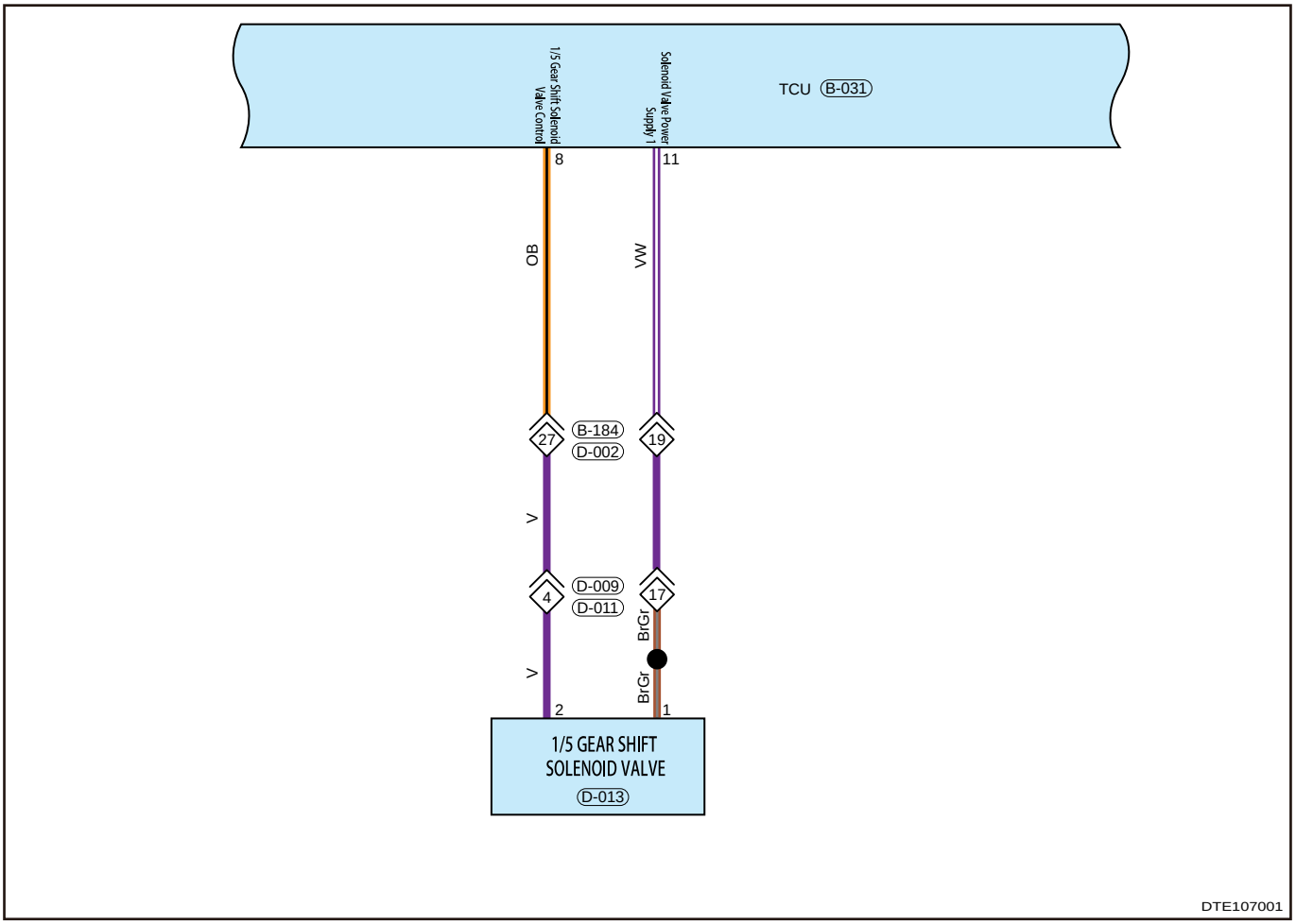
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ 1st/5th Gear Shift Solenoid Valve DTCs

DTC	P186213	1st/5th Gear Flow Solenoid Valve Open
DTC	P099B1	1st/5th Gear Flow Solenoid Valve Short to Ground
DTC	P099C12	1st/5th Gear Flow Solenoid Valve Short to Power Supply
DTC	P189904	1st/5th Gear Flow Solenoid Valve Passage Closes Unexpectedly
DTC	P189A01	1st/5th Gear Flow Solenoid Valve Circuit Error
DTC	P075A19	1st/5th Gear Flow Solenoid Valve Feedback Current Too High
DTC	P075D18	1st/5th Gear Flow Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.

- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	Check alternator

(a) Check generating capacity of alternator.

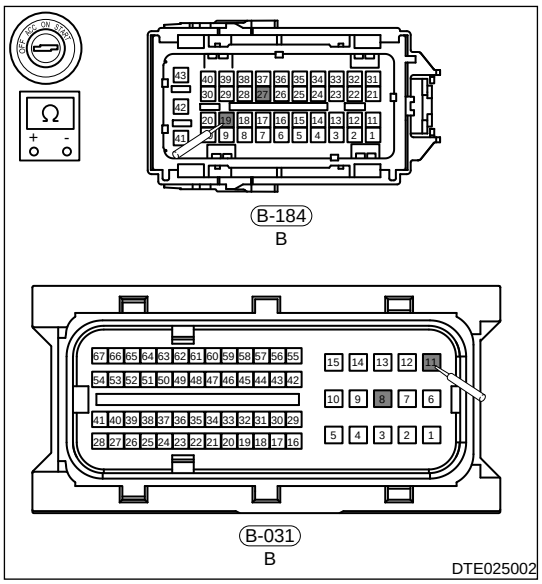
NG → **Replace alternator**

OK

3	Check 1st/5th gear shift solenoid valve wire harness

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.
(b) Turn ENGINE START STOP switch to OFF.
(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (8) - B-184 (27)	Always	Less than 1 Ω
B-031 (11) - B-184 (19)	Always	Less than 1 Ω



NG → **Check and repair 1st/5th gear shift solenoid valve wire harness**

OK

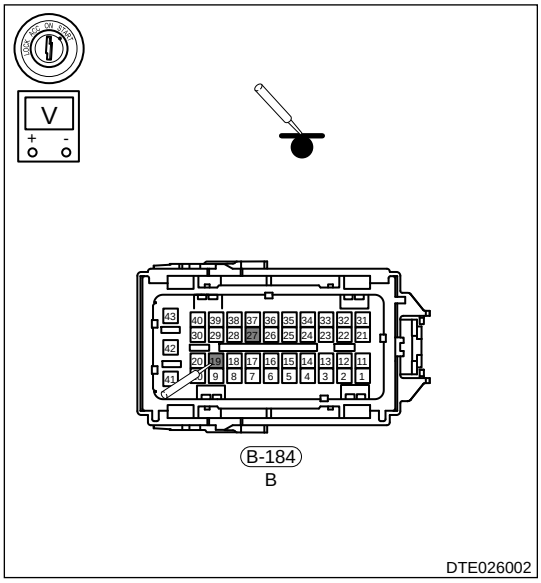
4	Check voltage of 1st/5th gear shift solenoid valve wire harness connector

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (19) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (27) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in 1st/5th gear shift solenoid valve wire harness**

OK

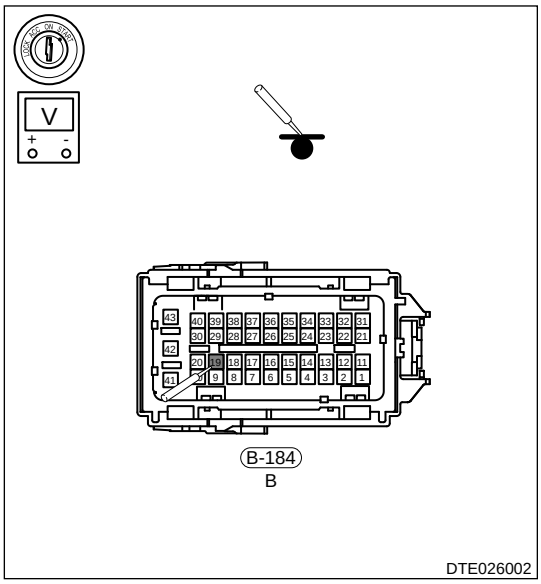
5	**Check TCU module output voltage**

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 19 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (19) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (19) and TCU**

OK

6	**Check sensor integration module B wire harness connectors D-002 and D-009.**

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

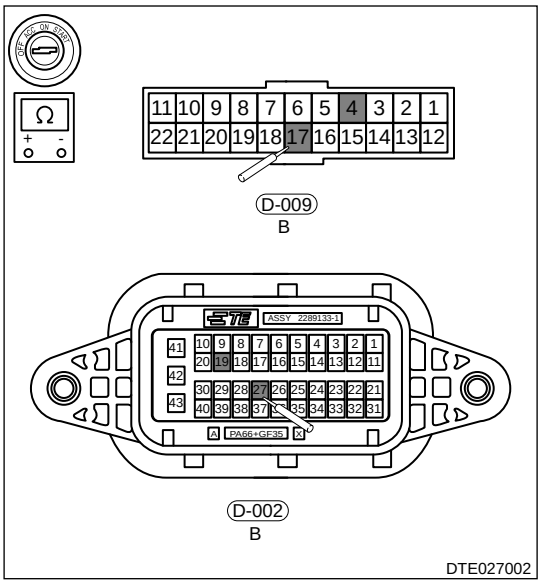
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 27 and 19 of connector D-002 and terminals 4 and 17 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (27) - D-009 (4)	Always	Less than 1 Ω
D-002 (19) - D-009 (17)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

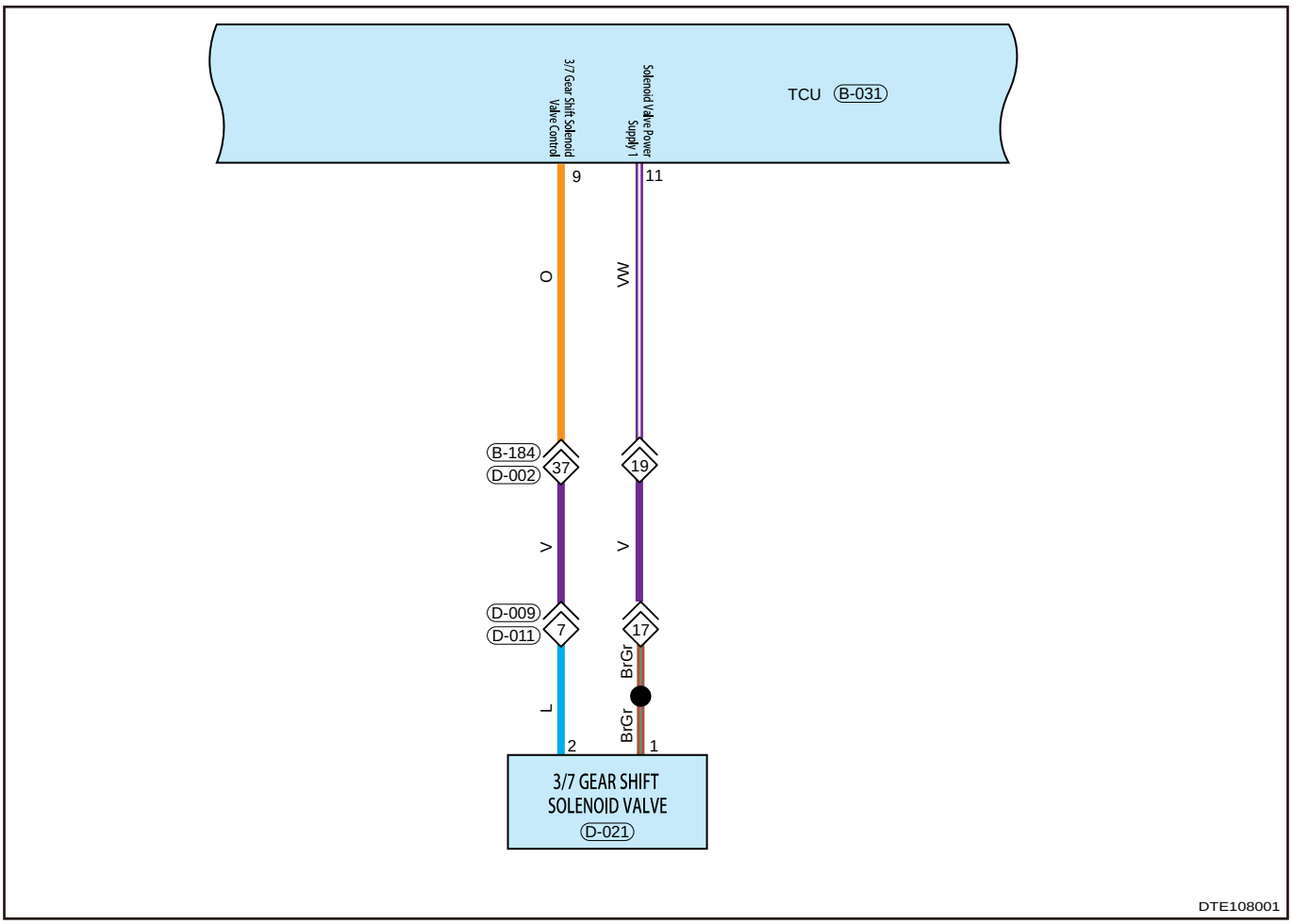
OK → **System operates normally**

NG → Replace TCU module assembly

■ 3rd/7th Gear Shift Solenoid Valve DTCs

DTC	P186313	3rd/7th Gear Flow Solenoid Valve Open
DTC	P187612	3rd/7th Gear Fork Position Sensor Short to Ground
DTC	P099F12	3rd/7th Gear Flow Solenoid Valve Short to Power Supply
DTC	P189B04	3rd/7th Gear Flow Solenoid Valve Passage Closes Unexpectedly
DTC	P189C01	3rd/7th Gear Flow Solenoid Valve Circuit Error
DTC	P076A19	3rd/7th Gear Flow Solenoid Valve Feedback Current Too High
DTC	P076D18	3rd/7th Gear Flow Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.

- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	**Check alternator**

(a) Check generating capacity of alternator.

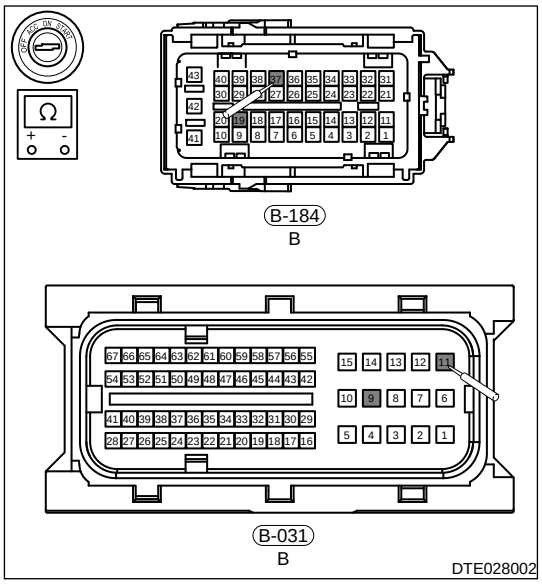
NG → **Replace alternator**

OK

3	**Check 3rd/7th gear shift solenoid valve wire harness**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.
(b) Turn ENGINE START STOP switch to OFF.
(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (9) - B-184 (37)	Always	Less than 1 Ω
B-031 (11) - B-184 (19)	Always	Less than 1 Ω



NG → **Check and repair 3rd/7th gear shift solenoid valve wire harness**

OK

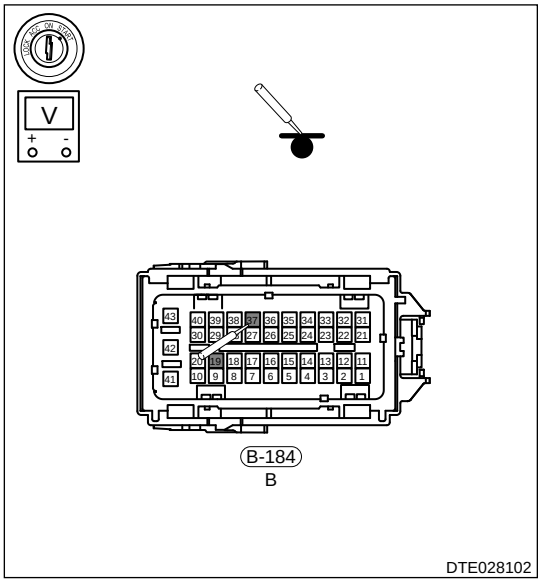
4	**Check voltage of 3rd/7th gear shift solenoid valve wire harness connector**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (19) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (37) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in 3rd/7th gear shift solenoid valve wire harness**

OK

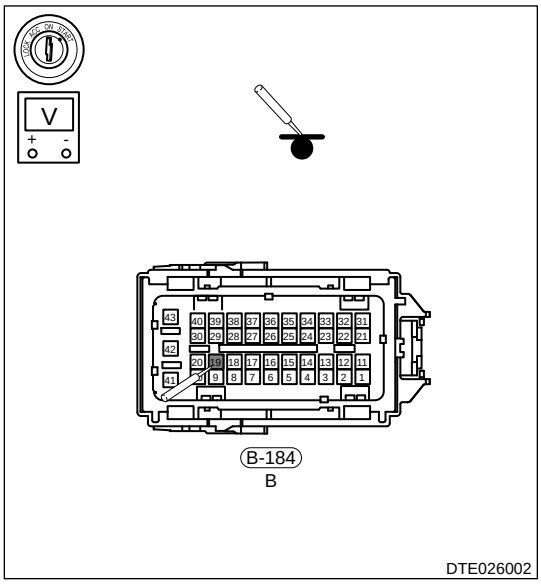
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 19 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (19) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (19) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

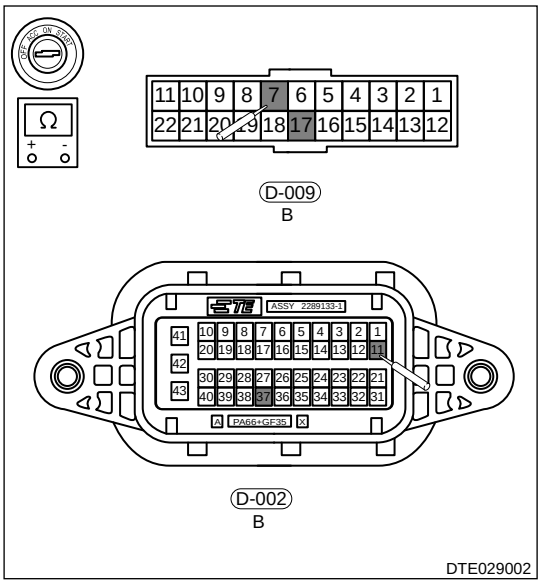
NG → **Repair or replace connector or wire harness**

OK

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 37 and 19 of connector D-002 and terminals 4 and 17 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (37) - D-009 (7)	Always	Less than 1 Ω
D-002 (11) - D-009 (17)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

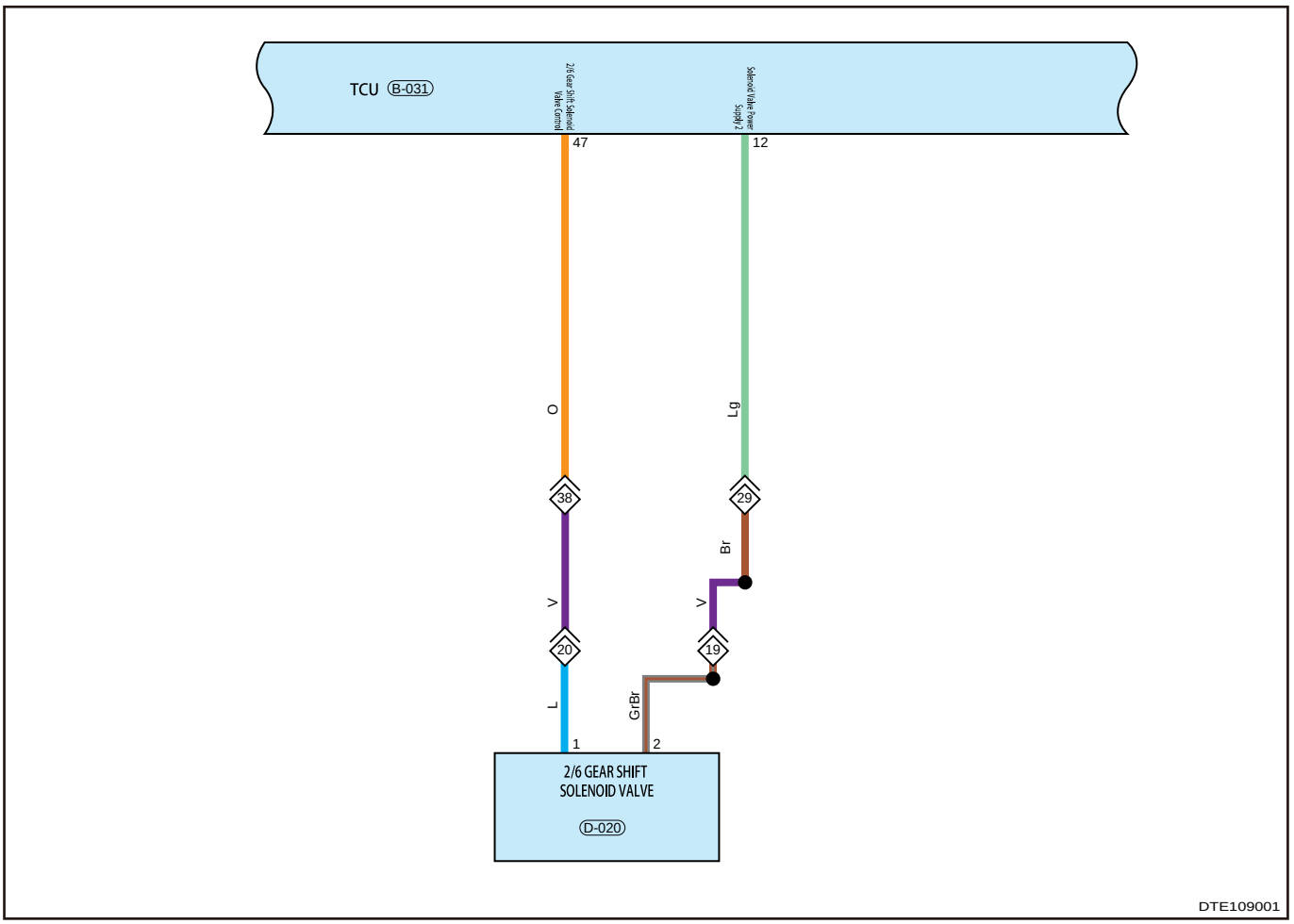
OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **2nd/6th Gear Shift Solenoid Valve DTCs**

DTC	P183013	2nd/6th Gear Flow Solenoid Valve Open
DTC	P099411	2nd/6th Gear Flow Solenoid Valve Short to Ground
DTC	P099512	2nd/6th Gear Flow Solenoid Valve Short to Power Supply
DTC	P189704	2nd/6th Gear Flow Solenoid Valve Passage Closes Unexpectedly
DTC	P189801	2nd/6th Gear Flow Solenoid Valve Circuit Error
DTC	P270619	2nd/6th Gear Flow Solenoid Valve Feedback Current Too High
DTC	P270918	2nd/6th Gear Flow Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.

- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	**Check alternator**

(a) Check generating capacity of alternator.

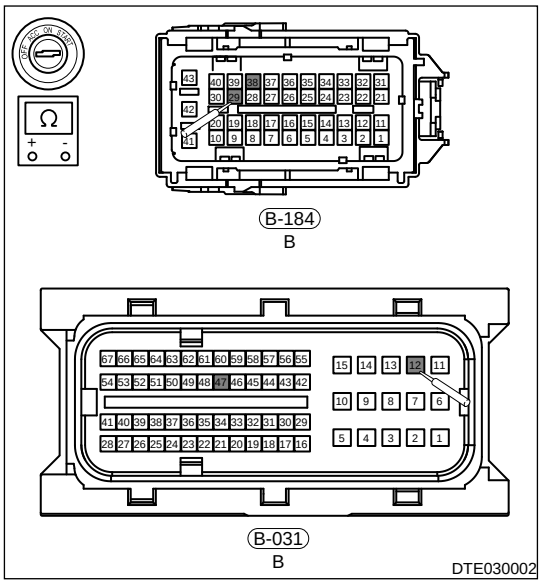
NG → **Replace alternator**

OK

3	**Check 2nd/6th gear shift solenoid valve wire harness**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.
(b) Turn ENGINE START STOP switch to OFF.
(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (47) - B-184 (38)	Always	Less than 1 Ω
B-031 (12) - B-184 (29)	Always	Less than 1 Ω



NG → **Check and repair 2nd/6th gear shift solenoid valve wire harness**

OK

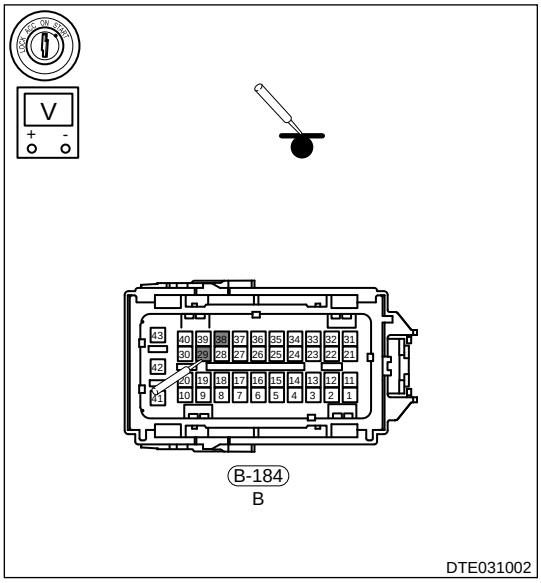
4	**Check voltage of 2nd/6th gear shift solenoid valve wire harness connector**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (29) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (38) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in 2nd/ 6th gear shift solenoid valve wire harness**

OK

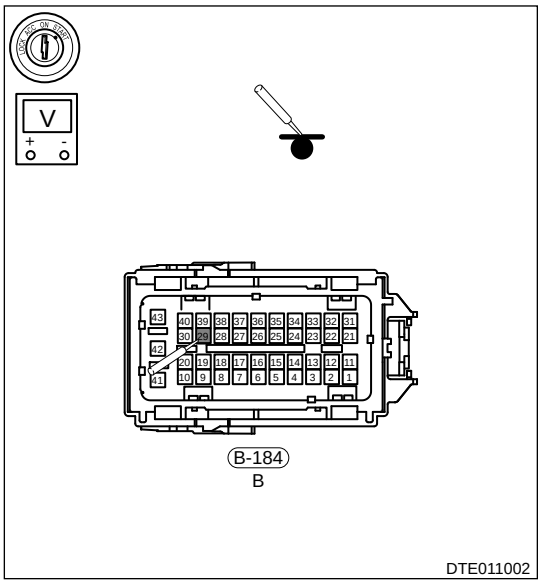
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 29 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-184 (29) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (29) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

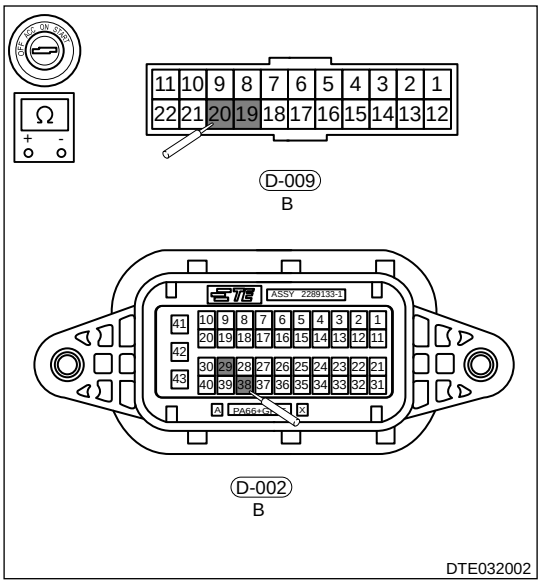
NG → **Repair or replace connector or wire harness**

OK ↓

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 38 and 29 of connector D-002 and terminals 20 and 19 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (38) - D-009 (20)	Always	Less than 1 Ω
D-002 (29) - D-009 (19)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK ↓

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK ↓

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

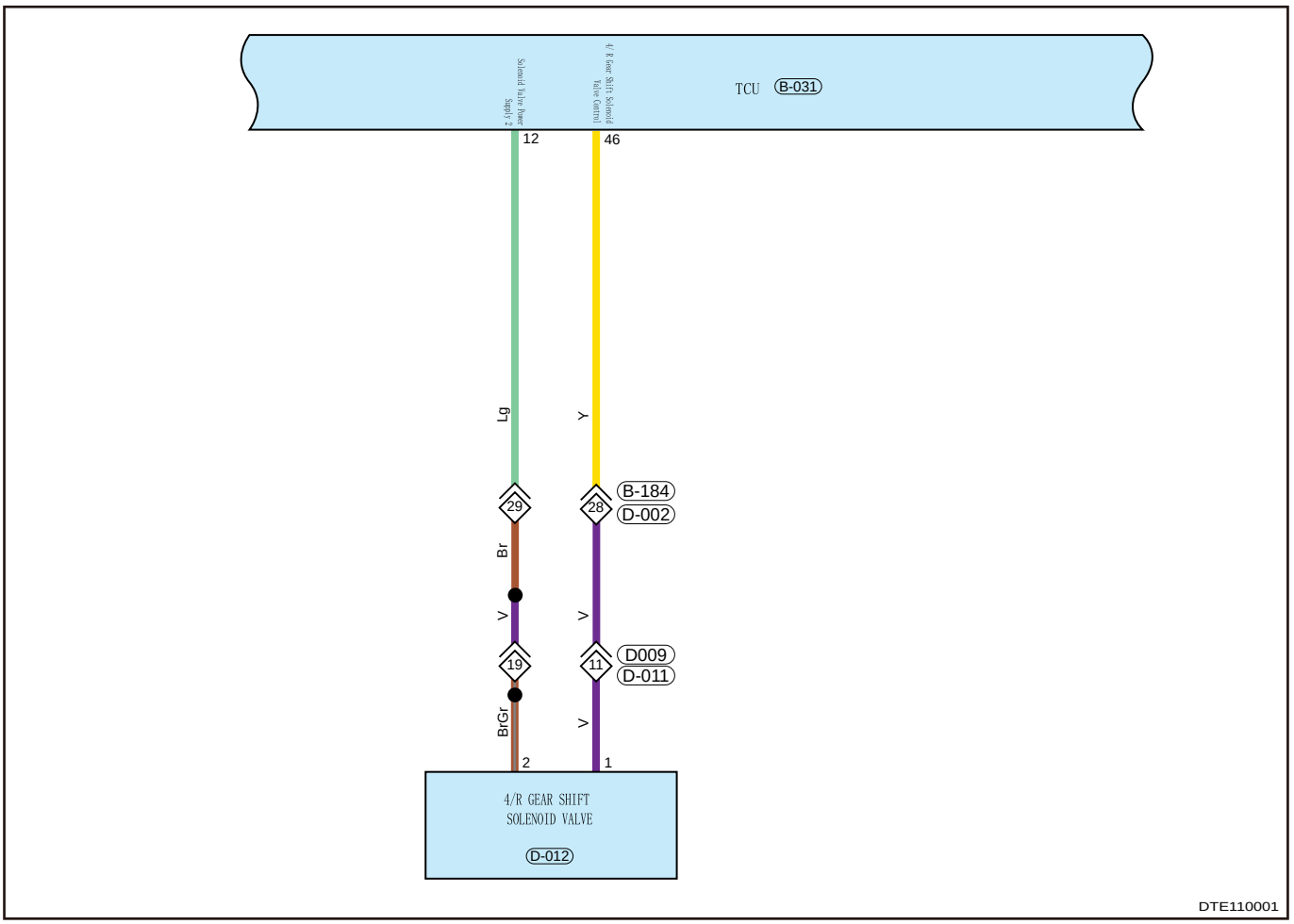
OK → **System operates normally**

NG → Replace TCU module assembly

■ 4th/R Gear Shift Solenoid Valve DTCs

DTC	P182913	4th/R Gear Flow Solenoid Valve Open
DTC	P098511	4th/R Gear Flow Solenoid Valve Short to Ground
DTC	P098612	4th/R Gear Flow Solenoid Valve Short to Power Supply
DTC	P189504	4th/R Gear Flow Solenoid Valve Passage Closes Unexpectedly
DTC	P189601	4th/R Gear Flow Solenoid Valve Circuit Error
DTC	P077019	4th/R Gear Flow Solenoid Valve Feedback Current Too High
DTC	P077318	4th/R Gear Flow Solenoid Valve Feedback Current Too Low

Circuit Diagram



■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to ON.
- Connect diagnostic tester (the latest software) to Data Link Connector (DLC).
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.

- Check and clean all Transmission Control Unit (TCU) ground related to latest DTC.
- If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery**

(a) Turn ENGINE START STOP switch to OFF.
(b) Using a multimeter, measure voltage between positive and negative battery terminals.

NG → **Replace battery**

OK

2	**Check alternator**

(a) Check generating capacity of alternator.

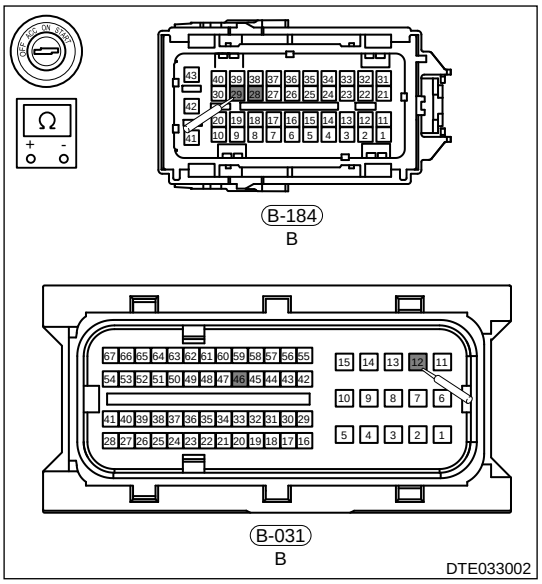
NG → **Replace alternator**

OK

3	**Check 4th/R gear shift solenoid valve wire harness**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.
(b) Turn ENGINE START STOP switch to OFF.
(c) Perform the resistance inspection.

Multimeter Connection	Condition	Specified Condition
B-031 (46) - B-184 (28)	Always	Less than 1 Ω
B-031 (12) - B-184 (29)	Always	Less than 1 Ω



NG → **Check and repair 4th/R gear shift solenoid valve wire harness**

OK

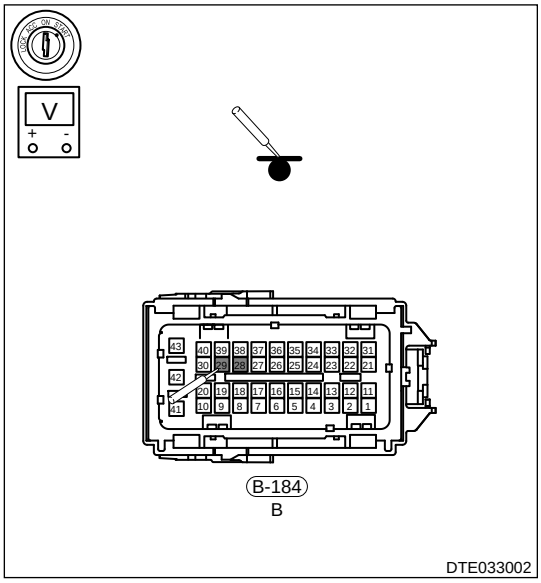
4	**Check voltage of 4th/R gear shift solenoid valve wire harness connector**

(a) Disconnect TCU connector, connector between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) Perform the voltage inspection.

Multimeter Connection	Condition	Specified Condition
B-184 (29) - Body ground	ENGINE START STOP switch ON	0 V
B-184 (28) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair short failure to power supply in 4th/R shift solenoid valve wire harness**

OK

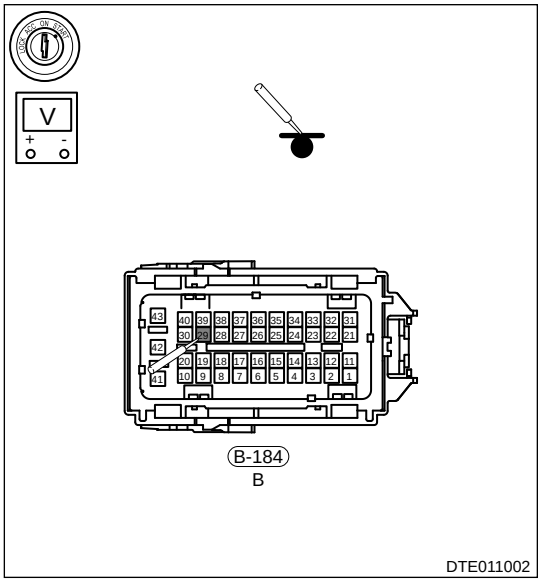
5	Check TCU module output voltage

(a) Connect TCU connector, disconnect connector (B-184) between interior wire harness and transmission internal wire harness.

(b) Turn ENGINE START STOP switch to ON.

(c) (Online detection) Measure voltage of terminal 29 of connector B-184 between interior wire harness and transmission internal wire harness (using a digital multimeter).

Multimeter Connection	Condition	Specified Condition
B-248 (29) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Check wire harness between B-184 (29) and TCU**

OK

6	Check sensor integration module B wire harness connectors D-002 and D-009.

(a) Check connectors D-002 and B-184, confirm that they are installed in position and connected properly.
(b) Drain the transmission oil.
(c) Remove 11 valve body cap fixing bolts, and remove valve body cap assembly.
(d) Disconnect sensor integration module B wire harness connectors D-002 and D-009. Check each PIN for looseness, disengagement, corrosion, aging or damage, etc.

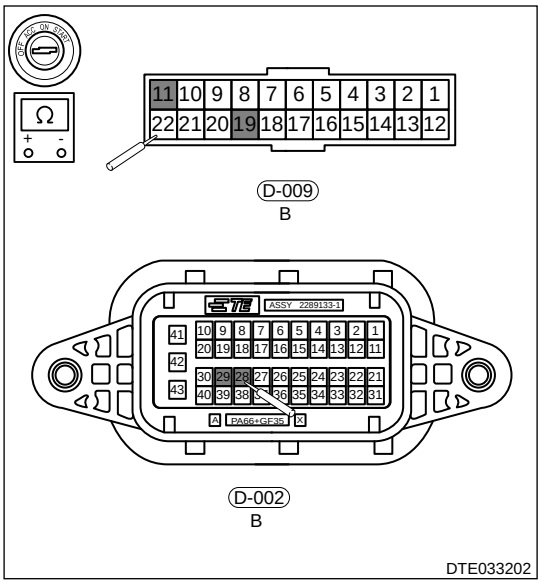
NG → **Repair or replace connector or wire harness**

OK ↓

7	**Check resistance of wire harness between sensor integration module B connectors D-002 and D-009.**

(a) Using a multimeter, measure resistance between terminals 28 and 29 of connector D-002 and terminals 11 and 19 of connector D-009.

Multimeter Connection	Condition	Specified Condition
D-002 (28) - D-009 (11)	Always	Less than 1 Ω
D-002 (29) - D-009 (19)	Always	Less than 1 Ω



NG → **Repair or replace wire harness between connectors D-002 and D-009**

OK ↓

8	**Check sensor integration module B assembly**

NG → **Replace sensor integration module B assembly**

OK ↓

9	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

OK → **System operates normally**

NG → **Replace TCU module assembly**

■ **Hydraulic Parking System DTCs**

DTC	DTC Definition	Malfunction Reason
P2824, P2827, P2826, P282F, P2830, P282D, P1871, P1878	• Power supply J2-54 to signal J2-41: 11.56M, signal J2-41 to ground J2-61: ∞ • Power supply J2-6 to signal J2-36: 8.2, signal J2-36 to ground J2-5: ∞ • Power supply J2-54 to signal J2-41: 11.56M, signal J2-41 to ground J2-61: ∞	• TCU itself • Vehicle power supply system (battery) • Inside of transmission

1 **Confirm and clear DTCs**

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT → **Perform rode test**

DTCs recur

2 **Perform battery power supply inspection**

(a) Check battery voltage and check if connecting wire is loose.

NG → **Replace battery or secure connecting wire**

OK

3 **Check resistance between wire harness and ground wire**

(a) Disconnect TCU connector, measure resistance between wire harness and ground wire through female terminal.

NG → **Check for continuity between female terminal connectors J2 and T1, J2 and S1 of TCU**

OK

4 **Check resistance between transmission internal wire harness and ground wire**

(a) Disconnect transmission terminal connector, measure resistance between wire harness terminals S1 and T1 and ground wire through male terminal.

OK → **Connector intermittent contact fault exists**

NG

5 **Replace vehicle wire harness or connector**

Fault is solved → **Rode test and delivery**

Fault is not solved

6	Check connection of TCU and C1

(a) Check for continuity between male terminal connector on TCU side and C1.

NG → **Replace or repair connector**

OK

7	Replace TCU

Fault is solved → **Confirm and replace TCU**

Fault is not solved

8	Replace transmission case (transmission internal wire harness fault)

■ **Shift Fault DTCs**

DTC	DTC Definition	Malfunction Reason
P1810, P1811, P1812, P1813, P1814, P1815, P1816, P1817, P1818, P1819, P1820, P1821, P1822, P1823, P1860, P1861, P1906, P1907, P1908, P1909	Shifting in/shifting out failure	• TCU itself • Inside of transmission

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT → **Perform rode test**

DTCs recur

2	Check transmission oil

(a) Check transmission oil level and whether there are impurities.

NG → **Replace transmission oil**

OK

3	Check TCU

(a) Perform road test after replacing TCU.

OK → **Replace TCU**

NG

4	Check each solenoid valve

(a) Disconnect transmission terminal connector, measure resistance between terminals S1 and T1 of wire harness and ground wire through male terminal.

NG → **Replace hydraulic system**

OK

5	Check fork position sensor

NG → **Replace sensor integration modules A, B**

OK

6	If transmission fork or synchronizer, or engagement teeth is damaged, replace transmission case.

■ **Simultaneous Gears Engagement DTCs**

DTC	DTC Definition	Malfunction Reason
P0893, P1824	Multiple gears are engaged simultaneously	• TCU itself • Inside of transmission

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

OK

2	When multi-gear engagement fault occurs, front wheel of vehicle will be locked and cannot be pulled properly. The following operations can be repeated unless serious faults cause multi-gear engagement:

(a) Shift to P and stall, then remove the key;

(b) Turn engine switch on, switch from P to N gear and observe whether there is Gear light on the instrument panel;

(c) If Gear light is still on, repeat steps 1 and 2 3 times

Gear light goes off → **Connector intermittent contact fault exists, and check connector pins**

Gear light does not go off

3	Check TCU

(a) Perform road test after replacing TCU.

DTCs do not recur → Replace TCU

DTC occurs

4	Check corresponding fork position sensor

(a) Disconnect transmission terminal connector, measure resistance between terminals S1 and T1 of wire harness and ground wire through male terminal.

NG → Replace sensor integration modules A, B

OK

5	Check fork position sensor

NG → Replace sensor integration modules A, B

OK

6	Check solenoid valve related to shifting

NG → Replace hydraulic system

■ **Unexpected Shifting Out DTCs**

DTC	DTC Definition	Malfunction Reason
P1850, P1851	• Unexpected Shifting Out on Odd Shaft • Unexpected Shifting Out on Even Shaft	• TCU itself failure • Transmission internal failure

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT

2	Perform rode test

No DTC → Connector intermittent contact fault exists, and check connector pins

DTC occurs

3	Check transmission oil

(a) Check transmission oil level and whether there are impurities.

NG → Replace transmission oil

OK

4	Check TCU

(a) Perform road test after replacing TCU.

No DTC → Replace TCU

DTC occurs

5	Replace transmission case

■ **Drive Ratio Not Matched DTCs**

DTC	DTC Definition	Malfunction Reason
P1805, P1806	• Odd Shaft Drive Ratio Not Matched • Even Shaft Drive Ratio Not Matched	• TCU itself failure • Transmission internal failure

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT

2	Perform rode test

No DTC → Connector intermittent contact fault exists, and check connector pins

DTC occurs

3	Check TCU software version

(a) Check whether the TCU software version number matches the vehicle.

NG → Refresh software

OK

4	Check TCU

(a) Perform road test after replacing TCU.

No DTC → Replace TCU

DTC occurs

5	Check odd/even input shaft speed sensor

NG → Replace sensor integration module A

OK

6	Check fork position sensor

NG → Replace sensor integration modules A, B

■ SubRom Fault DTCs

DTC	DTC Definition	Malfunction Reason
P1848, P1856	• Subrom Data Cannot be Read	• TCU itself failure • Vehicle wire harness failure • Transmission internal failure

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT

2	Perform rode test

No DTC → Connector intermittent contact fault exists, and check connector pins

DTC occurs

3	Check TCU

(a) Read SubRom again after replacing TCU.

NG → Replace TCU

OK

4	Check vehicle wire harness

(a) Perform road test after replacing TCU.

NG → Replace vehicle wire harness

OK

5	Check connector

■ **Clutch Fault DTCs**

DTC	DTC Definition	Malfunction Reason
P081107	• Excessive Clutch Slipping	• TCU itself failure • Transmission internal failure

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT

2	Perform rode test

No DTC → **Connector intermittent contact fault exists, and check connector pins**

DTC occurs

3	Check transmission oil

(a) Check transmission oil level and whether there are impurities.

NG → **Replace transmission oil**

OK

4	Check TCU

(a) Perform road test after replacing TCU.

OK → **Replace TCU**

NG

5	Check clutch speed sensor and input shaft speed sensor

NG → **Replace clutch temperature speed sensor and sensor integration module A**

OK

6	Check clutch solenoid valve

NG → **Replace hydraulic system**

■ **Clutch Fault DTCs**

DTC	DTC Definition	Malfunction Reason
P184592	• Dual Clutch Simultaneous Engagement	• TCU itself failure • Transmission internal failure

1	Confirm and clear DTCs

(a) Malfunction indicator comes on, connect diagnostic tester to vehicle; Confirm and record fault codes and related fault freeze frames; Clear the fault codes.

NEXT

2	Perform rode test

No DTC → **Connector intermittent contact fault exists, and check connector pins**

DTC occurs

3	Check TCU

(a) Perform road test after replacing TCU.

No DTC → **Replace TCU**

DTC occurs

4	Check dual clutch pressure sensor

NG → **Replace hydraulic system**

OK

5	Replace transmission case

4.9 Rode Test Operating Condition Table

After vehicle is repaired, perform relevant road test according to the table below and record the relevant results:

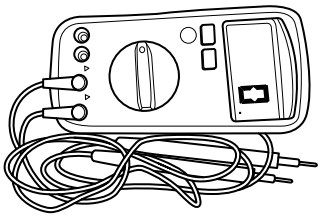
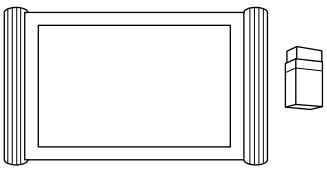
No.	Operating Condition	Test Item	Test Condition	Test Result
1	Stationary on a flat road	1.1	P->R->N->D>N->R->P (3 consecutive times, pause for 2 seconds at each gear)	OK
		1.2	P->R->N->D->S-‘M+’ -> ‘M-’ -D->N->R->P (3 consecutive times, pause for 2 seconds at each gear)	OK

No.	Operating Condition	Test Item	Test Condition	Test Result
2	Crawl starting	2.1	With shift lever in R position, brake pedal released, accelerator pedal not depressed, crawl to 5 km/h, depress the accelerator pedal slightly until speed reaches more than 12km/h, then depress brake pedal slightly	OK
		2.2	With shift lever in D position, brake pedal released, accelerator pedal not depressed, crawl to 5 km/h, depress the accelerator pedal slightly until speed reaches more than 12km/h, then depress brake pedal slightly	OK
3	Upshift/ downshift operation	3.1	With shift lever in D position, depress accelerator pedal in order of 1-2-3-4-5-6 to upshift, and then release the accelerator pedal in order of 6-5-4-3-2-1 to downshift	OK
		3.2	With shift lever in S position, depress accelerator pedal in order of 1-2-3 to upshift, and then release accelerator pedal quickly in order of 3-2 to downshift	OK
4	Simulate operating condition	4.1	Repeatedly simulate the operating condition for reported failure described by customer	OK
5	Self-adaption operating condition	5.1	Turn power switch on to start engine in P gear, shift the shift lever to carry out the following crawl operation: Crawl in D gear until vehicle speed is stable and then stop it, crawl in R gear until vehicle speed is stable and then stop it, repeat this cycle 3 to 5 times.	OK
		5.2	Use manual mode to switch to M3/M5 (M5 is recommended) for driving, make sure that small pedal opening (5% to 15%), medium opening (20% to 40%) and large opening (more than 50%) in M3/M5 all have a constant total driving time of more than 15 seconds, and repeat 3 to 5 times at each opening.	OK
		5.3	Use manual mode to switch to M4/M6 (M6 is recommended) for driving, make sure that small pedal opening (5% to 15%), medium opening (20% to 40%) and large opening (more than 50%) in M4/M6 all have a constant total driving time of more than 15 seconds, and repeat 3 to 5 times at each opening.	OK
		5.4	Use manual mode to drive and complete the following gear upshifting process: M1-M2-M3-M4-M5-M6-M7 (it is completed after accelerating vehicle to about 80 kph with acceleration pedal at medium lower opening), after upshifting to each gear, depress accelerator pedal at an opening of 10% to 20% for about 5 seconds, then switch to D mode for normal driving and stop vehicle, pay attention to the whole process and check if there is any fault reported. If a fault is reported, perform self-learning and clearing fault operations again, and then repeat above steps 1 to 4.	OK
		5.5	After above driving, turn power supply off and lock vehicle for 1 minute (ensure that the four doors and luggage compartment door are closed), then turn power supply on and start vehicle for normal driving (drive in D mode for about 5 km), deliver vehicle to customer if there is no obvious shock, shaking, abnormal engine speed, etc.	OK
		5.6	If there is any shock, shaking, abnormal speed, etc, repeat steps 1 to 5 until no obvious abnormal phenomenon occurs.	OK

5 ON-VEHICLE SERVICE

5.1 Tools

■ General Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001

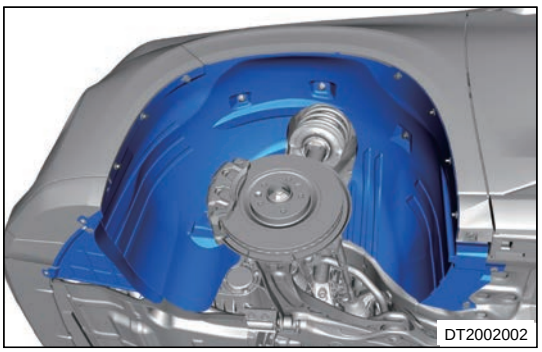
5.2 Replacement of TCU Module

■ Removal

⚠ Warning
During removal and installation of TCU, antistatic equipment should be worn to avoid damage to electronic components in TCU.

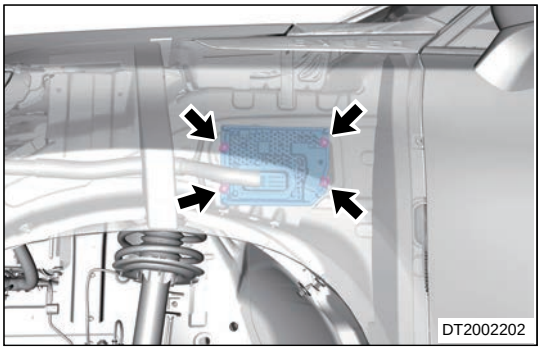
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left tire.

(4) Remove all fixing snap pins and nuts from front left fender liner, then remove liner.


DT2002002

(5) Disconnect the transmission control unit connector.

(6) Remove 4 fixing bolts (arrow) from transmission control unit.



■ **Installation**

⚠ Caution

- **TCU bolts are pre-coated parts. Residual sealant should be cleaned from threaded hole of housing before assembly.**
- **TCU bolts are non-reusable parts, which must be replaced after each removal.**
- **If TCU is replaced with a new one, fresh correct TCU software with diagnostic tester.**

(1) Install 4 fixing bolts to transmission control unit.

Tightening torque: 8.5 - 9.5 N·m

(2) Connect the transmission control unit connector.
(3) Install the front left fender liner.
(4) Install the front left tire.
(5) Connect the negative battery cable.
(6) Connect diagnostic tester, read and clear DTCs.

5.2 TRANSMISSION ASSEMBLY

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Drain bolt and oil inspection bolt are both non-reusable parts, and replace them with new ones after removal.

(2) Transmission oil (Kunlun DCTF-7S) has a service life of 60,000 km.

(3) The vehicle must be kept level during refilling.

(4) To avoid oil contamination, the container used to store transmission oil must be a special container for (-Kunlun DCTF-7S) oil (the container must not be used to store other liquids or items), and the container must be kept clean.

(5) In case of oil spillage, the transmission oil needs to be added depends on the actual situation, but it must be ensured that the filled oil can make the position of oil in transmission higher than that of oil inspection bolt before adjusting oil level.

(6) Transmission oil (Kunlun DCTF-7S) should be stored under 20 ˚C ± 10 ˚C.

(7) The oil is a part of (738DHA) transmission system. It must be sent back to manufacturer together with transmission for further analysis if required.

2 System Overview

2.1 System Description

The automatic transmission system is composed of transmission control module, shift motor and button-type electronic shift module etc. The connection between button-type electronic shift module and transmission adopts a safer and faster electronic control mode, other than a traditional mechanical way, which eliminates the traditional mechanical shift mode and adopts electronic signals. Its advantage is that the driver's wrong shift operation will be judged by the computer to see if it will cause damage to the transmission, so as to better protect the transmission and correct the bad shift habits. However, if there is a fault or short circuit, the button-type electronic shift module is unable to release the current gear, we can only rely on the trailer and rescue.

2.2 Operation Principle of Clutch

■ Operation principle of clutch 1

- Hydraulic oil enters clutch 1 servo cylinder (clutch drum) from oil passage of clutch 1, and then hydraulic oil pushes piston of clutch 1 to compress clutch plate, connecting clutch drum with input shaft 1.
- Clutch 2 is disengaged when engaging clutch 1.

■ Operation principle of clutch 2

- Hydraulic oil enters clutch 2 servo cylinder (clutch drum) from oil passage of clutch 2, and then hydraulic oil pushes piston of clutch 2 to compress clutch plate, connecting clutch drum with input shaft 2.
- Clutch 1 is disengaged when engaging clutch 2.

2.3 Parameter Specifications

■ Transmission oil standard

(1) Transmission oil selection standard:

Transmission Oil Type	Standard Capacity
Kunlun DCTF-7S	6.5 ± 0.2 L

(2) Operating temperature range:

- The normal temperature does not exceed 120˚C, the transient temperature does not exceed 140˚C, the performance will be affected when the ambient temperature is below -30˚C and will fail when it is below -40˚C.

(3) Period of replacing oil:

- Replace the transmission oil every 60,000 km, and replace the element of filter cooling module at the same time.

(4) Maintenance requirements:

- The specified oil must be used. The other oils may cause damage to transmission. Such damage is not covered under warranty.

⚠ Caution
• **The specified oil must be used. The other oils may cause damage to transmission. Such damage is not covered under warranty.**

■ Basic Parameters

Items	Parameter
Model	738DHA
Type	Wet Dual Clutch (DCT)
Layout	Transverse front-drive
Start Clutch Device	Wet dual clutch
Dimensions (L × W × H)	372mm × 562mm × 466mm
Weight (w/o Cooling Oil)	81kg
Central Distance	197.03mm
Maximum Input Speed	6500 rpm
Maximum Allowable Input Torque	380N•m
Gear Ratio Range	Higher than 6.89
Maximum Pressure of Hydraulic System	26.5 bar
Operating Pressure	Minimum: 3 bar; Maximum: 26.5 bar
Cooling Type	Water cooled

■ Gear Ratio Parameters

Gear Position	Gear Ratio	Overall Gear Ratio
1st	3.643	17.571
2nd	2.722	10.63
3rd	1.808	7.059
4th	1.047	5.048
5th	0.816	3.938
6th	0.791	3.087
7th	0.653	2.55
Rev	2.833	13.667
FD 1(154R)	4.824	/
FD 2 (3762)	3.905	/

■ **Torque Specifications**

Description	Specifications	Quantity	Preload (Nm)	Torque (Nm)
Hexagon Flange Bolt		12	80 ± 4 Nm + 90 ± 2°	120 - 150
Transmission Wire Harness Connector Fixing Bolt		6	2 - 3	2 - 3
Oil Level Pipe		1	3 ± 1	2 - 4
inner TORX Hexagon Bolt M6*12	M6*12	6	8 - 10	8 - 10
Pawl Rotary Shaft Fixing Bolt		1	23 ± 2	21 - 25
Output Shaft Locking Bolt		2	60 ± 3 Nm + 90 ± 2°	125 - 185
Guide Bolt		2	23 ± 2	21 - 25
Inner Hexagon Pan Head Bolt M6*20		8	9 ± 1	8 - 10
Inner Hexagon Pan Head Bolt M6*30	M6*30	13	9 ± 1	8 - 10
Inner TORX Hexagon Pan Head Bolt M6*25	M6*25	5	5 (± 1) Nm + 37.5 (± 2.5)°	10 - 18
Inner Hexagon Pan Head Bolt M6*58	M6*58	14	4 ± 0.5 Nm + 90 ± 2°	8 - 16
Inner Hexagon Oil Plug M18*1.5	M18*1.5	2	63 ± 3	60 - 66
Bearing Locating Plate Fixing Bolt		9	12 ± 1 Nm + 90 ± 5°	30 - 55
Hexagon Flange Bolt M8*35	M8*35	25	8 ± 0.5 Nm + 90 ± 2°	30 - 58

3 Component Operation Description

3.1 Output Speed Sensor

The sensor is a Hall sensor that can identify the actual speed of output shaft. The computer combines the engine speed sensor and other signals based on this value to accurately control the shift timing, lock clutch operating status, shift time, transmission oil pressure control, etc. This signal is a key signal for the normal shift of automatic transmission.

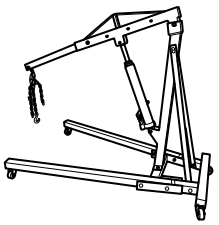
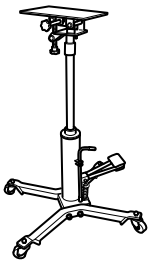
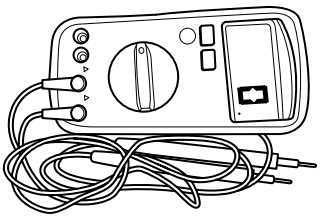
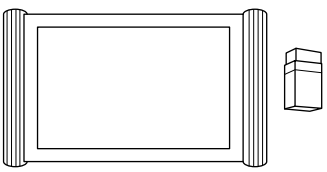
3.2 Clutch Temperature Speed Sensor

This sensor integrates clutch temperature sensor and clutch speed sensor. Detecting the temperature of clutch coolant. TCU detects the temperature of clutch coolant in real time to monitor the slipping state of clutch to avoid overheating and burning. This is a negative temperature coefficient resistor. The resistance becomes smaller as the temperature increases.

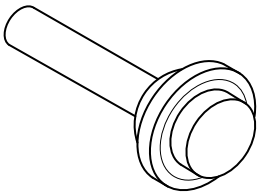
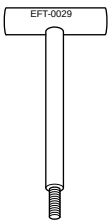
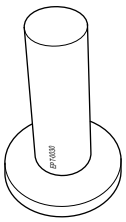
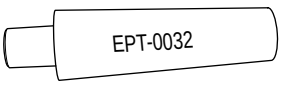
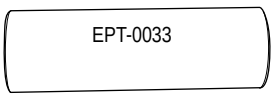
4 On-Vehicle Service

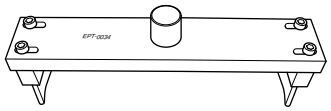
4.1 Tools

■ General Tools

Tool Name	Tool Drawing
Engine Hoist	 S00032
Transmission Carrier	 S00004
Digital Multimeter	 S00002
Diagnostic Tester	 S00001

■ Special Tools

Tool Name	Tool Drawing
Differential Oil Seal Assembly Fixture	 S00096006
HCU Mould Assembling Pickup Lever	 RCH017006
Input Shaft Cover Plate Knock Fixture	 RCH018006
Clutch Snap Spring Mounting Guide Block	 RCH019006
Clutch Snap Spring Mounting Socket	 RCH020006

Tool Name	Tool Drawing
Clutch Shaft Sealing Cover Assembly Fixture	 RCH021006
Clutch Cover Assembly Oil Seal Protective Sleeve	 RCH022006

4.2 Transmission Fluid Inspection

■ Maintenance period

(1) In order to extend the service life of the transmission, it is required to replace the transmission oil once when the vehicle is traveling 60,000 km, and replace the element of filter cooling module at the same time. Inspect regularly. If necessary, replace transmission oil (for example, fault caused by oil shortage or deterioration).

■ Transmission oil level inspection

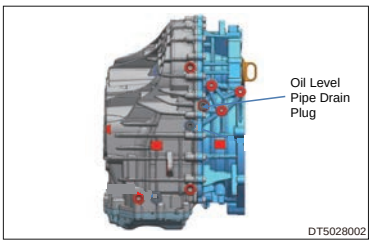
(1) In order to extend the service life of the transmission, it is required to replace the transmission oil once when the vehicle is traveling 60,000 km.

(2) Stop the vehicle on a level surface and pull up the parking brake handle.

(3) When the engine is running at idle speed, depress and hold the brake pedal, shift the gears in the order of R, N and D for three cycles (A reciprocating motion for each cycle), each gear is kept for 5 s, and finally shift the shift lever to "P" or "N" position.

(4) Raise the vehicle with a lift, keep it level, wipe off dust and oil stains around the plug, and remove oil level pipe drain plug.

Tightening torque: 6 - 9 N·m



(5) If there is oil flowing out when the oil amount is normal, replace and tighten oil level pipe drain plug.

Caution

- **Drain bolt and oil inspection bolt are both non-reusable parts, and replace them with new ones after removal.**
- **It is not allowed to increase the automatic transmission oil temperature by depressing on the accelerator rapidly at idling.**
- **Under the hot oil condition of transmission, the temperature of engine, radiator and its piping system is very high, fan may start with it, so care should be taken to avoid burns during operation.**
- **If the transmission oil level is too low, the transmission oil pump will suck in air while running, resulting in each clutch or brake working badly due to insufficient working pressure.**
- **If the transmission fluid is too high, the rotating parts of transmission will stir liquid to produce foam while rotating at high speed, which will produce same result as previous one.**

■ **Oil status inspection**

(1) The new transmission oil should be light yellow, but light yellow is not the quality indicator of the oil. As the vehicle is used, the color of the oil will gradually deepen and eventually become light brown.

Caution

- **If the oil is dark brown with burnt smell, change it and check vehicle condition;**
- **If the oil is milky white or turbid, it indicates that the water enters the oil; change the oil, check the leakage point and confirm whether the transmission is damaged.**
- **If the oil is black and mixed with a large amount of powder, there is abnormal wear in wet clutch, and the clutch needs to be checked and repaired.**

4.3 Transmission Oil Replacement

■ **Draining/Refilling**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lift is locked when repairing or inspecting the lifted vehicle.**

(1) The oil draining will begin within 5 minutes after the engine is shut down.

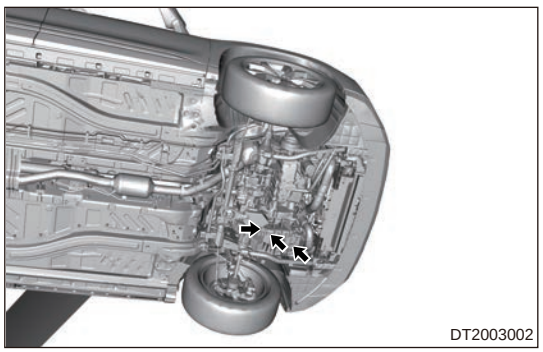
⚠ Caution

- **Prerequisites for replacing transmission oil: Transmission oil temperature must be: Between 35 and 45℃.**

(2) Raise vehicle with a lift.

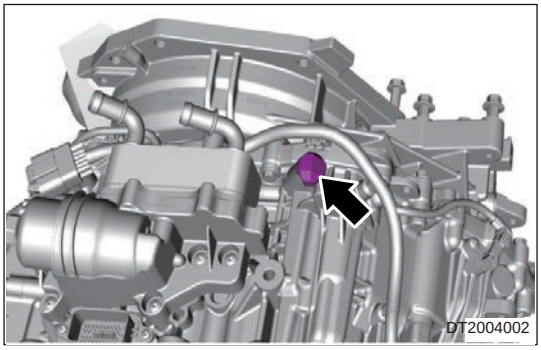
(3) Remove the engine lower protector.

(4) Remove 3 drain bolts (drain plug bolt in primary chamber/oil level pipe drain plug (overflow pipe)/drain plug in valve body chamber).

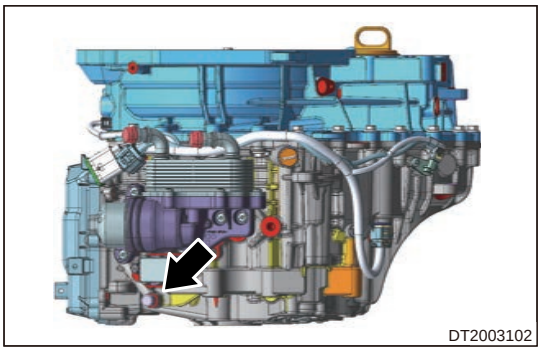


(5) Drain the transmission oil.
(6) Replace drain bolt and gasket with new ones and tighten the bolt again.
(7) Remove the air filter assembly.
(8) Removal the battery tray assembly.

(9) Remove transmission filler port bolt and gasket.



(10) Pull out the transmission breather cap.



(11) Fill transmission oil (Kunlun DCTF-7S) from filler plug. After filling, follow the steps in "Oil Level Inspection" to check.

⚠ Caution

- **Transmission oil (Kunlun DCTF-7S) has a service life of 60,000 km, and replace the element of filter cooling module at the same time.**
- **The vehicle must be kept level during refilling.**
- **To avoid oil contamination, the container used to store transmission oil must be a special container for (Kunlun DCTF-7S) oil (the container must not be used to store other liquids or items), and the container must be kept clean.**
- **In case of oil spillage, the transmission oil needs to be added depends on the actual situation, but it must be ensured that the filled oil can make the position of oil in transmission higher than that of oil inspection bolt before adjusting oil level.**
- **Transmission oil (Kunlun DCTF-7S) should be stored under 20 ˚C ± 10 ˚C.**
- **The oil, a part of 738DHA transmission system, must be sent back to manufacturer together with transmission for further analysis if required.**

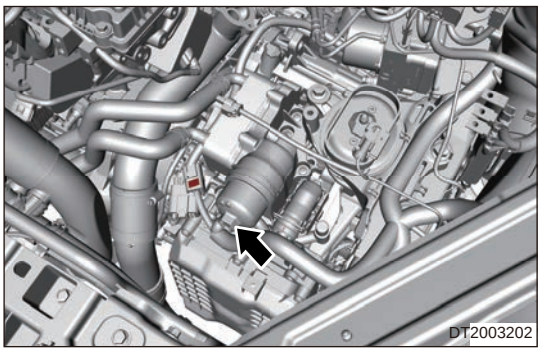
■ Transmission oil capacity and type are shown in the table below

Model	Oil Type	Total Capacity (After-sales Maintenance Oil Capacity)
738DHA	Kunlun DCTF-7S	6.5 ± 0.2 L

4.4 Transmission Oil Element Replacement

■ Removal

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the battery and battery tray.
(5) Drain the transmission oil.
(6) Remove transmission element cover (arrow) and take out element.


DT2003202

■ Installation

(1) Install element and element cover, and tighten element cover.
Tightening torque: 20 + 5 N·m

(2) Fill the transmission oil.
(3) Install the battery tray.
(4) Install the air filter assembly.
(5) Install the battery.

⚠ Caution

- **After installing, start the vehicle and check whether the filter is leaking.**

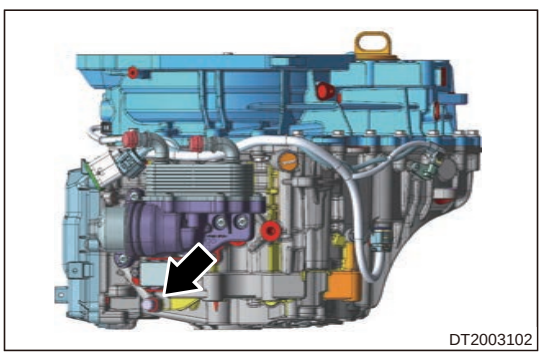
4.5 Transmission Breather Cap Replacement

■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **Try to prevent body paint surface from being scratched during removal.**

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the transmission breather cap.


DT2003102

■ **Installation**

(1) Install breather cap to a proper position on transmission.
(2) Install the air filter assembly.
(3) Connect the negative battery cable.

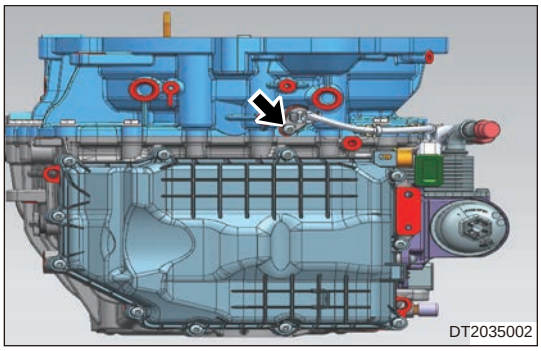
4.6 Clutch Temperature Sensor Replacement

■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **During replacement of sensor, it is necessary to wear anti-static equipment.**

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Drain the transmission oil.
(4) Disconnect the temperature sensor connector.



(5) Remove temperature sensor from housing with a torque wrench.

■ **Installation**

⚠ Caution

- **Sensor and its bolts are non-reusable parts, which must be replaced after each removal.**
- **Drain the transmission oil and remove wire harness before replacing the sensor (drain bolt and oil inspection bolt must be replaced).**

(1) Install temperature sensor to a proper position on transmission.
(2) Connect the temperature sensor connector.
(3) Add the specified transmission oil.
(4) Connect the negative battery cable.

4.7 Output Speed Sensor Replacement

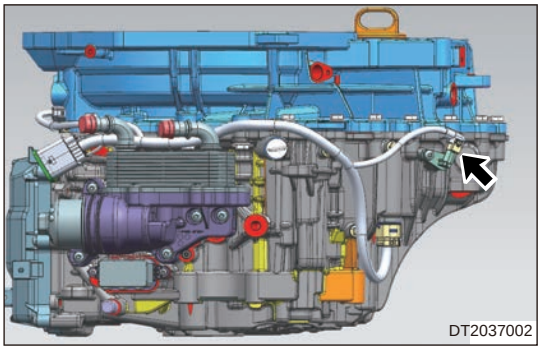
■ **Removal**

⚠ Warning

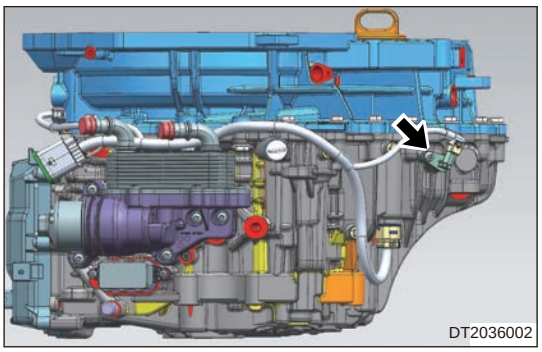
- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **During replacement of sensor, it is necessary to wear anti-static equipment.**

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the battery.
(5) Remove the battery tray.
(6) Drain the transmission oil.

(7) Disconnect the output speed sensor connector.



(8) Remove fixing bolt from output speed sensor.



(9) Remove the output speed sensor.

■ **Installation**

⚠ Caution

- **Sensor and its bolts are non-reusable parts, which must be replaced after each removal.**
- **Drain the transmission oil and remove wire harness before replacing the sensor (drain bolt and oil inspection bolt must be replaced).**

(1) Install output speed sensor to a proper position on transmission.

(2) Install fixing bolt to output speed sensor.

(3) Connect the output speed sensor connector.

(4) Fill the transmission oil.

(5) Install the battery tray.

(6) Install the battery.

(7) Install the air filter assembly.

(8) Connect the negative battery cable.

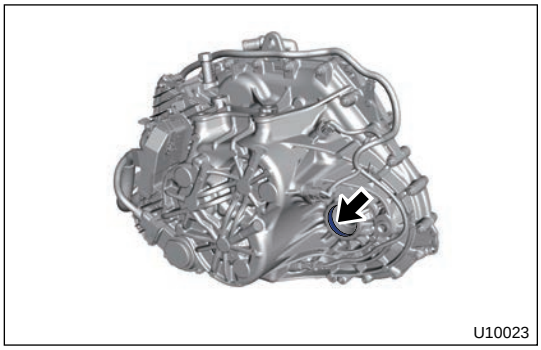
4.8 Drive Shaft Oil Seal Replacement

■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **Try to prevent body paint surface from being scratched during removal.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the battery.
(5) Remove the battery tray.
(6) Drain the transmission oil.
(7) Remove the front left wheel.
(8) Remove the front left drive shaft assembly.
(9) Remove left drive shaft oil seal from transmission assembly.

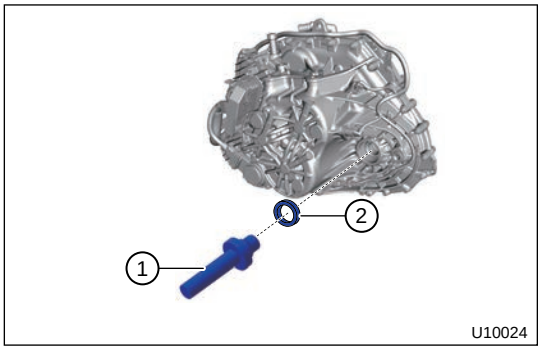

U10023

■ **Installation**

⚠ Caution

- **Ensure that the transmission oil has been drained before removing oil seal.**
- **Be sure to avoid scratching the mating surface between transmission case and clutch housing during removal of drive shaft oil seal.**
- **Drive shaft oil seal is a non-reusable part, which must be replaced after each removal.**

(1) Using a special tool (1), install drive shaft oil seal (2) into place.



U10024

⚠ Caution

- **Apply a proper amount of MP grease to new oil seal lip.**
- **Do not damage oil seal lip during installation.**

(2) Install the front left drive shaft assembly.
(3) Install the front left wheel.
(4) Fill the transmission oil.
(5) Install the battery tray.
(6) Install the battery.
(7) Install the air filter assembly.
(8) Connect the negative battery cable.

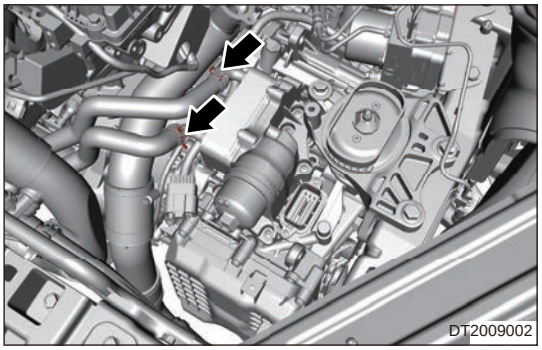
4.9 Coolant Connecting Pipe Assembly (Inlet and Outlet Pipes) Replacement

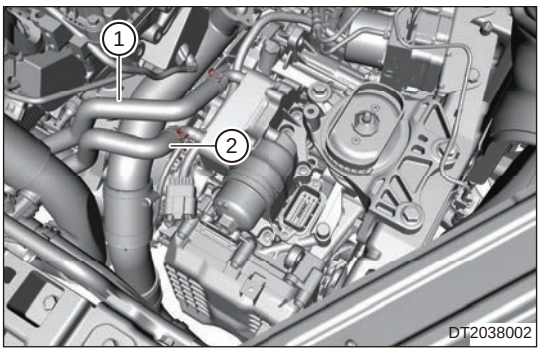
■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **When removing coolant pipe from coolant connecting pipe assembly, be careful not to splash the coolant on electronic parts and the inside of transmission to contaminate transmission oil.**

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the battery.
(5) Remove the battery tray.
(6) Remove the intercooler inlet pipe assembly Ⅱ.
(7) Drain the coolant.
(8) Remove clamps from engine inlet pipe.
(9) Disengage the engine inlet pipes ① and ②.


DT2009002



DT2038002

■ **Installation**

⚠ Caution

- **Bolts are non-reusable parts, which must be replaced after each removal.**

(1) Install coolant connecting pipe into hole, align bolt holes of coolant connecting pipe, and tighten bolts.
(2) Install the engine inlet pipes ① and ②.
(3) Install clamps to engine inlet pipe.
(4) Add the coolant.
(5) Install the intercooler inlet pipe assembly II.
(6) Install the battery tray.
(7) Install the battery.
(8) Install the air filter assembly.
(9) Connect the negative battery cable.

4.10 Transmission Assembly

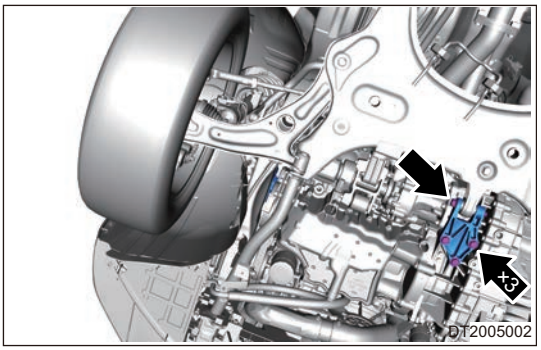
■ **Removal**

⚠ Caution

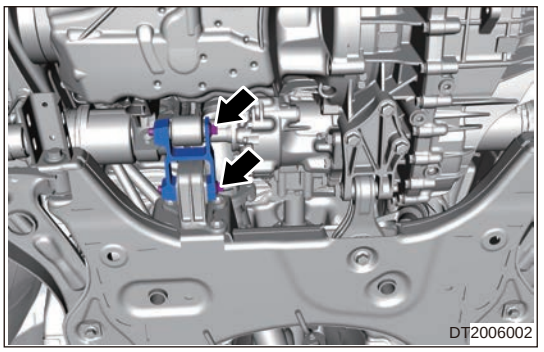
- **Before removal of power assembly, first drain transmission oil.**
- **During separation of engine and transmission, pay attention not to damage the peripheral accessories of transmission, such as rubber cooling pipe, pressure sensor, etc. If there is any damage, it is necessary to replace it according to requirements.**

(1) Turn off all electrical equipment and the ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the battery.
(4) Remove the battery tray.
(5) Remove the air filter assembly.
(6) Remove the front wheel tire.
(7) Remove the engine lower protector.
(8) Drain the transmission oil.
(9) Drain the coolant.
(10) Remove the lower coolant pipe.
(11) Remove left and right drive shaft.
(12) Disconnect the speed sensor connector and the oil pressure sensor connector, and move away the wire harness.
(13) Remove fixing nut between shift cable and gear switch.

(14) Raise vehicle to a proper height, remove 4 fixing bolts from rear left lower mounting.

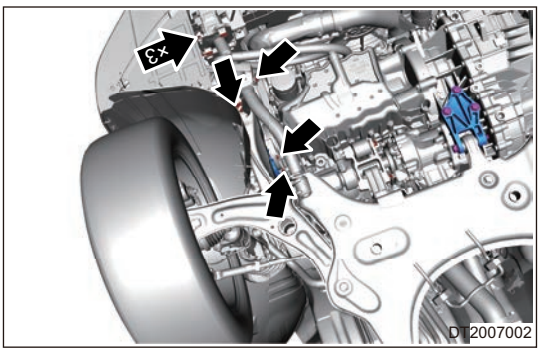


(15) Raise vehicle to a proper height, remove 2 fixing bolts from rear right lower mounting.



(16) Raise vehicle to a proper height, remove 7 fixing bolts from front left/right lower impact crossmember assembly.

Hint:
Use same removal procedures for left and right sides, here is front right lower impact crossmember.



(17) Raise vehicle to a proper height, remove 2 fixing bolts from left and right triangular arm, and remove triangular arm.

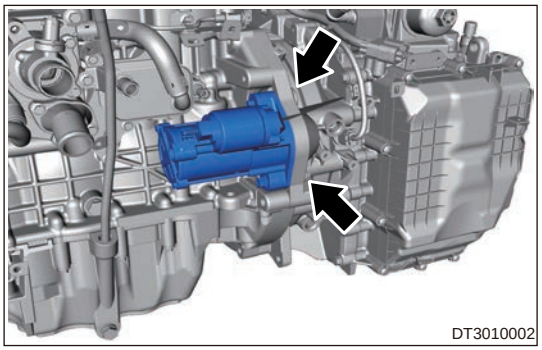
Hint:
Use same removal procedures for left and right sides, here is front right triangular arm.

(18) Raise vehicle to a proper height, remove 4 fixing bolts from sub frame. Use a transmission carrier to support sub frame, and then separate it from body and lower it to a proper position.

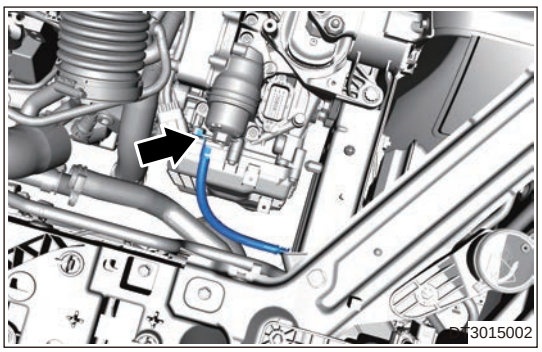
(19) Remove 2 fixing bolts from steering gear, separate it from sub frame, remove sub frame assembly.

(20) Raise vehicle to a proper height, remove rear propeller shaft.

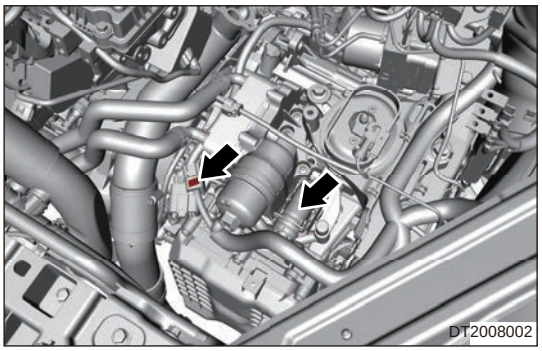
(21) Remove 1 fixing bolt from starter.



(22) Remove the transmission ground wire fixing bolt.

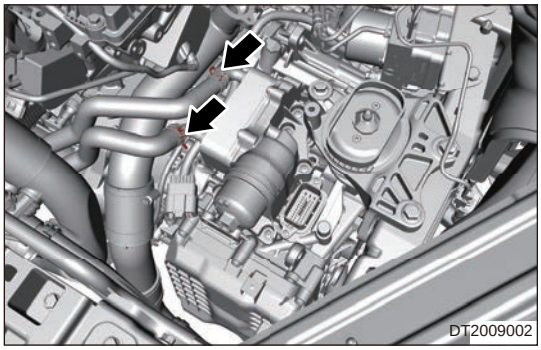


(23) Remove the connectors (arrow) of transmission wire harness.



(24) Remove cooler pipe clamps (arrow).

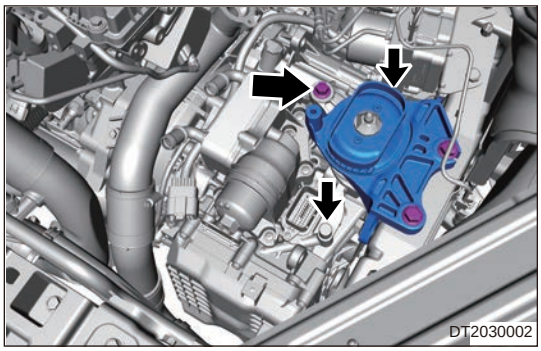
(25) Remove the cooler pipe.



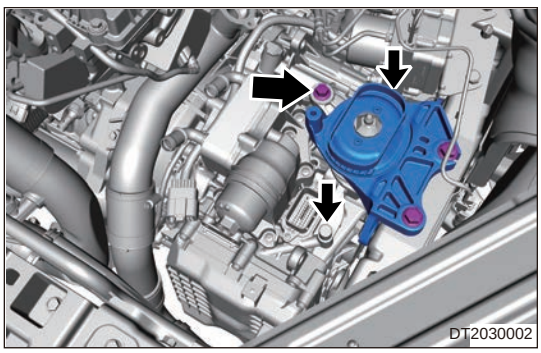
(26) Install the engine hoist.

(27) Install the transmission carrier.

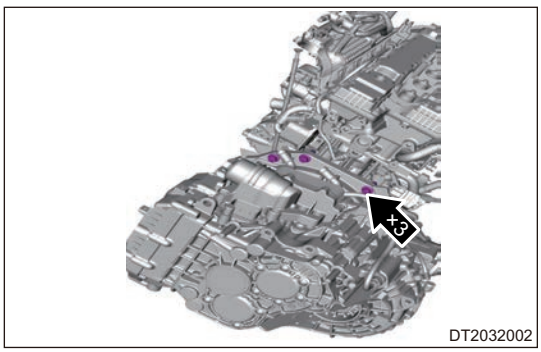
(28) Remove 4 fixing bolts and 1 nut from left mounting cushion and remove mounting cushion assembly.



(29) Remove 3 fixing bolts from left mounting bracket and remove mounting bracket assembly.



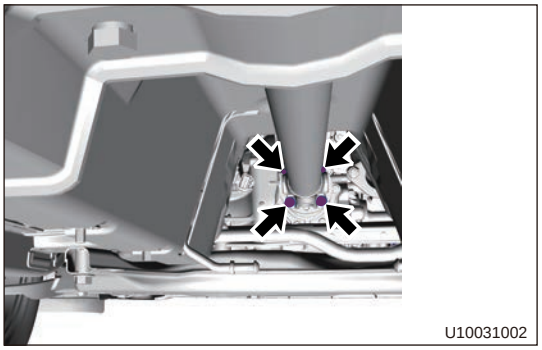
(30) Remove 3 fixing bolts between upper part of transmission and engine.



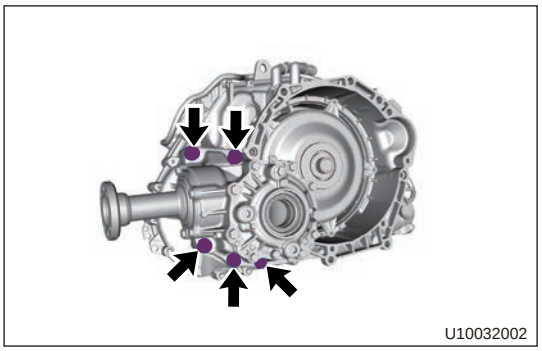
(31) Remove the pre-catalytic converter assembly (4WD).

(32) Remove the transfer assembly (4WD).

1) Remove 4 fixing bolts (arrow) between propeller shaft and PTU output flange surface.



2) Remove 5 fixing bolts (arrow) between transfer and transmission.

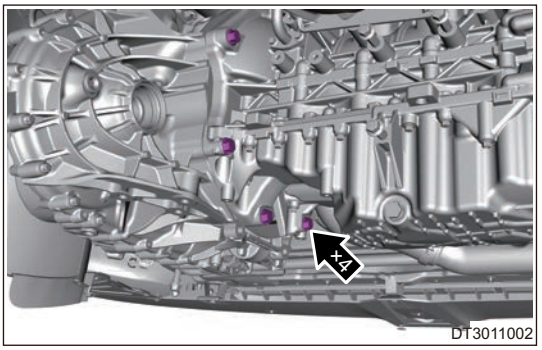


3) Remove the transfer assembly.

⚠ Warning

- **When handling the transfer, please pay attention to the flange surface connected with intermediate shaft and spline connected with transmission differential. Please pay attention to whether O-ring is intact and whether the oil seal is intact to avoid touching the lip of oil seal. Please handle the transfer case with care during whole operation, and do not move the transfer case upside down.**

(33) Remove 4 fixing bolts between lower part of transmission and engine.



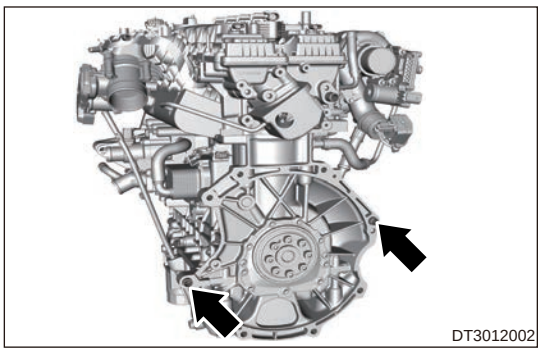
(34) Use tool to separate transmission and engine assembly, and remove transmission assembly.

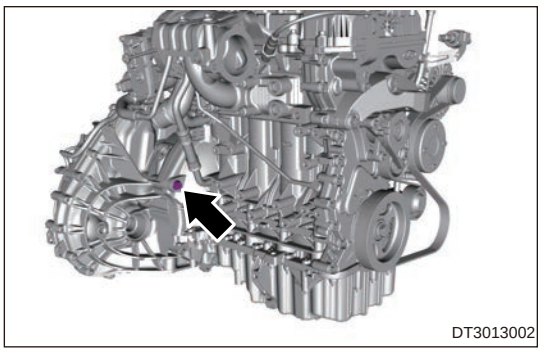
■ **Installation**

⚠ Caution

- **Before assembly, the engine cannot be missed to install or sealing plate cannot be bent.**
- **When assembling transmission and engine, the joint surfaces between transmission and engine must be fully contacted before installing coupling bolts between transmission and engine, and then tighten them diagonally and alternately, otherwise it is easy to loose thread of bolt hole on the transmission clutch case.**
- **Teeth-to-teeth (dual clutch spline teeth and dual mass flywheel spline teeth) will occur when transmission and engine are assembled. It can not install assembling bolts or manually press to assemble forcibly. The transmission must be completely disengaged and re-assembled, otherwise it will easily cause the clutch adjusting spring position to deviate, clutch half-clutch point value does not match the joint point value stored in the transmission control unit, and also, vehicle is moved when shifting to driving position, vehicle does not move when depressing accelerator pedal, vehicle jitter will occur when reversing or engine stall will occur when releasing brake pedal in reverse gear.**

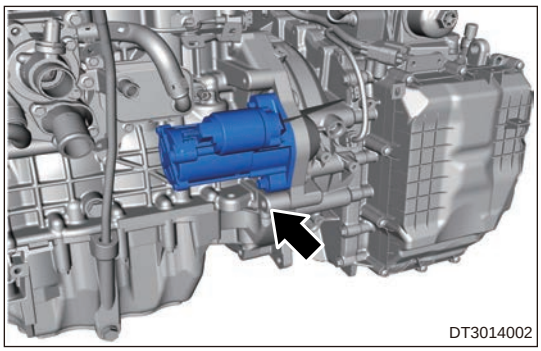
(1) As shown in the illustration below, install sealing plate to engine and ensure that dowel pin holes on engine are inserted into the corresponding holes of the sealing plate.


DT3012002


DT3013002

(2) Align the dowel pin hole of transmission with the dowel pin hole of engine, push the transmission so that the joint surfaces between engine and transmission can be contacted well, and install 2 coupling bolts to engine side as shown in the illustration.

Tightening torque: 50 ± 5 N·m


DT3014002

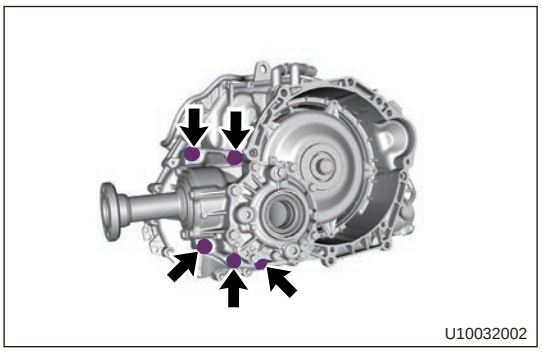
(3) Install the transfer assembly (4WD).

⚠ Warning

- **Install transfer spline to differential by turning it left and right, and align the transfer case dowel pin with positioning hole of differential case simultaneously.**
- **When installing 5 tightening bolts between transfer and transmission, follow the order of up, down, left and right and tighten diagonally.**

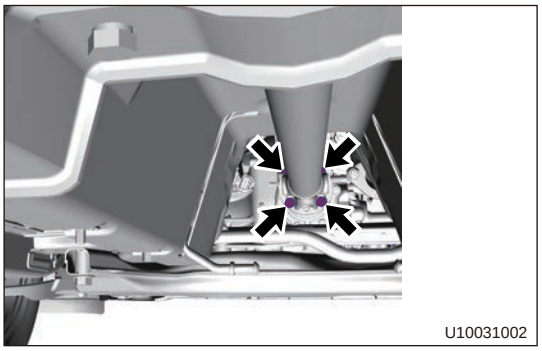
1) Install 5 fixing bolts between transfer and transmission.

   Tightening torque: 120 ± 10 N·m


U10032002

2) Install 4 fixing bolts between propeller shaft and PTU output flange.

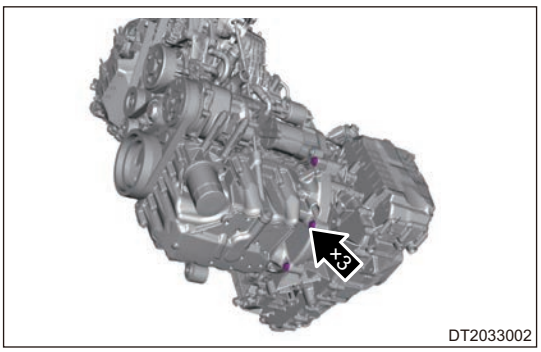
   Tightening torque: 33 ± 3 N·m


U10031002

(4) Install the precatalytic converter assembly (4WD).

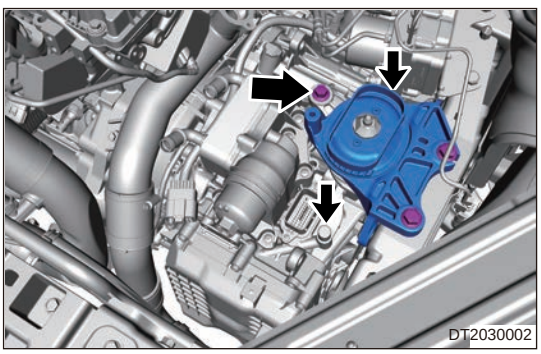
(5) Install 4 coupling bolts to lower part of transmission.

   Tightening torque: 50 ± 5 N·m



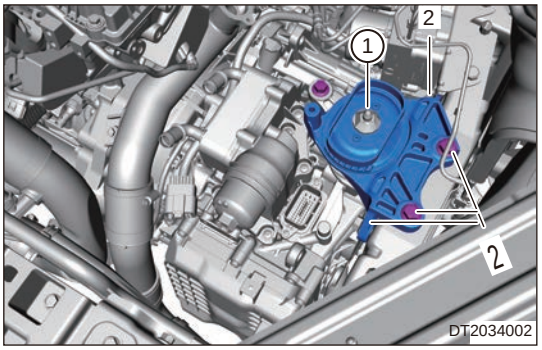
DT2033002

(6) Install left mounting bracket and 3 fixing bolts.


DT2030002

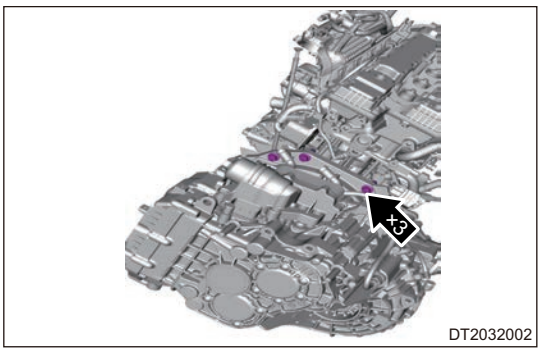
(7) Install 4 fixing bolts (2) and 1 nut (1) to left mounting cushion.

Tightening torque: 110 ± 15 N·m



(8) Install 3 coupling bolts to transmission side.

Tightening torque: 90 ± 9 N·m



(9) Connect connectors of transmission wire harness.
(10) Install the engine inlet pipe.
(11) Install clamps to engine inlet pipe.
(12) Install the intercooler inlet pipe assembly II.
(13) Install the transmission ground wire fixing bolt.
(14) Install 1 fixing bolt to starter.
(15) Install 1 fixing bolt to starter.
(16) Install engine speed sensor and 1 fixing bolt.
(17) Connect the engine speed sensor wire harness connector.
(18) Install the rear propeller shaft assembly.
(19) Use transmission carrier to support sub frame to a proper height, install steering gear assembly to sub frame.
(20) Use transmission carrier to support sub frame to engage with axle and then install 4 fixing bolts.
(21) Install left and right triangular arm assembly.
(22) Install front left/right lower impact beam assembly.
(23) Install 2 rear lower mounting.
(24) Install the front right drive shaft with bearing bracket assembly.
(25) Install the front left drive shaft assembly.
(26) Install the front right wheel.
(27) Install the front left wheel.
(28) Fill the transmission oil.
(29) Install the battery tray.
(30) Install the battery.
(31) Install the air filter assembly.
(32) Add the coolant.
(33) Install the engine trim cover assembly.
(34) Connect the negative battery cable.

■ Follow the following process to perform diagnostic tester self-learning after replacing transmission body

(1) The vehicle is powered on, shift lever is in P and the vehicle is stationary.

(2) Use a diagnostic tester to activate "Reset Memory" function (Routine $31 01 04 05) and get a positive response.

(3) Use a diagnostic tester to activate "Read Transmission Storage Data" (Routine $31 01 04 06 01) and get a positive response.

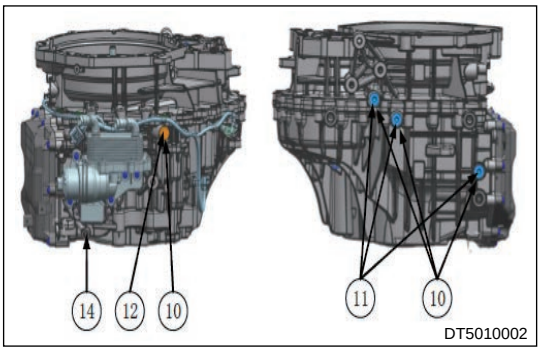
(4) The vehicle is powered off and wait for 10 seconds.

(5) Replacement is complete.

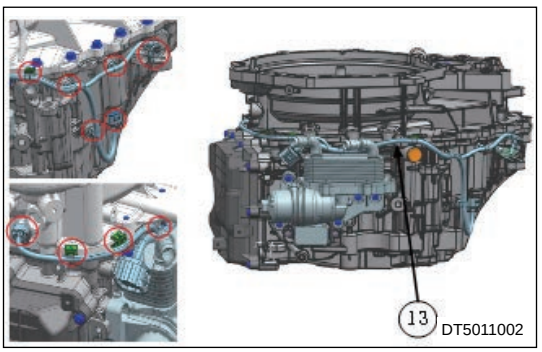
4.11 Transmission Assembly Disassembly

■ Disassembly

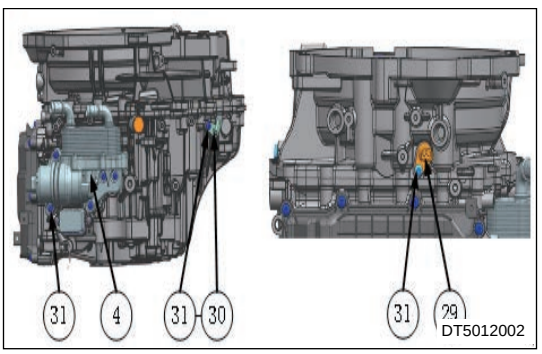
(1) Place transmission assembly steadily. Remove breather plug (14) and filler plug (12), oil plug gasket (10), and then remove 3 inner hexagon oil plugs (11) and 3 oil plug gaskets (10). Drain transmission oil.



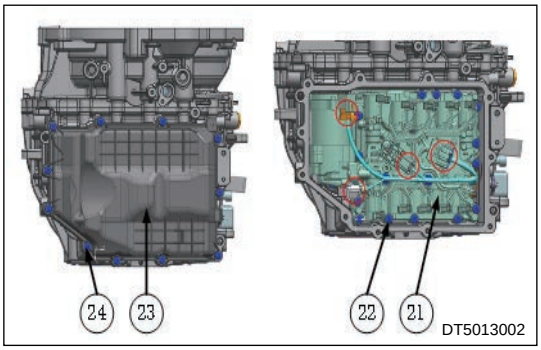
(2) Remove connectors and clips as shown in illustration below, and then remove three-in-one wire harness (13).



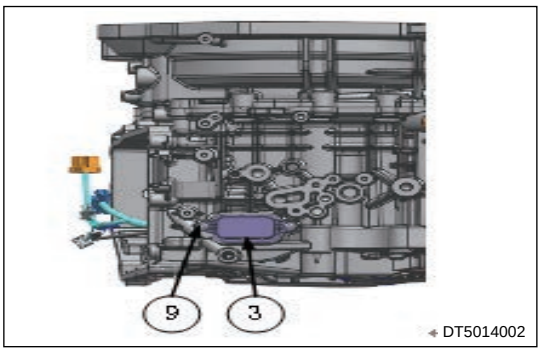
(3) Remove 5 filter cooling module fixing bolts (31) and filter cooling module assembly (4); remove fixing bolts (31) and output speed sensor (30) & clutch temperature speed sensor (29).



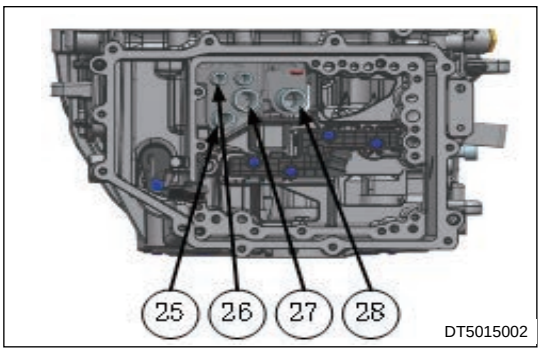
(4) Remove 11 valve body cover fixing bolts (24) and valve body cover assembly (23); remove 4 connectors as shown in illustration below and 14 hydraulic system fixing bolts (22), and remove hydraulic system (21) by HCU mould assembling pickup lever, pay attention not to damage transmission wire harness.



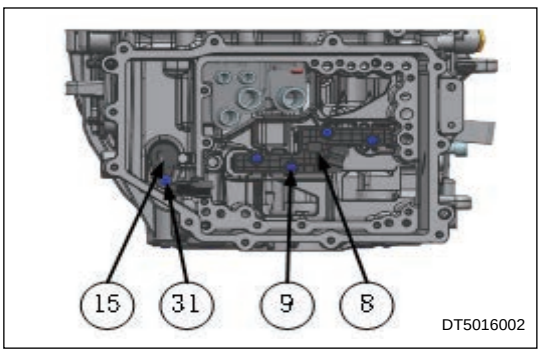
(5) Remove 2 fixing bolts (9) from transmission wire harness and take out transmission wire harness assembly (3).



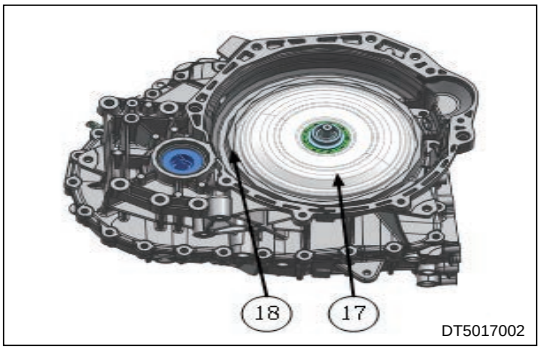
(6) Remove oil pump valve body connecting pipe assembly 2 (25), oil pump valve body connecting pipe assembly 3 (26), oil pump valve body connecting pipe assembly 1 (27), oil pump valve body connecting pipe assembly 4 (28).



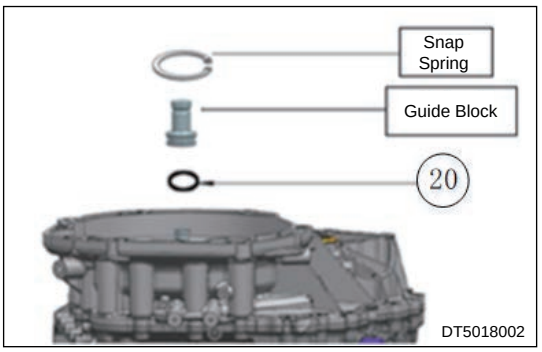
(7) Remove fixing bolt (31) and, sensor integrated module B (15); remove 4 fixing bolts (9) and sensor integrated module A (8), pay attention not to drop the bolts into transmission.



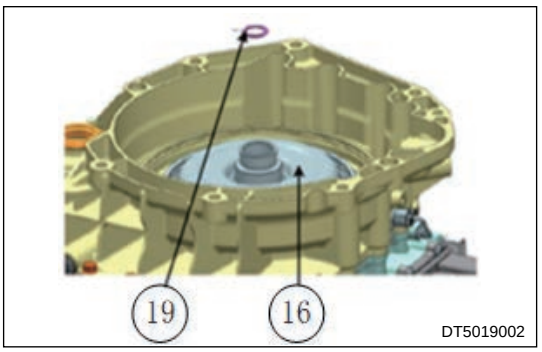
(8) Remove fixing snap spring (18) and clutch sealing cover (17), pay attention not to scratch the joint surface between housing and sealing cover.



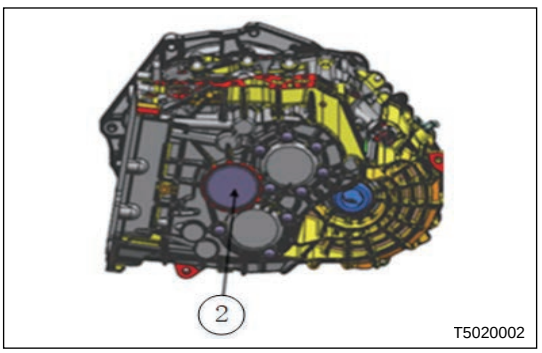
(9) Remove snap spring from clutch guide block, take out guide block, and then remove clutch snap spring (20).



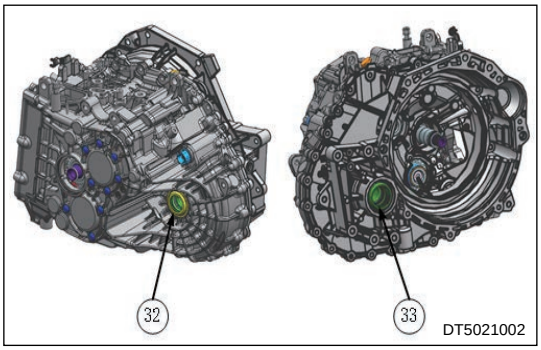
(10) Take out clutch adjusting shim (19), remove dual clutch assembly (16) with clutch lifting fixture.



(11) Remove input shaft cover plate (2), pay attention not to damage the joint surface between housing and input shaft cover plate.

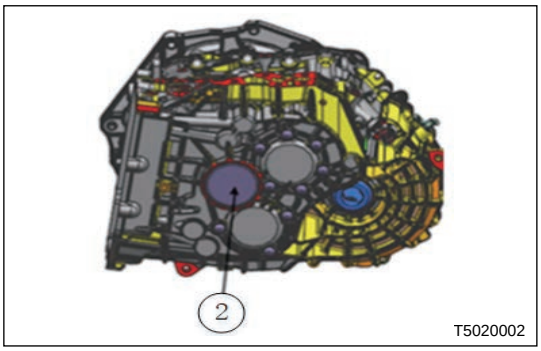


(12) Remove half shaft oil seal (32) from main housing side and half shaft oil seal (33) from clutch housing side.

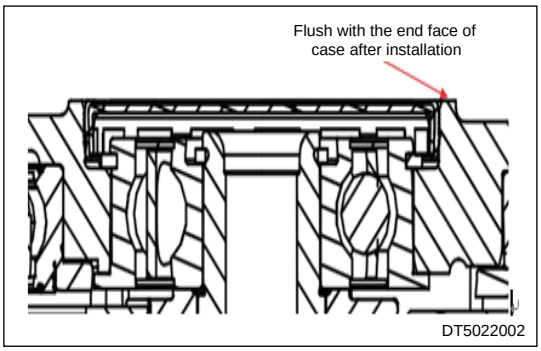


■ Assembly

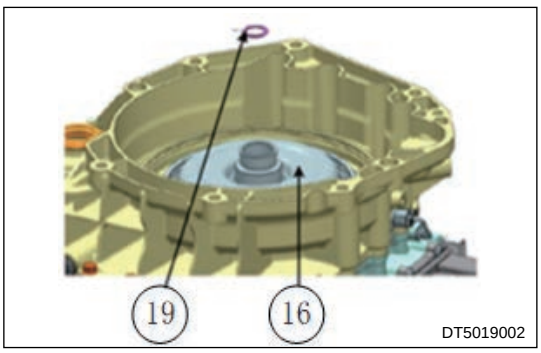
(1) Install input shaft cover plate (2) with input shaft cover plate knock fixture.



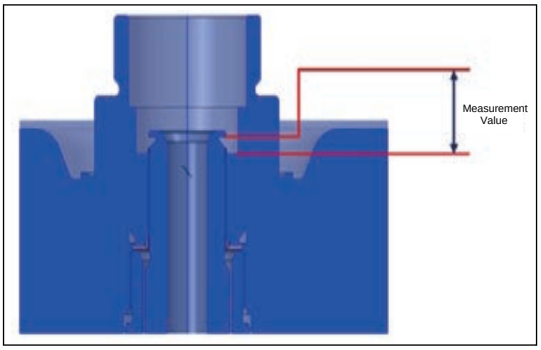
Note: Installation position of cover plate is shown in the following figure.



(2) Place transmission assembly steadily. Install dual clutch assembly (16) with a clutch lifting fixture.



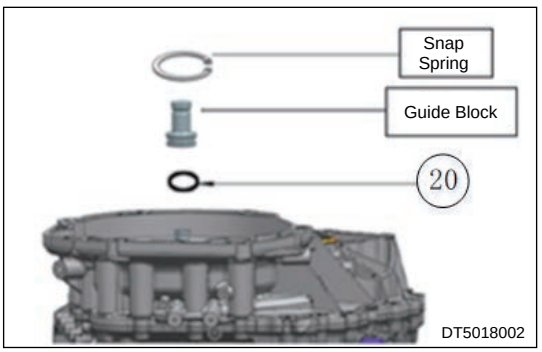
1) Using a clutch measuring fixture, measure the clearance H between end face of clutch and end face of input shaft snap spring groove.



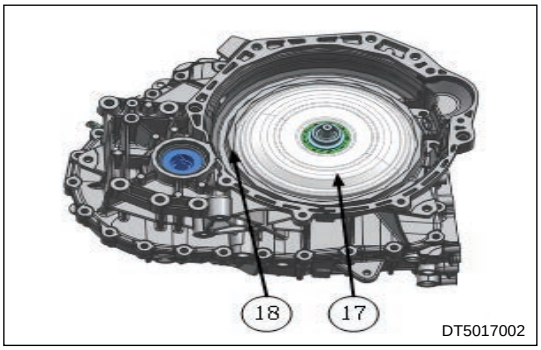
2) Select a appropriate clutch adjusting shim (19) to install to clutch assembly according to the following rules.

X=H-1.6 – 0.2		Thickness of selected adjusting shim
>	<	
1.13	1.15	1.10 ± 0.01
1.15	1.25	1.20 ± 0.01
1.25	1.35	1.30 ± 0.01
1.35	1.45	1.40 ± 0.01
1.45	1.55	1.50 ± 0.01
1.55	1.65	1.60 ± 0.01
1.65	1.75	1.70 ± 0.01
1.75	1.85	1.80 ± 0.01
1.85	1.95	1.90 ± 0.01
1.95	2.05	2.00 ± 0.01
2.05	2.15	2.10 ± 0.01
2.15	2.25	2.20 ± 0.01
2.25	2.35	2.30 ± 0.01
2.35	2.42 (inclusive)	2.40 ± 0.01

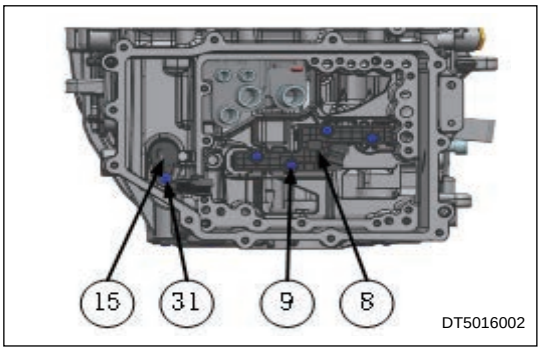
(3) Using clutch snap spring mounting guide block and clutch snap spring mounting socket, install clutch snap spring (20), and then install guide block and guide block snap spring.



(4) Using clutch sealing cover fixture and clutch sealing cover guide fixture, install clutch sealing cover (17) in place, and then clamp sealing cover to secure snap spring (18).



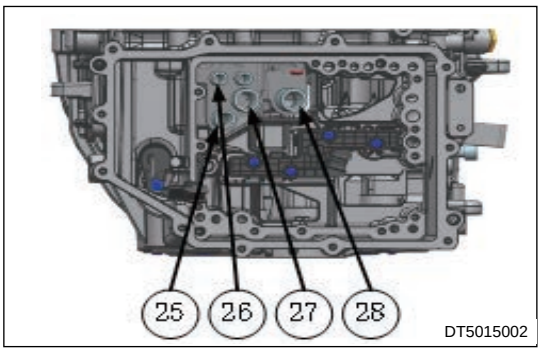
(5) Install sensor integrated module A (8) and tighten 4 sensor integrated module A fixing bolts (9), install sensor integrated module B (15) and tighten 1 sensor integrated module B fixing bolt (31).



⚠ Caution

- **Be careful not to drop the bolts into transmission when installing.**

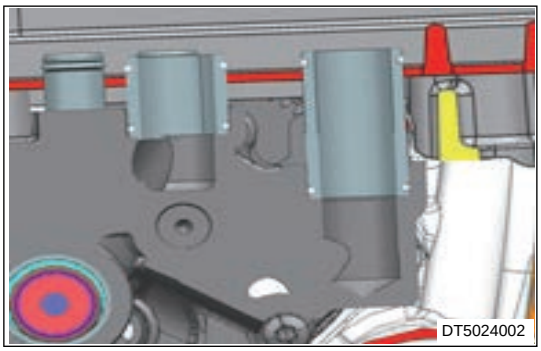
(6) Install oil pump valve body connecting pipe assembly 2 (25), oil pump valve body connecting pipe assembly 3 (26), oil pump valve body connecting pipe assembly 1 (27), oil pump valve body connecting pipe assembly 4 (28), pay attention to apply transmission oil to O-ring of valve body connecting pipe.



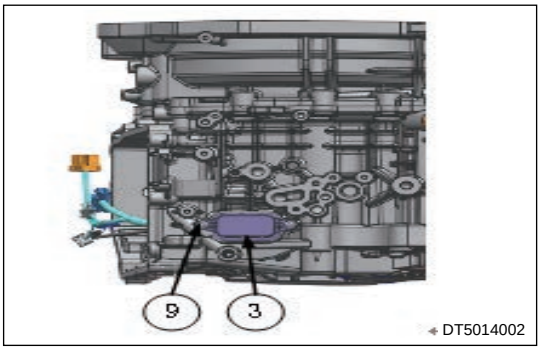
⚠ Caution

- **Oil pump valve body connecting pipe assembly 1 and oil pump valve body connecting pipe assembly 4 have the same diameter, but the length is different, so do not install them incorrectly.**

1) After installing correctly, the two connecting pipe assemblies are at the same height as shown in illustration.



(7) Pass transmission wire harness connector assembly (3) through transmission case and install, and then tighten 2 fixing bolts (9) to transmission wire harness connector assembly. Tightening torque: 2 - 3 N·m.



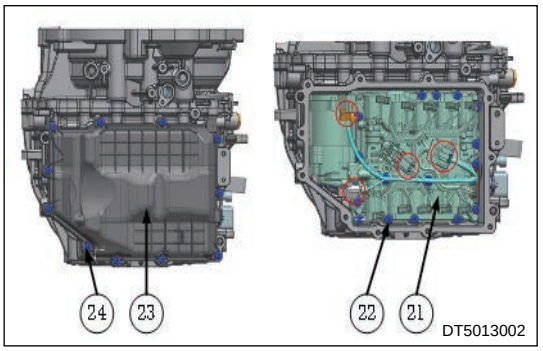
(8) Install hydraulic system (21) in place with HCU mould assembling pickup lever and HCU mould assembling guide lever.

⚠ Caution

- **When HCU is assembled, pay attention to adjust the position of transmission wire harness connector assembly and do not damage it.**

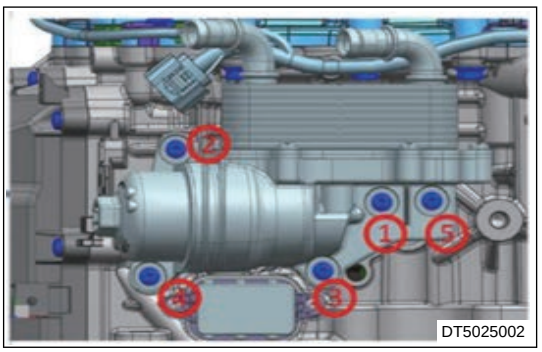
(9) Tighten 14 fixing bolts (22) to hydraulic system diagonally, tightening torque: 4 ± 0.5 Nm + 90 ± 2°, connect 4 connectors as shown in illustration, install valve body cover assembly (23) and tighten 11 fixing bolts (24) to valve body cover diagonally.

Tightening torque: 8 - 10 N·m

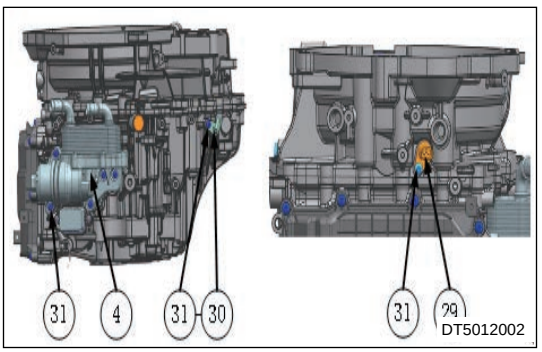


(10) Install filter cooling module assembly (4) and tighten 5 fixing bolts (31) to filter cooling module assembly in the order of 1-2-3-4-5-1-2-3 as shown in the illustration below.

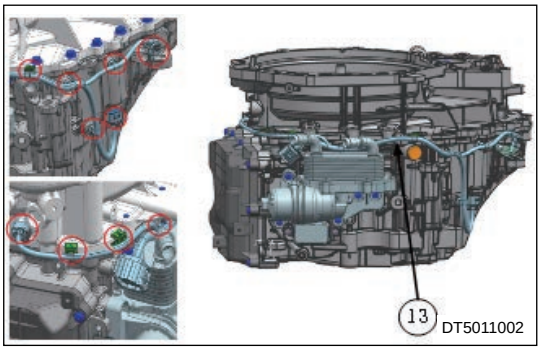
Tightening torque: 8 - 10 N·m



(11) Install output speed sensor (30) and clutch temperature speed sensor (29), and tighten fixing bolts (31) to output speed sensor and clutch temperature speed sensor, tightening torque: 8 - 10 N m.



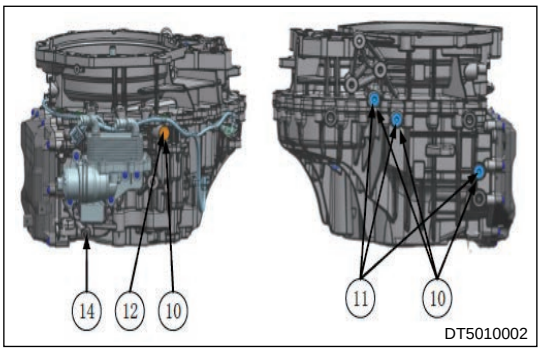
(12) Install three-in-one wire harness assembly (13), and connect 7 connectors and clips as shown in illustration.



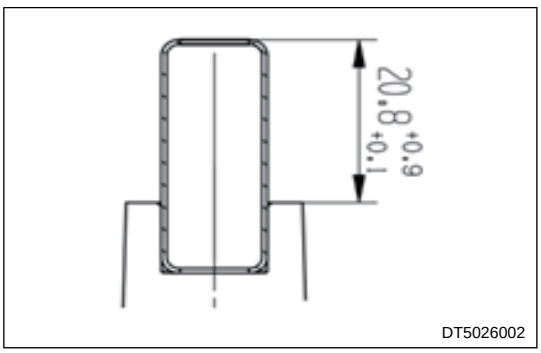
(13) Install 3 inner hexagonal oil plugs (11) and oil plug gaskets (10), and tighten 3 inner hexagonal oil plugs, tightening torque: 60 - 66 N·m.

(14) Fill transmission oil into transmission from filling port, install oil plug (12) and oil plug gasket (10), and tighten oil plug.

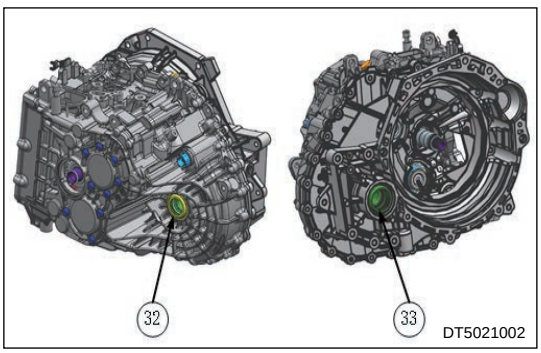
(15) Install breather plug assembly (14) with breather plug knock fixture.



Note: After breather plug is installed in place, the distance above housing is shown in the following figure.



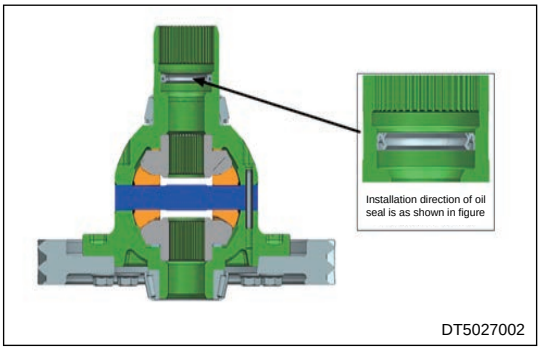
(16) Install half shaft oil seal (32) to main housing side.



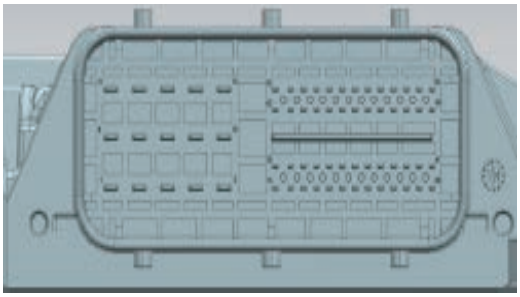
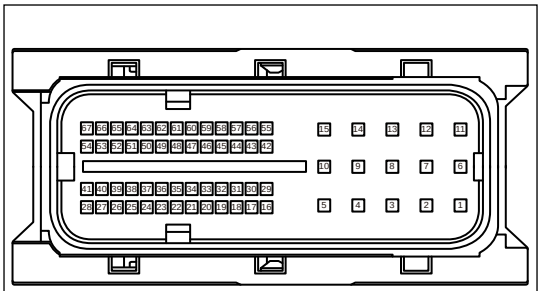
(17) Install half shaft oil seal (33) to clutch housing side.

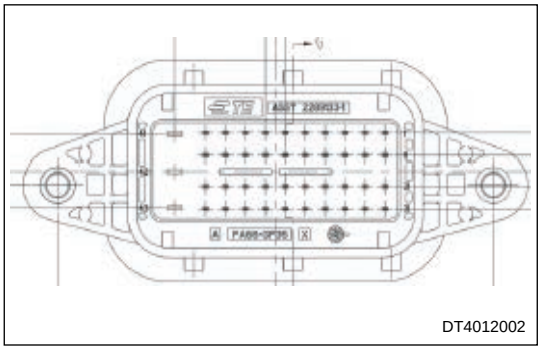
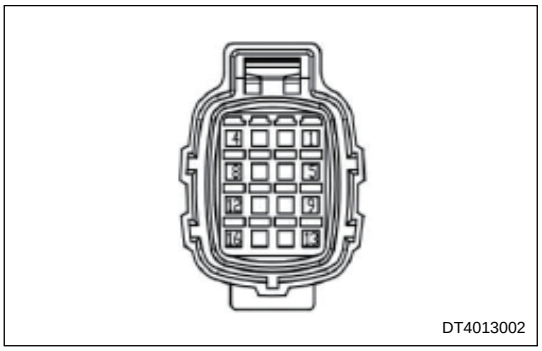
⚠ Caution

- **The installation direction of oil seal is shown on the right.**



4.12 Sensor Inspection

Terminal Name	Terminal Image
TCU Terminal Male Connector J1	 DT4010002
TCU Terminal Wire Harness Female Connector J2	 DT4011002

Terminal Name	Terminal Image
Transmission End Large Connector Male Terminal T1	 DT4012002
Transmission End Small Connector Female Terminal S1	 DT4013002

■ **Fork position sensor 1/5, fork position sensor 2/6, fork position sensor 3/7, fork position sensor 4/R**

Detection 1: Detect wire harness terminal of fork position sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of fork position sensor 1/5 power supply to signal, connect positive terminal to J2-54, the negative terminal to J2-64, read the resistance value.

(3) Measure the resistance value of fork position sensor 1/5 signal to ground, connect positive terminal to J2-64, the negative terminal to J2-61, read the resistance value.

(4) Measure the resistance value of fork position sensor 2/6 power supply to signal, connect positive terminal to J2-42, the negative terminal to J2-57, read the resistance value.

(5) Measure the resistance value of fork position sensor 2/6 signal to ground, connect positive terminal to J2-57, the negative terminal to J2-34, read the resistance value.

(6) Measure the resistance value of fork position sensor 3/7 power supply to signal, connect positive terminal to J2-54, the negative terminal to J2-64, read the resistance value.

(7) Measure the resistance value of fork position sensor 3/7 signal to ground, connect positive terminal to J2-64, the negative terminal to J2-61, read the resistance value.

(8) Measure the resistance value of fork position sensor 4/R power supply to signal, connect positive terminal to J2-42, the negative terminal to J2-58, read the resistance value.

(9) Measure the resistance value of fork position sensor 4/R signal to ground, connect positive terminal to J2-58, the negative terminal to J2-34, read the resistance value.

(10)

Detection 2: Detect transmission terminal of fork position sensor

(1) Disconnect negative battery, unplug corresponding transmission wire harness connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of transmission wire harness connector T1.

(2) Measure the resistance value of fork position sensor 1/5 power supply to signal, connect positive terminal to T1-13, the negative terminal to T1-31, read the resistance value.

(3) Measure the resistance value of fork position sensor 1/5 signal to ground, connect positive terminal to T1-31, the negative terminal to T1-32, read the resistance value.

(4) Measure the resistance value of fork position sensor 2/6 power supply to signal, connect positive terminal to T1-3, the negative terminal to T1-4, read the resistance value.

(5) Measure the resistance value of fork position sensor 2/6 signal to ground, connect positive terminal to T1-4, the negative terminal to T1-33, read the resistance value.

(6) Measure the resistance value of fork position sensor 3/7 power supply to signal, connect positive terminal to T1-13, the negative terminal to T1-12, read the resistance value.

(7) Measure the resistance value of fork position sensor 3/7 signal to ground, connect positive terminal to T1-12, the negative terminal to T1-32, read the resistance value.

(8) Measure the resistance value of fork position sensor 4/R power supply to signal, connect positive terminal to T1-3, the negative terminal to T1-2, read the resistance value.

(9) Measure the resistance value of fork position sensor 4/R signal to ground, connect positive terminal to T1-2, the negative terminal to T1-33, read the resistance value.

Detection 3: Detect TCU terminal of fork position sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to fork position sensor 1/5 power supply, connect positive terminal to J1-15, the negative terminal to J1-54, read the resistance value.

(3) Measure the resistance value of fork position sensor 1/5 power supply to ground, connect positive terminal to J1-54, the negative terminal to J1-5, read the resistance value.

(4) Measure the resistance value of power supply to fork position sensor 2/6, connect positive terminal to J1-15, the negative terminal to J1-42, read the resistance value.

(5) Measure the resistance value of fork position sensor 2/6 power supply to ground, connect positive terminal to J1-42, the negative terminal to J1-5, read the resistance value.

(6) Measure the resistance value of power supply to fork position sensor 3/7, connect positive terminal to J1-15, the negative terminal to J1-54, read the resistance value.

(7) Measure the resistance value of fork position sensor 3/7 power supply to ground, connect positive terminal to J1-54, the negative terminal to J1-5, read the resistance value.

(8) Measure the resistance value of power supply to fork position sensor 4/R power supply, connect positive terminal to J1-15, the negative terminal to J1-42, read the resistance value.

(9) Measure the resistance value of fork position sensor 4/R power supply to ground, connect positive terminal to J1-42, the negative terminal to J1-5, read the resistance value.

■ Odd input shaft speed sensor, even input shaft speed sensor, output shaft speed sensor, clutch speed sensor

Detection 1: Detect wire harness terminal of speed sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of odd input shaft speed sensor power supply to signal, connect positive terminal to J2-53, the negative terminal to J2-62, read the resistance value.

(3) Measure the resistance value of even input shaft speed sensor power supply to signal, connect positive terminal to J2-43, the negative terminal to J2-63, read the resistance value.

(4) Measure the resistance value of output shaft speed sensor power supply to signal, connect positive terminal to J2-53, the negative terminal to J2-59, read the resistance value.

(5) Measure the resistance value of clutch speed sensor power supply to signal, connect positive terminal to J2-43, the negative terminal to J2-60, read the resistance value.

Detection 2: Detect transmission terminal of speed sensor

(1) Disconnect negative battery, unplug corresponding transmission wire harness connector and small connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of transmission wire harness connector T1 and small connector S1.

(2) Measure the resistance value of odd input shaft speed sensor power supply to signal, connect positive terminal to T1-23, the negative terminal to T1-11, read the resistance value.

(3) Measure the resistance value of even input shaft speed sensor power supply to signal, connect positive terminal to T1-22, the negative terminal to T1-21, read the resistance value.

(4) Measure the resistance value of output shaft speed sensor power supply to signal, connect positive terminal to S1-9, the negative terminal to S1-11, read the resistance value.

(5) Measure the resistance value of clutch speed sensor power supply to signal, connect positive terminal to S1-13, the negative terminal to S1-14, read the resistance value.

Detection 3: Detect TCU terminal of speed sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to odd input shaft speed sensor power supply, connect positive terminal to J1-15, the negative terminal to J1-53, read the resistance value.

(3) Measure the resistance value of odd input shaft speed sensor power supply to ground, connect positive terminal to J1-53, the negative terminal to J1-5, read the resistance value.

(4) Measure the resistance value of power supply to even input shaft speed sensor power supply, connect positive terminal to J1-15, the negative terminal to J1-43, read the resistance value.

(5) Measure the resistance value of even input shaft speed sensor power supply to ground, connect positive terminal to J1-43, the negative terminal to J1-5, read the resistance value.

(6) Measure the resistance value of power supply to output shaft speed sensor power supply, connect positive terminal to J1-15, the negative terminal to J1-53, read the resistance value.

(7) Measure the resistance value of output shaft speed sensor power supply to ground, connect positive terminal to J1-53, the negative terminal to J1-5, read the resistance value.

(8) Measure the resistance value of power supply to clutch speed sensor power supply, connect positive terminal to J1-15, the negative terminal to J1-43, read the resistance value.

(9) Measure the resistance value of clutch speed sensor power supply to ground, connect positive terminal to J1-43, the negative terminal to J1-5, read the resistance value.

4.13 Solenoid Valve Inspection

■ Main oil passage, lubricant oil passage solenoid valve

Detection 1: Detect wire harness terminal of main oil passage, lubricating oil passage solenoid valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of power supply to main oil passage solenoid valve power supply, connect positive terminal to J2-15, the negative terminal to J2-6, read the resistance value.

(3) Measure the resistance value of main oil passage solenoid valve power supply to signal, connect positive terminal to J2-6, the negative terminal to J2-44, read the resistance value.

(4) Measure the resistance value of main oil passage solenoid valve signal to ground, connect positive terminal to J2-44, the negative terminal to J2-5, read the resistance value.

(5) Measure the resistance value of power supply to lubricant oil passage solenoid valve power supply, connect positive terminal to J2-15, the negative terminal to J2-6, read the resistance value.

(6) Measure the resistance value of lubricant oil passage solenoid valve power supply to signal, connect positive terminal to J2-6, the negative terminal to J2-45, read the resistance value.

(7) Measure the resistance value of lubricant oil passage solenoid valve signal to ground, connect positive terminal to J2-45, the negative terminal to J2-5, read the resistance value.

Detect transmission terminal of main oil passage, lubricant oil passage solenoid valve

(1) Disconnect negative battery, unplug corresponding transmission wire harness connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of transmission wire harness connector T1.

(2) Measure the resistance value of main oil passage solenoid valve power supply to signal, connect positive terminal to T1-39, the negative terminal to T1-26, read the resistance value.

(3) Measure the resistance value of lubricant oil passage solenoid valve power supply to signal, connect positive terminal to T1-39, the negative terminal to T1-36, read the resistance value.

Detection 3: Detect TCU terminal of main oil passage, lubricant oil passage solenoid valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to main oil passage solenoid valve power of supply, connect positive terminal to J1-15, the negative terminal to J1-6, read the resistance value.

(3) Measure the resistance value of main oil passage solenoid valve signal to ground, connect positive terminal to J1-44, the negative terminal to J1-5, read the resistance value.

(4) Measure the resistance value of power supply to lubricant oil passage solenoid valve power supply, connect positive terminal to J1-15, the negative terminal to J1-6, read the resistance value.

(5) Measure the resistance value of lubricant oil passage solenoid valve signal to ground, connect positive terminal to J1-45, the negative terminal to J1-5, read the resistance value.

■ Odd clutch, even clutch solenoid valve

Detection 1: Detect wire harness terminal of clutch solenoid valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of power supply to odd clutch solenoid valve power supply, connect positive terminal to J2-15, the negative terminal to J2-11, read the resistance value.

(3) Measure the resistance value of odd clutch solenoid valve power supply to signal, connect positive terminal to J2-11, the negative terminal to J2-4, read the resistance value.

(4) Measure the resistance value of odd clutch solenoid valve signal to ground, connect positive terminal to J2-4, the negative terminal to J2-5, read the resistance value.

(5) Measure the resistance value of power supply to even clutch solenoid valve power supply, connect positive terminal to J2-15, the negative terminal to J2-12, read the resistance value.

(6) Measure the resistance value of even clutch solenoid valve power supply to signal, connect positive terminal to J2-12, the negative terminal to J2-33, read the resistance value.

(7) Measure the resistance value of even clutch solenoid valve signal to ground, connect positive terminal to J2-33, the negative terminal to J2-5, read the resistance value.

Detection 2: Detect transmission terminal of clutch solenoid valve

(1) Disconnect negative battery, unplug corresponding transmission wire harness connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of transmission wire harness connector T1.

(2) Measure the resistance value of odd clutch solenoid valve power supply to signal, connect positive terminal to T1-19, the negative terminal to T1-7, read the resistance value.

(3) Measure the resistance value of even clutch solenoid valve power supply to signal, connect positive terminal to T1-29, the negative terminal to T1-8, read the resistance value.

Detection 3: Detect TCU terminal of clutch solenoid valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to odd clutch solenoid valve power supply, connect positive terminal to J1-15, the negative terminal to J1-11, read the resistance value.

(3) Measure the resistance value of odd clutch solenoid valve signal to ground, connect positive terminal to J1-4, the negative terminal to J1-5, read the resistance value.

(4) Measure the resistance value of power supply to even clutch solenoid valve power supply, connect positive terminal to J1-15, the negative terminal to J1-12, read the resistance value.

(5) Measure the resistance value of even clutch solenoid valve signal to ground, connect positive terminal to J1-33, the negative terminal to J1-5, read the resistance value.

■ Odd shift pressure, even shift pressure solenoid valve

Detection 1: Detect wire harness terminal of shift pressure solenoid valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of power supply to odd shift pressure solenoid valve power supply, connect positive terminal to J2-15, the negative terminal to J2-11, read the resistance value.

(3) Measure the resistance value of odd shift pressure solenoid valve power supply to signal, connect positive terminal to J2-11, the negative terminal to J2-10, read the resistance value.

(4) Measure the resistance value of odd shift pressure solenoid valve signal to ground, connect positive terminal to J2-10, the negative terminal to J2-5, read the resistance value.

(5) Measure the resistance value of power supply to even shift pressure solenoid valve power supply, connect positive terminal to J2-15, the negative terminal to J2-12, read the resistance value.

(6) Measure the resistance value of even shift pressure solenoid valve power supply to signal, connect positive terminal to J2-12, the negative terminal to J2-48, read the resistance value.

(7) Measure the resistance value of even shift pressure solenoid valve signal to ground, connect positive terminal to J2-48, the negative terminal to J2-5, read the resistance value.

Detect transmission terminal of shift pressure solenoid valve

(1) Disconnect negative battery, unplug corresponding transmission wire harness connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of transmission wire harness connector T1.

(2) Measure the resistance value of odd shift pressure solenoid valve power supply to signal, connect positive terminal to T1-19, the negative terminal to T1-17, read the resistance value.

(3) Measure the resistance value of even shift pressure solenoid valve power supply to signal, connect positive terminal to T1-29, the negative terminal to T1-18, read the resistance value.

Detection 3: Detect TCU terminal of clutch solenoid valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to odd shift pressure solenoid valve power supply, connect positive terminal to J1-15, the negative terminal to J1-11, read the resistance value.

(3) Measure the resistance value of odd shift pressure solenoid valve signal to ground, connect positive terminal to J1-10, the negative terminal to J1-5, read the resistance value.

(4) Measure the resistance value of power supply to even shift pressure solenoid valve power supply, connect positive terminal to J1-15, the negative terminal to J1-12, read the resistance value.

(5) Measure the resistance value of even shift pressure solenoid valve signal to ground, connect positive terminal to J1-48, the negative terminal to J1-5, read the resistance value.

4.14 Motor Inspection

■ Driver motor

Detection 1: Detect wire harness terminal of driver motor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of motor power supply to U phase, connect positive terminal to J2-13, the negative terminal to J2-1, read the resistance value.

(3) Measure the resistance value of motor power supply to V phase, connect positive terminal to J2-13, the negative terminal to J2-2, read the resistance value.

(4) Measure the resistance value of motor power supply to W phase, connect positive terminal to J2-13, the negative terminal to J2-3, read the resistance value.

(5) Measure the resistance value of motor U phase to ground, connect positive terminal to J2-1, the negative terminal to J2-5, read the resistance value.

(6) Measure the resistance value of motor V phase to ground, connect positive terminal to J2-2, the negative terminal to J2-5, read the resistance value.

(7) Measure the resistance value of motor W phase to ground, connect positive terminal to J2-3, the negative terminal to J2-5, read the resistance value.

(8) Measure the resistance value of U phase to V phase, connect positive terminal to J2-1, the negative terminal to J2-2, read the resistance value.

(9) Measure the resistance value of V phase to W phase, connect positive terminal to J2-2, the negative terminal to J2-3, read the resistance value.

(10) Measure the resistance value of W phase to U phase, connect positive terminal to J2-3, the negative terminal to J2-1, read the resistance value.

Detection 2: Detect transmission terminal of driver motor

(1) Disconnect negative battery, unplug corresponding transmission wire harness connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of transmission wire harness connector T1.

(2) Measure the resistance value of U phase to V phase, connect positive terminal to T1-41, the negative terminal to T1-42, read the resistance value.

(3) Measure the resistance value of V phase to W phase, connect positive terminal to T1-42, the negative terminal to T1-43, read the resistance value.

(4) Measure the resistance value of W phase to U phase, connect positive terminal to T1-43, the negative terminal to T1-41, read the resistance value.

Detection 3: Detect TCU terminal of driver motor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of motor power supply to U phase, connect positive terminal to J1-13, the negative terminal to J1-1, read the resistance value.

(3) Measure the resistance value of motor power supply to V phase, connect positive terminal to J1-13, the negative terminal to J1-2, read the resistance value.

(4) Measure the resistance value of motor power supply to W phase, connect positive terminal to J1-13, the negative terminal to J1-3, read the resistance value.

(5) Measure the resistance value of motor U phase to ground, connect positive terminal to J1-1, the negative terminal to J1-5, read the resistance value.

(6) Measure the resistance value of motor V phase to ground, connect positive terminal to J1-2, the negative terminal to J1-5, read the resistance value.

(7) Measure the resistance value of motor W phase to ground, connect positive terminal to J1-3, the negative terminal to J1-5, read the resistance value.

4.15 Hydraulic Parking Inspection

■ E-Park hydraulic valve

Detection 1: Detect wire harness terminal of E-Park hydraulic valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of power supply to E-Park hydraulic valve power supply, connect positive terminal to J2-15, the negative terminal to J2-6, read the resistance value.

(3) Measure the resistance value of E-Park hydraulic valve signal to ground, connect positive terminal to J2-36, the negative terminal to J2-5, read the resistance value.

(4) Measure the resistance value of E-Park hydraulic valve power supply to E-Park hydraulic valve signal, connect positive terminal to J2-6, the negative terminal to J2-36, read the resistance value.

Detection 2: Detect transmission terminal of E-Park hydraulic valve

(1) Disconnect negative battery, unplug corresponding small connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of small connector S1.

(2) Measure the resistance value of E-Park hydraulic valve power supply to E-Park hydraulic valve signal, connect positive terminal to S1-1, the negative terminal to S1-2, read the resistance value.

Detection 3: Detect TCU terminal of E-Park hydraulic valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to E-Park hydraulic valve power supply, connect positive terminal to J1-15, the negative terminal to J1-6, read the resistance value.

(3) Measure the resistance value of E-Park hydraulic valve signal to ground, connect positive terminal to J1-36, the negative terminal to J1-5, read the resistance value.

■ E-Park safety valve

Detection 1: Detect wire harness terminal of E-Park safety valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of power supply to E-Park safety valve power supply, connect positive terminal to J2-15, the negative terminal to J2-6, read the resistance value.

(3) Measure the resistance value of E-Park safety valve signal to ground, connect positive terminal to J2-35, the negative terminal to J2-5, read the resistance value.

(4) Measure the resistance value of E-Park safety valve power supply to E-Park safety valve signal, connect positive terminal to J2-6, the negative terminal to J2-35, read the resistance value.

Detection 2: Detect transmission terminal of E-Park safety valve

(1) Disconnect negative battery, unplug corresponding small connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of small connector S1.

(2) Measure the resistance value of E-Park safety valve power supply to E-Park safety valve signal, connect positive terminal to S1-1, the negative terminal to S1-3, read the resistance value.

Detection 3: Detect TCU terminal of E-Park safety valve

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of power supply to E-Park safety valve power supply, connect positive terminal to J1-15, the negative terminal to J1-6, read the resistance value.

(3) Measure the resistance value of E-Park safety valve signal to ground, connect positive terminal to J1-35, the negative terminal to J1-5, read the resistance value.

■ E-Park position sensor

Detection 1: Detect wire harness terminal of E-Park position sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of female connector J2 of wire harness side matched with TCU.

(2) Measure the resistance value of E-Park position sensor power supply to signal, connect positive terminal to J2-54, the negative terminal to J2-41, read the resistance value.

(3) Measure the resistance value of E-Park position sensor signal to ground, connect positive terminal to J2-41, the negative terminal to J2-61, read the resistance value.

Detection 2: Detect transmission terminal of E-Park position sensor

(1) Disconnect negative battery, unplug corresponding small connector from transmission terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of small connector S1.

(2) Measure the resistance value of E-Park position sensor power supply to signal, connect positive terminal to S1-5, the negative terminal to S1-4, read the resistance value.

(3) Measure the resistance value of E-Park position sensor signal to ground, connect positive terminal to S1-4, the negative terminal to S1-8, read the resistance value.

Detection 3: Detect TCU terminal of E-Park position sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of E-Park position sensor power supply to signal, connect positive terminal to J1-54, the negative terminal to J1-41, read the resistance value.

(3) Measure the resistance value of E-Park position sensor signal to ground, connect positive terminal to J1-41, the negative terminal to J1-61, read the resistance value. Measure the resistance value of sensor 4/R power supply, connect positive terminal to J1-15, the negative terminal to J1-42, read the resistance value.

(4) Measure the resistance value of fork position sensor 4/R power supply to ground, connect positive terminal to J1-42, the negative terminal to J1-5, read the resistance value.

Detection 3: Detect TCU terminal of E-Park position sensor

(1) Disconnect negative battery, unplug corresponding connector from TCU terminal, adjust digital multimeter to ohm band, measure the resistance between the pins of TCU male connector J1.

(2) Measure the resistance value of E-Park position sensor power supply to signal, connect positive terminal to J1-54, the negative terminal to J1-41, read the resistance value.

(3) Measure the resistance value of E-Park position sensor signal to ground, connect positive terminal to J1-41, the negative terminal to J1-61, read the resistance value. Measure the resistance value of sensor 4/R power supply, connect positive terminal to J1-15, the negative terminal to J1-42, read the resistance value.

(4) Measure the resistance value of fork position sensor 4/R power supply to ground, connect positive terminal to J1-42, the negative terminal to J1-5, read the resistance value.

■ **Resistance Inspection Result**

There is no short circuit when detection resistance is greater than or equal to 1 megohm. It is a short circuit when detection resistance is low.

⚠ Caution
• **When measuring resistance value, gently shake wire harness in vertical and horizontal directions.**

4.16 Diagnostic Tester Operation Process after Replacing Parts

Depend to maintenance needs, the replacement process for transmission or transmission control unit TCU needs to be performed in the following steps:

⚠ Caution
• **The transmission EOL off-line related self-learning has been completed, and there is no need to perform self-learning without replacing parts.**

Hint:
In order to learn more accurate data, the following conditions need to be met when learning clutch engagement point:

- Clutch temperature: 40 - 100℃
- Engine coolant temperature: 80 - 100℃
- External ambient temperature: is 15 - 50℃
- Intake temperature: 0 - 55℃
- Net torque fluctuation at engine flywheel end is within ± 3.5 N m
- Engine speed is lower than 1,200 rpm, engine idle has no change
- Accelerator pedal is not depressed

■ **Replacing transmission body**

(1) The vehicle is powered on, shift lever is in P and the vehicle is stationary.
(2) Use a diagnostic tester to activate "Reset Memory" function (Routine $31 01 04 05) and get a positive response.
(3) Use a diagnostic tester to activate “Read Transmission Storage Data" (Routine $31 01 04 06 01) and get a positive response.
(4) The vehicle is powered off and wait for 10 seconds.
(5) Replacement is complete.

Reset memory

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P, stable engine idle, stable engine torque, normal temperature (transmission oil temperature does not exceed 70°C), there is no fault in transmission.
- Reasons for learning failure: 1. BE function request times out; 2. F2 EEPROM Reset is failed.

Read transmission storage data

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P
- Reasons for learning failure: 1. BE function request times out; 2. F1 Subrom fails to communicate with TCU.

■ **Replacing transmission control unit (TCU)**

(1) The vehicle is powered on, shift lever is in P and the vehicle is stationary.
(2) Use a diagnostic tester to activate "Reset Memory" function (Routine $31 01 04 05) and get a positive response.
(3) Use a diagnostic tester to activate "Read Transmission Storage Data" (Routine $31 01 04 06 01) and get a positive response.
(4) Use a diagnostic tester to activate "VIN Code Writing" (2E F1 90 XX XX...).
(5) The vehicle is powered off and wait for 10 seconds.

(6) Replacement is complete.

■ **Replacing transmission clutch assembly**

(1) The vehicle is powered on, shift lever is in P, the vehicle is stationary, engine is in idling condition.

(2) Use a diagnostic tester to activate "Reset Memory" function (Routine $31 01 04 05) and get a positive response.

(3) Use a diagnostic tester to activate "Clutch TP Point Self-learning" (Routine $31 01 04 03) and get a positive response.

(4) Use a diagnostic tester to activate "Clutch PC Curve Self-learning" (Routine $31 01 04 04) and get a positive response.

(5) The vehicle is powered off and wait for 10 seconds.

(6) Replacement is complete.

Reset memory

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P, stable engine idle, stable engine torque, normal temperature (transmission oil temperature does not exceed 70°C), there is no fault in transmission.
- Reasons for learning failure: 1. BE function request times out; 2. F2 EEPROM Reset is failed.

Clutch TP point self-learning

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P, stable engine idle, stable engine torque, normal temperature (transmission oil temperature does not exceed 70°C), there is no fault in transmission.
- Reasons for learning failure: 1. BC does not find odd clutch contact points; 2. BD does not find even clutch contact point; 3. BE function request times out; 4. D1 temperature condition is not met; 5. D2 transmission is failed (report DFC failure); 6.D3 self-learning engine torque is unstable.

Clutch PC curve self-learning

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P, stable engine idle, stable engine torque, normal temperature (transmission oil temperature does not exceed 70°C), there is no fault in transmission.
- Reasons for learning failure: 1. A5 odd/even clutch pressure is out of range; 2. A6 odd clutch pressure is out of range; 3. A7 even clutch pressure is out of range; 4. A8 odd/even clutch pressure curve monotonicity inspection is failed; 5. A9 odd clutch pressure curve monotonicity inspection is failed; 6. AA even clutch pressure curve monotonicity inspection is failed; 7. BE function request times out; 8. D1 temperature condition is not met; 9. D2 transmission is failed (report DFC failure).

■ **Replacing transmission hydraulic system**

(1) The vehicle is powered on, shift lever is in P, the vehicle is stationary, engine is in idling condition.

(2) Use a diagnostic tester to activate "Reset Memory" function (Routine $31 01 04 05) and get a positive response.

(3) Use a diagnostic tester to activate "Read Transmission Storage Data" (Routine $31 01 04 06 01) and get a positive response.

(4) Use a diagnostic tester to activate "Fork Position Self-learning" (Routine $31 01 04 02) and get a positive response.

(5) Use a diagnostic tester to activate "Clutch TP Point Self-learning" (Routine $31 01 04 03) and get a positive response.

(6) Use a diagnostic tester to activate "Clutch PC Curve Self-learning" (Routine $31 01 04 04) and get a positive response.

(7) The vehicle is powered off and wait for 10 seconds.

(8) Replacement is complete.

Fork Position Self-learning

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P, stable engine idle, stable engine torque, normal temperature (transmission oil temperature does not exceed 70°C), there is no fault in transmission.
- Reasons for learning failure: 1. The middle position of B0 1/5 gear is abnormal; 2. The middle position of B1 3/7 gear is abnormal; 3. The middle position of B2 2/6 gear is abnormal; 4. The middle position of B3 4/R gear is abnormal; 5. B4 1st gear position is abnormal; 6. B5 2nd gear position is abnormal; 7. B6 3rd gear position is abnormal; 8. B7 4th gear position is abnormal; 9. B8 5th gear position is abnormal 10. B9

6th gear position is abnormal; 11. BA 7th gear position is abnormal; 12. BB reverse gear position is abnormal; 13. BE function request times out; 14. D2 transmission is failed (report DFC failure).

■ Reporting solenoid valve stuck malfunction

If solenoid valve stuck malfunction is reported, clutch solenoid valve can be scoured. If the malfunction is not repaired, hardware needs to be checked.

(1) The vehicle is powered on, shift lever is in P, the vehicle is stationary, engine is in idling condition.

(2) Use a diagnostic tester to activate "Clutch Solenoid Valve Scour" and get a positive response.

(3) The vehicle is powered off and wait for 10 seconds.

(4) Scour is completed.

Clutch solenoid valve scour

- Self-learning conditions: The vehicle is stationary (accelerator pedal is not depressed), shift lever is in P, stable engine idle, stable engine torque, normal temperature (transmission oil temperature does not exceed 70°C), there is no fault in transmission.
- Reasons for learning failure: 1. C7 odd gear is not in neutral; 2. C8 even gear is not in neutral; 3. BE function request times out; 4. D1 temperature condition is not met; 5. D2 transmission is failed (report DFC failure).

5.3 ELECTRONIC SHIFT

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) When removing electronic shift module assembly, be sure to wear safety equipment to prevent accidents.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

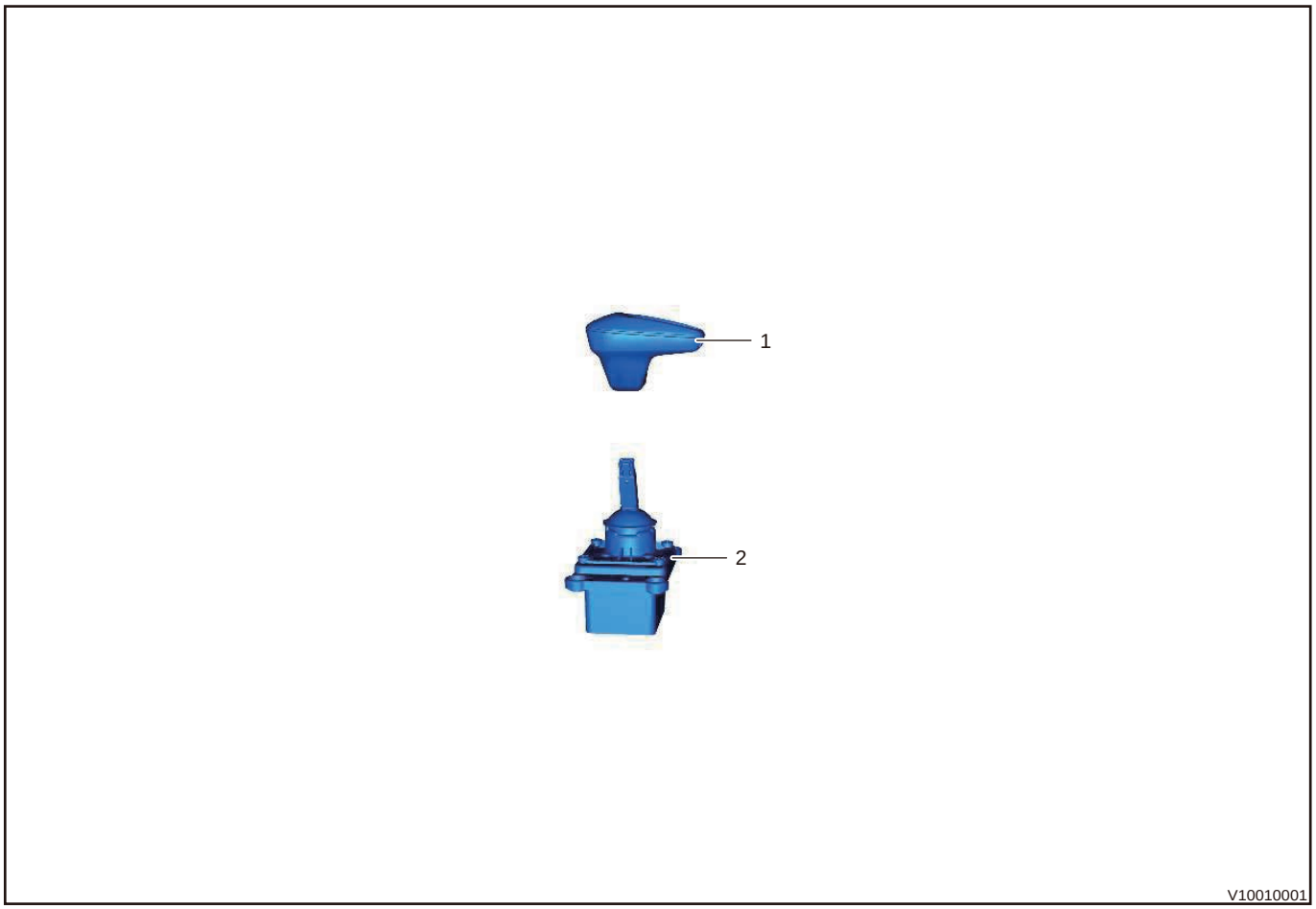
(1) Appropriate force should be applied, when removing upper cover plate body. Be careful not to operate roughly.

2 System Overview

2.1 System description

Electronic shift is gear shift mechanism and transmission are not connected in a traditional mechanical way, but a safer and faster electronic control mode, eliminating the traditional mechanical shift mode, and all using electronic signals for substitution. Its advantage is that the driver's wrong shift operation will be judged by the computer to see if it will cause damage to the transmission, so as to better protect the transmission and correct the bad shift habits. As a luxurious, high-technology configuration, electronic shift lever eliminates the traditional mechanical shifting mechanism and provides us with a more convenient operation. However, if there is a fault or short circuit, the electronic shifting mechanism is unable to release the current gear, we can only rely on the trailer and rescue.

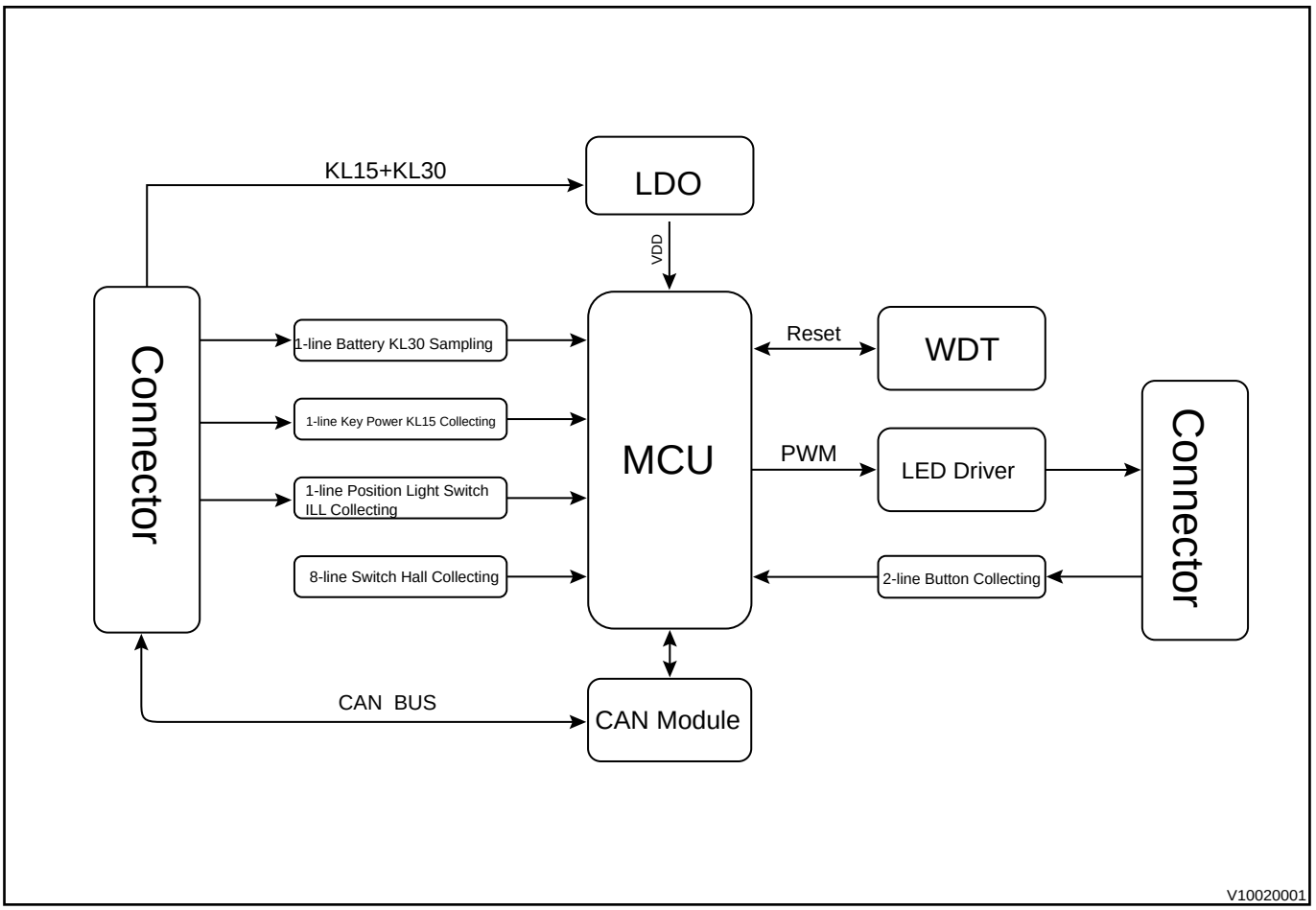
2.2 System component diagram



1	Shift Lever Assembly	2	Electronic Shift Module

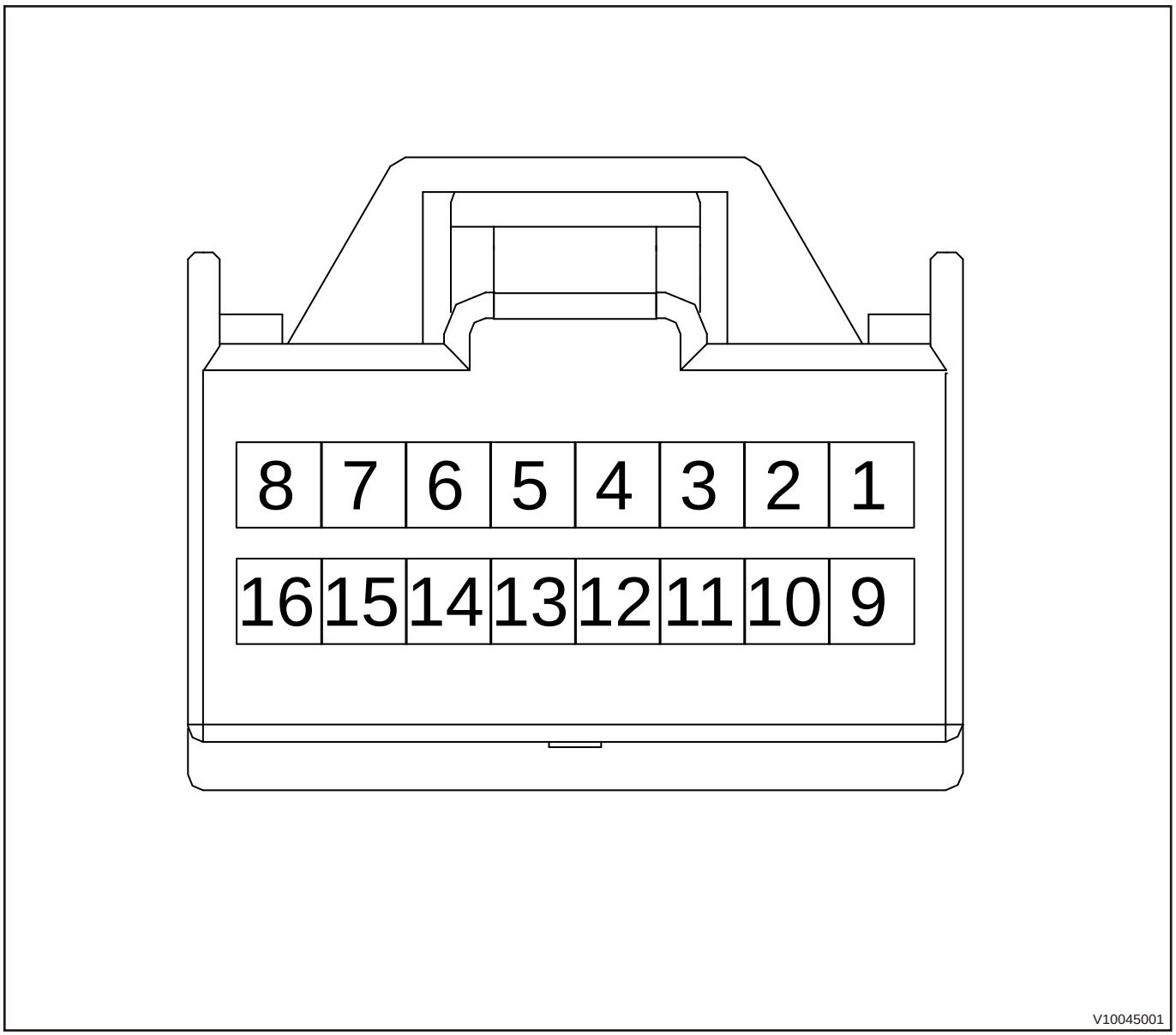
Electronic shift module collects vehicle speed and other signals through CAN network and transmits gear signal to TCU. TCU collects signals input from sensors and other devices to shift gear.

2.3 System schematic diagram



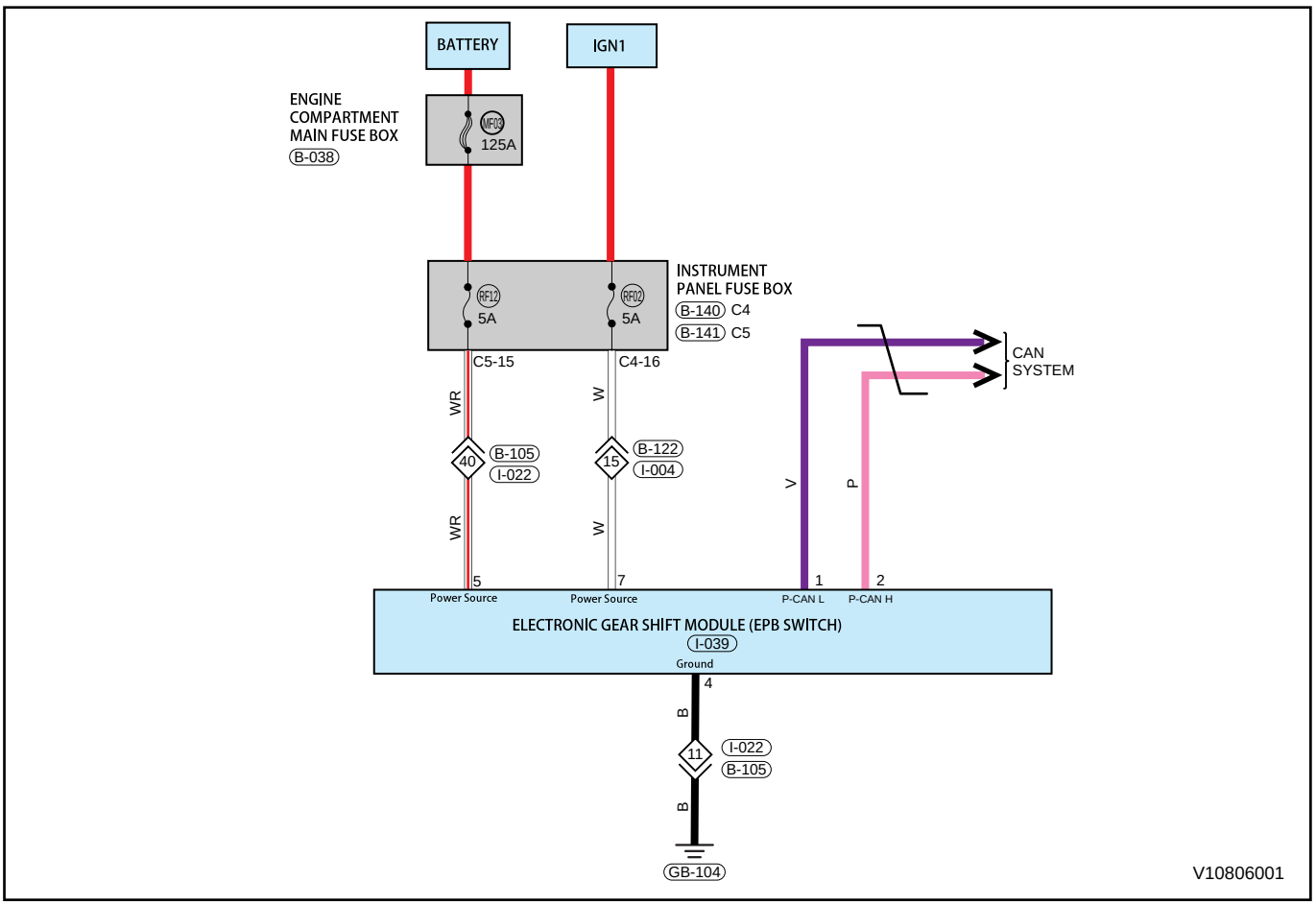
3 System Circuit Diagram

3.1 Electronic shift module (integrated EPB switch) connector terminal definition



Pin	Terminal Definition	Pin	Terminal Definition
1	CAN-L	9	-
2	CAN-H	10	SW6
3	-	11	AUTOHOLD switch operation indicator drives
4	Ground	12	AUTOHOLD switch signal outputs
5	Power supply	13	SW4
6	-	14	SW3
7	Ignition signal	15	EPB switch operation indicator drives
8	-	16	SW1

3.2 Circuit diagram



4 DTC Diagnosis

4.1 Diagnosis procedure

Hint:

- Use following procedures to troubleshoot the transmission system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Check if battery voltage is normal.
Standard condition
Standard voltage: Not less than 12V.

NG → **Replace battery**

OK

3	**Customer problem analysis**

Next

4	Read DTCs

NG → Perform repair according to problem symptoms table

OK

5	Read DTCs (current DTC and history DTC)

NG → Troubleshoot according to Intermittent DTC Fault Flow

OK

6	Repair according to Diagnostic Trouble Code (DTC) chart

Next

7	Adjust, repair or replace

Next

8	Conduct test and confirm malfunction has been repaired

Next → End

4.2 DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.3 Intermittent DTC troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate conditions under which DTC was set.

- Look for data that has changed or DTC to reset during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Check electronic shift system components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.4 Ground inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.5 Diagnostic trouble code (DTC) chart

Electronic Shift System

Hint:

- History trouble code cannot be reported, otherwise it will affect the use by customer.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C244016	Supply Voltage Too Low	The voltage is less than 9 V for 5 s, which is stored as current fault	• Battery • Wire harness or connector is damaged • Shift module failure	• Check for generating capacity of battery and alternator • Check if wire harness or connectors is damaged • Check shift module
C244017	Supply Voltage Too High	The voltage is less than 16V for 5 s, which is stored as current fault		
C244200	Push Forward Stuck	Shifter is pushed forward for more than 60 s	• Electronic shift module is damaged • Wire harness or connector is damaged • Switch stuck	• Check if electronic shift module is damaged • Check if circuit is connected normally • Check switch for stuck
C244300	Push Back Stuck	Shifter rear pushed back for more than 60 s		
C244400	M+ Stuck	Move M+ for more than 60 s		
C244500	M- Stuck	Move M- for more than 60 s		
C244649	Shift Lever Position Sensor Slight Failure	If one or more of the following conditions exist, the fault is		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		determined to be present: • Position sensor self-diagnostic failed • – SPI received error message, CRC error		
C244749	Shift Lever Position Sensor Serious Failure	There is an error in the data of two position sensors		
C244892	P Button Stuck	Press P gear button for more than 60 s		
C244946	Calibration Parameters Damaged	• Position sensor has not been calibrated after repair or replacement • Standard parameters are damaged		
C244A92	Shifter Connection Failure	• Defective or missing torque connector for 60 s		
U128F88	CAN Bus Off	1) After ignition on T diagstart (Tdiastart defined in network DTC strategy specification); 2) After system resets Tdiagstart; 3) After power supply voltage is normal from abnormal voltage Tdiagstart.	Network line connection is abnormal	Check the network connection
U012287	Lost Communication With ESP	1) After ignition on T diagstart (Tdiastart defined in network DTC strategy specification); 2) After system resets Tdiagstart; 3) After power supply voltage recovers from abnormal voltage Tdiagstart; 4) Tdiagstart after CAN bus off and fault disappears.	• Corresponding module node failure • CAN bus connection failure • Shift module failure	• Check if corresponding module node sends messages in correct cycle • Check CAN bus connection between shift module and each module for damage/problem • Check shift module
U010187	Lost Communication With TCU			
U024887	Lost Communication With PEPS			
U015587	Lost Communication With IPC			
U014087	Lost Communicate With BCM			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U042281	Invalid Data Received From BCM	1) Normal communication (-messages received from each module); 2) After ignition on T diagstart (Tdiastart defined in network DTC strategy specification); 3) After system resets Tdiagstart; 4) After power supply voltage recovers from abnormal voltage Tdiagstart; 5) Tdiagstart after CAN bus off and fault disappears.	• Each module to shift module wire harness node failure • Shift module failure	• Check if each module node is sending a message with correct valid • Check shift module
U041681	Invalid Data Received From ESP			
U042381	Invalid Data Received From IPC			
U040281	Invalid Data Received From TCU			

4.6 DTC trouble diagnosis

Description

DTC	DTC Definition
C244016	Supply Voltage Too Low
C244017	Supply Voltage Too High

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Check battery voltage

(a) Check if battery voltage is normal.

(b) Check battery voltage with voltage band of multimeter.

OK

Standard voltage: Not less than 12V.

NG → **Check and repair battery**

OK

2	Check fuse

(a) Check if fuses RF02 and RF12 are blown.

NG → **Replace fuse**

OK

3	Check supply circuit

(a) Turn ENGINE START STOP switch to OFF.

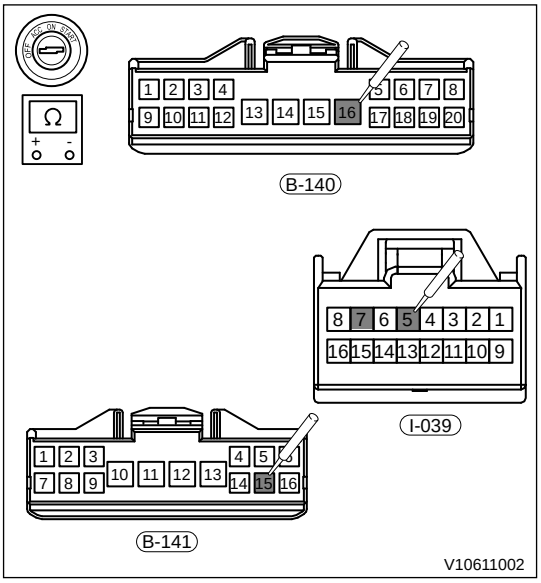
(b) Disconnect the negative battery cable.

(c) Disconnect the electronic shift module connector I-039.

(d) Using a digital multimeter, check for open circuit among connectors I-039, B-140 and B-141 according to table below.

OK

Multimeter Connection	Condition	Specified Condition
I-039 (5) - B-141 (15)	Always	⩽ 1 Ω
I-039 (7) - B-140 (16)		⩽ 1 Ω



NG → **Repair or replace related wire harness**

OK

4	Check ground

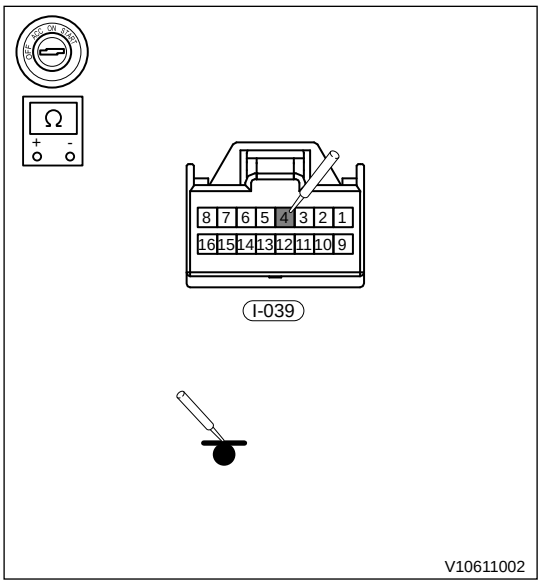
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the electronic shift module connector I-039.

(c) Check for continuity between I-039 (4) and body ground with ohm band of multimeter.

Standard Resistance

Multimeter Connection	Condition	Specified Condition
I-039 (4) - Body ground	ENGINE START STOP switch “OFF”	⩽ 1 Ω



NG → **Repair ground point**

OK

5	Reconfirm DTCs

(a) Connect all connectors.
(b) Connect the negative battery cable.
(c) Turn ENGINE START STOP switch to ON.
(d) Check if DTC exists.

OK	**Conduct test and confirm vehicle function system operates normally**
NG	**Replace shift module assembly**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C244200	Push Forward Stuck	ENGINE START STOP switch is in ON and engine is running	• Wire harness or connector damaged • Shift Lever Position Sensor Failure • Electronic shift module is damaged
C244300	Push Back Stuck		
C244400	M+ Stuck		
C244500	M- Stuck		
C244649	Shift Lever Position Sensor Slight Failure		
C244749	Shift Lever Position Sensor Serious Failure		
C244892	P Button Stuck		
C244946	Calibration Parameters Damaged		
C244A92	Shifter Connection Failure		

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

Diagnosis Procedure

1	**Check shift module connector**

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Disconnect the connector I-039.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.

NG	**Repair or replace related connector or wire harness**

OK

2	**Check ground circuit**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check the electronic shifter ground point GB-104.

NG → **Repair ground circuit**

OK

3	Check shift module

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Replace electronic shift knob with a new one and confirm if the fault still exists.

NG → **Replace shift module assembly**

OK

4	Reconfirm DTCs

(a) Connect all connectors.
(b) Connect the negative battery cable.
(c) Turn ENGINE START STOP switch to ON.
(d) Check if same DTCs or same problem symptoms are output.

OK → **Conduct test and confirm vehicle function system operates normally**

Description

DTC	DTC Definition	Possible Cause
U010187	Lost Communication With TCU	CAN network fault
U012287	Lost Communication With ESP	
U014087	Lost Communicate With BCM	
U015587	Lost Communication With IPC	
U024887	Lost Communication With PEPS	
U040281	Invalid Data Received From TCU	
U041681	Invalid Data Received From ESP	
U042281	Invalid Data Received From BCM	
U042381	Invalid Data Received From IPC	
U128F88	CAN Bus Off	

Refer to CAN Network Diagnosis

5 Diagnosis Procedure

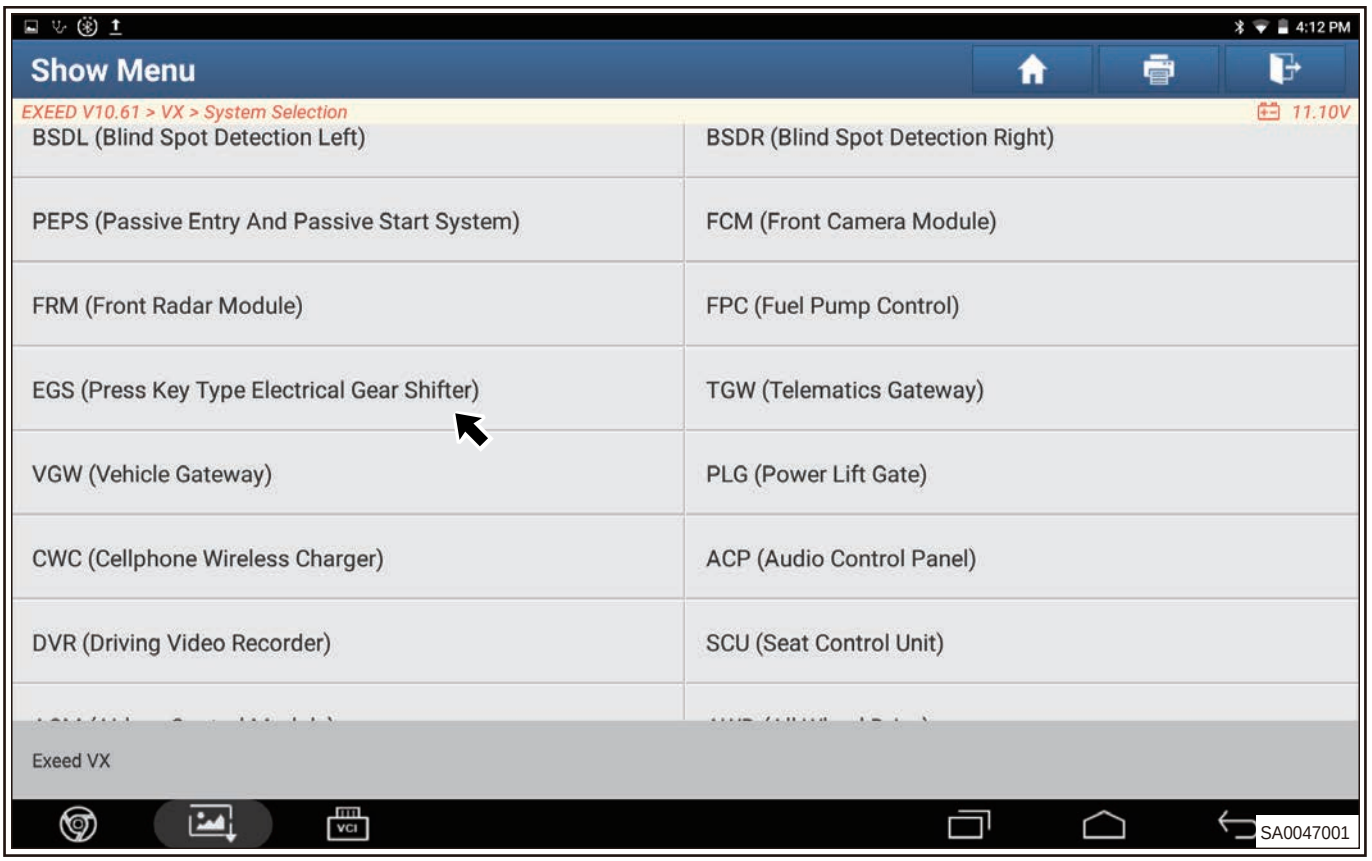
5.1 Diagnostic tester menu

(1) Read data stream.

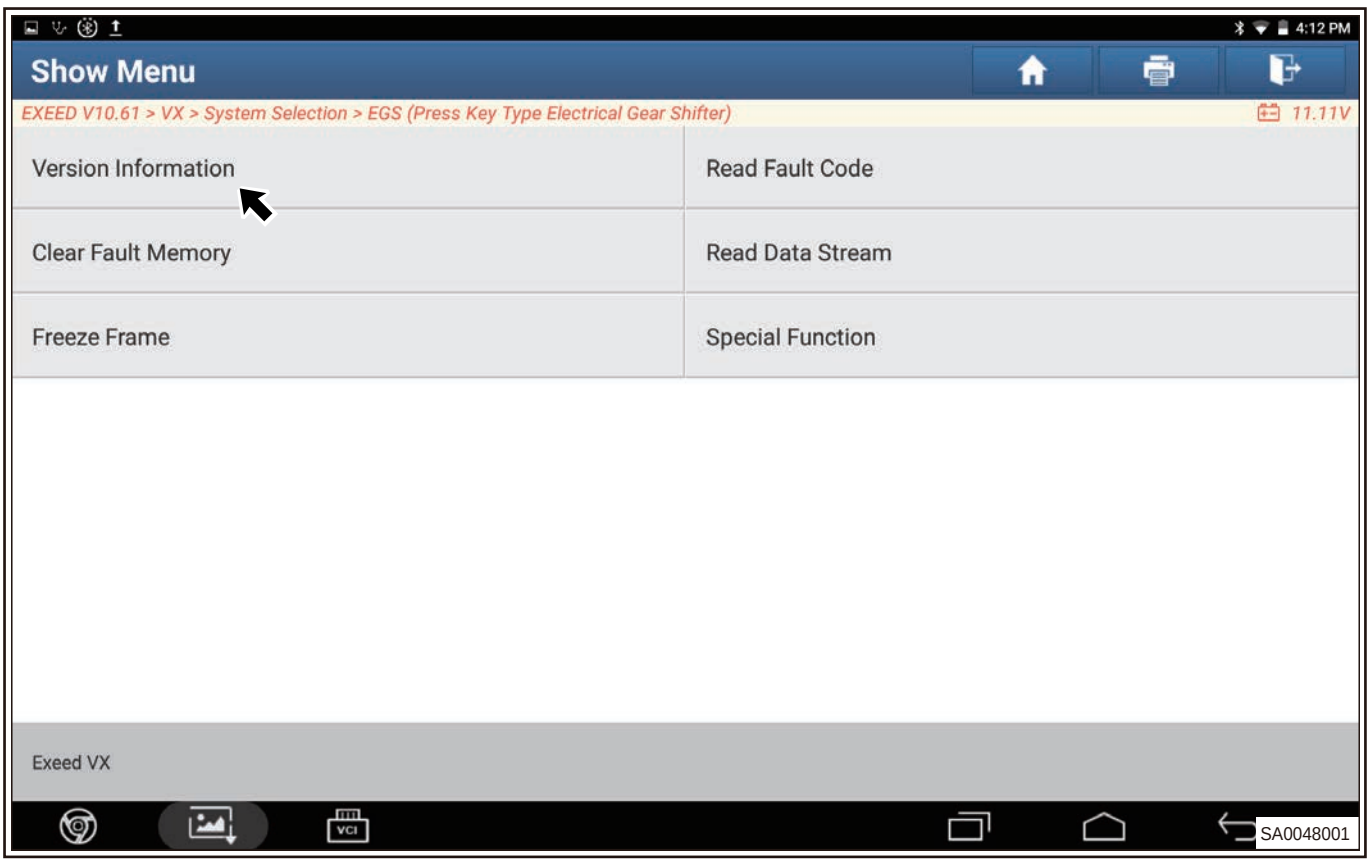
1) Connect the diagnostic tester. Turn ENGINE START STOP switch to ON.

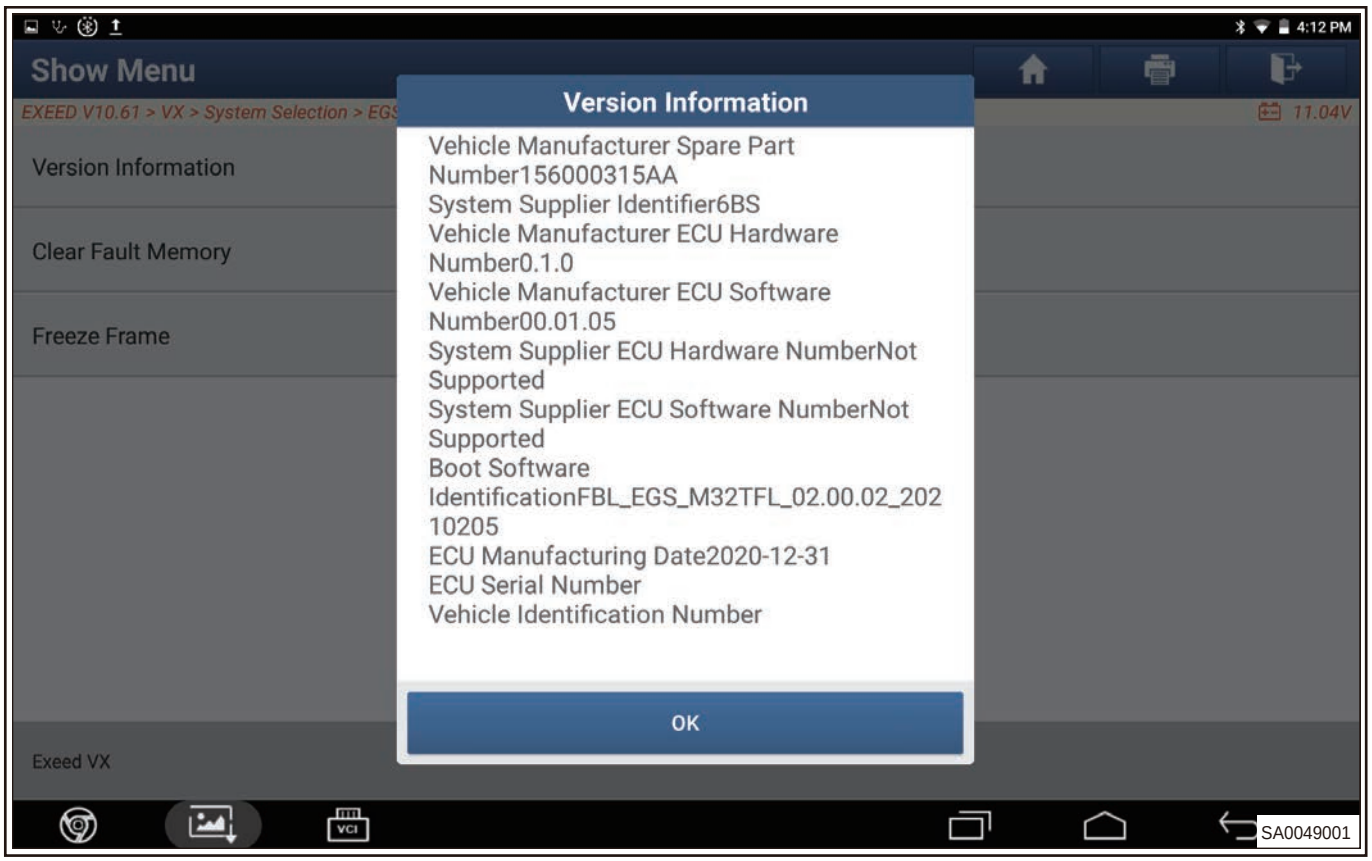
2) Select the model “VX”.

(2) Enter next screen, and click “EGS”.

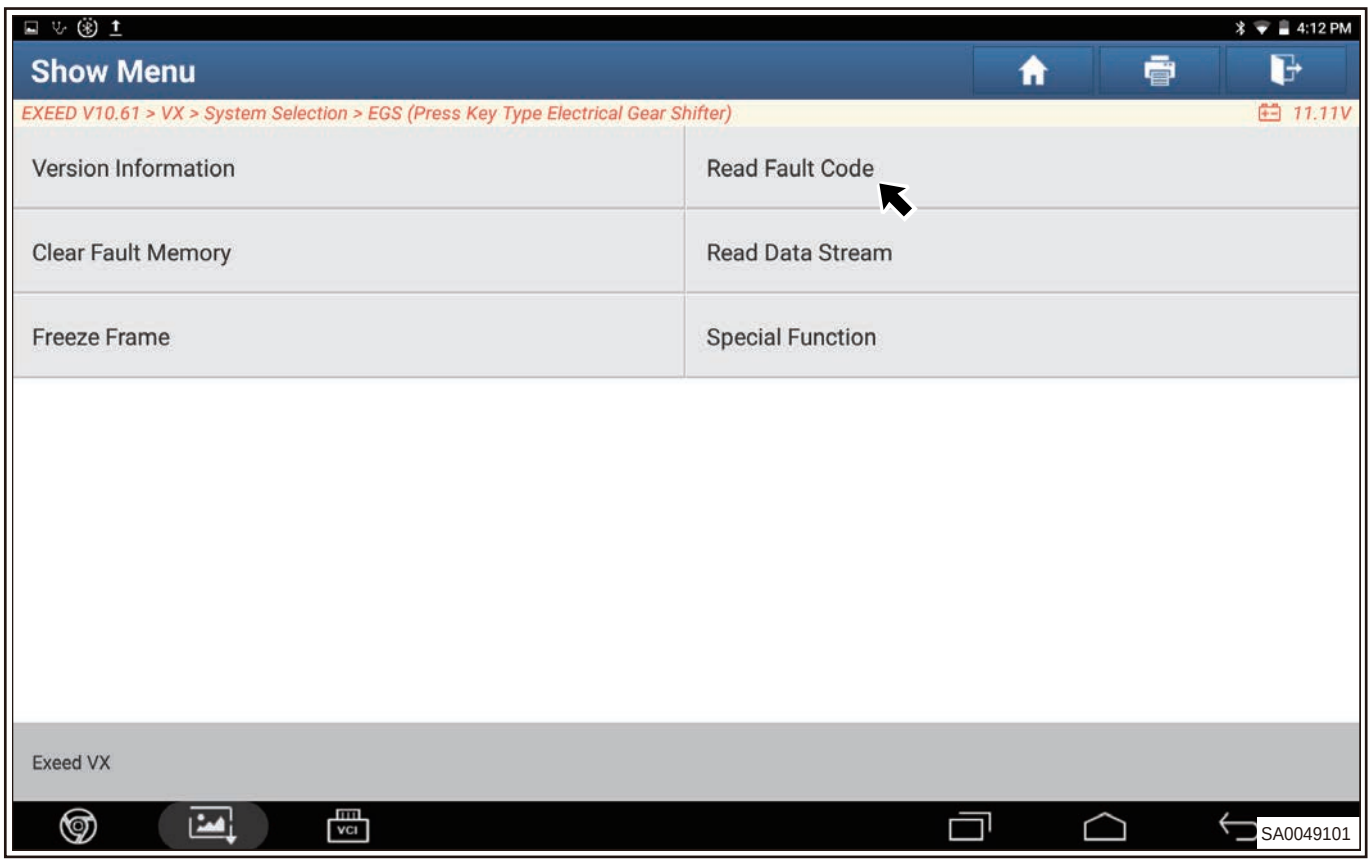


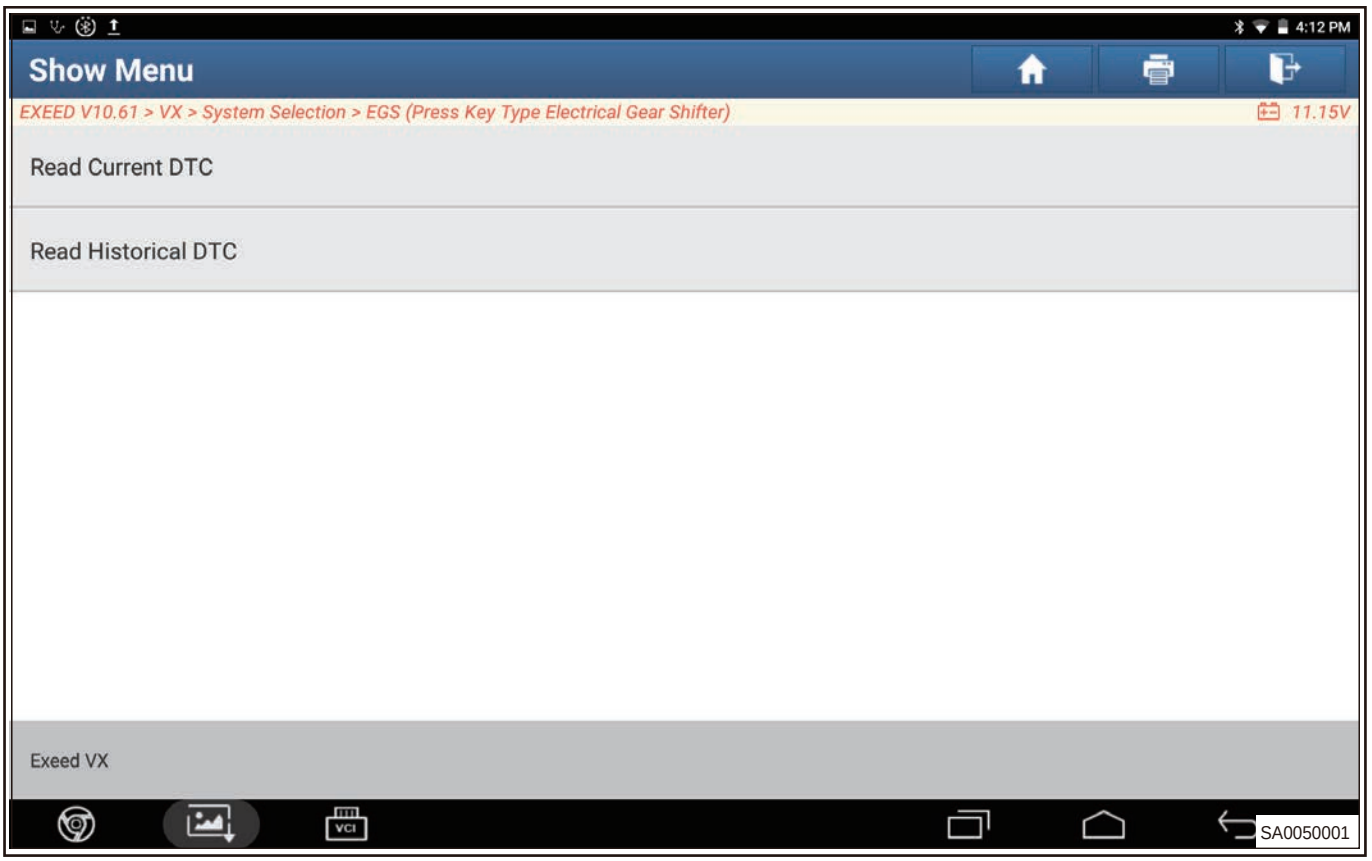
(3) Enter next screen and click “Version Information”.



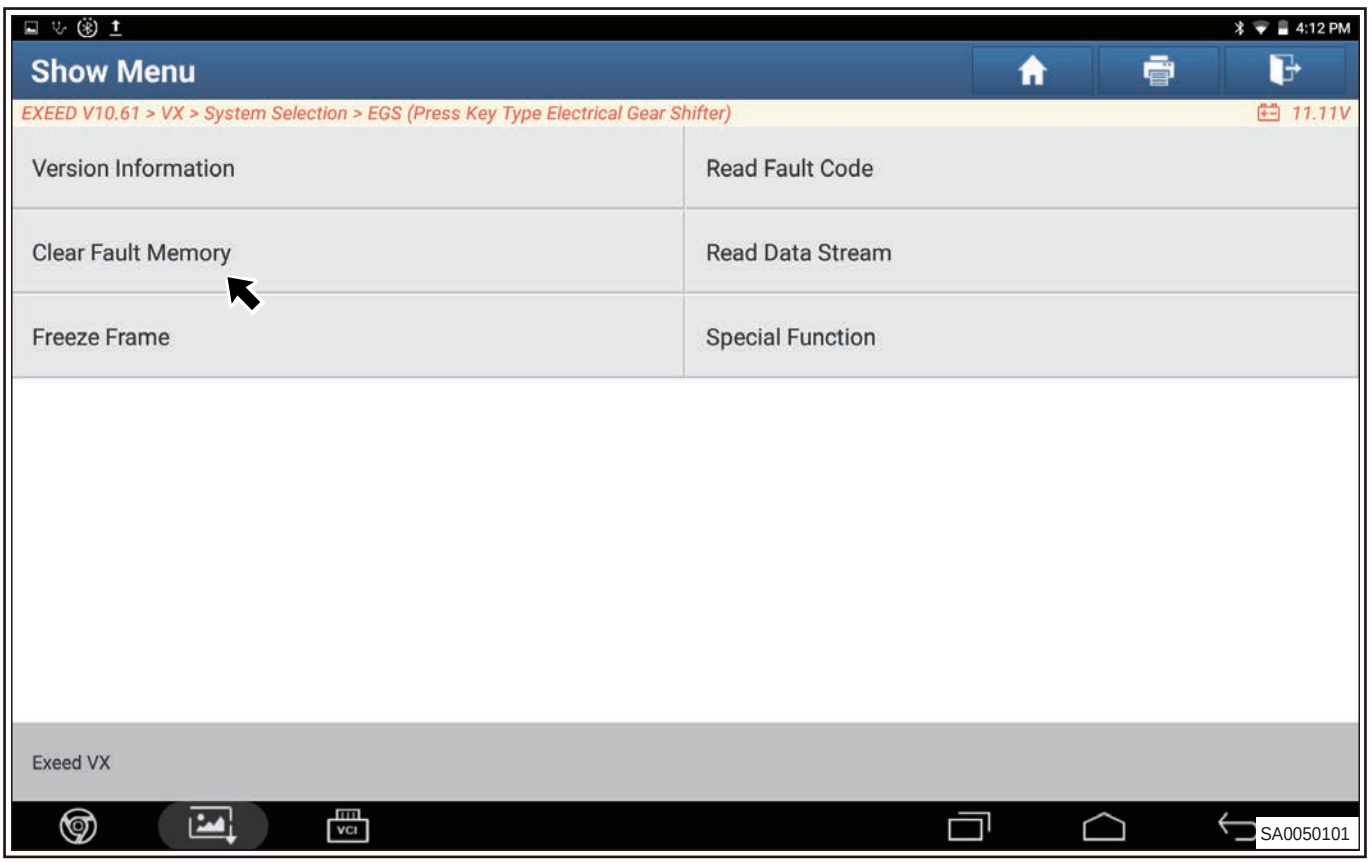


(4) Read DTC screen: Read the current and history DTCs.

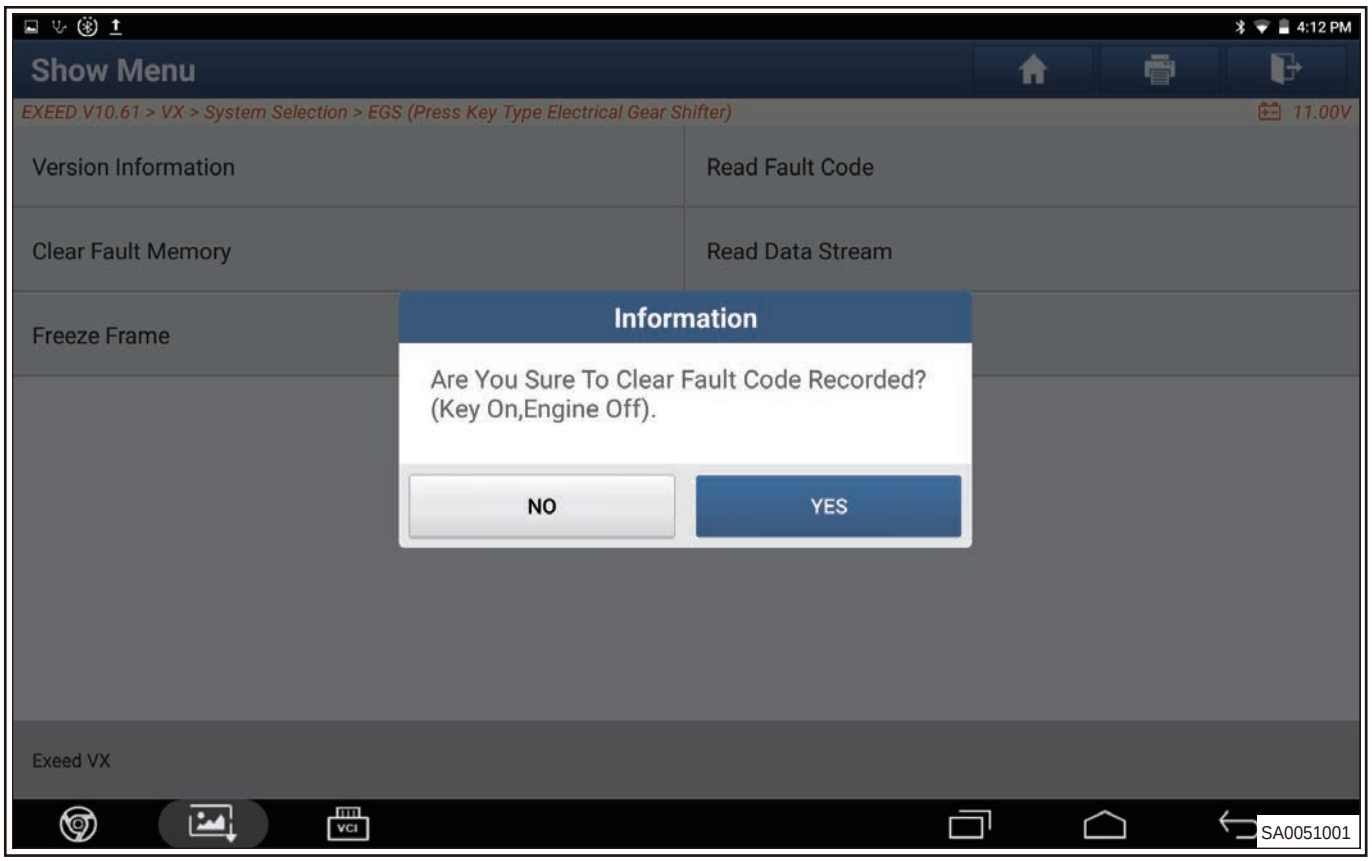


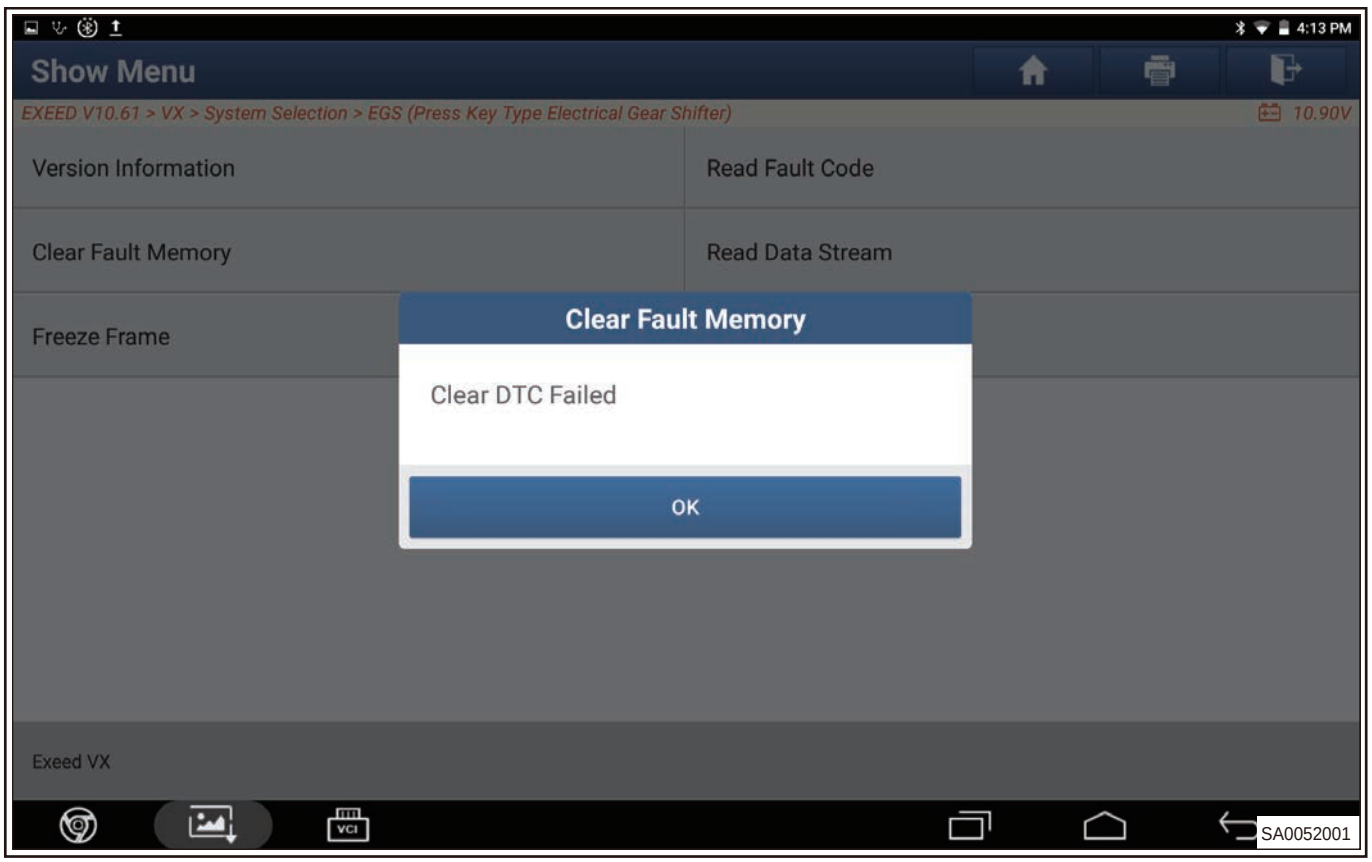


(5) Click Clear DTC screen.

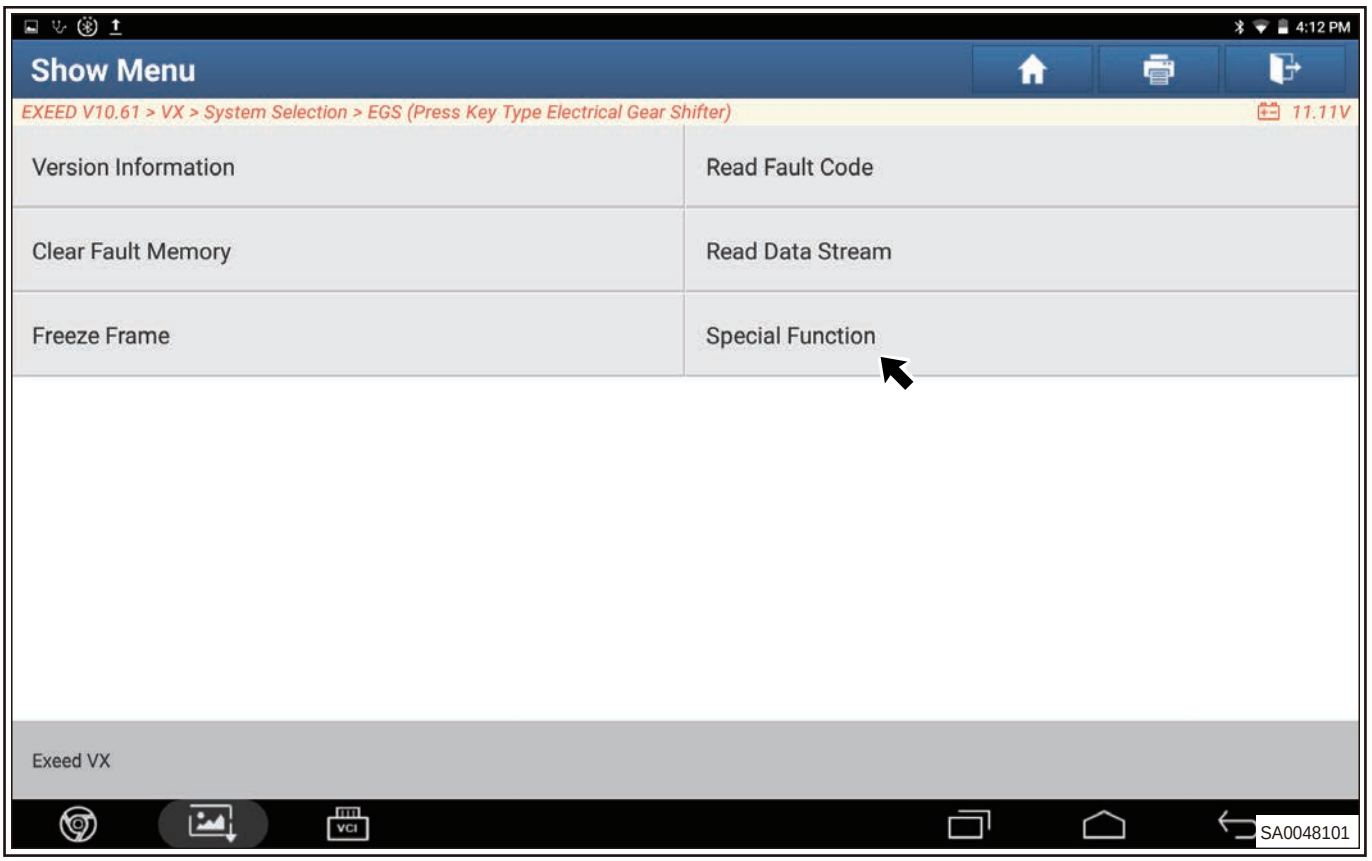


(6) Click "Yes" to display the conditions for clearing DTC, and click "Yes" to clear DTC.

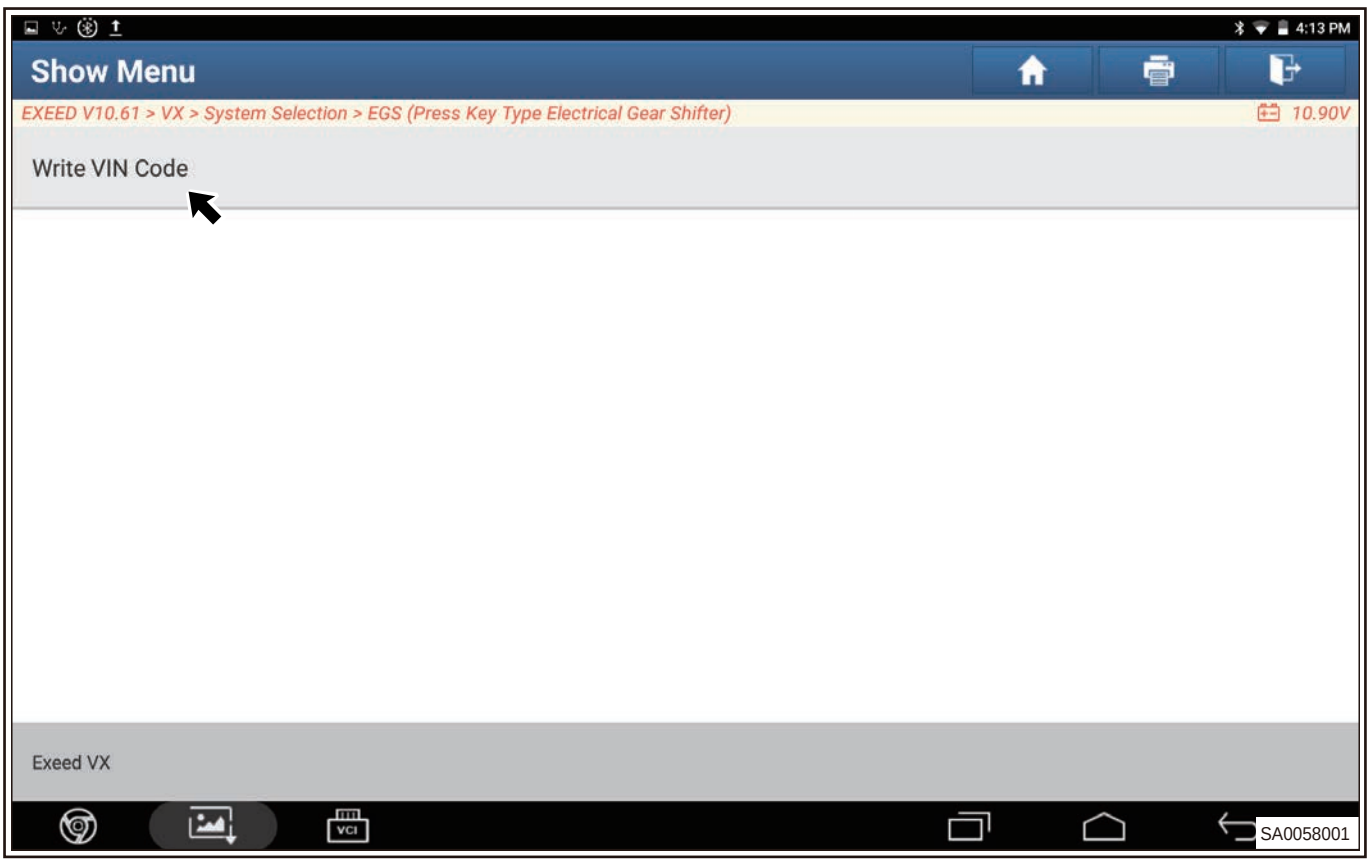




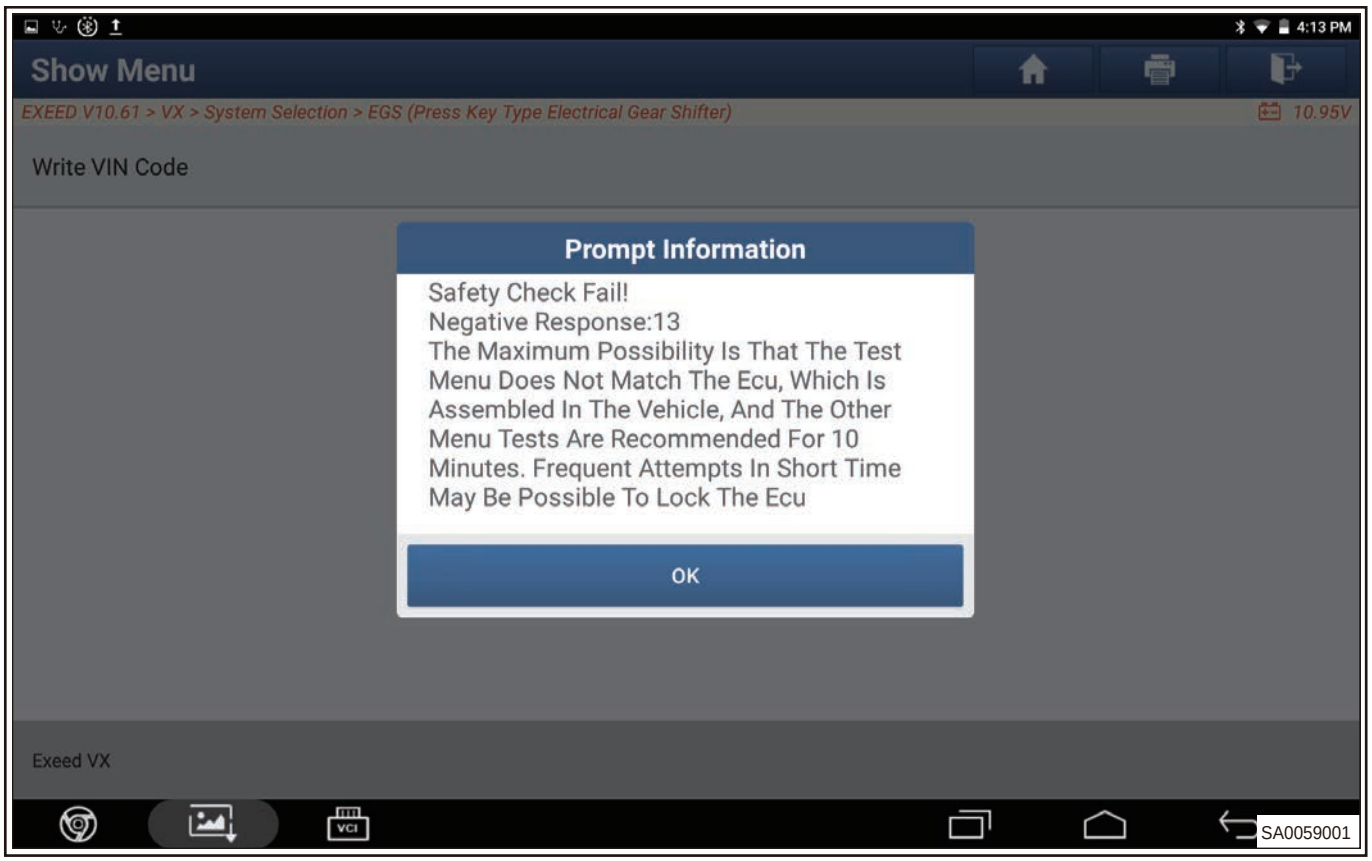
(7) As shown in illustration, click “Special Function” on diagnostic tester.



(8) Click Write VIN Code.



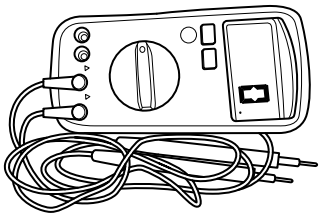
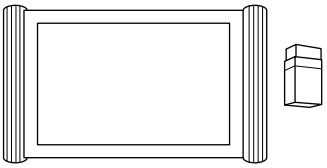
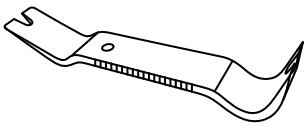
(9) Display prompt information, click “OK”.



(10) Input VIN code.

6 On-Vehicle Service

6.1 Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001
Interior Crow Plate	 S00020

6.2 Electronic shift lever

■ **Removal**

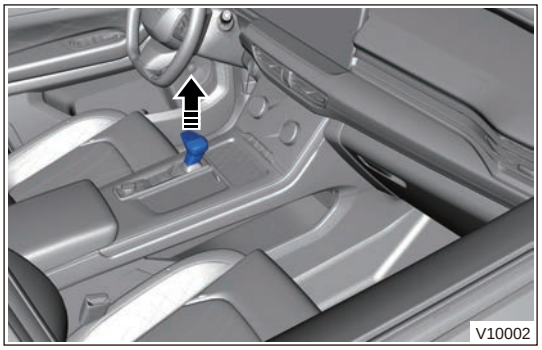
⚠ Warning

- **When removing shift lever assembly, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied, when removing shift lever assembly. Be careful not to operate roughly.**

(1) Disconnect the negative battery cable.

(2) Remove the shift lever assembly.

1) Remove shift lever assembly in direction of arrow.



■ **Installation**

(1) Insert shift lever assembly along the direction of shift lever of shift control mechanism, until shift lever reaches the lower limit (there will be a slight sound of a snap ring in place), and shift lever can not be pushed down.

(2) Connect the negative battery cable.

⚠ Warning

- **Slightly apply force to push the lever upward after assembly, confirm it is assembled in place.**
- **Do not hit the lever to avoiding damaging connector.**

6.3 Electronic shift module assembly

■ **Removal**

⚠ Warning

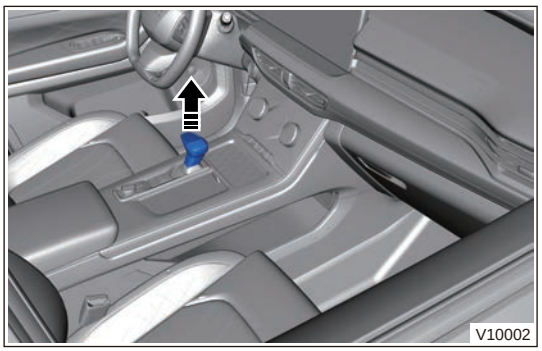
- **When removing electronic shift module assembly, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied when removing electronic shift module assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

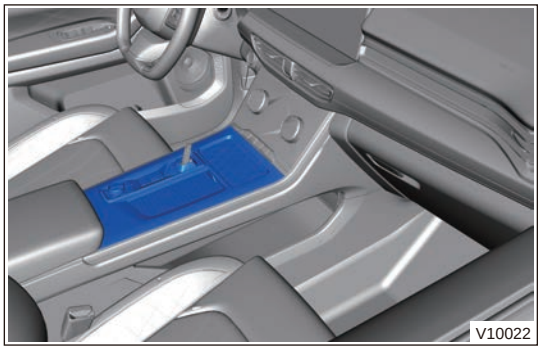
(2) Disconnect the negative battery cable.

(3) Remove the shift lever.

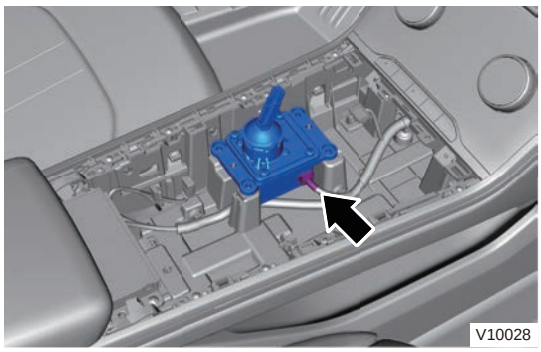
(4) Hold shift lever assembly with both hands and directly pull out shift lever (arrow).



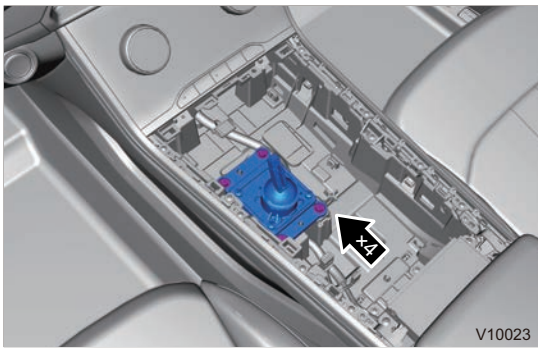
(5) Open armrest box cover and gradually tilt out auxiliary fascia console control panel assembly from rear of auxiliary fascia console control panel assembly.



(6) Disconnect the electronic shift module assembly wire harness connector (arrow).



(7) Remove 4 fixing bolts (arrow) from electronic shift module assembly, and remove electronic shift module assembly.



■ Installation

(1) Install electronic shift module assembly to a proper position.
(2) Install 4 fixing screws to electronic shift module.

Tightening torque: 5 ± 1 N•m

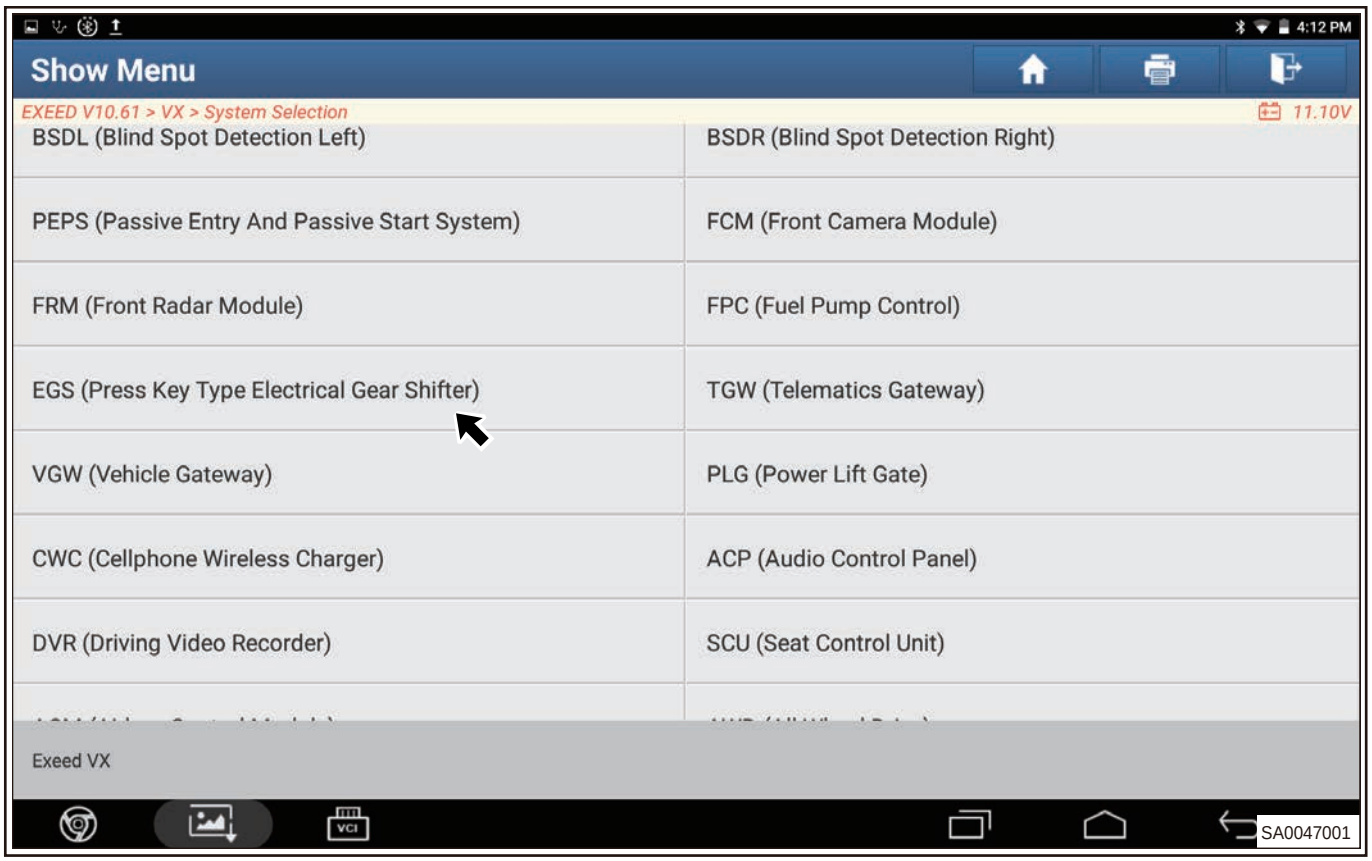
(3) Connect the electronic shift module assembly wire harness connector.
(4) Install the auxiliary fascia console control panel assembly.
(5) Install the shift lever assembly.
(6) Connect the negative battery cable.
(7) Connect diagnostic tester, read and clear DTCs.

■ Matching learning

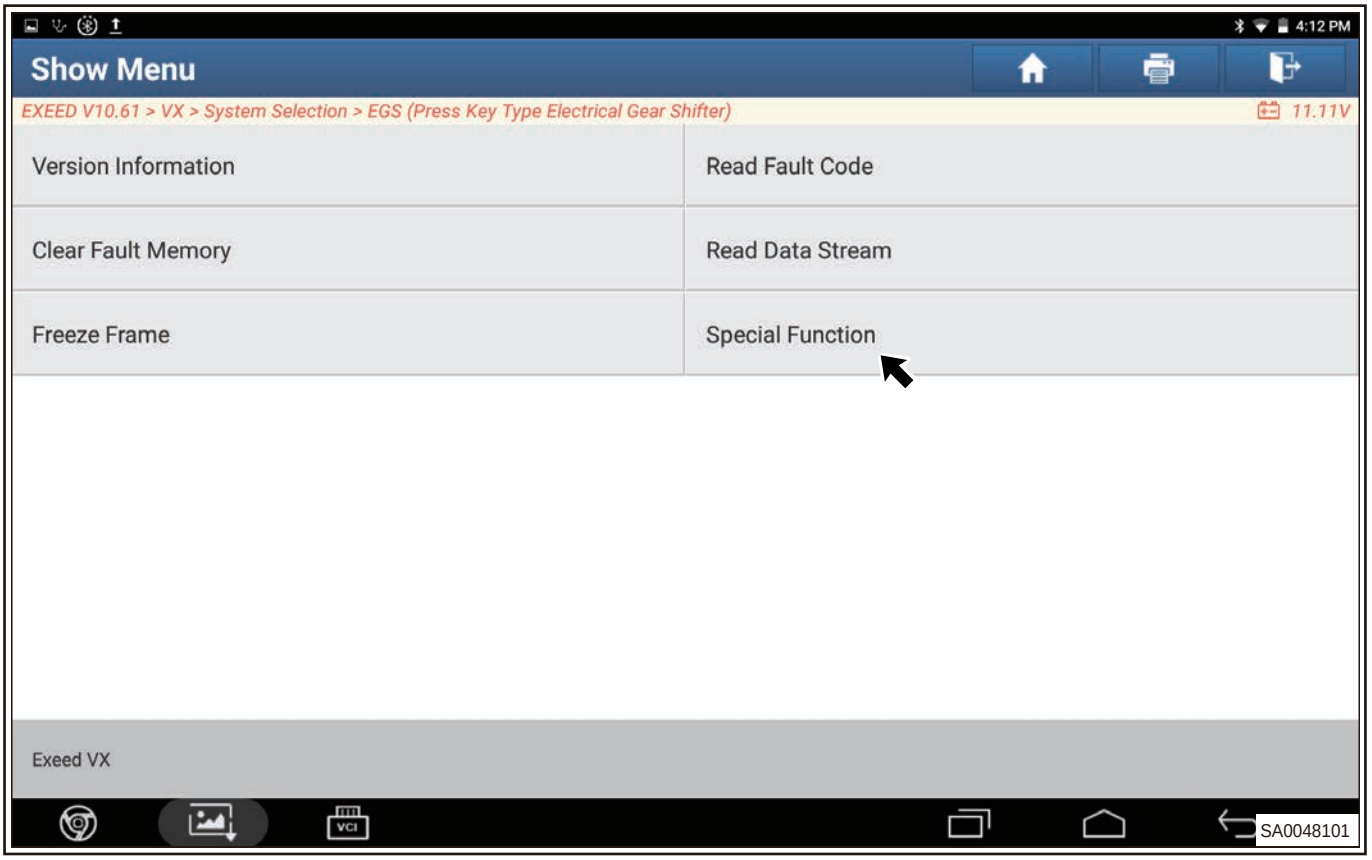
⚠ Caution

- **It is necessary to write module VIN code with a diagnostic tester when replacing a new EGS module.**

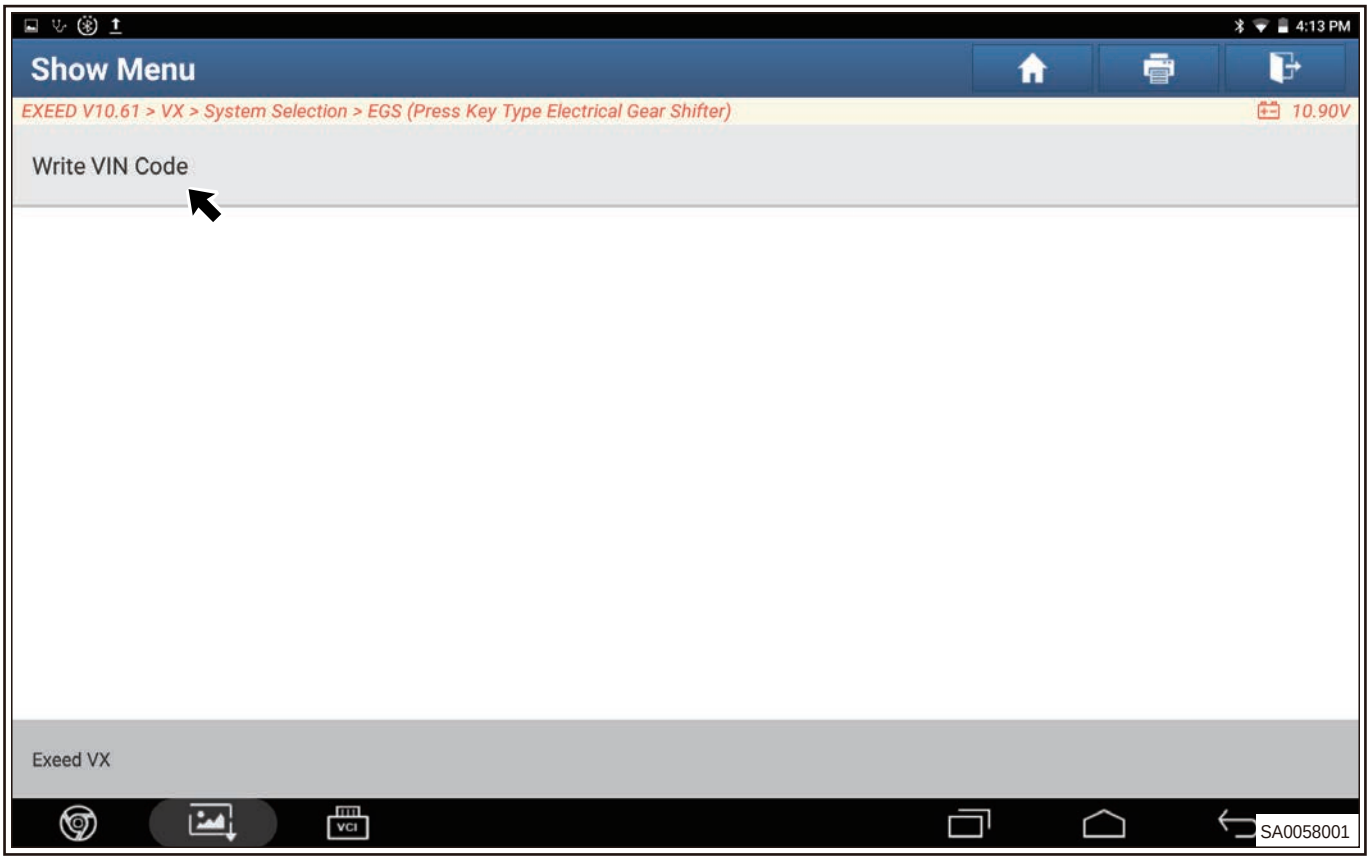
(1) Connect the diagnostic tester. Turn ENGINE START STOP switch to ON.
(2) Select the model "New TXL”.
(3) Enter next screen and click “System Selection”.
(4) Enter next screen, and click “EGS (Button-type Electronic Shift Module)”.



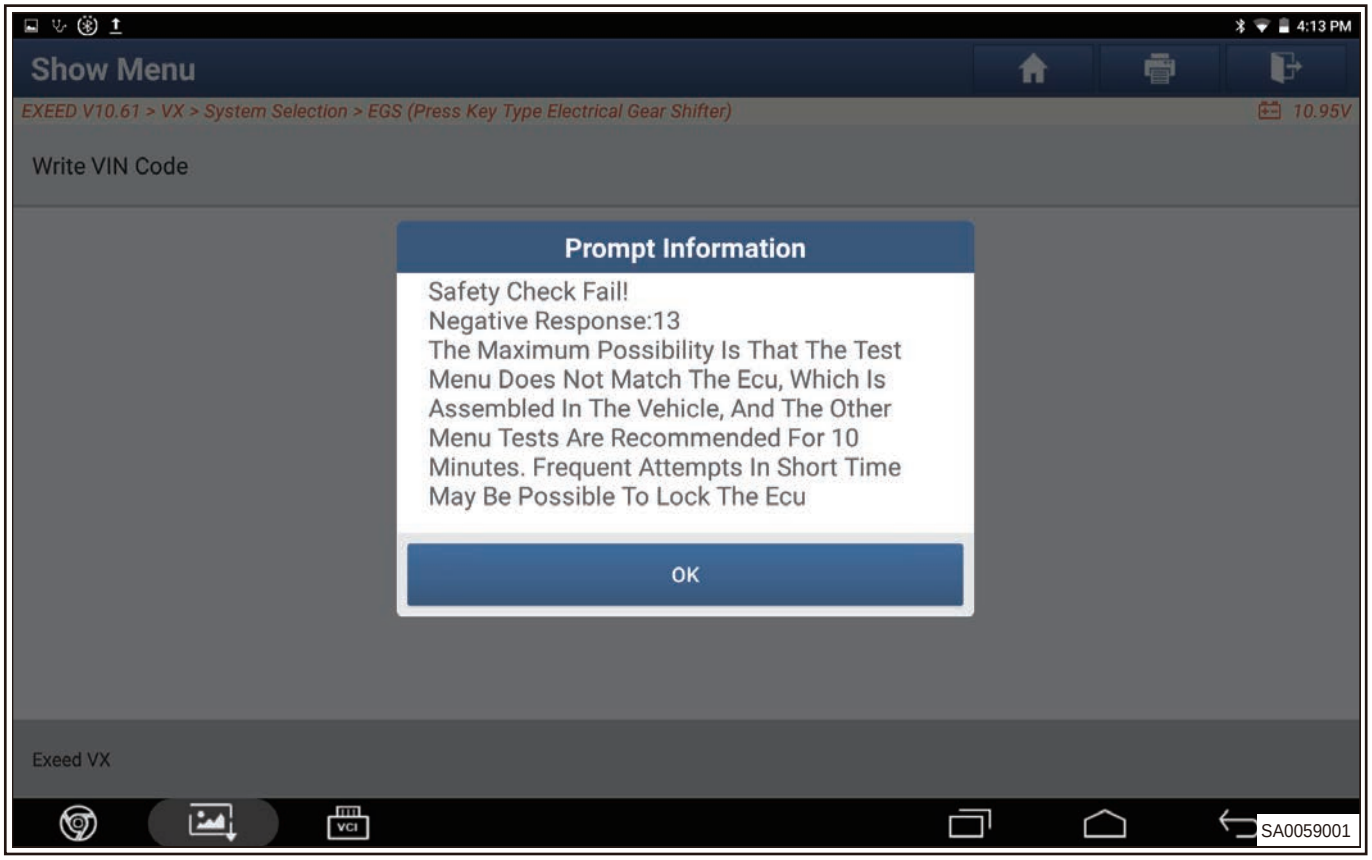
(5) Enter next screen and click “Special Function”.



(6) The screen displays “Write VIN Code”.



(7) The screen displays information and click “OK”.



(8) Input VIN code.

6.4 Shift paddle

■ **Removal**

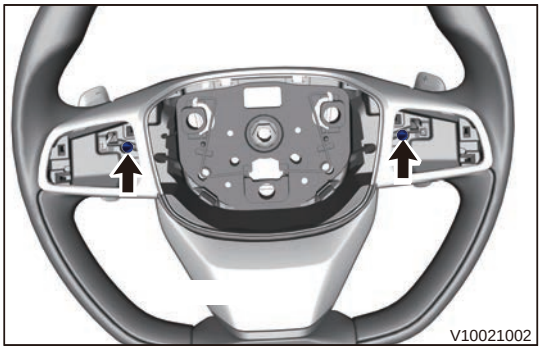
⚠ **Warning**
• **Be sure to read precautions for SRS airbag before removing steering wheel.**

(1) Set the steering wheel to straight-ahead position.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.

⚠ **Caution**
• **Wait at least 90 seconds after disconnecting the negative battery cable to prevent airbag and belt pretensioner from being activated.**

(4) Remove the driver airbag assembly.
(5) Remove the steering wheel assembly.
(6) Remove the multi-function switch assembly.
(7) Remove the shift paddle.

1) Remove 2 fixing screws from shift paddle and steering wheel.



2) Remove the shift paddle assembly.

■ **Inspection**

(1) Way to check shift paddle is as follow:

1) Using a multimeter, check value of resistance between connector PIN1 and PIN2. The value during pressing shift paddle is: 228 Ω ⩽ R ⩽ 252 Ω. During releasing: R ⩾ 10 MΩ

■ **Installation**

(1) Install the shift paddle assembly.

(2) Install 2 fixing screws between shift paddle and steering wheel.

Tightening torque: 0.8 ± 0.2 N·m

(3) Install the multi-function switch assembly.

(4) Install the steering wheel assembly.

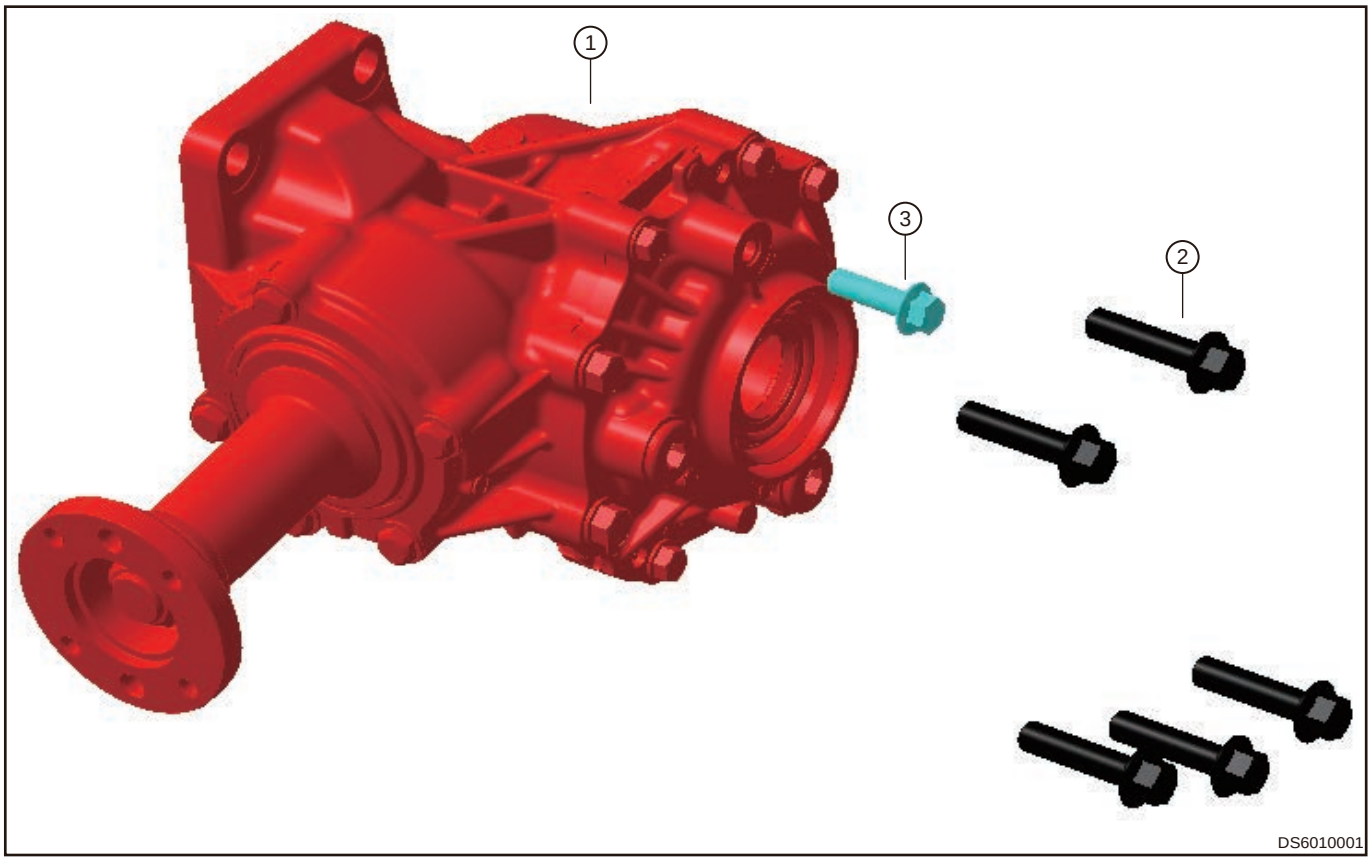
(5) Install the driver airbag assembly.

(6) Install the negative battery cable.

5.4 TRANSFER CASE

1 Overview

1.1 Description



1 - Transfer Case Assembly	2 - Hexagon Flange Bolt
3 - Hexagon Flange Bolt	

Transfer case is a device that distributes engine power, which can output power to rear axle.

2 Specifications

2.1 Torque specifications

Description	Torque (N·m)
Fixing Bolt Between Transfer Case and Transmission	120 ± 10
Baffle Plate Fixing Bolt	3.7 - 5

3 Transfer Case Assembly

3.1 Removal

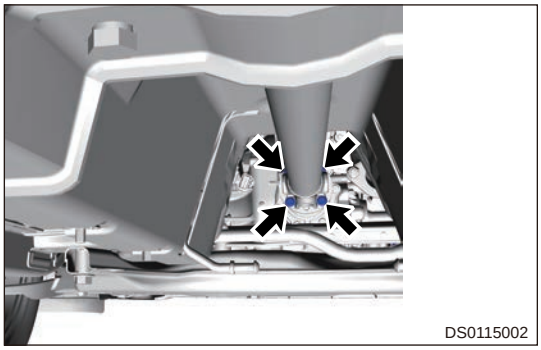
(1) Remove the front right wheel.

(2) Remove the front right drive shaft assembly (4WD).

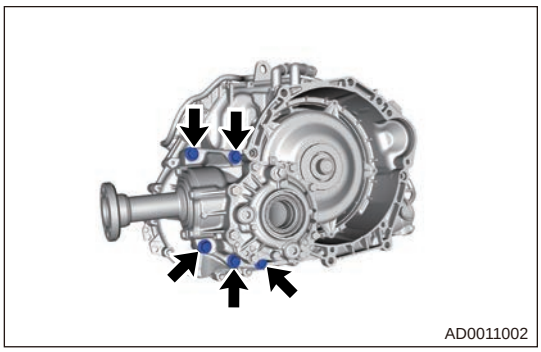
(3) Remove the precatalytic converter assembly.

(4) Remove the transfer case assembly.Remove 4 fixing bolts (arrow) between propeller shaft and PTU output flange.

Tightening torque: 79 ± 8 N·m


DS0115002

(5) Remove fixing bolt between front left lower control arm and steering knuckle, and remove 5 fixing bolts (arrow) between transfer case and transmission.Tightening torque: 120 ± 10 N·m


AD0011002

(6) Remove the transfer assembly.

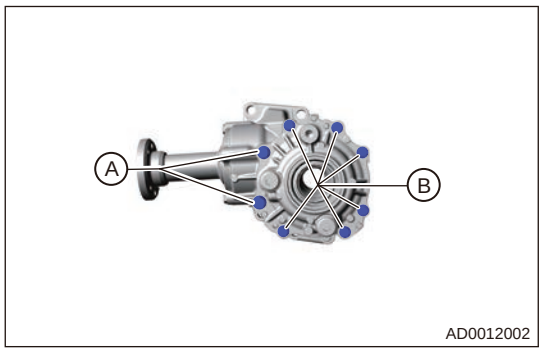
⚠ Warning

After any bumps, pay attention to whether O-ring is intact and whether the oil seal is intact to avoid touching the lip of oil seal. Please handle the transfer case with care during whole operation, and do not move the transfer case upside down.

3.2 Disassembly

(1) Remove the output shaft oil seal. a. Remove 8 fixing bolts (A and B) from transfer case cover. Tightening torque: A: 45.5 - 50.5 N·m

B: 28 - 31.5 N·m



AD0012002

(2) Slightly tap the edge of cover with a rubber hammer, and remove cover.

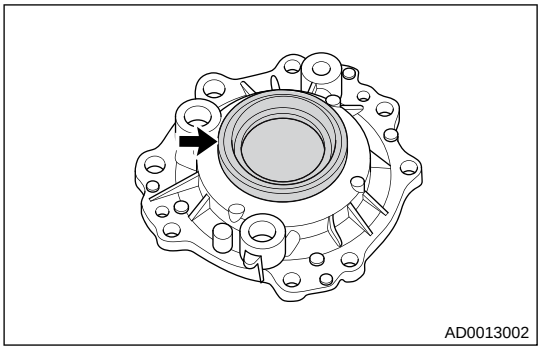
(3) Remove O-ring from cover.

⚠ Warning

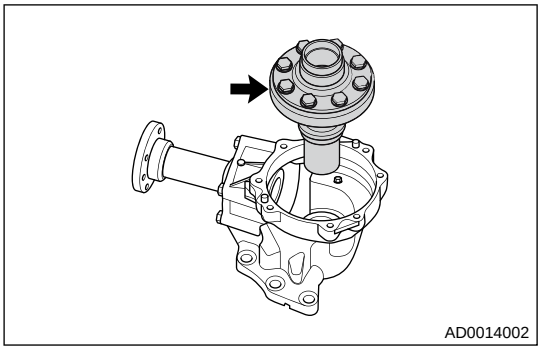
Do not use tools or damage cover.

(4) Slightly tap the metal part of oil seal from inside to remove oil seal.

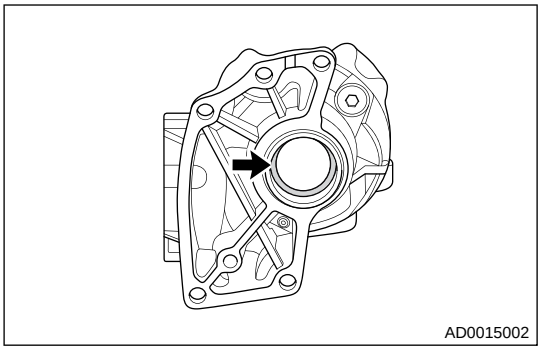
⚠ Warning
Do not take it out with a tool during removal.


AD0013002

(5) Remove the main shaft.

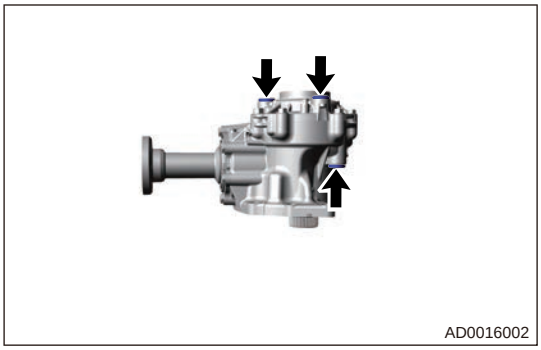

AD0014002

(6) Slightly tap the oil seal, and then remove it.

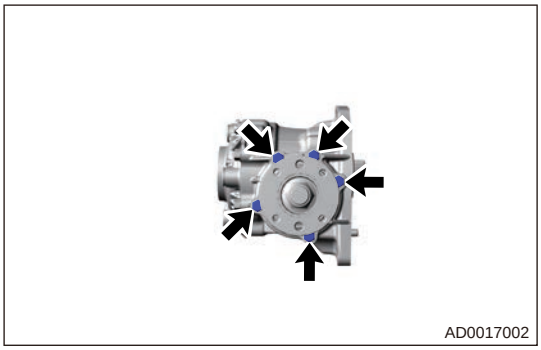

AD0015002

(7) Remove the oil plugs (arrow).

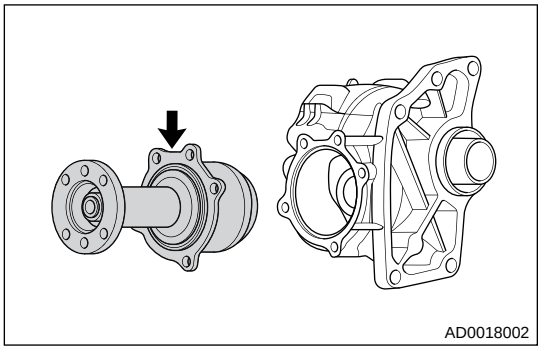
⚠ Warning
The used gasket cannot be reused.


AD0016002

(8) Remove the O-ring, and remove 5 fixing bolts (arrow) from main gear assembly.


AD0017002

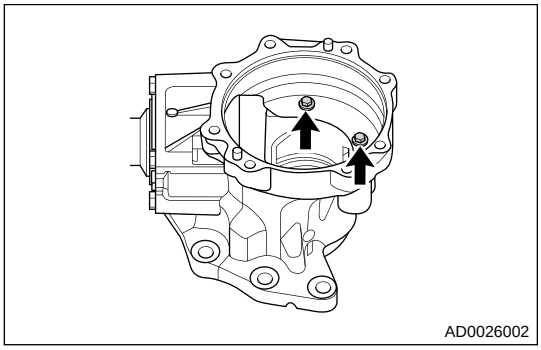
(9) Remove the main gear assembly (arrow).



(10) Remove the O-ring.

(11) Remove the main shaft assembly.

(12) Remove 2 fixing bolts (arrow) from baffle plate.
Tightening torque: 3.7 - 5 N·m

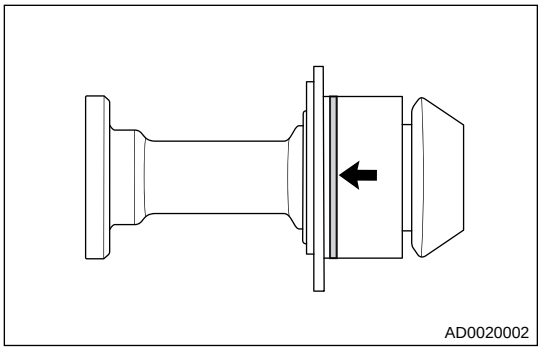


(13) Remove the baffle plate.

3.3 Reassembly

(1) Install the baffle plate, the installation is in the reverse order of removal.

(2) Replace O-ring, and apply vaseline oil to O-ring and outer diameter of bearing.



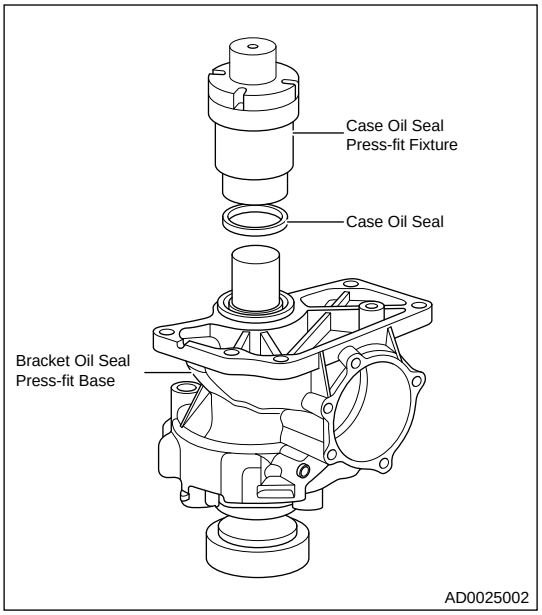
(3) Install main gear, and tighten 5 fixing bolts (arrow) with specified torque.
Tightening torque: 45 - 50 N·m

(4) Install the oil plug, loosen 2 to 3 teeth of pre-locking oil hole, tighten oil plug to torque range of 30 - 39 N·m with a torque wrench and paint the oil plug, indicating that torque is within specified range.

(5) Install the output shaft oil seal, put main shaft into case, turn the flange slightly, confirm that main shaft assembly is placed in place, replace O-ring with a new one and install O-ring.

⚠ Warning
After installing O-ring, apply vaseline oil.

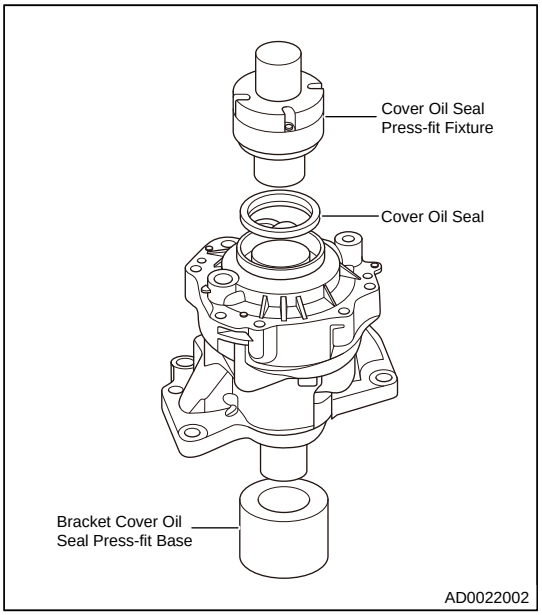
(6) Install transfer case cover, and tighten 8 fixing bolts to specified torque.



(7) Install oil seal with oil seal press-fit fixture.

⚠ Warning

Apply vaseline oil to cover before assembly, 100% visually check if oil seal lip is turned over after tapping. Otherwise, the oil seal must be removed and installed again.



3.4 Installation

Installation is in the reverse order of removal.

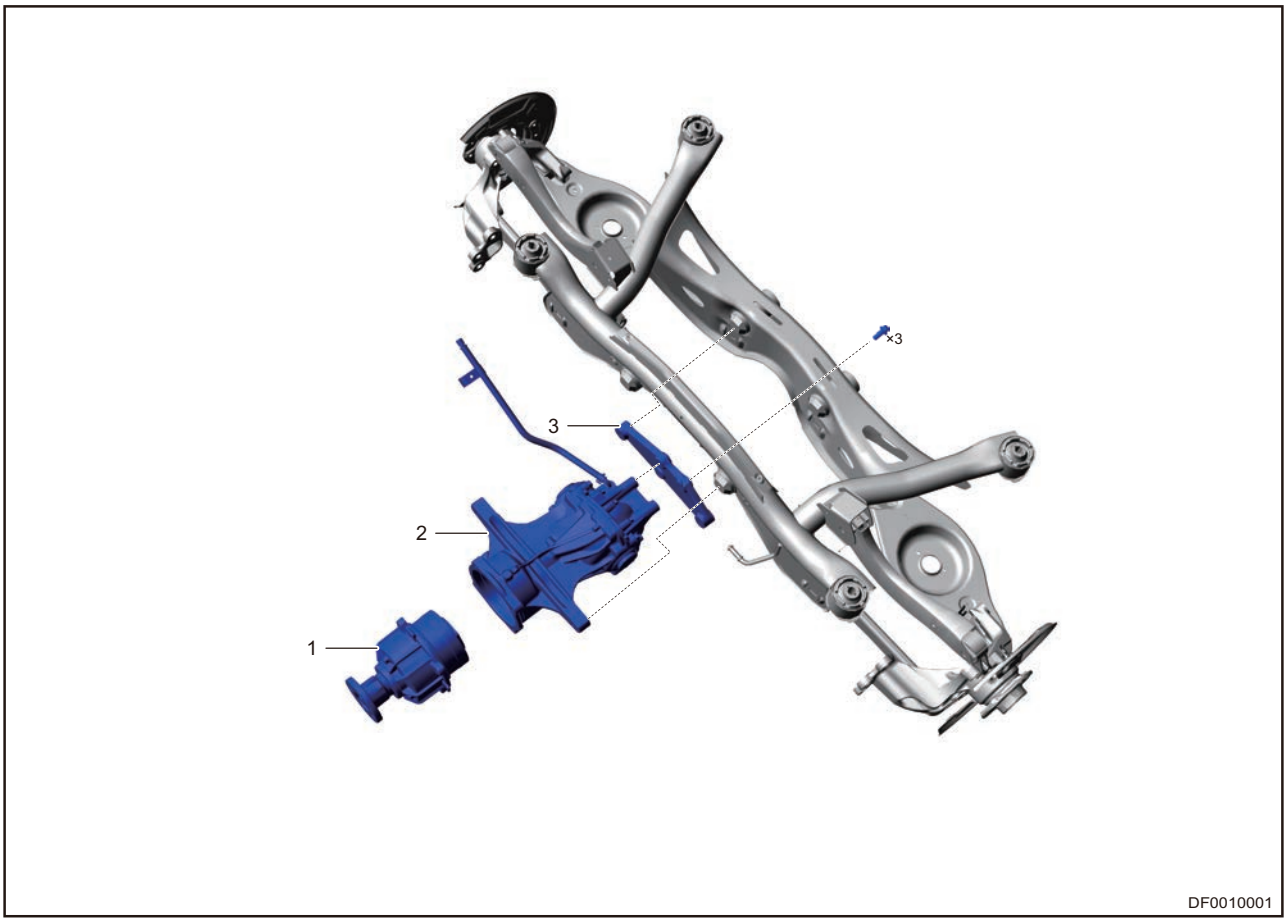
⚠ Warning

- **Install transfer case spline to differential by turning it left and right, and align the transfer case dowel pin with positioning hole of differential case simultaneously.**
- **When installing 5 tightening bolts between transfer case and transmission, follow the order of up, down, left and right and tighten diagonally.**

5.5 REAR FINAL DRIVE

1 Description

1.1 Rear final drive assembly



1	Torque Manager	2	Rear Final Drive
3	Rear Final Drive Bracket		

2 Rear drive operating principle

Dana Spicer M150 single speed rear axle is an integral rear final drive, which adopts a hypoid gear design. The center axis of drive gear is located below the center axis of driven gear. Drive gear and driven gear consist of a ring gear with a diameter of 150 mm and a driven gear matched with it. Drive gear is positioned between driven gear and internal drive gear conical bearing with selectable gaskets, and supported by two conical rolling shafts. Drive gear bearing is adjusted by drive gear nut and gasket during pre-installation. The whole rear axle housing is composed of bracket and rear cover. The connecting part of rear cover is sealed with RTV sealant. Differential case is an integral unit with two openings for the assembly of internal components and flow of lubricant. The differential shaft is fixed by fixing pin. Differential assembly is placed in the bracket housing. Differential adjusts the clearance through adjusting shim between outer rolling bearing cup and bracket, and is fixed by movable bearing cap and bracket. The rear axle drive gear obtains power from engine through transmission and propeller shaft. Drive gear rotates the differential by engaging with driven gear, which is fixed on outer edge of differential case with bolts. Differential side gear is connected to drive shaft of vehicle. Drive shaft is connected to tires. During steering, differential gear system applies torque separately to drive shafts, so that they rotate at different speeds. In differential case, two drive gears are placed on differential shaft fixed to case. These drive gears engage with differential side gear. When differential case rotates, drive shaft and wheels also rotate. When one wheel and axle shaft need to be rotated faster than the other one (such as when steering), the differential gear on the faster side will make

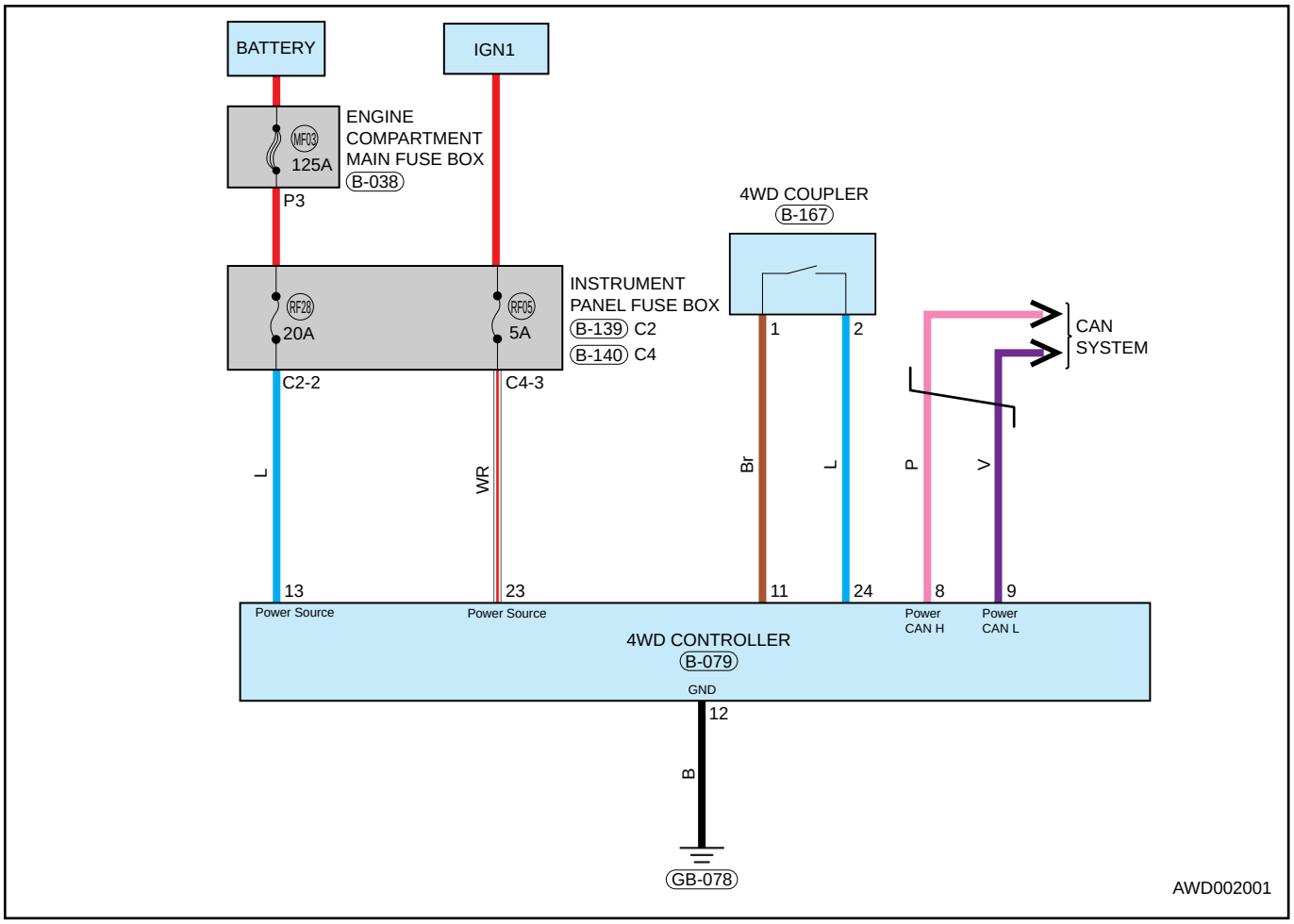
drive gear to rotate on differential side gear with low speed, so that the axle shafts on both sides to rotate at different speeds. When driving straight ahead, the differential drive gear will not rotate on the drive gear matching shaft. This is because the torque input by drive gear acts equally on both side gears, and drive gear rotates together with drive gear matching shaft, rather than rotating around it.

3 Specification

3.1 Torque specifications

Description	Torque (N•m)
Torque Manager Control Unit Fixing Bolt	8 ± 1
Rear Final Drive Bracket Fixing Bolt	110 - 130
Rear Final Drive Filler Plug/Drain Plug	24 - 34

4 AWD Control System Circuit Diagram



5 DTC Diagnosis

5.1 Diagnostic trouble code (DTC) chart

DTC	DTC Definition
P172813	Electromagnetic Coupling Coil Open Circuit
P172912	Electromagnetic Coupling Coil Circuit Short to Power Supply

DTC	DTC Definition
P173011	Electromagnetic Coupling Coil Circuit Short to Ground
P177198	Electromagnetic Coupler Overheating
P177398	Electromagnetic Coupler Close to Overheating
P30031C	System Voltage Out of Range
U000188	Bus Off
U010000	CAN Communication Error - Lost Communication with EMS
U010100	CAN Communication Error - Lost Communication with TCU
U012200	CAN Communication Error - Lost Communication with ESC
U012800	CAN Communication Error - Lost Communication with EPB
U015100	CAN Communication Error - Lost Communication with ACM
U015500	CAN Communication Error - Lost Communication with IPC
U021200	CAN Communication Error - Lost Communication with SCM
U024800	CAN Communication Error - Lost Communication with PEPS
U040181	CAN Communication Error - Invalid Data Length Received from EMS
U040186	CAN Communication Error - Invalid Data Received from EMS
U040281	CAN Communication Error - Invalid Data Length Received from TCU
U040286	CAN Communication Error - Invalid Data Received from TCU
U041681	CAN Communication Error - Invalid Data Length Received from ESC
U041686	CAN Communication Error - Invalid Data Received from ESC
U041781	CAN Communication Error - Invalid Data Length Received from EPB
U041786	CAN Communication Error - Invalid Data Received from EPB
U042381	CAN Communication Error - Invalid Data Length Received from IPC
U042386	CAN Communication Error - Invalid Data Received from IPC
U042681	CAN Communication Error - Invalid Data Length Received from PEPS
U042686	CAN Communication Error - Invalid Data Received from PEPS
U042981	CAN Communication Error - Invalid Data Length Received from SCM
U042986	CAN Communication Error - Invalid Data Received from SCM
U045281	CAN Communication Error - Invalid Data Length Received from ACM
U045286	CAN Communication Error - Invalid Data Received from SACM

DTC	P30031C	System Voltage Out of Range

5.2 DTC diagnosis procedure

DTC	P30031C	System Voltage Out of Range

Description

DTC	DTC Definition	Possible Cause
P30031C	System Voltage Out of Range	• Wire harness or connector failure • 4WD coupler module failure

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	**Check fuse**

(a) Check if the fuses RF28 20A, RF05 5A in instrument panel fuse box are blown.

NG → **Replace fuse**

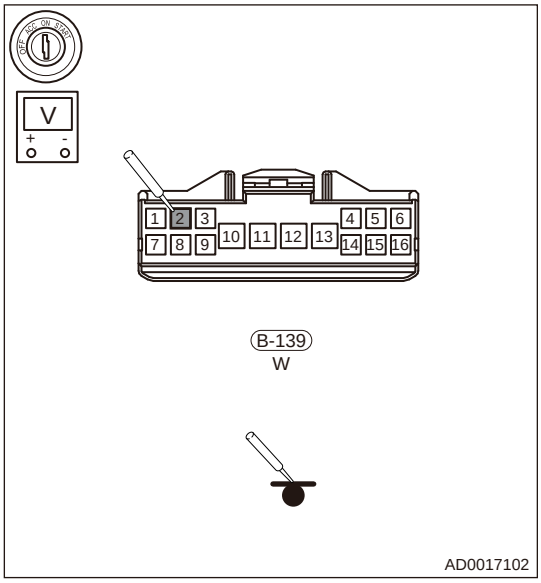
OK

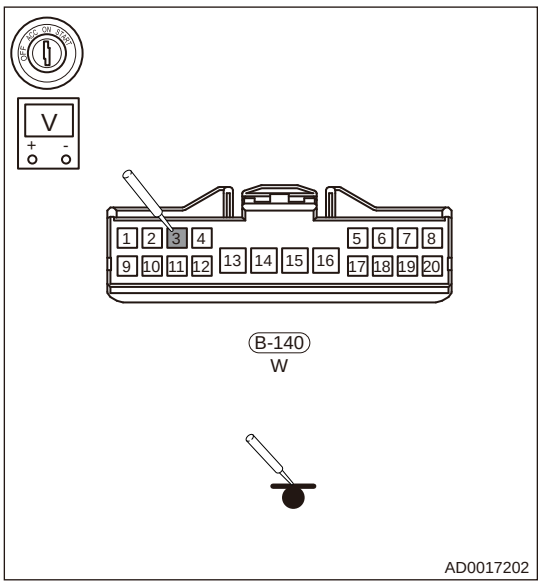
2	**Check instrument panel fuse box output voltage**

(a) Turn ENGINE START STOP switch to ON.

(b) Measure voltage between terminal 2 of instrument panel fuse box B-139, terminal 3 of B-140 and ground. (When using digital multimeter)

Multimeter Connection	Condition	Specified Condition
B-139 (2) - Body ground	ON	12V
B-140 (3) - Body ground	ON	12V





NG → **Replace instrument panel fuse box assembly**

OK

3	Check wire harness for open

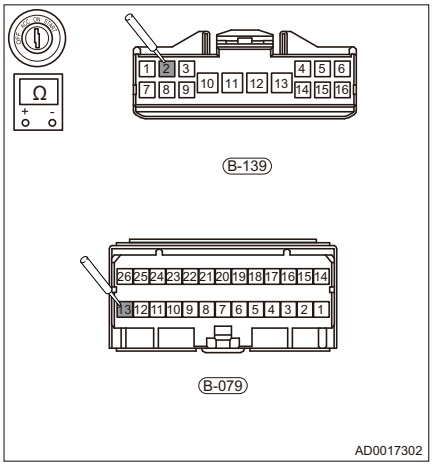
(a) Turn ENGINE START STOP switch to OFF.

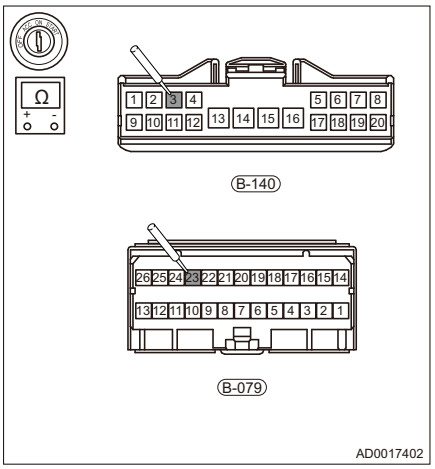
(b) Disconnect the negative battery cable.

(c) Disconnect 4WD coupler module connector B-079, instrument panel fuse box connectors B-139 and B-140.

(d) Using ohm band of digital multimeter, measure resistance between connectors B-079 (13) and B-139 (2), connectors B-079 (23) and B-140 (3) to check wire harness for open.

Multimeter Connection	Condition	Specified Condition
B-139 (2) - B-079 (13)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
B-140 (3) - B-079 (23)	ENGINE START STOP switch “OFF”	⩽ 1 Ω





NG	**Repair or replace related wire harness or connector**
OK	**Replace 4WD coupler module assembly**

DTC	**P172813**	**Electromagnetic Coupling Coil Open Circuit**
DTC	**P172912**	**Electromagnetic Coupling Coil Circuit Short to Power Supply**
DTC	**P173011**	**Electromagnetic Coupling Coil Circuit Short to Ground**

Description

DTC	DTC Definition
P172813	Electromagnetic Coupling Coil Open Circuit
P172912	Electromagnetic Coupling Coil Circuit Short to Power Supply
P173011	Electromagnetic Coupling Coil Circuit Short to Ground

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	**Check wire harness for open or short**

(a) Disconnect electromagnetic coupler connector B-022 and 4WD coupler module connector B-026.

(b) Check if wire harnesses are worn, pierced, pinched or partially broken.

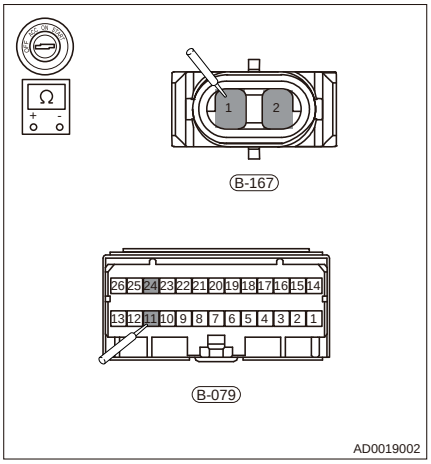
(c) Check for broken, bent, protruded or corroded terminals.

(d) Check if related connector pins are in good condition.

(e) Using ohm band of digital multimeter, measure resistance of connecting wire harness between B-167 (1) - B-079 (11) and B-167 (2) - B-079 (24) to check wire harness for open.

Standard Resistance

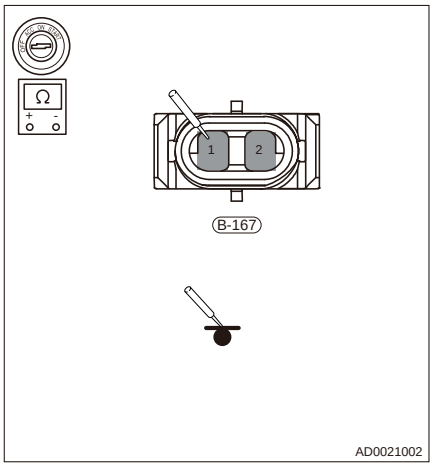
Multimeter Connection	Condition	Specified Condition
B-079 (11) - B-167 (1)	Always	⩽ 1 Ω
B-079 (24) - B-167 (2)	Always	⩽ 1 Ω



(f) Using ohm band of digital multimeter, measure resistance between terminals 1 and 2 of connector B-167 and body ground respectively to check wire harness for short to body ground.

Standard Resistance

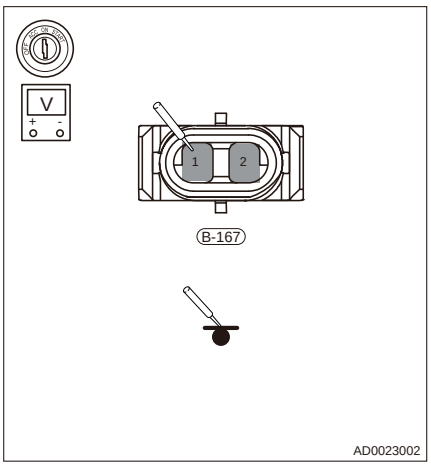
Multimeter Connection	Condition	Specified Condition
B-167 (1) - Body ground	Always	∞
B-167 (2) - Body ground	Always	∞



(g) Connect the negative battery cable, and turn the ENGINE START STOP switch to ON (confirm that connectors B-079 and B-167 are disconnected). Using voltage band of digital multimeter, measure voltage between terminals 1, 2 of connector B-167 and body ground respectively to check wire harness for short to power supply.

Standard Resistance

Multimeter Connection	Condition	Specified Condition
B-167 (1) - Body ground	Always	0V
B-167 (2) - Body ground	Always	0V



NG	**Repair or replace wire harness or connector**
OK	**Replace electromagnetic coupler assembly**

6 On-Vehicle Service

6.1 Rear final drive oil replacement

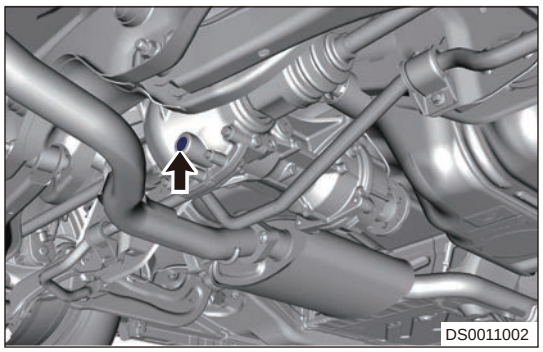
⚠ Caution

- **Replace rear final drive oil only when engine stops and rear final drive cools down.**
- **Used filler plug and drain plug are non-reusable.**

■ Rear final drive oil draining

(1) Park vehicle on a level ground.
(2) Turn off all electrical equipment and the ENGINE START STOP switch.
(3) Raise the vehicle to a proper height.
(4) Put a recovering container under transmission drain hole.
(5) Remove drain plug (with magnet) (arrow) with a tool.

Tightening torque: 24 - 34 N·m

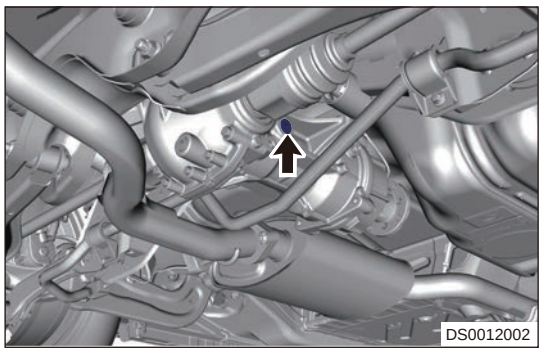

DS0011002

■ Rear final drive oil filling

Gear oil type: Sinolube 80W90, oil capacity: 445 ml ± 30 ml.

(1) Make sure that rear final drive drain plug is tightened in place.
(2) Remove filler plug (with magnet) (arrow) with a tool.

Tightening torque: 24 - 34 N·m


DS0012002

(3) Fill rear final drive oil from fill plug.
(4) Replace filler plug with a new one after filling, and tighten it in place according to torque.

6.2 Rear final drive assembly

■ Removal

⚠ Caution

- **If gear loaded housing is submerged in water, especially if it exceeds the breather valve, it is recommended to drain gear lubricant daily and check internal components for any damage and/or contamination caused by water.**
- **Clean, test and replace damaged parts before assembly and refilling of specified gear lubricant.**

(1) Disconnect the negative battery cable.
(2) Drain the final drive oil.

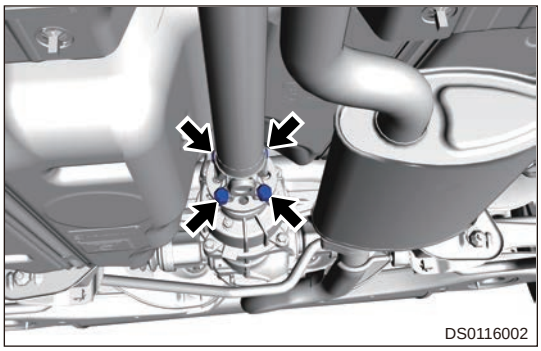
(3) Remove the rear left drive shaft assembly.

(4) Remove the rear right drive shaft assembly.

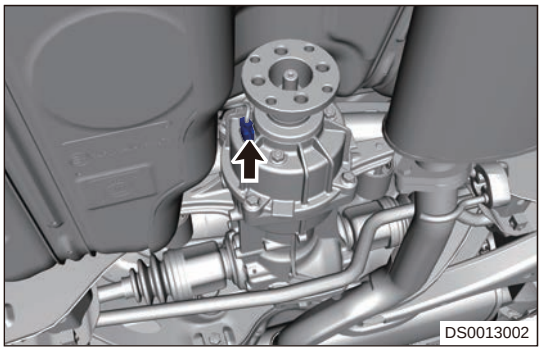
(5) Remove the rear final drive assembly.

1) Remove 4 fixing bolts (arrow) between propeller shaft and torque manager flange.

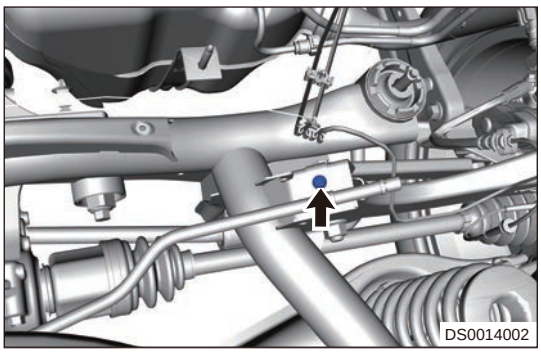
Tightening torque: 71.5 ± 6.5N·m


DS0116002

2) Disconnect the torque manager connector (arrow).

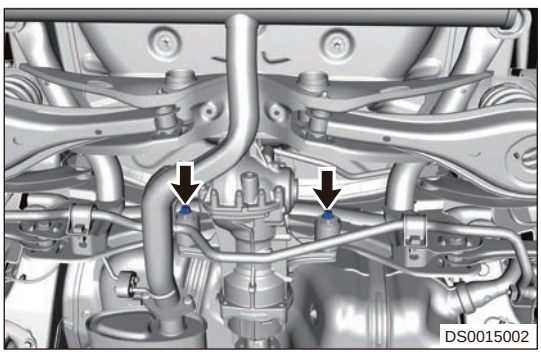

DS0013002

3) Remove fixing bolt (arrow) between rear final drive breather pipe and rear sub frame.

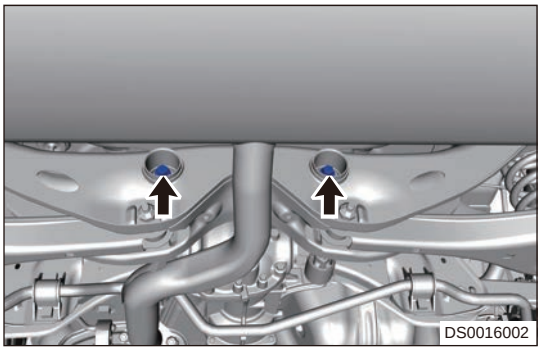

DS0014002

4) Place jack firmly in a proper position under rear final drive assembly.

5) Remove 2 fixing bolts (arrow) between rear final drive and front part of rear sub frame.


DS0015002

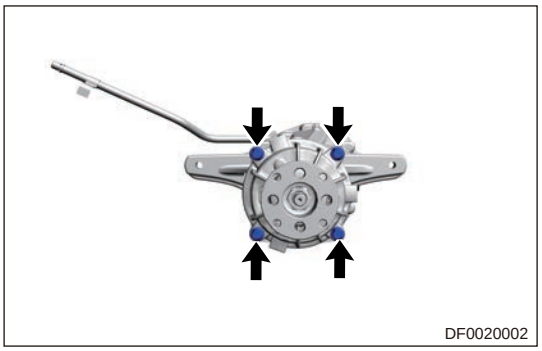
6) Remove 2 fixing bolts (arrow) between rear final drive and rear part of rear sub frame.



7) Remove the rear final drive assembly.

■ Disassembly

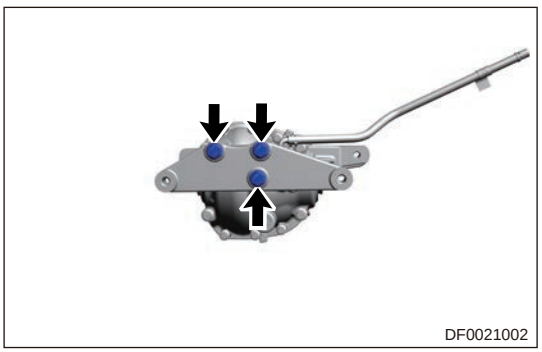
(1) Remove 4 fixing bolts (arrow) between torque manager and rear final drive.



(2) Remove the torque manager.

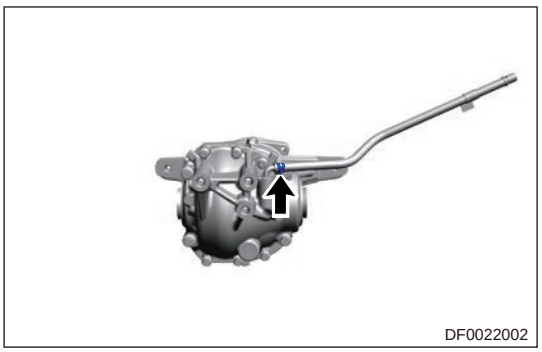
(3) Remove 3 fixing bolts (arrow) between rear final drive bracket and rear final drive.

Tightening torque: 110 - 130 N·m



(4) Remove the rear final drive bracket.

(5) Remove clamp (arrow) and breather pipe.



■ Reassembly

(1) Install breather pipe and clamp.

(2) Install the rear final drive bracket.

(3) Install 3 fixing bolts between rear final drive bracket and rear final drive.

Tightening torque: 110 - 130 N·m

(4) Install the torque manager.

(5) Install 4 fixing bolts between torque manager and rear final drive.

■ **Installation**

(1) Install the rear final drive assembly.

(2) Install 2 fixing bolts (arrow) between rear final drive and rear part of rear sub frame.

Tightening torque: 120 ± 10 N·m

(3) Install 2 fixing bolts (arrow) between rear final drive and front part of rear sub frame.

Tightening torque: 120 ± 10 N·m

(4) Install fixing bolt between rear final drive breather pipe and rear sub frame.

(5) Install the torque manager connector.

(6) Install 4 fixing bolts between propeller shaft and torque manager flange.

Tightening torque: 71.5 ± 6.5N·m

6.3 Torque manager control unit

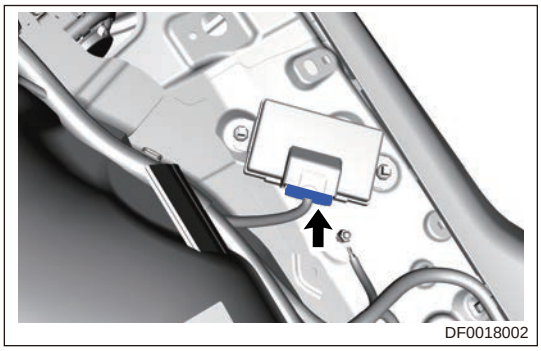
■ **Removal**

(1) Disconnect the negative battery cable.

(2) Remove the rear right interior trim panel.

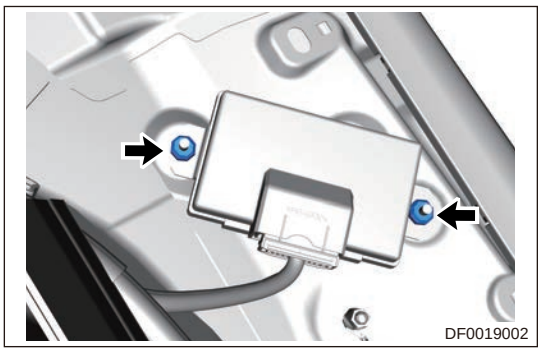
(3) Remove the torque manager control unit.

1) Disconnect the torque manager control unit connector (arrow).


DF0018002

2) Remove 2 fixing nuts (arrow) from torque manager control unit.

Tightening torque: 8 ± 1N·m


DF0019002

3) Remove the torque manager control unit.

■ **Installation**

(1) Install the torque manager control unit.

(2) Install 2 fixing nuts to torque manager control unit.

Tightening torque: 8 ± 1 N·m

(3) Install the torque manager control unit connector.

(4) Rear right interior trim panel.

(5) Connect the negative battery cable.

6.4 Drive shaft oil seal (final drive side)

■ Replace oil seal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Make sure that safety lock of lifter has been locked, when removing and installing chassis parts.**

Hint:
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

(1) Remove the rear left wheel.
(2) Drain the final drive oil.
(3) Remove the rear left drive shaft.
(4) Remove the drive shaft oil seal.
    1)Using a screwdriver with the tip wrapped with protective tape, remove drive shaft oil seal.

⚠ Caution

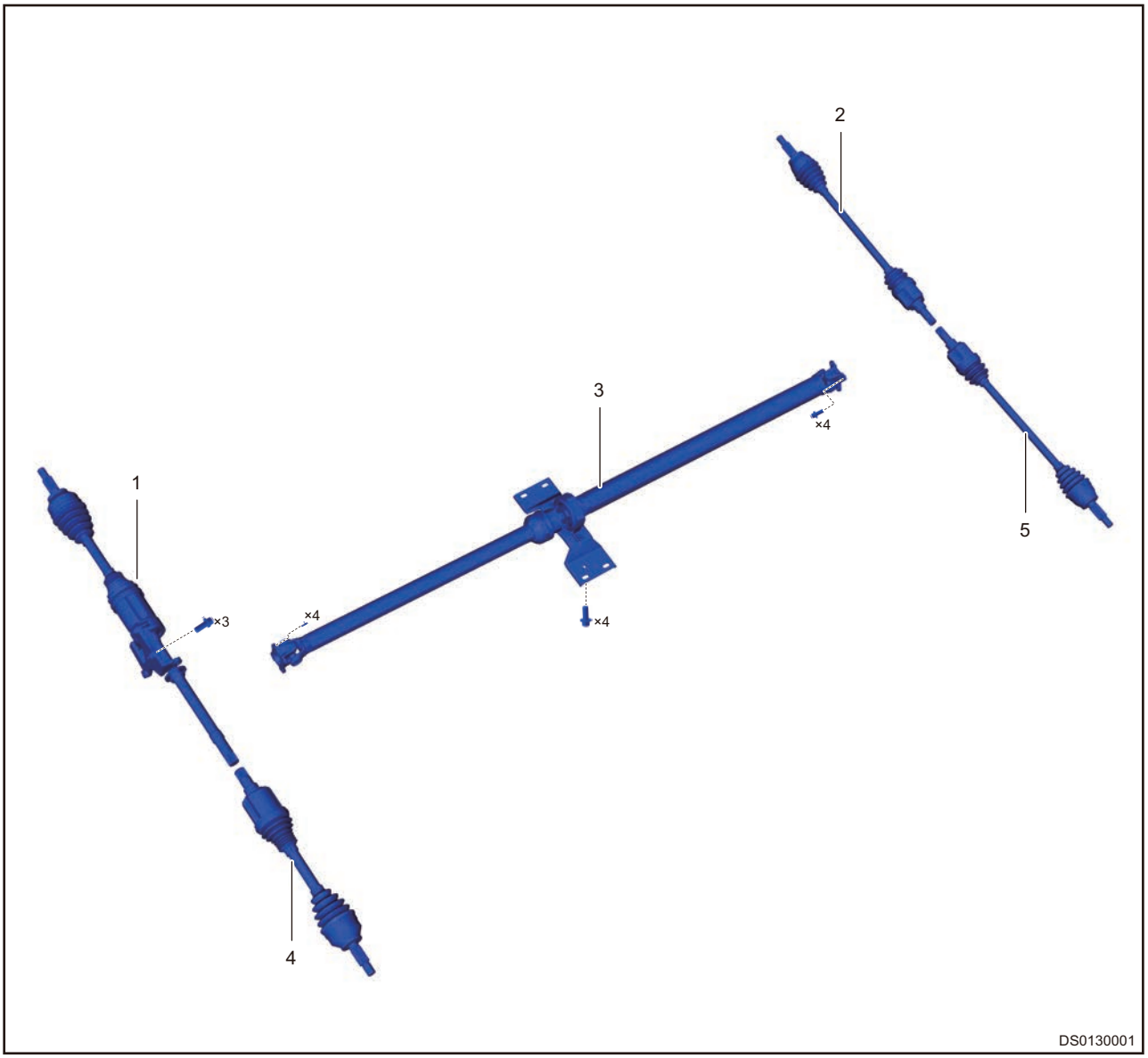
- **Ensure that the transmission oil has been drained before removal.**
- **Oil seal is a non-reusable part, which must be replaced after each removal.**

(5) Install the drive shaft oil seal.
    1)Install new drive shaft oil seal in position with a tool.
(6) Install the rear left drive shaft.
(7) Fill the final drive oil.
(8) Install the rear left wheel.

5.6 DRIVE SHAFT

1 Overview

1.1 Description



1	Front Right Drive Shaft Assembly	2	Rear Right Drive Shaft Assembly
3	Propeller Intermediate Shaft Assembly	4	Front Left Drive Shaft Assembly
5	Rear Left Drive Shaft Assembly		

Drive shaft, which is a solid shaft, transmits torque between differential and drive wheels. Generally, the inner end of drive shaft is connected with drive shaft gear by spline, and the outer end is connected with wheel hub. Drive shaft transmits torque from differential to wheels, thus rotating the wheels to run vehicle.Propeller intermediate shaft is the shaft which transmits rotation of transmission to main final drive.

2 Specifications

2.1 Torque Specifications

Description	Torque (N•m)
Tightening Bolt Between Propeller Intermediate Shaft Bracket and Body	71.5 ± 6.5
Tightening Bolt Between Propeller Intermediate Shaft and Torque Manager	71.5 ± 6.5
Tightening Bolt Between Propeller Intermediate Shaft and PTU	79 ± 8
Fixing Bolt Between Front Right Drive Shaft Bracket and Engine	70 ± 10
Drive Shaft Fixing Nut	Firstly tighten torque to 200 N•m, reverse it by 100 °, and then tighten to 286 ± 23 N•m

3 On-vehicle Service

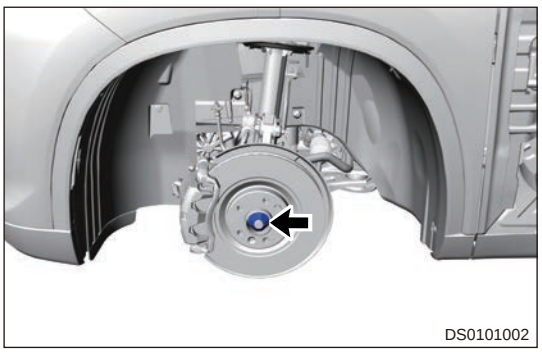
3.1 Front Drive Shaft Assembly

■ Removal

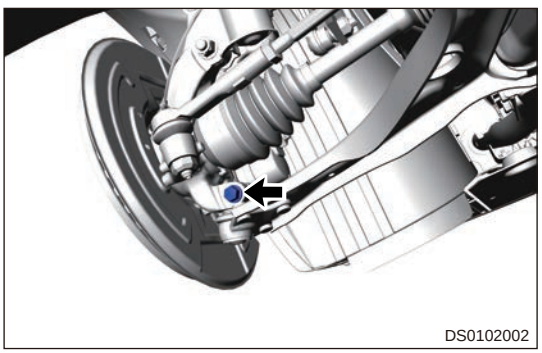
(1) Remove the front left wheel.
(2) Remove the right left wheel.
(3) Drain the transmission oil.

(4) Remove the front left drive shaft assembly.

1) Remove fixing nut (arrow) from front left drive shaft.

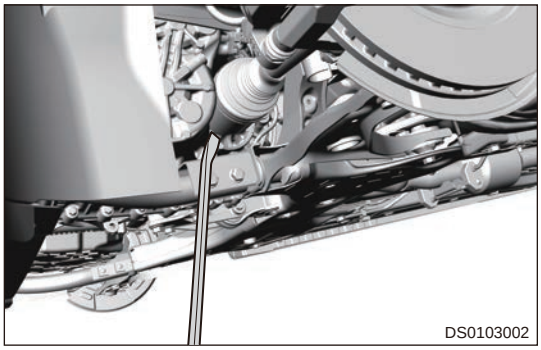

DS0101002

2) Remove fixing bolt (arrow) between front left lower control arm and steering knuckle.


DS0102002

3) Disconnect the connection between front left lower control arm and steering knuckle.

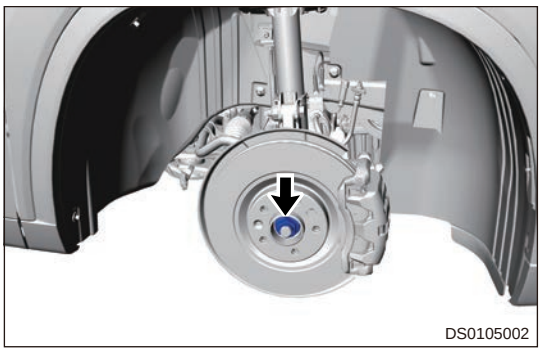
4) Use crowbar to pry out inner ball cage spline inserted into transmission end.


DS0103002

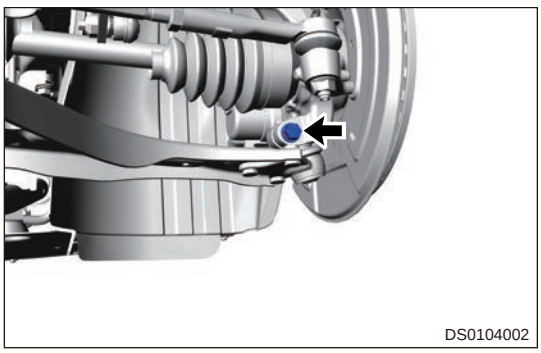
5) Remove the front left drive shaft.

(5) Remove the front right drive shaft assembly.

1) Remove fixing nut (arrow) from front right drive shaft.

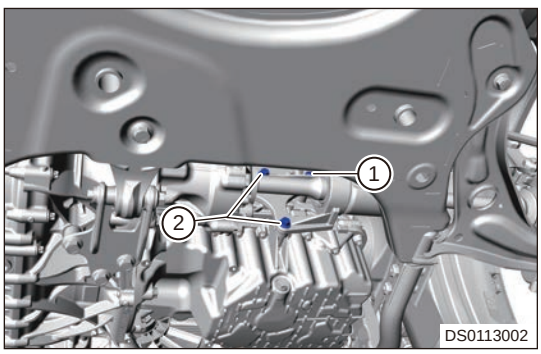

DS0105002

2) Remove fixing nut (arrow) from front right drive shaft.


DS0104002

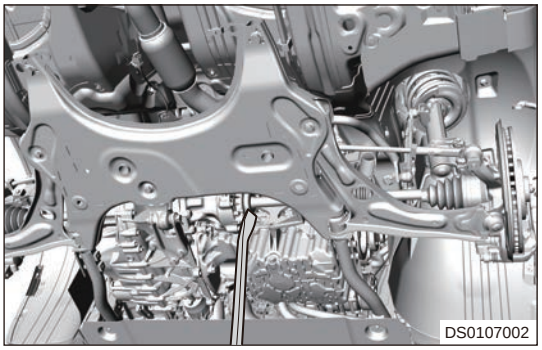
3) Disconnect the connection between front right lower control arm and steering knuckle.

4) Remove 3 fixing bolts (1) and (2) from front right drive shaft bracket.



DS0113002

5) Use crowbar to pry out inner ball cage spline inserted into transfer case.



6) Remove the front right drive shaft assembly.

■ **Installation**

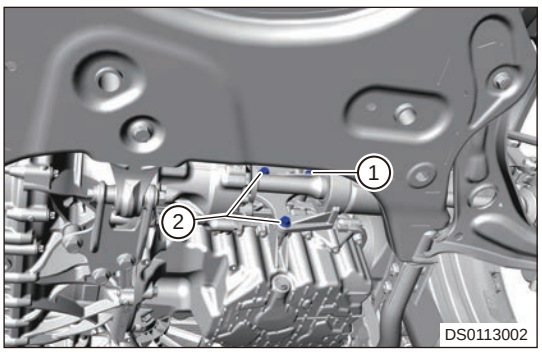
(1) Install the front right drive shaft.

⚠ Caution

- **It is necessary to use oil seal mounting fixture to ensure that transmission output shaft oil seal is not scratched during installation. Remove fixture after drive shaft spline is passed through fixture, and do not remove it forcibly.**
- **It is necessary to align drive shaft spline with spline hole when assembling drive shaft. Drive shaft can be pushed firmly and smoothly only drive shaft spline is aligned with spline hole.**
- **Install drive shaft bracket in the order above.**

1) Raise the right shaft first until drive shaft spline end axis centering is flush with transmission differential hole center.
2) Insert oil seal protection fixture into transmission output shaft oil seal.
3) Push drive shaft into fixture, and remove fixture after drive shaft spline passes through fixture.
4) Finally, push the drive shaft to bottom.
5) Install 3 fixing bolts (arrow) from front right drive shaft bracket.

   Tightening torque: 70 ± 10 N·m



⚠ Caution

- **Put a bolt into bolt mounting hole at position (1) firstly and pre-tighten it. Put the other 2 bolts to mounting holes (2) respectively and pre-tighten them.**
- **Tighten them to specified torque.**

(2) Install the connection between front right lower control arm and steering knuckle.

Tightening torque: 95 ± 7.3 N·m

(3) Install fixing nut to front right drive shaft.
(4) Install the front right wheel.
(5) Install the front left drive shaft.

⚠ Caution

- **It is necessary to use oil seal mounting fixture to ensure that transmission output shaft oil seal is not scratched during installation. Remove fixture after drive shaft spline is passed through fixture, and do not remove it forcibly.**
- **It is necessary to align drive shaft spline with spline hole when assembling drive shaft. Drive shaft can be pushed firmly and smoothly only drive shaft spline is aligned with spline hole.**
- **Install drive shaft bracket in the order above.**

1) Raise the left shaft first until drive shaft spline end axis centering is flush with transmission differential hole center.
2) Insert oil seal protection fixture into transmission output shaft oil seal.
3) Push drive shaft into fixture, and remove fixture after drive shaft spline passes through fixture.
4) Finally, push the drive shaft to bottom.

(6) Install the connection between front left lower control arm and steering knuckle.

Tightening torque: 95 ± 7.3 N·m

(7) Install fixing nut to front left drive shaft.
(8) Install the front left wheel.
(9) Fill the transmission oil.

3.2 Rear Drive Shaft Assembly (4WD)

■ Removal

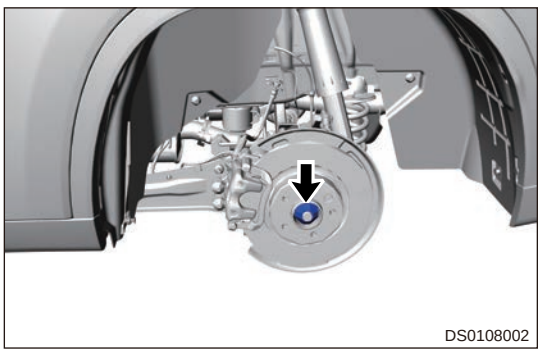
⚠ Caution

- **Use same removal and installation procedures for left drive shaft and right drive shaft assembly.**
- **Removal procedures listed below are for left drive shaft.**

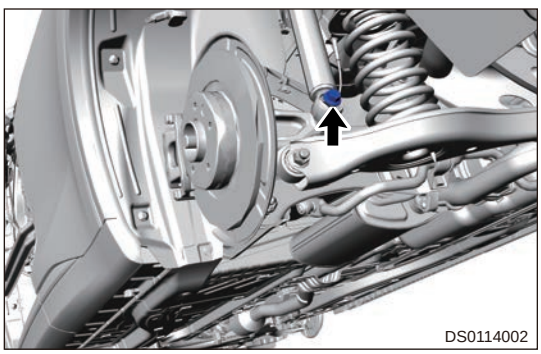
(1) Remove the rear left wheel.
(2) Drain the final drive oil.

(3) Remove the rear left drive shaft assembly.

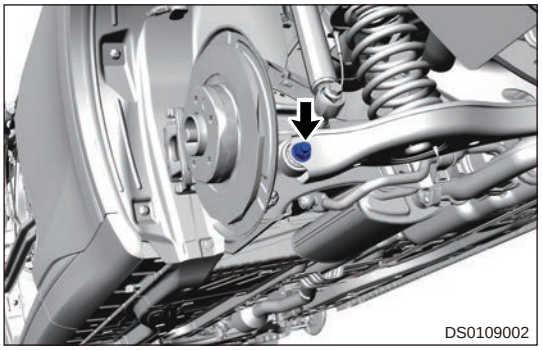
1) Remove fixing nut (arrow) from rear left drive shaft.


DS0108002

2) Remove fixing bolt (arrow) between rear left shock absorber and steering knuckle.

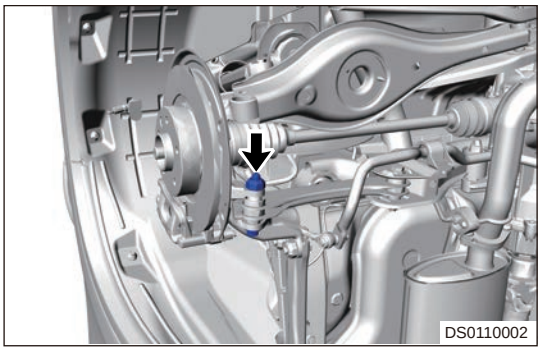

DS0114002

3) Remove fixing bolt (arrow) between rear left lower control arm and steering knuckle.

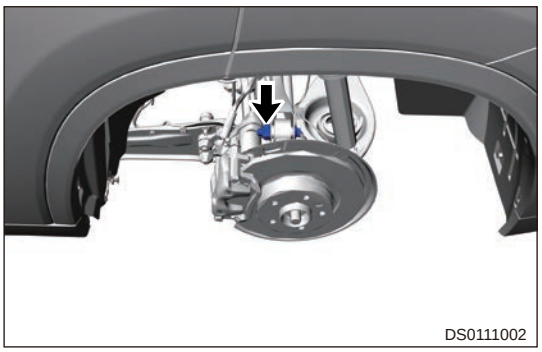

DS0109002

4) Disconnect the connection between rear left lower control arm and steering knuckle, and remove coil spring.

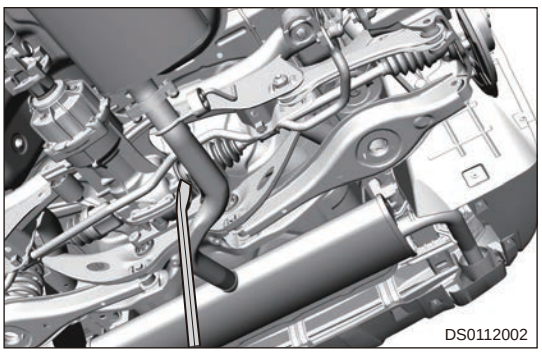
5) Remove fixing bolt (arrow) between left tie rod and steering knuckle.


DS0110002

6) Remove fixing bolt (arrow) between upper left control arm and steering knuckle.


DS0111002

7) Use crowbar to pry out the rear left drive shaft assembly.


DS0112002

8) Remove the rear left drive shaft assembly.

■ Installation

⚠ Caution

- **Use same installation procedures for left drive shaft and right drive shaft assembly.**
- **Installation procedures listed below are for left drive shaft.**

(1) Install the rear left drive shaft assembly.

(2) Install fixing bolt between upper left control arm and steering knuckle.

(3) Install fixing bolt between left tie rod and steering knuckle.

(4) Install fixing bolt between rear left shock absorber and steering knuckle.

Tightening torque: 160 ± 12 N·m

(5) Install fixing nut to rear left drive shaft.

(6) Install the rear left drive shaft assembly.

(7) Install the rear left wheel.

(8) Use same installation procedures for right drive shaft and left drive shaft assembly.

(9) Fill the final drive oil.

⚠ Caution
• **Check wheel alignment after installation. Adjust wheel alignment to the standard range as necessary.**

3.3 Propeller Intermediate Shaft Assembly (4WD)

■ Removal

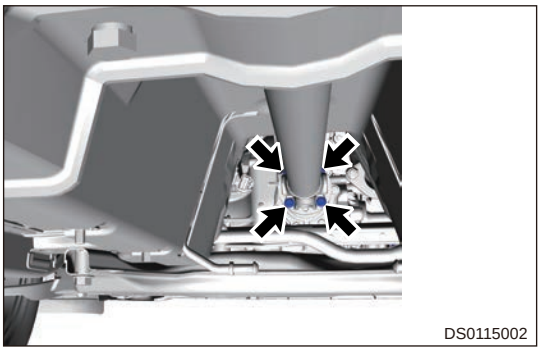
(1) Turn off all electrical equipment and the ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

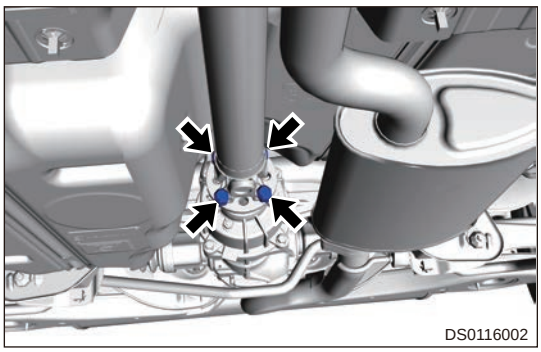
(3) Remove the front muffler assembly.

(4) Remove the propeller intermediate shaft assembly.

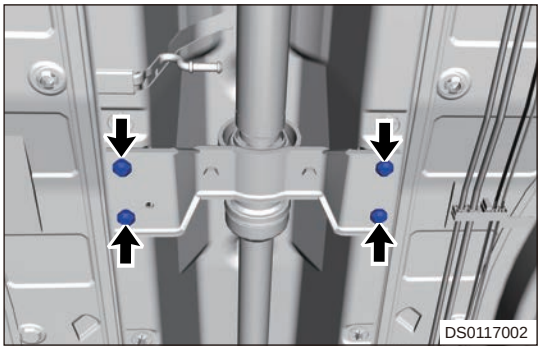
1) Remove 4 fixing bolts (arrow) between propeller shaft and PTU output flange.


DS0115002

2) Remove 4 fixing bolts (arrow) between propeller shaft and torque manager flange.


DS0116002

3) Remove 4 fixing bolts (arrow) between intermediate bracket and lower body.



4) Remove the propeller intermediate shaft assembly.

■ **Installation**

(1) Install the propeller intermediate shaft assembly.

(2) Install 4 fixing bolts between intermediate bracket and lower body.

Tightening torque: 71.5 ± 6.5 N·m

(3) Install 4 fixing bolts between propeller shaft and torque manager flange.

Tightening torque: 71.5 ± 6.5 N·m

(4) Install 4 fixing bolts between propeller shaft and PTU output flange.

Tightening torque: 33 ± 3 N·m

(5) Install the front muffler assembly.

(6) Install the negative battery cable.

⚠ Caution

- **Raise the propeller shaft to installation height with a lifter, fit front end cross fork flange with PTU output shaft flange, align 4 bolt holes separately and tighten them with bolts. Installation of bolt should follow the principle of diagonal tightening.**
- **Fit rear end cross fork flange with torque manager flange, align 4 bolt holes separately and tighten them with bolts. Installation of bolt should follow the principle of diagonal tightening.**

3.4 Replacement of Outer Ball Cage

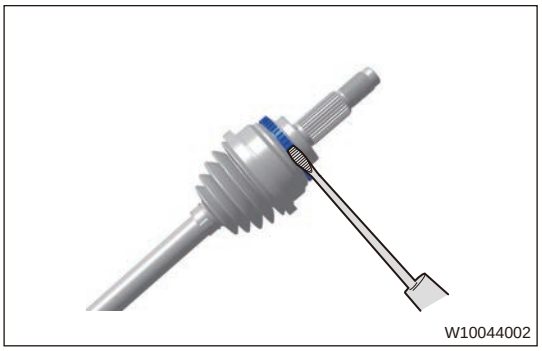
■ **Removal**

⚠ Warning

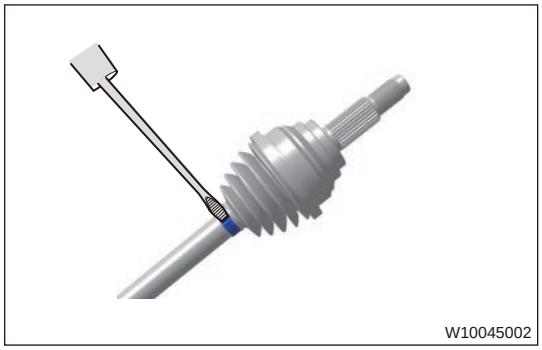
- **Use same disassembly and assembly procedures for outer ball cage of left / right drive shaft assemblies.**

(1) Remove the drive shaft assembly.

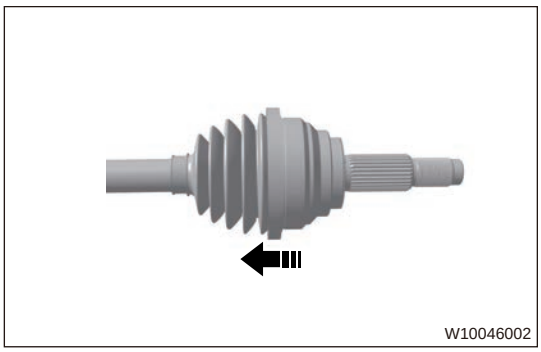
(2) Using a screwdriver, pry out striker of outer ball cage dust boot outer clamp and remove outer ball cage dust boot outer clamp.



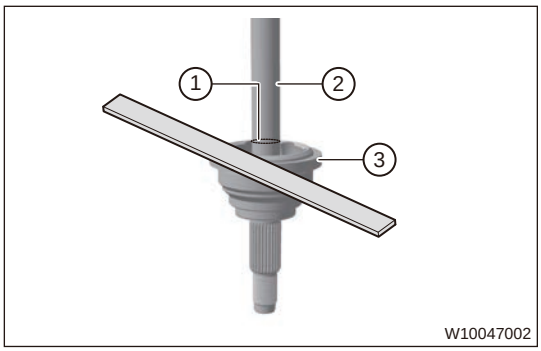
(3) Using a screwdriver, pry out striker of outer ball cage dust boot inner clamp and remove outer ball cage dust boot inner clamp.


W10045002

(4) Slide the outer dust boot carefully into the inner ball cage side in direction of arrow.

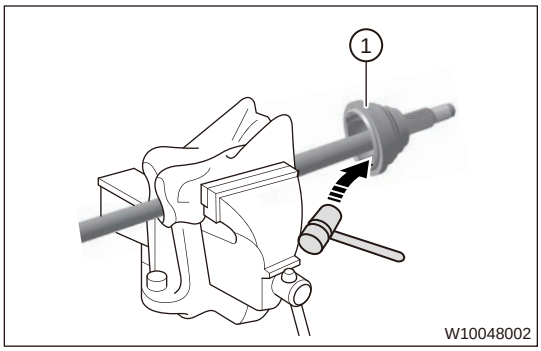

W10046002

(5) Put matchmarks (1) on area at same height as drive shaft assembly (2) and edge of outer ball cage (3) for correct installation.



W10047002

(6) Wrap the drive shaft assembly with a piece of cloth and put it onto a vise. Secure the vise to prevent drive shaft assembly from shaking. Expand the internal positioning snap spring of outer ball cage with snap spring calipers, then tap outer ball cage with a hammer and remove outer ball cage (1).

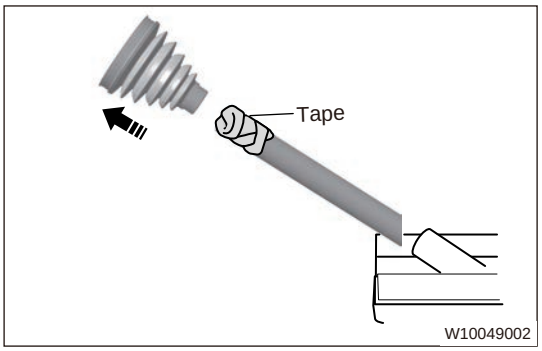


W10048002

(7) Remove the left drive shaft from vise.

(8) Remove the internal positioning snap spring of outer ball cage.

(9) Wrap tape on the spline of drive shaft, and remove dust boot.



(10) Remove the tape.

■ **Installation**

⚠ Caution

- **Check if spline of drive shaft is in good condition. If it is deformed or damaged, replace it.**
- **Check if dust boot is in good condition. If it is scratched or broken, replace it.**
- **Refill grease during installation, and install with a new clamp.**

(1) Wrap tape on the spline of drive shaft, and install dust boot.
(2) Install outer ball cage and internal positioning snap spring.
(3) Install the outer ball cage dust boot.
(4) Install the outer ball cage dust boot inner clamp.
(5) Install the outer ball cage dust boot outer clamp.

SUSPENSION SYSTEM

SUSPENSION SYSTEM

6.1 FRONT SUSPENSION

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Be sure to wear necessary safety equipment to prevent accidents.

(2) Check if safety lock of lifter is locked when repairing chassis parts.

(3) It is not allowed to weld or modify suspension loading parts and guide parts.

(4) When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.

(5) Operate carefully when removing and installing coil spring, to prevent spring from jumping out and causing personal injury.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Be sure to tighten coupling bolts and nuts to specified torques.

(2) Make sure that ball pin assembly rotates smoothly without any sticking after installation.

(3) Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.

(4) Before pressing in, apply grease on the outside of front control arm assembly rubber bushing to prevent control arm assembly rubber bushing from being damaged.

(5) Align dowel pin of top end connecting plate with body positioning hole when installing front left shock absorber assembly.

(6) Please note that opening of retainer must face opening of front wheel speed sensor, when installing front hub bearing retainer.

(7) When removing front sub frame welding assembly, it is necessary to securely support engine and transmission assembly with engine equalizer to avoid damage.

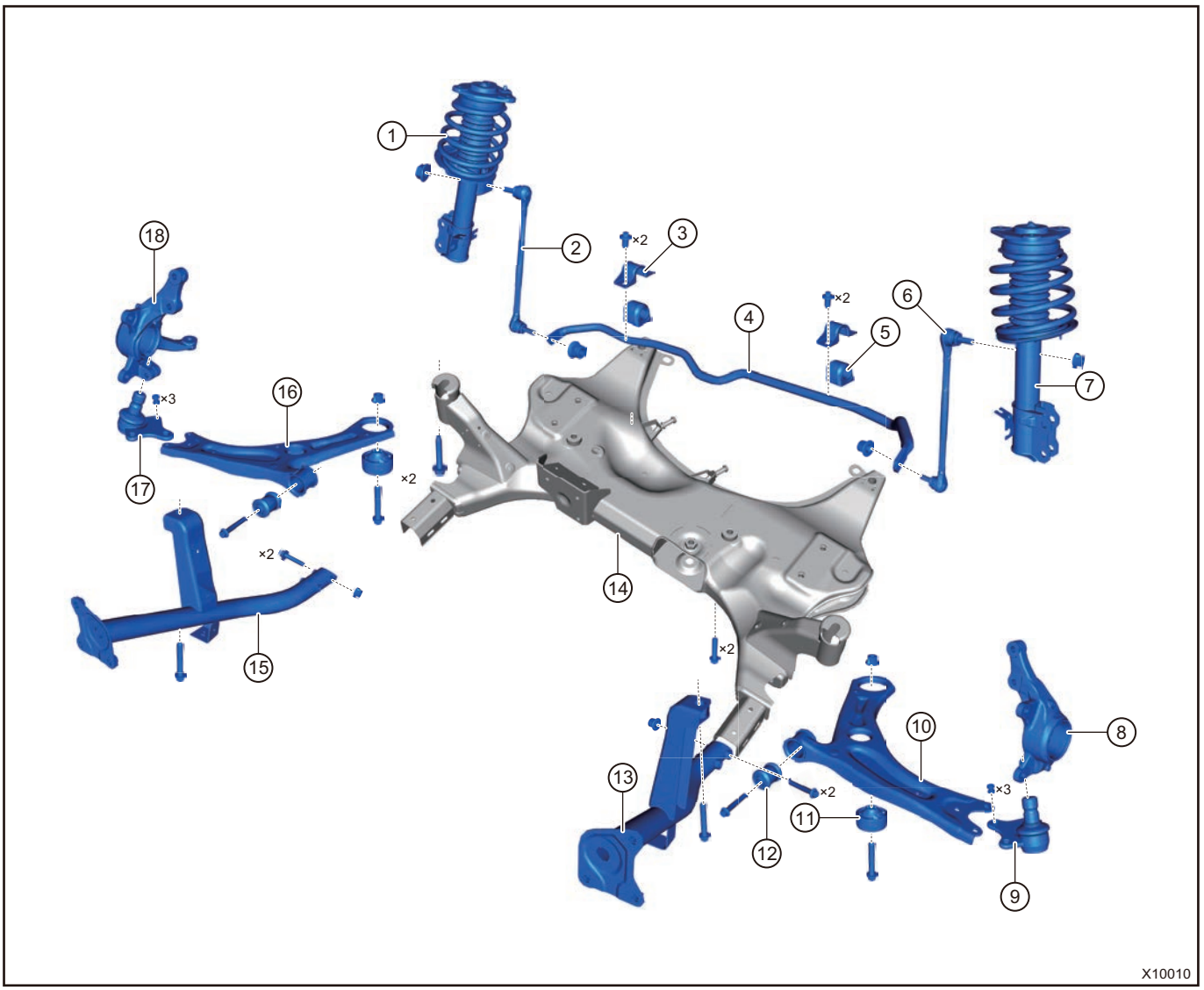
(8) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Description

Front suspension of this model uses Macpherson independent suspension (toe-in is adjustable and height is non-adjustable), which is equipped with lateral stabilizer, cylindrical coil spring, double action telescopic shock absorber.

2.2 System Components Diagram



1	Front Right Strut Assembly	10	Front Left Control Arm Welding Assembly
2	Front Connecting Rod Assembly	11	Control Arm Rear Bushing Assembly
3	Front Stabilizer Bar Clamp	12	Control Arm Front Bushing Assembly
4	Front Stabilizer Bar	13	Left Side Rail Assembly
5	Front Stabilizer Bar Bushing	14	Front Sub Frame Assembly
6	Front Connecting Rod Assembly	15	Right Side Rail Assembly
7	Front Left Strut Assembly	16	Front Right Control Arm Welding Assembly
8	Front Left Steering Knuckle	17	Control Arm Ball Pin
9	Control Arm Ball Pin	18	Front Right Steering Knuckle

2.3 Components Operation Description

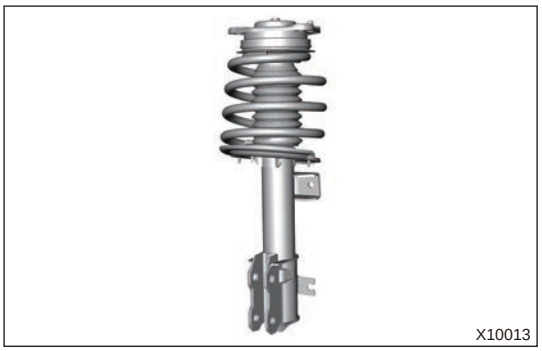
■ Front Control Arm Welding Assembly

As a guide and power transmission element for suspension system of vehicle, control arm transmits various power acting on wheels to vehicle body and keeps wheels moving in a certain trail. Control arm elastically connects wheels and vehicle body together with ball joint or bushing.


X10012

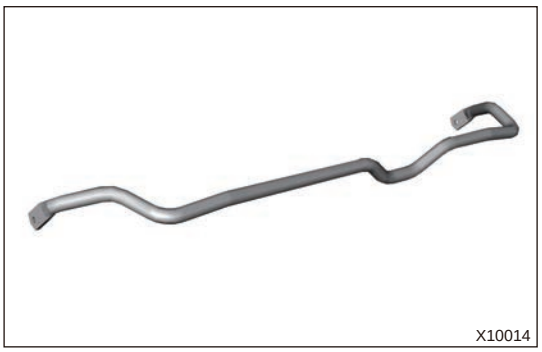
■ Front Strut Assembly

It filters and eliminates vibration from roads to improve driving stability and bring people a sense of comfort and stability.


X10013

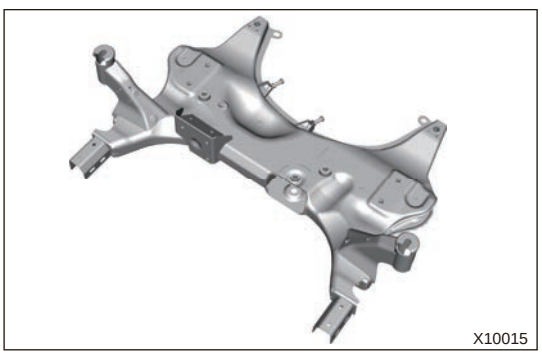
■ Front Stabilizer Bar

Lateral stabilizer bar functions to prevent excessive lateral incline while vehicle is turning and keeps vehicle body in balance as much as possible. It aims to reduce lateral incline level of vehicle and improve smoothness. When vehicle is turning, vehicle body inclines and suspension on both sides have inconsistent bounce. The outer suspension will press against stabilizer bar to twist it, then elastic force from bar body will prevent wheel from lifting, so that vehicle body can be kept in balance as much as possible, thus realizing the lateral stability function.


X10014

■ Front Sub Frame Assembly

Sub frame can reduce impact on vehicle body due to road shock and enhance connection rigid of suspension system and improve driving comfort and stability, making a strong and compact chassis during driving. It bears the deformation conditions such as loaded bend, longitudinal torsion, lateral bend and horizontal lozenging, etc. in place of vehicle body, which improves torsion resistance ability of vehicle body. Also, the force will be directly applied on it in a collision to improve vehicle safety performance.


X10015

3 Diagnosis & Testing

3.1 Problem Symptoms Table

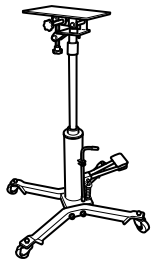
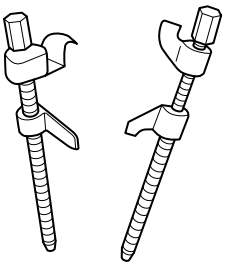
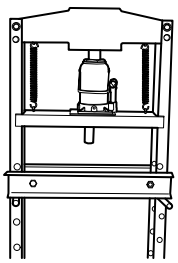
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Pulls	Tire (worn or improperly inflated)
	Front wheel alignment (incorrect)
	Control arm ball pin assembly (loose)
	Steering tie rod (loose or worn)
	Front hub bearing (excessively worn)
	Steering gear (misaligned or damaged)
	Suspension component (worn)
Droop	Vehicle (overloaded)
	Front coil spring (too soft)
	Front shock absorber assembly (worn or damaged)
	Front suspension components (excessively worn or deformed)
	Front tire (improperly inflated)
	Front wheel alignment (incorrect)
Sways/pitches	Front tire (worn or improperly inflated)
	Front stabilizer bar assembly (bent or broken)
	Front shock absorber assembly (worn or damaged)
Wheel shimmy	Front tire (worn or improperly inflated)
	Front wheel (out of balance)
	Front shock absorber assembly (worn or damaged)
	Front wheel alignment (incorrect)
	Control arm ball pin assembly (loose)
	Front hub bearing (excessively worn)
	Steering gear (misaligned or damaged)
Abnormal tire wear	Front tire (improperly inflated)
	Front wheel alignment (incorrect)
	Front shock absorber assembly (worn or deformed)
	Front suspension components (worn or deformed)

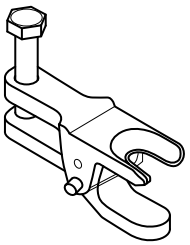
4 Removal & Installation

4.1 Tools

■ General Tools

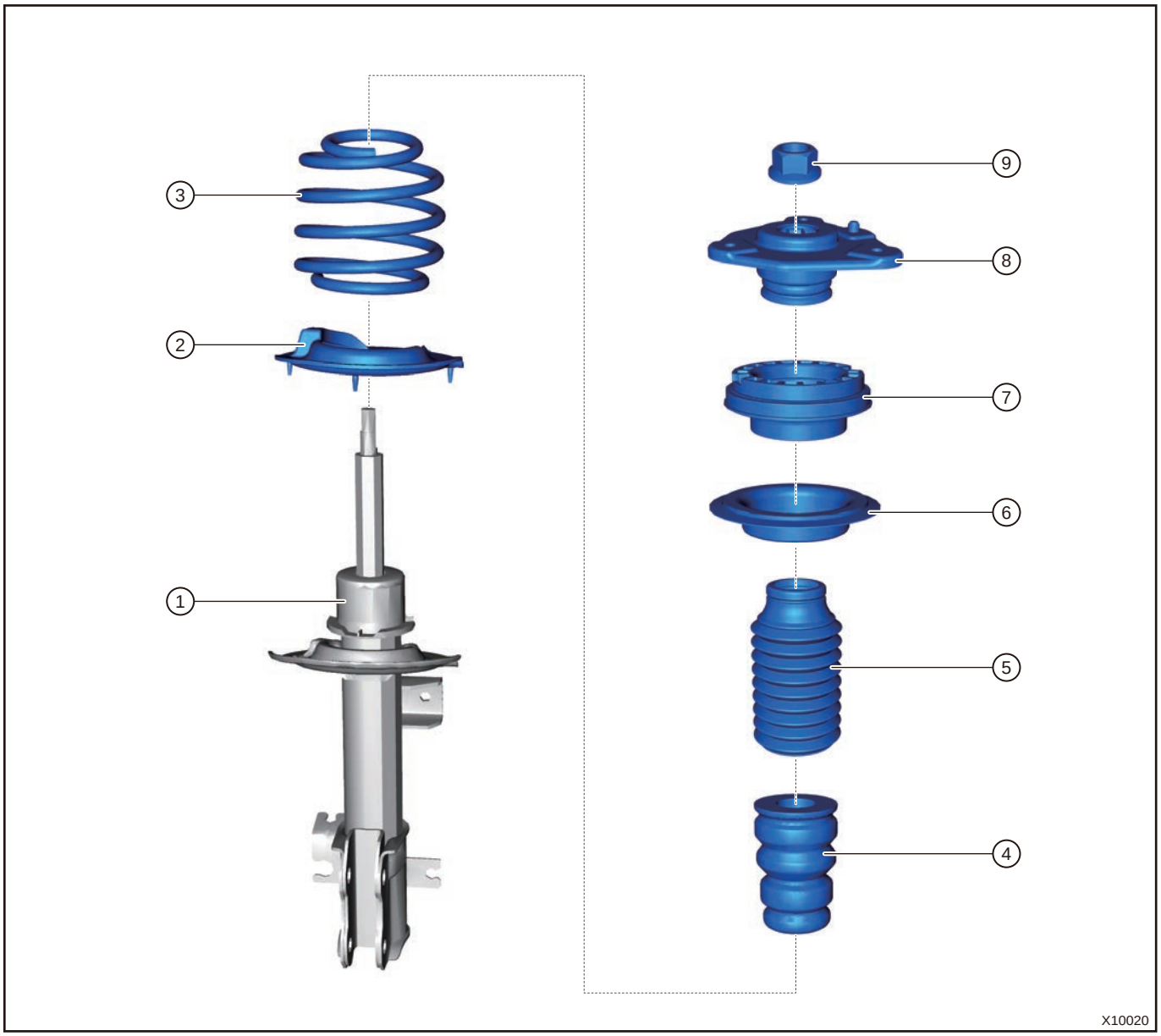
Tool Name	Tool Drawing
Transmission Carrier	 S00004
Spring Compressor	 S00016
Hydraulic Press	 S00010

■ **Special Tools**

Tool Name	Part No.	Tool Drawing
Front Shock Absorber Nut Remover	ECH-0001	 S00160
Tie Rod Ball Remover	ECH-0002	 S00019

4.2 Replacement of Front Strut Assembly

■ Description



1	Front Left Shock Absorber Assembly	6	Upper Spring Cushion
2	Lower Spring Cushion	7	Bearing Assembly
3	Front Coil Spring	8	Upper Connecting Plate Assembly
4	Front Buffer Block	9	Hexagon Flange Nut
5	Front Dust Boot		

■ On-Vehicle Inspection

Check the front shock absorber assembly.

(1) Park vehicle on level ground, and bounce vehicle up and down, then check if vehicle shakes up and down when body bounds. If vehicle shakes up and down consecutively, shock absorber assembly may be damaged and should be replaced.

Check front shock absorber assembly for leakage

(1) As shock absorber assembly operates frequently during vehicle driving, oil gas is formed due to temperature rise of shock absorber, which then adheres to dust boot. This is a normal phenomenon, and it is not necessary to replace the shock absorber assembly.

(2) If following conditions occur:

- Oil traces in circumferential direction are uneven;
- Oil traces reach lower connecting positions.

Above conditions indicate that there may be a leakage in shock absorber assembly, and it is necessary to replace the shock absorber assembly.

(3) If it is difficult to accurately judge if shock absorber assembly leaks from appearance. Perform road test after wiping off oil on the surface of malfunctioning shock absorber. Under normal road conditions, drive vehicle for 5 to 10 minutes and perform inspection. If there are oil traces on the surface of shock absorber assembly, it indicates that oil leakage exists, and it is necessary to replace the shock absorber assembly.

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Caution

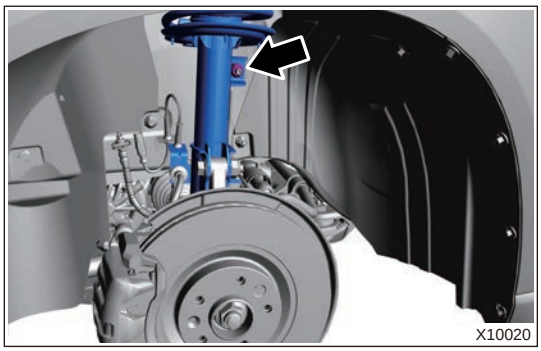
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Make sure that safety lock of lifter has been locked, when removing and installing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing and installing chassis parts, replace self-locking nuts and rusted nuts for safety.**
- **Operate carefully when removing and installing coil spring, to prevent spring from jumping out and causing personal injury.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

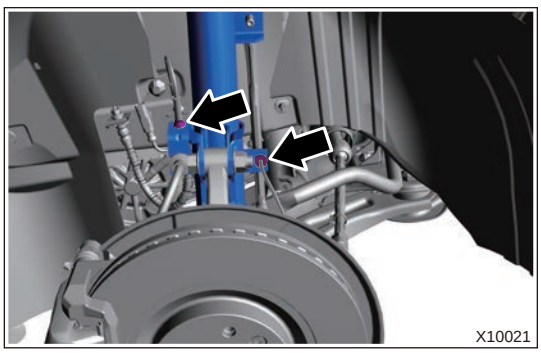
(2) Disconnect the negative battery cable.

(3) Remove the front left wheel.

(4) Remove coupling nut (arrow) between front left connecting rod assembly and front left shock absorber assembly.


X10020

(5) Disengage front left wheel speed sensor wire harnesses from front left shock absorber assembly.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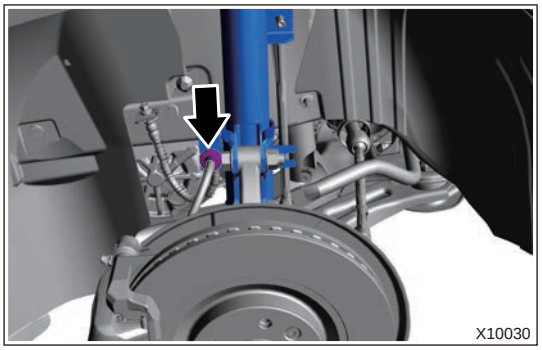
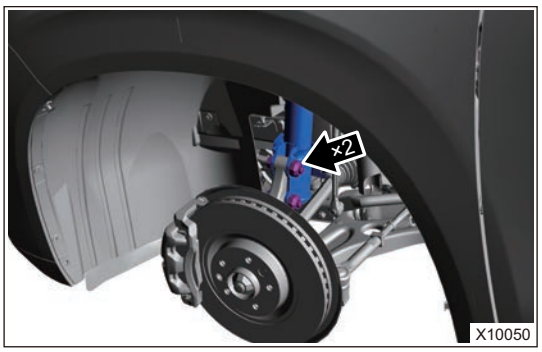
(6) Disengage front left brake hose assembly from front left shock absorber assembly.

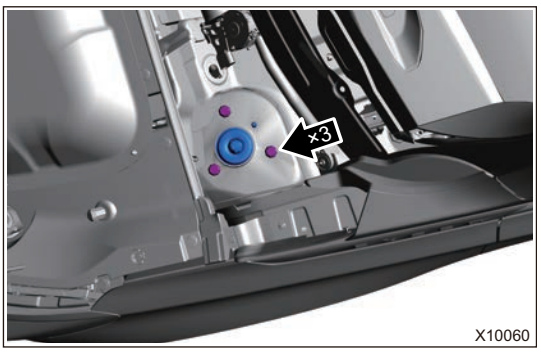


(7) Remove 2 coupling bolts and nuts between front left shock absorber assembly and front left steering knuckle assembly.



(8) Remove the front windshield lower support assembly.

(9) Remove 3 coupling bolts between front left shock absorber assembly and vehicle body.



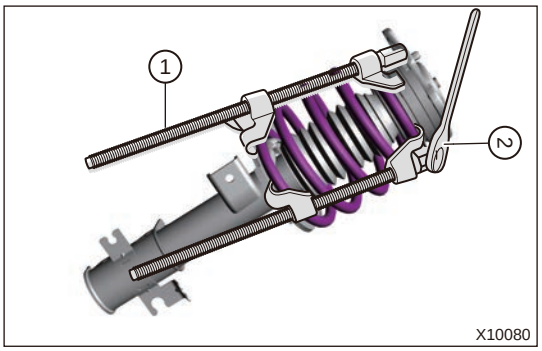
(10) Remove the front left shock absorber assembly with front coil spring.

■ Disassembly

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

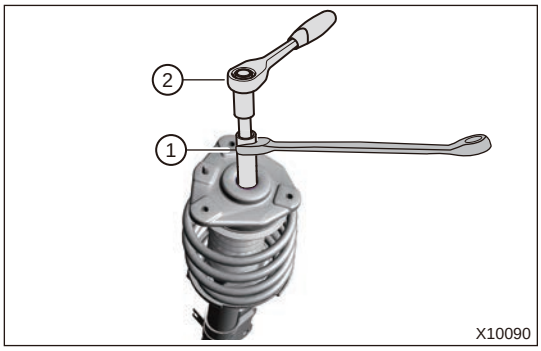
(1) Using spring compressor (1) and wrench (2), tighten the end lever of spring compressor to compress the front coil spring.



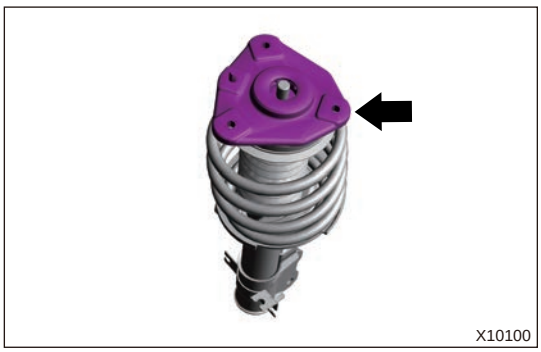
⚠ Warning

When removing front coil spring, compress spring until locking nut can be rotated. DO NOT compress spring more than necessary, avoid damaging spring and personal injury.

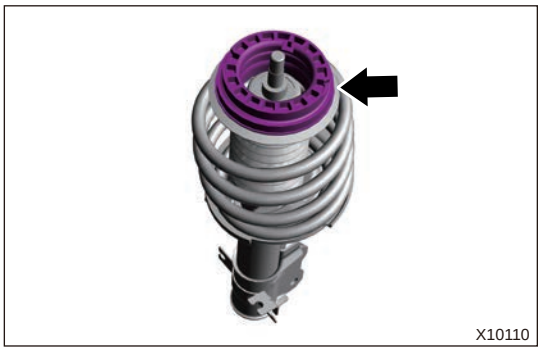
(2) Hold the end of front left shock absorber assembly lever with shock absorber nut remover (1), and then remove locking nut from front left shock absorber assembly with wrench (2).



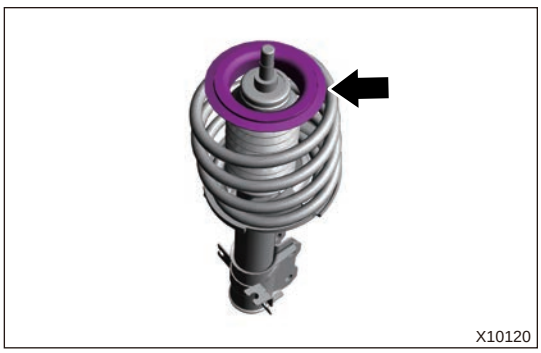
(3) Remove front strut upper connecting plate assembly (w/ insulator) from upper part of front left shock absorber assembly.



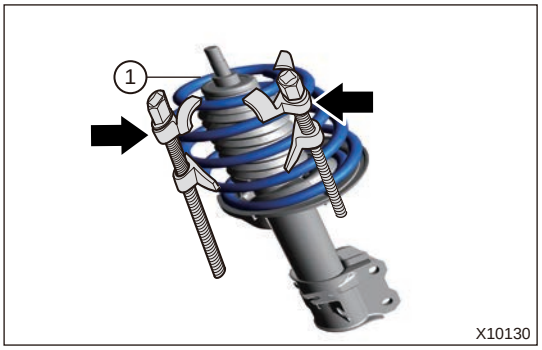
(4) Remove bearing assembly from upper part of front left shock absorber assembly.



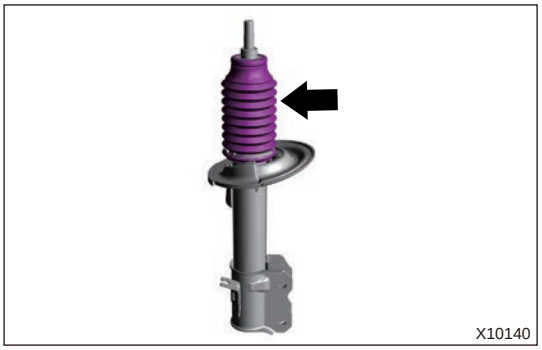
(5) Remove front spring upper cushion from upper part of front left shock absorber assembly.



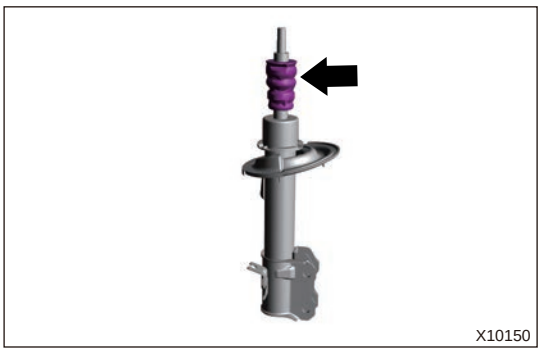
(6) Remove front coil spring (1) with spring compressor from front left shock absorber assembly.



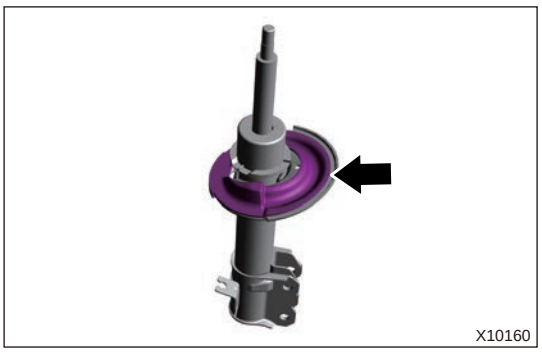
(7) Remove front dust boot from upper part of front left shock absorber assembly.



(8) Detach front buffer block from front left shock absorber assembly, and remove it.



(9) Remove front spring lower cushion from lower end of front left shock absorber assembly strut.



■ Assembly

⚠ Caution

- **Be sure to tighten bolt to specified torque.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**
- **Please note that opening of retainer must face opening of front wheel speed sensor, when installing front hub bearing retainer.**

(1) Install the front spring lower cushion.

(2) Install the front buffer block.
(3) Install the front dust boot.
(4) Install the front coil spring.
(5) Using spring compressor (1) and wrench (2), tighten the end lever of spring compressor to compress the front coil spring.
(6) Install the front spring upper cushion.
(7) Install the bearing assembly.
(8) Install the front strut upper connecting plate assembly (w/ insulator).
(9) Hold the end of front left shock absorber assembly lever with shock absorber nut remover (1), and then tighten locking nut to front left shock absorber assembly with wrench (2).

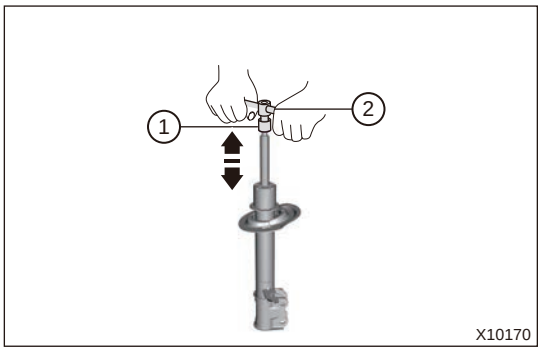
Torque: 70 ± 3 N·m

■ Inspection

(1) Check the front shock absorber assembly.

Manual inspection

1) Install the locking nut (1) to the upper end of front shock absorber assembly strut, and then install the T-wrench (2) or equivalent.



2) Compress and extend the front shock absorber assembly strut several times by hands in direction of arrow as shown in illustration. Check that there is no abnormal resistance or unusual sound during operation. If there is any abnormality, replace the front shock absorber assembly with a new one.

(2) Check the other components of front shock absorber assembly.
1) Check front shock absorber cover cap, front spring upper cushion, front dust boot, front buffer block and front spring lower cushion for cracks, wear or deformation. Replace it as necessary.
2) Check front strut upper connecting plate assembly (w/ insulator) and bearing assembly for damage. Replace it as necessary.
3) Check front coil spring for wear, cracks or deformation. Replace it as necessary.

(3) Check the front shock absorber spring.
1) Check front coil spring for wear, cracks or permanent deformation due to excessive use. Replace it as necessary.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Align dowel pin of top end connecting plate with body positioning hole when installing front left shock absorber assembly.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install front left shock absorber assembly to a proper position on vehicle body.
(2) Install 3 coupling bolts between front left shock absorber assembly and vehicle body.

Torque: 85 ± 6 N·m

(3) Install 2 coupling bolts and nuts between front left shock absorber assembly and front left steering knuckle assembly.

Torque: 200 ± 16 N·m

(4) Install front left brake hose assembly to clip of front left shock absorber assembly.

(5) Install front left wheel speed sensor wire harness to clip of front left shock absorber assembly.

(6) Install coupling nut between front left connecting rod assembly and front left shock absorber assembly.

Torque: 46 ± 2.5 N·m

(7) Install the front windshield lower support assembly.

(8) Install the front left wheel.

(9) Connect the negative battery cable.

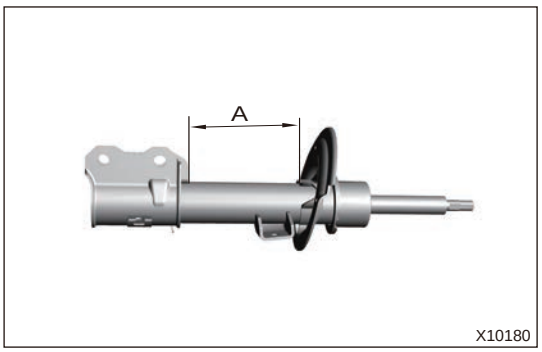
■ **Disposal**

⚠ Warning

- **Do not drill at high temperature and heat, and be sure to pay attention to safety!**
- **Shock absorber assembly contains nitrogen and oil, which are under high pressure. As hydraulic oil is explosive easily when exposed to heat, the surface is wet with water first before drilling or cutting.**
- **Be careful when drilling or cutting, because mental chips may fly about. Always perform operations with proper safety equipment to avoid personal injury.**
- **Before handling, be sure to wear goggles and release pressure inside shock absorber assembly to avoid personal injury.**

(1) Extend the front shock absorber assembly strut fully, and clamp it in a vise at an angle.

(2) Using a drill or equivalent, make a hole slowly at area A shown in the illustration, to discharge gas and hydraulic oil in the front shock absorber assembly.



(3) Handle front shock absorber assembly properly after discharging gas and hydraulic oil.

Hint:
Recycle disposed front shock absorber assembly according to local environmental regulations.

4.3 Replacement of Front Control Arm Assembly

■ **Removal**

Hint:

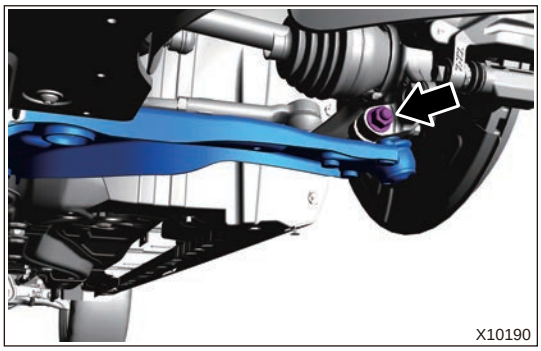
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

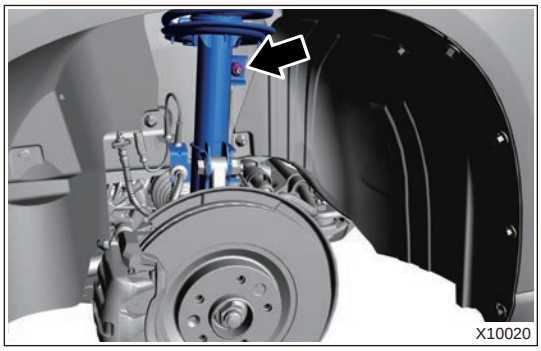
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left wheel.
(4) Remove the engine lower protector assembly.
(5) Remove the left side rail assembly.
(6) Remove coupling bolt and nut between front left control arm ball pin and front left steering knuckle.

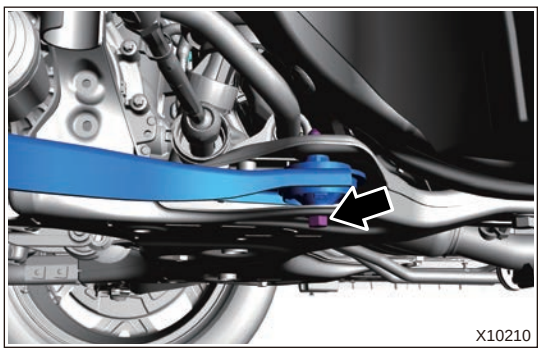
Hint:
If it is difficult to remove control arm ball pin end from steering knuckle, detach ball pin by striking the end of steering knuckle uniformly and slightly with a hammer or equivalent.


X10190

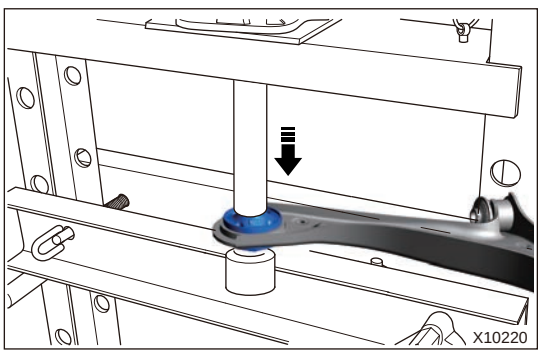
(7) Remove coupling bolt between front part of front left control arm assembly and front sub frame welding assembly.


X10020

(8) Remove coupling bolt between rear part of front left control arm assembly and front sub frame welding assembly.

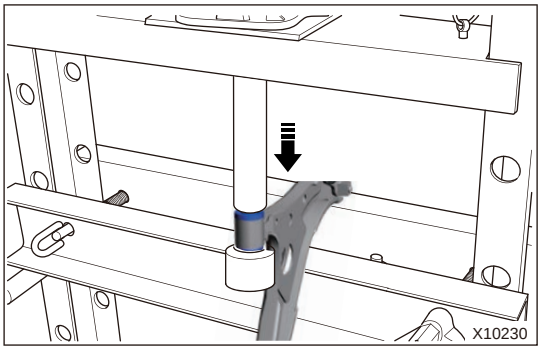

X10210

(9) Remove the front control arm front rubber bushing assembly.
1) Place the front control arm assembly on a hydraulic press, install front control arm remover and adapter, and press out and remove front control arm rear rubber bushing assembly with hydraulic press.


X10220

(10) Remove the front control arm rear rubber bushing assembly.

1) Place the front control arm assembly on a hydraulic press, install front control arm remover and adapter, and press out and remove front control arm rear rubber bushing assembly with hydraulic press.



■ **Installation**

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Make sure that ball pin assembly rotates smoothly without any sticking after installation.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Place the front control arm assembly on a hydraulic press, and install front control arm rear rubber bushing assembly with hydraulic press.

⚠ Caution

Before pressing in, apply grease on the outside of front control arm assembly rubber bushing to prevent control arm assembly rubber bushing from being damaged.

(2) Install coupling bolt between rear part of front left control arm assembly and front sub frame welding assembly.

Torque: 90 ± 90 N·m

(3) Install coupling bolt between front part of front left control arm assembly and front sub frame welding assembly.

Torque: 180 ± 12.6 N·m

(4) Install coupling bolt and nut between front left control arm ball pin and front left steering knuckle.

Torque: 95 ± 7.3 N·m

4.4 Replacement of Left Side Rail Assembly

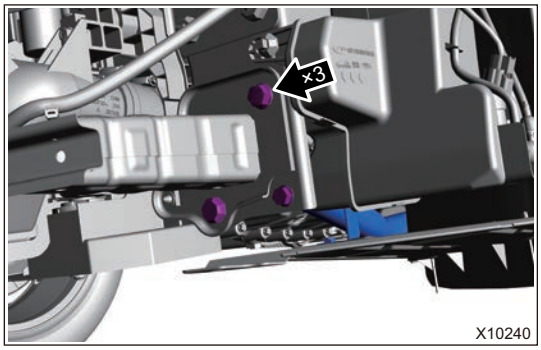
■ **Removal**

⚠ Warning

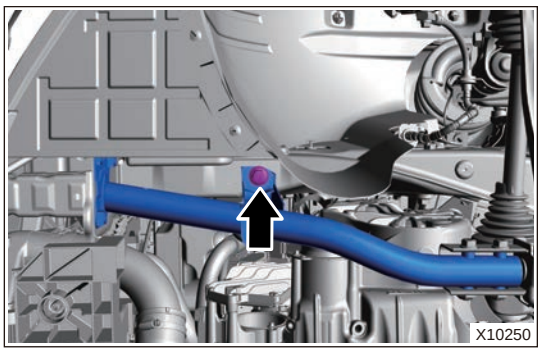
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine lower protector assembly.
(4) Remove the front bumper assembly.

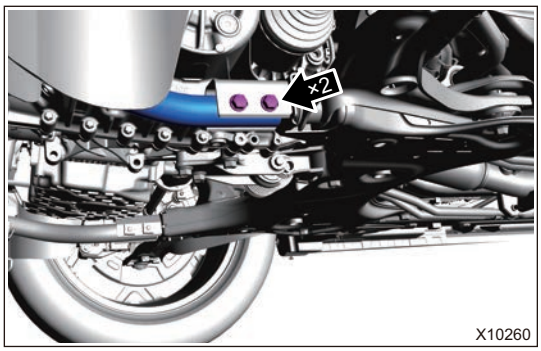
(5) Remove 3 fixing bolts from front end of left side rail assembly.



(6) Remove 1 fixing bolt between upper end of left side rail assembly and body.



(7) Remove 2 fixing bolts between left side rail assembly and front sub frame assembly.



(8) Remove the left welding side rail assembly.

■ Installation

(1) Install 2 fixing bolts between left side rail assembly and front sub frame assembly.

Torque: 55 ± 8.25 N·m

(2) Install 1 fixing bolt between upper end of left side rail assembly and body.

Torque: 110 ± 8 N·m

(3) Install 3 fixing bolts to front end of left side rail assembly.

Torque: 30 ± 4.5 N·m

(4) Install the front bumper assembly.

(5) Install the engine lower protector assembly.

(6) Connect the negative battery cable.

4.5 Replacement of Right Side Rail Assembly

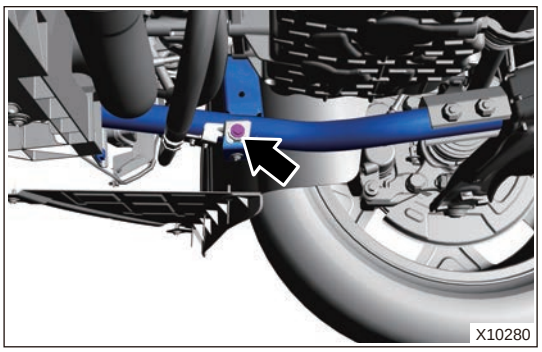
■ Removal

⚠ Warning

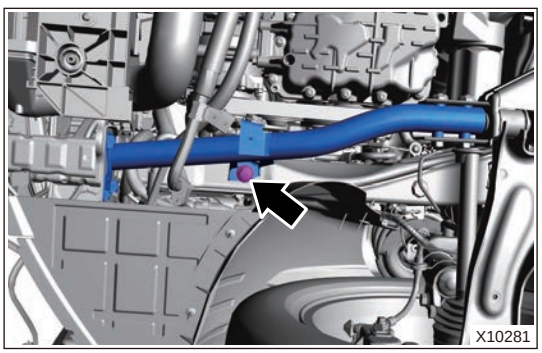
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine lower protector assembly.
(4) Remove the front bumper assembly.
(5) Remove 3 fixing bolts from front end of right side rail assembly.

(6) Remove 1 fixing bolt from evaporator to compressor line assembly.



(7) Remove 1 fixing bolt between upper end of right side rail assembly and body.



(8) Remove 2 fixing bolts and nuts between right side rail assembly and front sub frame assembly.

(9) Remove the left welding side rail assembly.

■ **Installation**

(1) Install 2 fixing bolts and nuts between right side rail assembly and front sub frame assembly.

Torque: 55 ± 8.25 N·m

(2) Install 1 fixing bolt between upper end of right side rail assembly and body.

Torque: 110 ± 8 N·m

(3) Install 1 fixing bolt to evaporator to compressor line assembly.

(4) Install 3 fixing bolts to front end of right side rail assembly.

Torque: 30 ± 4.5 N·m

(5) Install the front bumper assembly.

(6) Install the engine lower protector assembly.

(7) Connect the negative battery cable.

4.6 Replacement of Front Connecting Rod Assembly

■ **Removal**

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

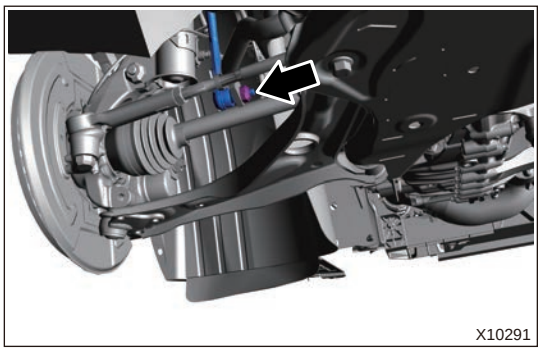
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

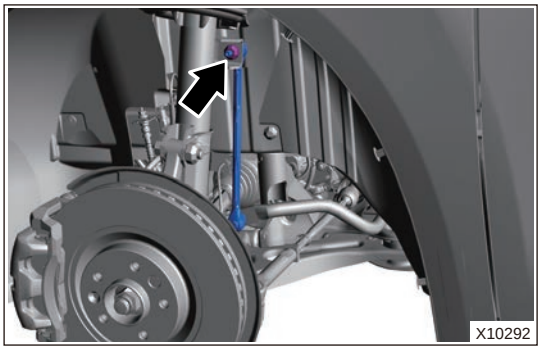
(2) Disconnect the negative battery cable.

(3) Remove the front left wheel.

(4) Remove coupling nut between front left stabilizer bar assembly and lower part of front left connecting rod assembly.



(5) Remove coupling nut between front left connecting rod assembly and upper part of front left shock absorber assembly, and remove front left connecting rod assembly.



■ **Inspection**

(1) Check front connecting rod assembly bushing for wear, cracks, deformation, damage or grease leakage. Replace it as necessary.

(2) Check if end of front connecting rod assembly rotates smoothly. Replace it as necessary.

■ **Installation**

(1) Install coupling nut between front left connecting rod assembly and lower part of front left shock absorber assembly.

Torque: 46 ± 2.5 N·m

(2) Install coupling nut between front left stabilizer bar assembly and upper part of front left connecting rod assembly.

Torque: 58 ± 4 N·m

(3) Install the front left wheel.

(4) Connect the negative battery cable.

4.7 Replacement of Front Stabilizer Bar Assembly

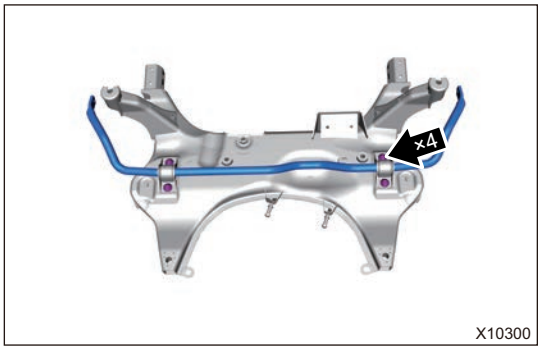
■ **Removal**

⚠ Warning

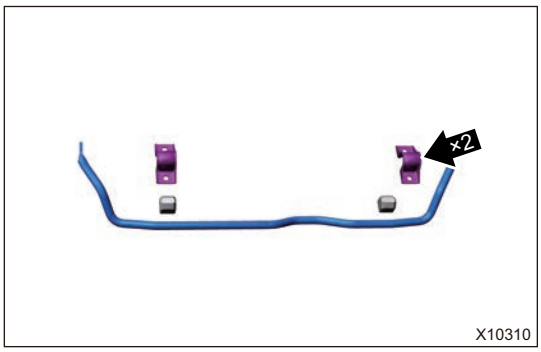
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front bumper assembly.
(4) Remove the front left wheel.
(5) Remove the front right wheel.
(6) Remove the engine lower protector assembly.
(7) Remove the left side rail assembly.
(8) Remove the right side rail assembly.
(9) Remove the front sub frame welding assembly.

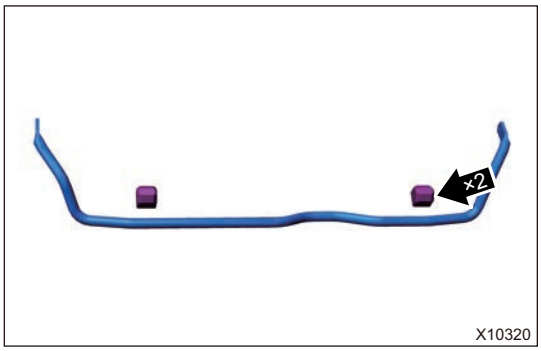
(10) Remove 4 fixing bolts between front stabilizer bar and sub frame.



(11) Detach left and right fixing clamps from front stabilizer bar assembly.



(12) Detach left and right rubber supports from front stabilizer bar assembly.



■ Inspection

(1) Check front stabilizer bar assembly fixing clamps for wear, cracks, deformation or damage. Replace it as necessary.

(2) Check front stabilizer bar assembly rubber supports for dirt, wear, cracks, deformation or damage. Replace it as necessary.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install left and right rubber supports to front stabilizer bar assembly.

(2) Install 2 fixing clamps between front stabilizer bar assembly and front sub frame assembly.

(3) Install 4 fixing bolts between front stabilizer bar and sub frame.

Torque: 80 ± 6 N·m

(4) Install the front sub frame welding assembly.

(5) Install the right side rail assembly.

(6) Install the left side rail assembly.

(7) Install the engine lower protector assembly.

(8) Install the front wheels.

(9) Install the front bumper assembly.

(10) Connect the negative battery cable.

4.8 Replacement of Front Steering Knuckle

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

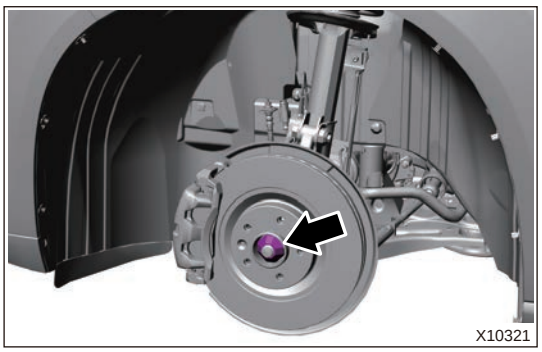
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the front left wheel.

(4) Remove fixing nut from front left drive shaft.

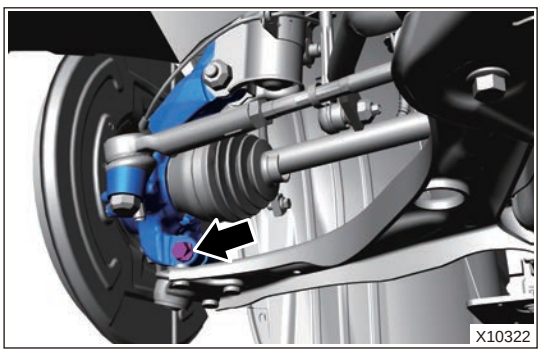

X10321

⚠ Caution

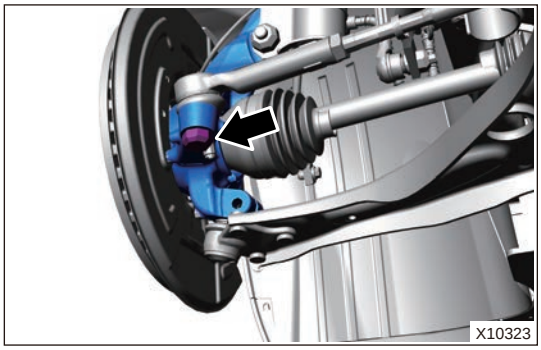
Loosen staked part of nut completely, otherwise it will damage threads of drive shaft assembly.

(5) Remove the front left brake caliper assembly.

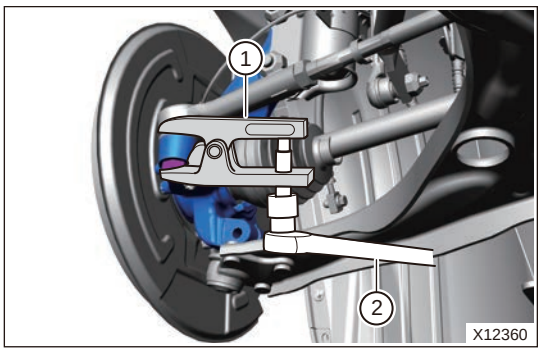
(6) Remove fixing bolt and nut between front left control arm assembly ball pin and front left steering knuckle assembly.


X10322

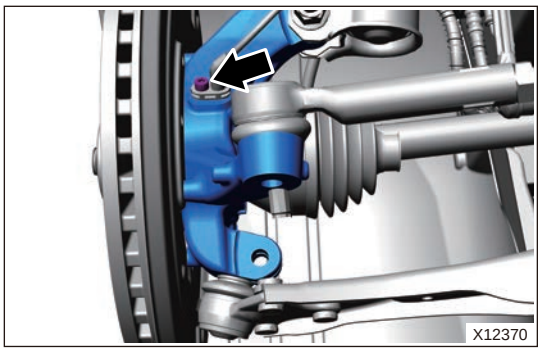
(7) Remove fixing nut between left steering tie rod outer ball pin assembly and front left steering knuckle assembly.



(8) Install ball pin separator (1), and tighten ball pin separator bolt with wrench (2) to separate steering tie rod ball pin from steering knuckle assembly.



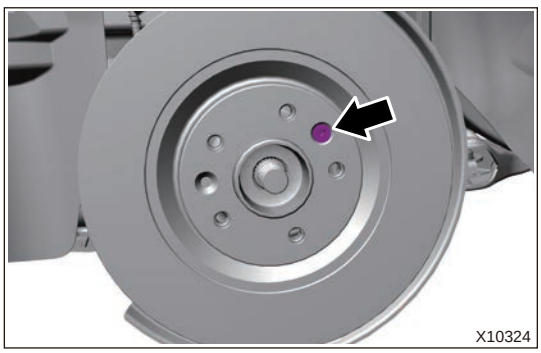
(9) Remove fixing bolt between front left wheel speed sensor and front left steering knuckle assembly, and disengage the front left wheel speed sensor carefully.



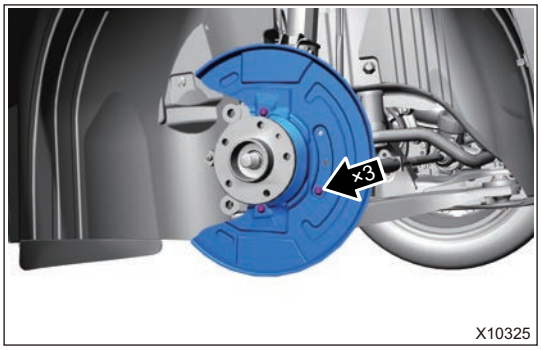
⚠ Caution

Keep head and installation hole of sensor free of foreign matter.

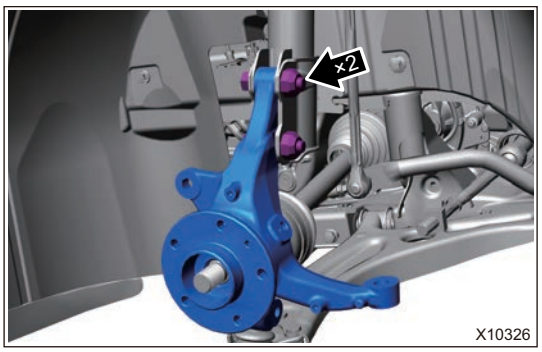
(10) Remove 1 fixing screw and front left brake disc.



(11) Remove 3 fixing bolts between front left dust guard and front left steering knuckle assembly, and remove the front left dust guard.



(12) Remove 2 coupling bolts and nuts between front left shock absorber assembly and front left steering knuckle assembly.



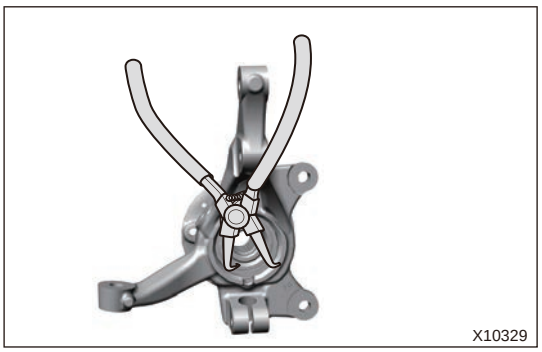
(13) Disengage the left drive shaft and remove the front left steering knuckle assembly.

■ **Disassembly**

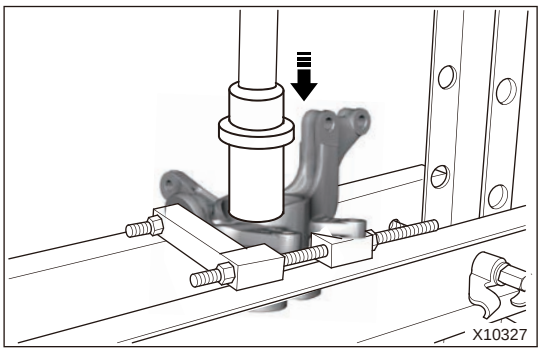
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when disassembling the front steering knuckle assembly, front hub, front hub bearing.**
- **Appropriate force should be applied, when disassembling front steering knuckle assembly, front hub, front hub bearing. Be careful not to operate roughly.**

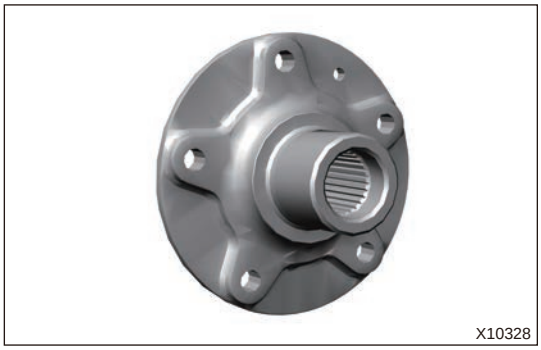
(1) Remove the front hub bearing retainer.



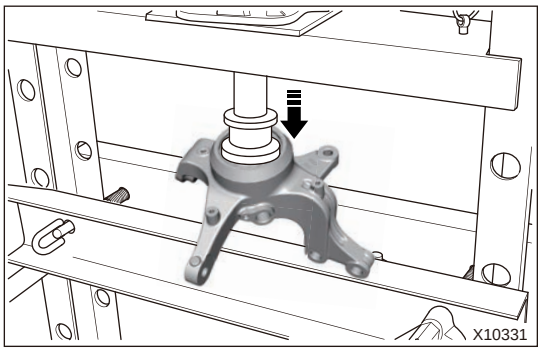
(2) Place front steering knuckle assembly on a hydraulic press, install bearing remover and adapter, and press out front hub with hydraulic press.



(3) Remove the front hub carefully.



(4) Place steering knuckle assembly on a hydraulic press, install bearing remover and adapter, and press out front hub bearing with hydraulic press.



(5) Remove the front hub bearing carefully.

■ **Inspection**

(1) Check front steering knuckle for wear, cracks, deformation or damage. Replace it as necessary.

(2) Check dust guard for dirt, wear, cracks, deformation or damage. Replace it as necessary.

■ **Assembly**

(1) Place steering knuckle assembly on a hydraulic press, install bearing remover and adapter, and carefully press front hub bearing into steering knuckle with hydraulic press.

(2) Install the front hub bearing retainer.

(3) Place steering knuckle assembly on a hydraulic press, install bearing remover and adapter, and carefully press front hub into steering knuckle with hydraulic press.

■ **Installation**

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check that hub assembly rotates smoothly without any sticking after installation.**
- **Check wheel alignment after installation. Adjust wheel alignment to the standard range as necessary.**

(1) Align drive shaft accurately into front hub bearing of steering knuckle.

(2) Install coupling nut between front left connecting rod assembly and lower part of front left shock absorber assembly.

Torque: 200 ± 16 N·m

(3) Install 3 fixing bolts between front left dust guard and front left steering knuckle assembly.

Torque: 7.5 ± 1 N·m

(4) Install front left brake disc, and install 1 fixing screw.

Torque: 7.5 ± 1 N·m

(5) Install fixing bolt between front left wheel speed sensor and front left steering knuckle assembly.

Torque: 8 ± 1.2 N·m

(6) Install fixing bolt and nut between front left control arm assembly ball pin and front left steering knuckle assembly.

Torque: 95 ± 7.3 N·m

(7) Install fixing nut between left steering tie rod outer ball pin assembly and front left steering knuckle assembly.

Torque: 60 ± 5 N·m

(8) Install the front left brake caliper assembly.

(9) Install fixing nut to front left drive shaft.

Torque: 286 ± 23 N·m

(10) Install the front left wheel.

(11) Connect the negative battery cable.

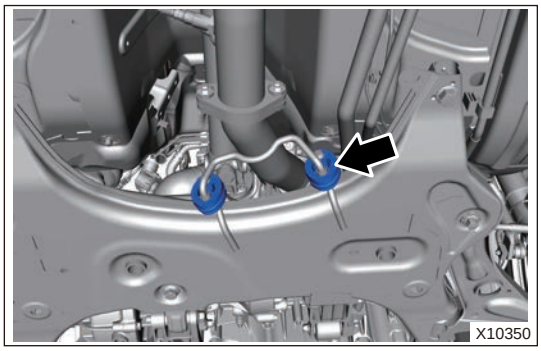
4.9 Replacement of Front Sub Frame Welding Assembly

■ **Removal**

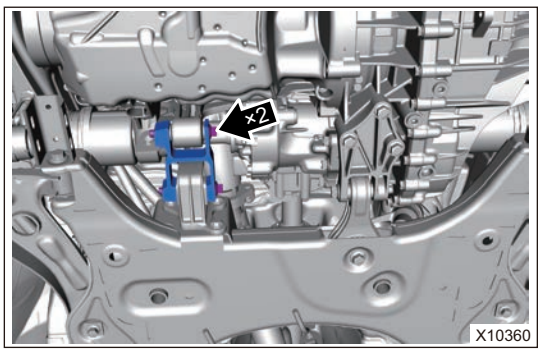
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**
- **When removing front sub frame welding assembly, it is necessary to securely support engine and transmission assembly with engine equalizer to avoid damage.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front wheel.
(4) Remove the engine lower protector assembly.
(5) Remove the left side rail assembly.
(6) Remove the right side rail assembly.
(7) Remove the front left control arm assembly.
(8) Remove the front right control arm assembly.
(9) Using an engine equalizer, support engine and transmission assembly securely.
(10) Detach the precatalytic converter hanger block.

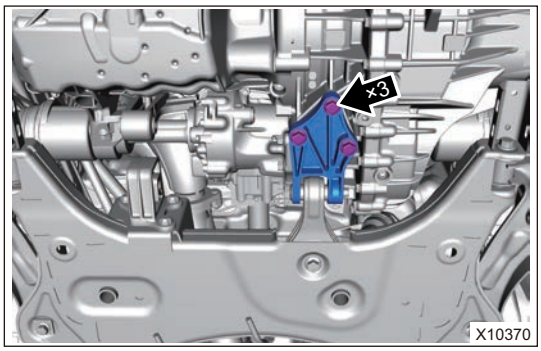

X10350

(11) Remove 2 coupling bolts from rear right mounting.



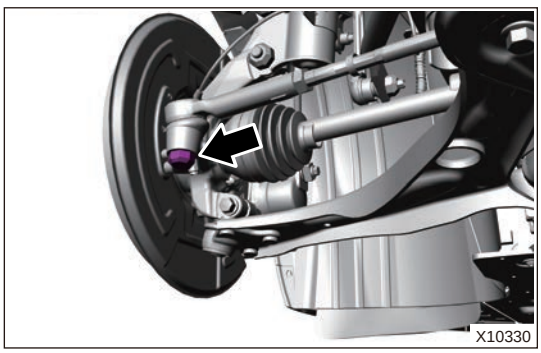
X10360

(12) Remove 3 fixing bolts from rear mounting.



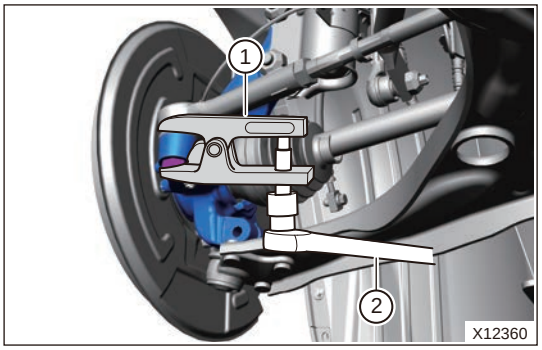
X10370

(13) Remove fixing nut between left steering tie rod outer ball pin assembly and front left steering knuckle assembly.


X10330

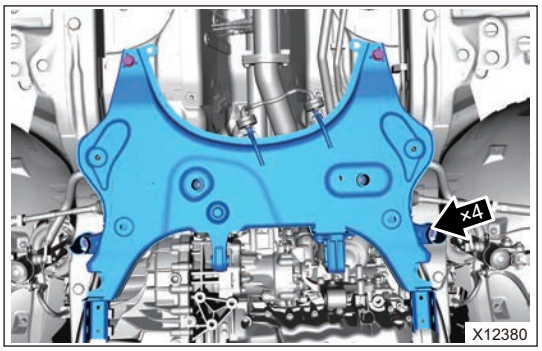
(14) Install ball pin separator (1), and tighten ball pin separator bolt with wrench (2) to separate steering tie rod outer ball pin from steering knuckle assembly. The removal method of right tie rod outer ball pin is the same as that of left side.

Hint:
If it is difficult to remove tie rod outer ball pin end from steering knuckle, detach ball pin by striking the end of steering knuckle uniformly and slightly with a hammer or equivalent.



(15) Remove coupling bolt between steering column assembly and steering gear, separate steering column from steering gear.

(16) Remove 4 fixing bolts between front sub frame and vehicle body.



(17) Slowly lower the sub frame welding assembly with stabilizer bar.

(18) Remove the steering gear assembly.

(19) Remove the stabilizer bar assembly.

(20) Remove the front sub frame assembly.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install stabilizer bar assembly to front sub frame.

(2) Install steering gear assembly to front sub frame.

(3) Install sub frame welding assembly with stabilizer bar to transmission carrier, and raise it to a proper position.

(4) Install 2 fixing bolts between right side of front sub frame and vehicle body.

Front mounting bolt torque between sub frame and body: 110 ± 8 N·m

Rear mounting bolt torque between sub frame and body: 200 ± 18 N·m

(5) Install 2 fixing bolts between left side of front sub frame and vehicle body.

Front mounting bolt torque between sub frame and body: 110 ± 8 N·m

Rear mounting bolt torque between sub frame and body: 200 ± 18 N·m

(6) Install coupling bolt between steering column assembly and steering gear.

Torque: 40 ± 3 N·m

(7) Install fixing nut between left steering tie rod outer ball pin assembly and front left steering knuckle assembly.

Torque: 60 ± 5 N·m

(8) Install the rear mounting assembly.
(9) Install the rear right mounting assembly.
(10) Install the precatalytic converter hanger block.
(11) Install the front right control arm assembly.
(12) Install the front left control arm assembly.
(13) Install the left side rail assembly.
(14) Install the right side rail assembly.
(15) Install the engine lower protector assembly.
(16) Install the front wheel.
(17) Connect the negative battery cable.

6.2 REAR SUSPENSION

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Be sure to wear necessary safety equipment to prevent accidents.

(2) Check if safety lock of lifter is locked when repairing chassis parts.

(3) It is not allowed to weld or modify suspension loading parts and guide parts.

(4) When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Be sure to tighten coupling bolts and nuts to specified torques.

(2) Align the protrusion of rear coil spring lower cushion with the positioning hole of rear lower control arm during installation.

(3) Before assembling the control arm assembly, apply grease on the outside of control arm assembly rubber bushing to prevent control arm assembly rubber bushing from being damaged.

(4) Due to rubber bushing deformation, false torque may be exist on tightened bolt, so it is necessary to retighten the tightened bolt.

(5) After installation, lower vehicle and bounce vehicle up and down several times to stabilize rear suspension.

(6) Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.

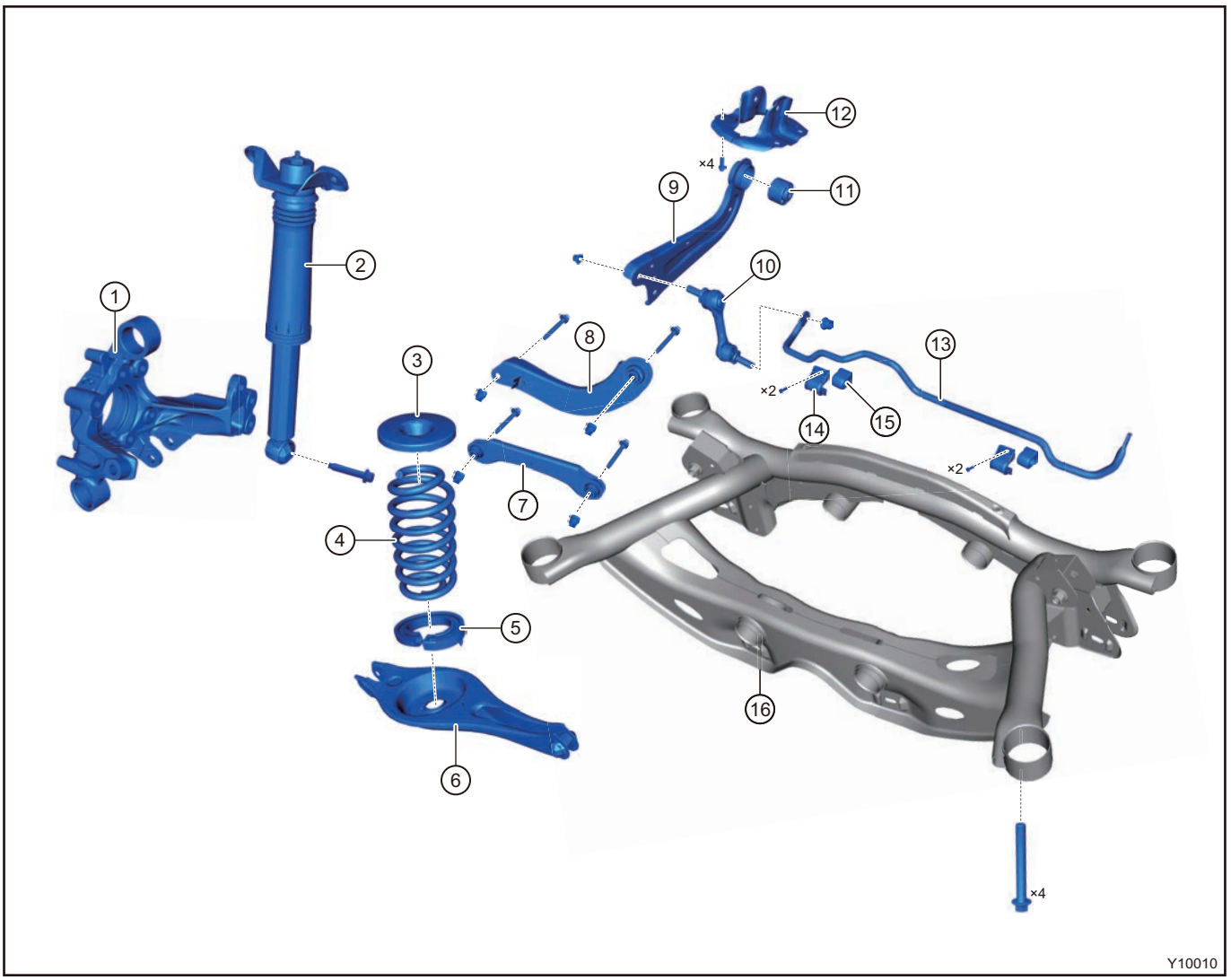
(7) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Description

Rear suspension of this model uses multi-link independent suspension (height is non-adjustable), which is equipped with lateral stabilizer, cylindrical coil spring and double action telescopic shock absorber.

2.2 System Components Diagram



1	Rear Left Steering Knuckle	9	Rear Right Trailing Arm Welding Assembly
2	Rear Shock Absorber Device	10	Rear Connecting Rod Assembly
3	Upper Coil Spring Cushion Assembly	11	Trailing Arm Bushing Assembly
4	Rear Coil Spring Assembly	12	Trailing Arm Mounting Bracket Assembly
5	Lower Coil Spring Cushion Assembly	13	Rear Stabilizer Bar
6	Rear Lower Control Arm Welding Assembly	14	Rear Stabilizer Bar Clamp
7	Pull Rod Welding Assembly	15	Stabilizer Bar Bushing
8	Rear Upper Control Arm Welding Assembly	16	Rear Sub Frame Assembly

2.3 Components Operation Description

■ Rear Control Arm Welding Assembly

As a guide and power transmission element for suspension system of vehicle, control arm transmits various power acting on wheels to vehicle body and keeps wheels moving in a certain trail. Control arm elastically connects wheels and vehicle body together with ball joint or bushing.


Y10011

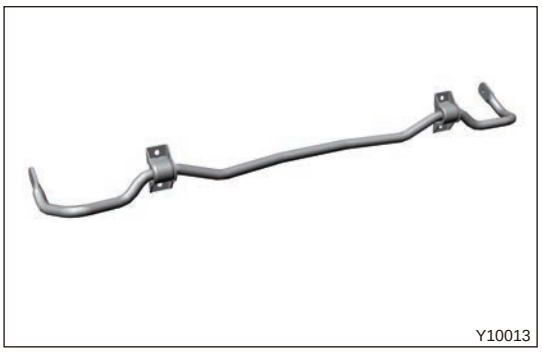
■ Rear Shock Absorber Assembly

It filters and eliminates vibration from roads to improve driving stability and bring people a sense of comfort and stability.


Y10012

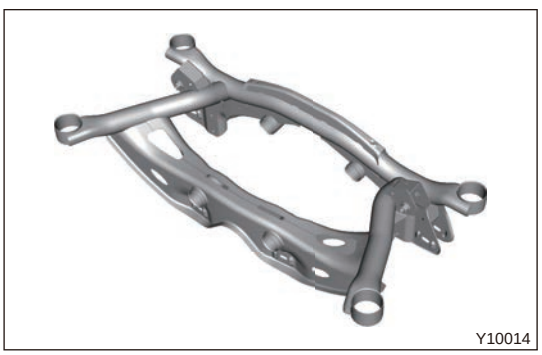
■ Rear Stabilizer Bar

Lateral stabilizer bar functions to prevent excessive lateral incline while vehicle is turning and keeps vehicle body in balance as much as possible. It aims to reduce lateral incline level of vehicle and improve smoothness. When vehicle is turning, vehicle body inclines and suspension on both sides have inconsistent bounce. The outer suspension will press against stabilizer bar to twist it, then elastic force from bar body will prevent wheel from lifting, so that vehicle body can be kept in balance as much as possible, thus realizing the lateral stability function.


Y10013

■ Rear Sub Frame Assembly

Sub frame can reduce impact on vehicle body due to road shock and enhance connection rigid of suspension system and improve driving comfort and stability, making a strong and compact chassis during driving. It bears the deformation conditions such as loaded bend, longitudinal torsion, lateral bend and horizontal lozenging, etc. in place of vehicle body, which improves torsion resistance ability of vehicle body. Also, the force will be directly applied on it in a collision to improve vehicle safety performance.


Y10014

3 Diagnosis & Testing

3.1 Problem Symptoms Table

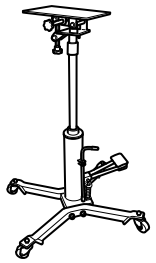
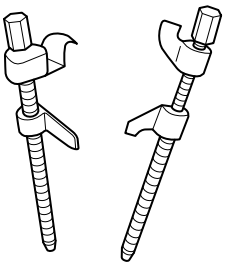
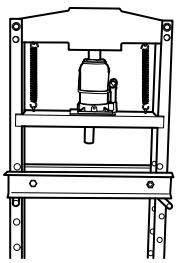
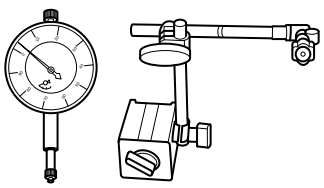
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Pulls	Tire (worn or improperly inflated)
	Rear wheel alignment (incorrect)
	Rear hub bearing (excessively worn)
	Rear suspension components (worn or deformed)
	Steering gear (misaligned or damaged)
	Suspension component (worn)
Droop	Vehicle (overloaded)
	Rear coil spring (too soft)
	Rear shock absorber assembly (worn or damaged)
	Rear suspension components (excessively worn or deformed)
	Rear tire (improperly inflated)
	Rear wheel alignment (incorrect)
Sways/pitches	Rear tire (worn or improperly inflated)
	Rear stabilizer bar assembly (bent or broken)
	Rear shock absorber assembly (worn or damaged)
Rear wheel shimmy	Rear tire (worn or improperly inflated)
	Rear wheel (out of balance)
	Rear shock absorber assembly (worn or damaged)
	Rear wheel alignment (incorrect)
	Rear hub bearing (excessively worn)

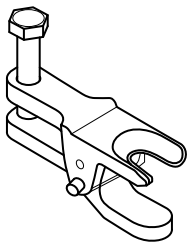
4 Removal & Installation

4.1 Tools

■ General Tools

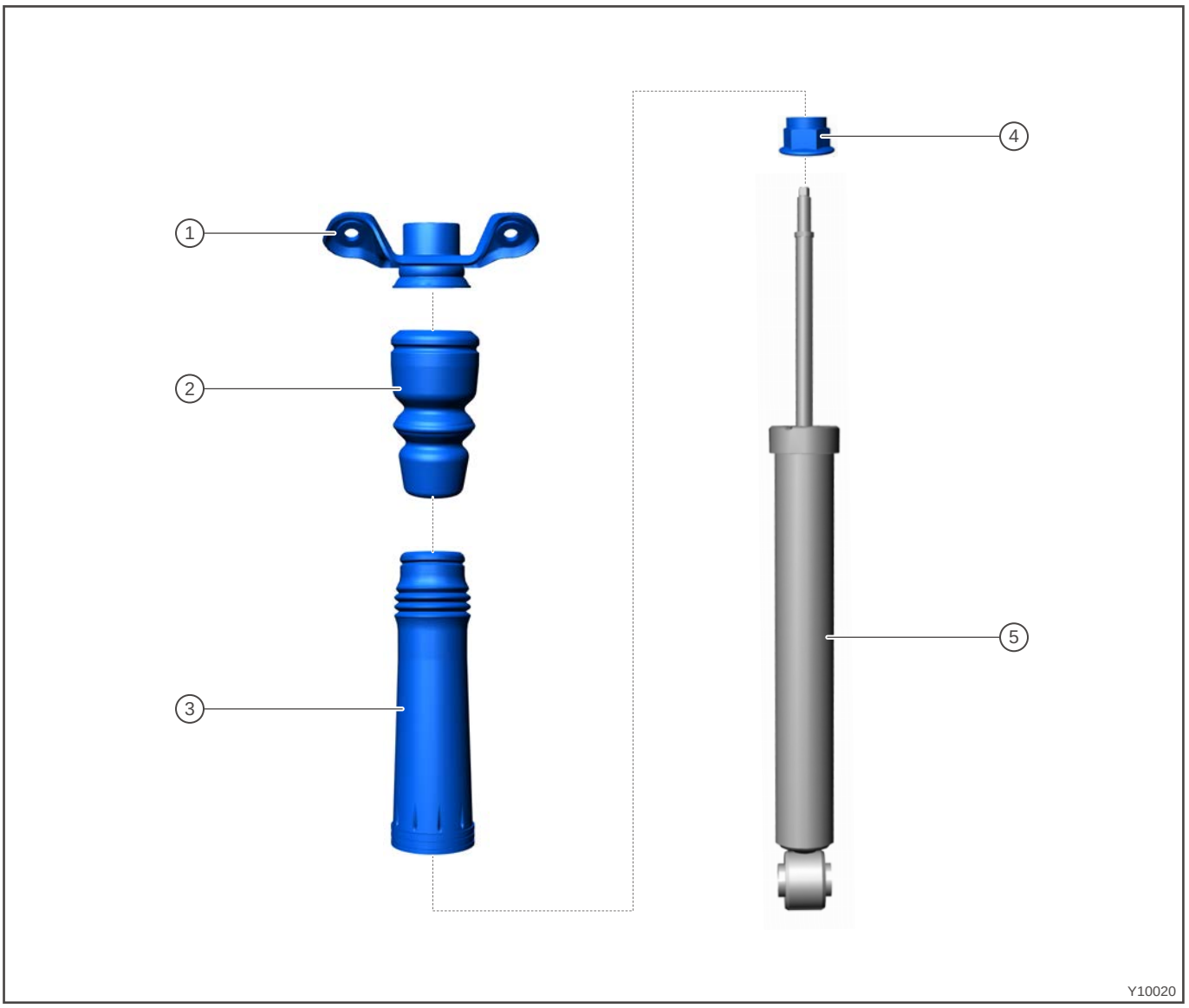
Tool Name	Tool Drawing
Transmission Carrier	 S00004
Spring Compressor	 S00016
Hydraulic Press	 S00010
Dial Indicator and Magnetic Holder	 S00018

■ **Special Tool**

Tool Name	Part No.	Tool Drawing
Tie Rod Ball Remover	ECH-0002	 S00019

4.2 Replacement of Rear Shock Absorber Assembly

■ **Description**



1	Rear Shock Absorber Upper Connecting Plate Assembly	4	Hexagon Flange Nut
2	Rear Buffer Block Assembly	5	Rear Shock Absorber Assembly
3	Rear Shock Absorber Dust Boot		

■ On-vehicle Inspection

Rear Shock Absorber Assembly Inspection

(1) Park vehicle on level ground, and bounce vehicle up and down, then check if vehicle shakes up and down when body bounds. If vehicle shakes up and down consecutively, shock absorber assembly may be damaged and should be replaced.

(1) As shock absorber assembly operates frequently during vehicle driving, oil gas is formed due to temperature rise of shock absorber, which then adheres to dust boot. This is a normal phenomenon, and it is not necessary to replace the shock absorber assembly.

(2) If following conditions occur:

- Oil traces in circumferential direction are uneven;
- Oil traces reach lower connecting positions.

Above conditions indicate that there may be a leakage in shock absorber assembly, and it is necessary to replace the shock absorber assembly.

(3) If it is difficult to accurately judge if shock absorber assembly leaks from appearance. Perform road test after wiping off oil on the surface of malfunctioning shock absorber. Under normal road conditions, drive vehicle for 5 to 10 minutes and perform inspection. If there are oil traces on the surface of shock absorber assembly, it indicates that oil leakage exists, and it is necessary to replace the shock absorber assembly.

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Caution

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Make sure that safety lock of lifter has been locked, when removing and installing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing and installing chassis parts, replace self-locking nuts and rusted nuts for safety.**

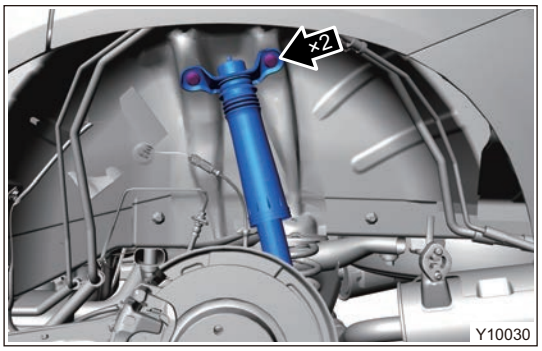
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

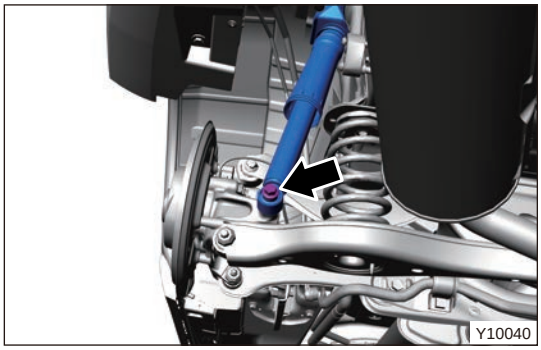
(3) Remove the rear left wheel.

(4) Remove the rear left wheel house protector.

(5) Remove 2 coupling bolts between upper part of rear left shock absorber assembly and body.



(6) Remove coupling bolt between lower part of rear left shock absorber assembly and rear left steering knuckle assembly.



(7) Remove the rear left shock absorber assembly.

■ Disassembly

Hint:

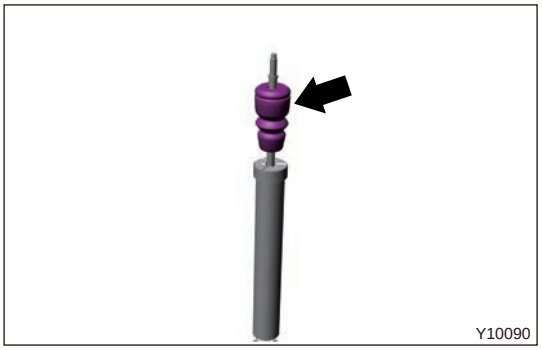
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

(1) Remove fixing nut from rear left shock absorber assembly.

(2) Remove the rear left shock absorber upper connecting plate assembly.

(3) Remove the rear dust boot.

(4) Remove the rear buffer block.



■ Assembly

(1) Install the rear buffer block.

(2) Install the rear dust cover.

(3) Install the rear left shock absorber upper connecting plate assembly.

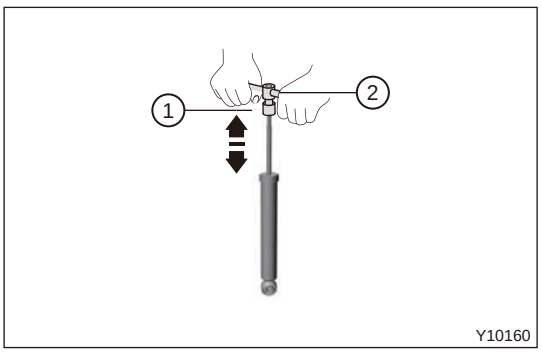
(4) Install fixing nut to rear left shock absorber assembly.

■ Inspection

(1) Check the front shock absorber assembly.

Manual inspection

1) Install the locking nut (1) to the upper end of front shock absorber assembly strut, and then install the T-wrench (2) or equivalent.



2) Compress and extend the front shock absorber assembly strut several times by hands in direction of arrow as shown in illustration. Check that there is no abnormal resistance or unusual sound during operation. If there is any abnormality, replace the front shock absorber assembly with a new one.

(2) Check the other components of front shock absorber assembly.

1) Check front shock absorber cover cap, front spring upper cushion, front dust boot, front buffer block and front spring lower cushion for cracks, wear or deformation. Replace it as necessary.

2) Check front coil spring for wear, cracks or deformation. Replace it as necessary.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Bounce vehicle up and down several times to stabilize rear suspension after installation.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install coupling bolt between lower part of rear left shock absorber assembly and rear left steering knuckle assembly.

Torque: 160 ± 12 N·m

(2) Install 2 coupling bolts between upper part of rear left shock absorber assembly and body.

Torque: 95 ± 6.7 N·m

(3) Install the rear left wheel house protector.

(4) Install the rear left wheel.

(5) Connect the negative battery cable.

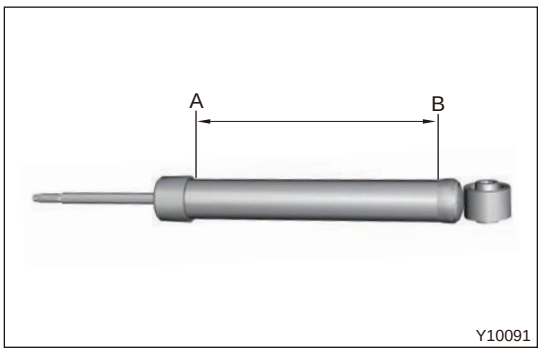
■ **Disposal**

⚠ Warning

- **Do not drill at high temperature and heat, and be sure to pay attention to safety!**
- **Shock absorber assembly contains nitrogen and oil, which are under high pressure. As hydraulic oil is explosive easily when exposed to heat, the surface is wet with water first before drilling or cutting.**
- **Be careful when drilling or cutting, because mental chips may fly about. Always perform operations with proper safety equipment to avoid personal injury.**
- **Before handling, be sure to wear goggles and release pressure inside shock absorber assembly to avoid personal injury.**

(1) Extend the rear shock absorber assembly strut fully.

(2) Using a drill, make a hole between A and B in the strut as shown in the illustration, to discharge gas from rear shock absorber assembly and hydraulic oil.



(3) After discharging gas and hydraulic oil from rear shock absorber assembly, handle the rear shock absorber assembly properly.

Hint:
Recycle disposed rear shock absorber assembly according to local environmental regulations.

4.3 Replacement of Rear Coil Spring

■ **Removal**

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

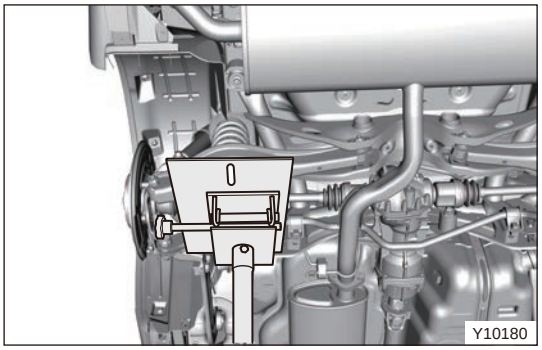
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

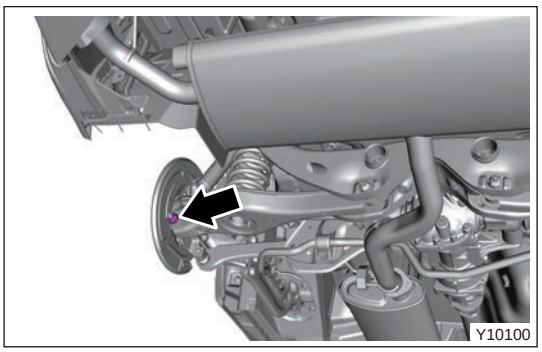
(2) Disconnect the negative battery cable.

(3) Remove the rear wheel.

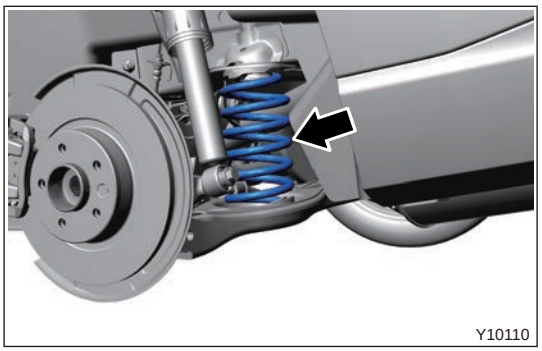
(4) Support the rear lower control arm assembly with a transmission carrier securely.



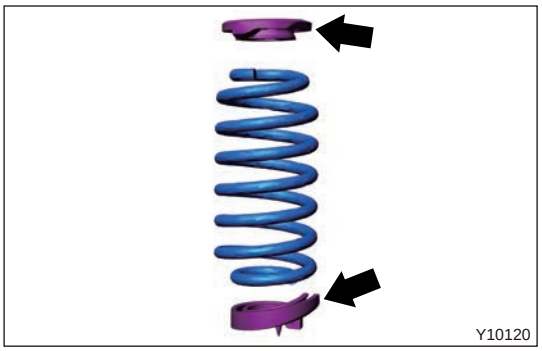
(5) Remove coupling bolt and nut between rear lower control arm assembly and rear steering knuckle assembly.



(6) Lower the transmission carrier slowly to an appropriate height and remove the rear coil spring carefully.



(7) Remove the rear coil spring upper and lower cushions.



■ Inspection

(1) Check rear coil spring for wear, cracks or permanent deformation due to excessive use. Replace it as necessary.

(2) Check rear coil spring upper cushion and lower cushion for dirty, wear, cracks, deformation or damage. Replace it as necessary.

(3) Check the free length of rear coil spring.

■ **Installation**

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Align the protrusion of rear coil spring lower cushion with the positioning hole of rear lower control arm during installation.**
- **After installation, lower vehicle and bounce vehicle up and down several times to stabilize rear suspension.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install the rear coil spring upper and lower cushions.

(2) Install coil spring and use transmission carrier to lift rear lower control arm to a proper height.

(3) Install coupling bolt and nut between rear lower control arm assembly and rear steering knuckle assembly.

Torque: 165 ± 12.4 N·m

(4) Slowly lower the transmission carrier and remove it.

(5) Install the rear wheel.

(6) Connect the negative battery cable.

4.4 Replacement of Rear Upper Control Arm Assembly

■ **Removal**

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

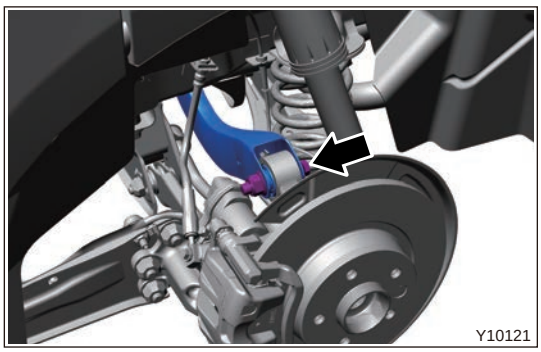
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

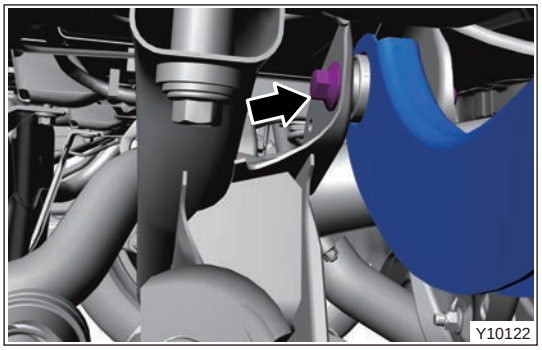
(2) Disconnect the negative battery cable.

(3) Remove the rear wheel.

(4) Remove coupling bolt and nut between rear upper control arm assembly and rear steering knuckle assembly.

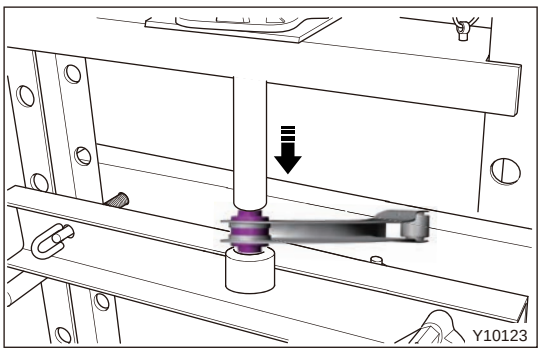


(5) Remove coupling bolt between rear upper control arm assembly and rear sub frame welding assembly.



(6) Remove the rear upper control arm assembly.

(7) Place the rear upper control arm assembly on a hydraulic press, cooperate with tools, and press out rear upper control arm assembly rubber bushing with hydraulic press.



■ **Installation**

⚠ Caution
• **Be sure to tighten coupling bolts and nuts to specified torques.** • **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Place the rear upper control arm assembly on a hydraulic press, cooperate with tools, and press control arm assembly rubber bushing into rear upper control arm with hydraulic press.

⚠ Caution
Before pressing in, apply grease on the outside of control arm assembly rubber bushing to prevent control arm assembly rubber bushing from being damaged.

(2) Install coupling bolt between rear upper control arm assembly and rear sub frame welding assembly.

Torque: 160 ± 12 N·m

(3) Install coupling bolt and nut between rear upper control arm assembly and rear steering knuckle assembly.

Torque: 160 ± 12 N·m

(4) Install the rear wheel.

(5) Connect the negative battery cable.

4.5 Replacement of Rear Lower Control Arm Assembly

■ **Removal**

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

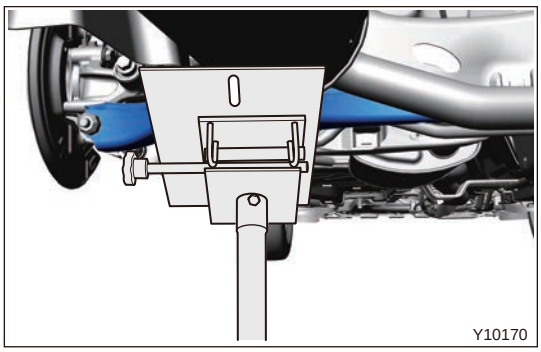
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

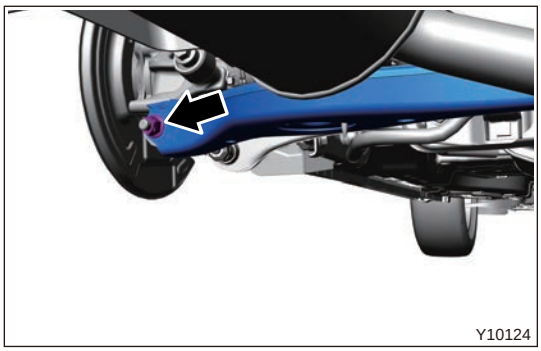
(2) Disconnect the negative battery cable.

(3) Remove the rear wheel.

(4) Support the rear lower control arm assembly with a transmission carrier securely.

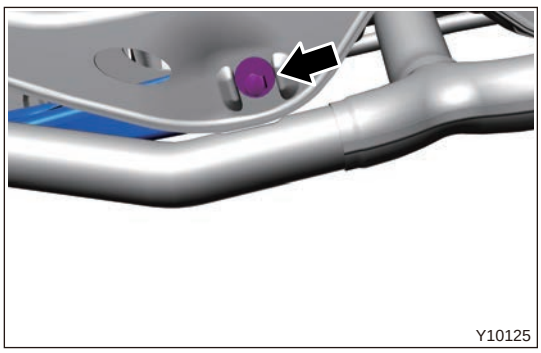


(5) Remove coupling bolt and nut between rear lower control arm assembly and rear steering knuckle assembly.



(6) Lower the transmission carrier slowly to a proper height and remove rear coil spring, rear coil spring upper cushion and rear coil spring lower cushion carefully.

(7) Remove coupling bolt, nut and adjusting shim between rear lower control arm assembly and rear sub frame welding assembly.



(8) Remove the rear lower control arm assembly.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install coupling bolt, nut and adjusting shim between rear lower control arm assembly and rear sub frame welding assembly.

Torque: 130 ± 13.5 N·m

(2) Install rear coil spring, rear coil spring upper and lower cushions and use transmission carrier to lift rear lower control arm to a proper height.

(3) Install coupling bolt and nut between rear lower control arm assembly and rear steering knuckle assembly.

Torque: 165 ± 12.4 N·m

(4) Slowly lower the transmission carrier.

(5) Install the rear wheel.

(6) Connect the negative battery cable.

4.6 Replacement of Rear Trailing Arm Assembly

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

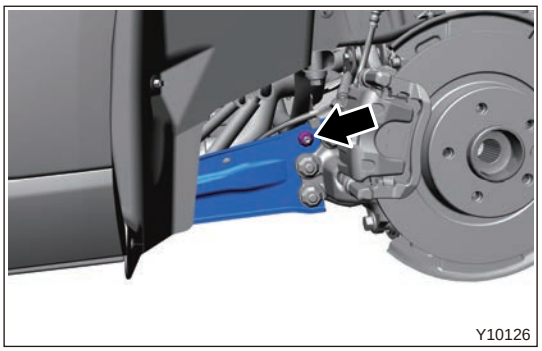
- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

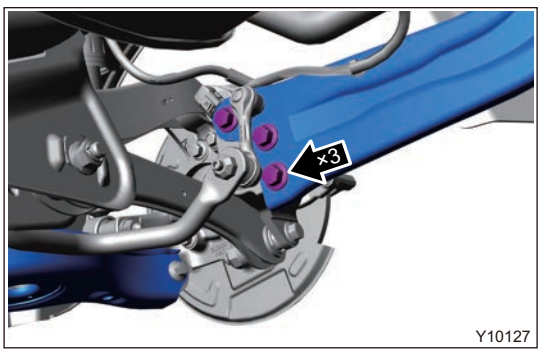
(2) Disconnect the negative battery cable.

(3) Remove the rear wheel.

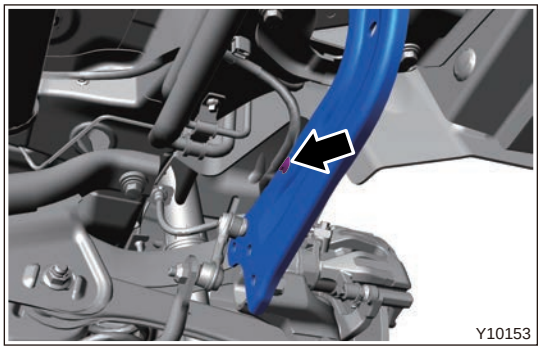
(4) Remove coupling nut between rear connecting rod assembly and rear trailing arm assembly, and disengage rear connecting rod assembly.



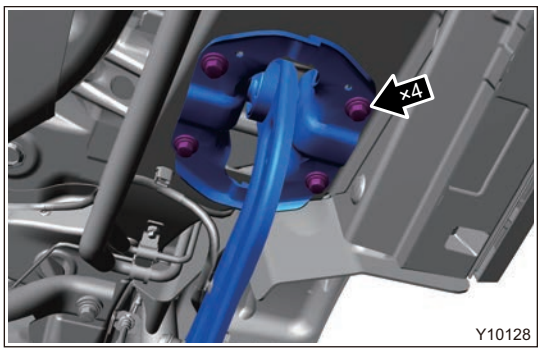
(5) Remove 3 coupling bolts between rear steering knuckle assembly and rear trailing arm assembly.



(6) Remove the wire harness clip.



(7) Remove 4 coupling bolts between rear trailing arm assembly mounting bracket and body.



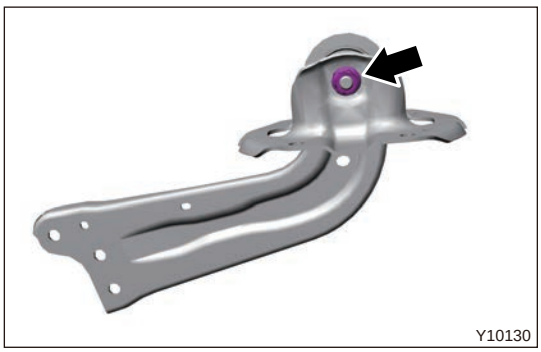
(8) Remove the rear trailing arm assembly (w/ mounting bracket).

■ Disassembly

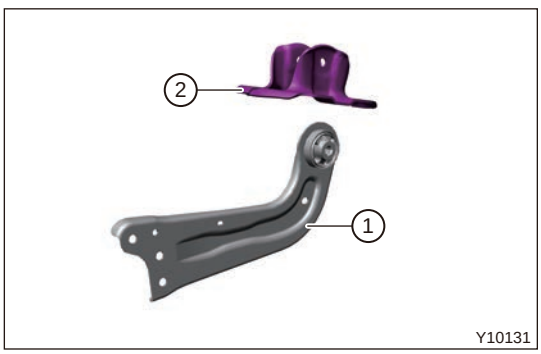
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

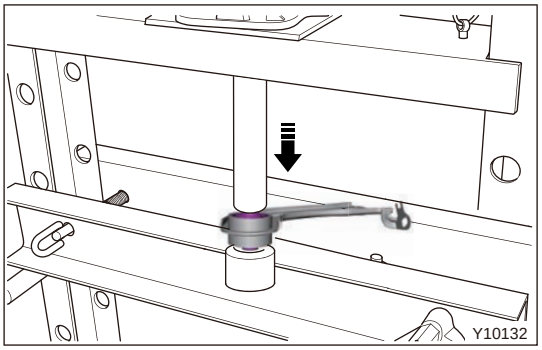
(1) Remove coupling bolt and nut between rear trailing arm assembly and mounting bracket.



(2) Separate rear trailing arm assembly (1) from mounting bracket (2).



(3) Place the rear trailing arm assembly on a hydraulic press, and press out rear trailing arm assembly rubber bushing with hydraulic press.



■ **Assembly**

(1) Place the rear trailing arm assembly on a hydraulic press, cooperate with tools, and press rear trailing arm assembly rubber bushing into rear trailing arm assembly with hydraulic press.

⚠ Caution

Before pressing in, apply grease on the outside of trailing arm assembly rubber bushing to prevent it from damage.

(2) Install coupling bolt and nut between rear trailing arm assembly and mounting bracket.

■ **Installation**

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install 4 coupling bolts between rear trailing arm assembly mounting bracket and body.

Torque: 65 ± 5.5 N·m

(2) Install the wire harness clip.

(3) Install 3 coupling bolts between rear steering knuckle assembly and rear trailing arm assembly.

Torque: 200 ± 15 N·m

(4) Install coupling nut between rear connecting rod assembly and rear trailing arm assembly.

Torque: 55 ± 4.1 N·m

(5) Install the rear wheel.

(6) Connect the negative battery cable.

4.7 Replacement of Rear Pull Rod Assembly

■ **Removal**

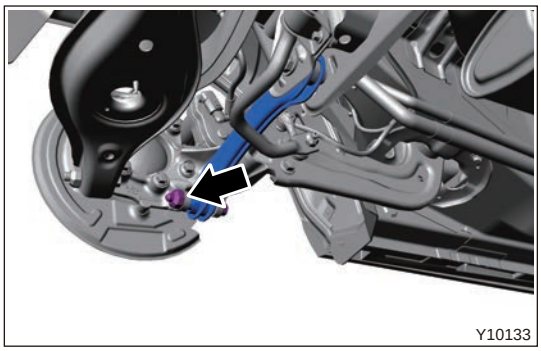
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

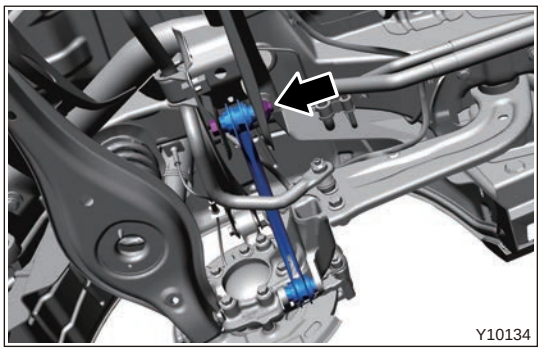
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

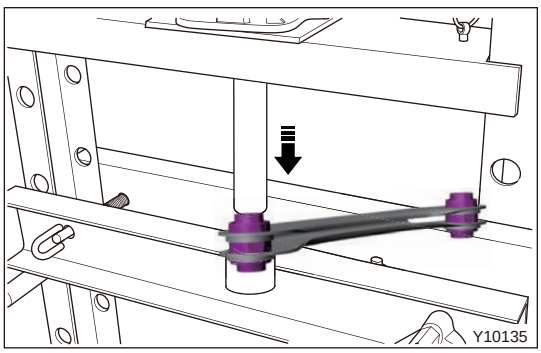
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear wheel.
(4) Remove coupling bolt and nut between rear pull rod assembly and rear steering knuckle assembly.



(5) Remove coupling bolt and nut between rear pull rod assembly and rear sub frame welding assembly.



(6) Remove the rear pull rod assembly.
(7) Place the rear pull rod assembly on a hydraulic press, and press out rear pull rod assembly rubber bushing with hydraulic press.



■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**

(1) Place the rear pull rod assembly on a hydraulic press, cooperate with tools, and press rear pull rod assembly rubber bushing into rear pull rod assembly with hydraulic press.

⚠ Caution

Before pressing in, apply grease on the outside of rear pull rod assembly rubber bushing to prevent it from damage.

(2) Install coupling bolt and nut between rear pull rod assembly and rear sub frame welding assembly.
(3) Install coupling bolt and nut between rear pull rod assembly and rear steering knuckle assembly.
(4) Install the rear wheel.
(5) Connect the negative battery cable.

4.8 Replacement of Rear Stabilizer Bar Assembly

■ Removal

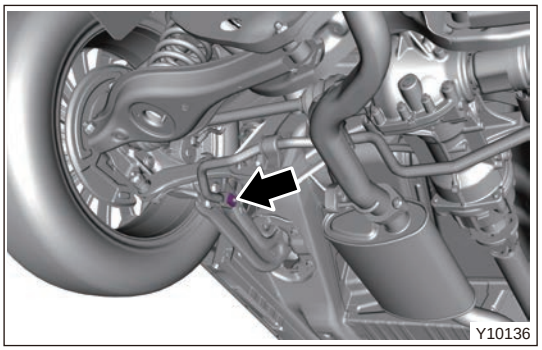
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

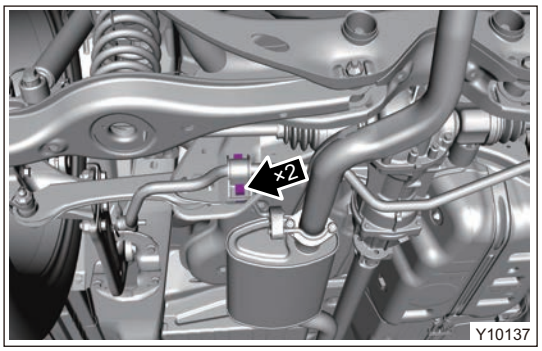
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove coupling nut between rear left connecting rod assembly and rear stabilizer bar assembly. Use same removal procedure for right side.

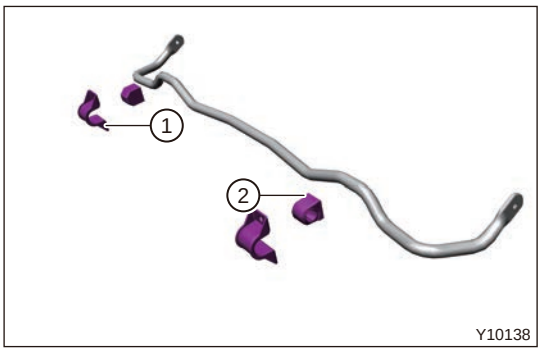


(4) Remove 2 coupling bolts between rear stabilizer bar assembly and rear sub frame welding assembly. Use same removal procedure for right side.



(5) Remove the rear stabilizer bar assembly.

(6) Remove rear stabilizer bar fixing clamp (1) and rear stabilizer bar rubber support (2) from rear stabilizer bar assembly.



■ Inspection

(1) Check rear stabilizer bar assembly fixing clamps for wear, cracks, deformation or damage. Replace it as necessary.

(2) Check rear stabilizer bar assembly rubber supports for dirt, wear, cracks, deformation or damage. Replace it as necessary.

■ **Installation**

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check wheel alignment after installation. Adjust wheel alignment to the standard range as necessary.**

(1) Install rear stabilizer bar fixing clamp (1) and rear stabilizer bar rubber support (2).

(2) Install 2 coupling bolts between rear stabilizer bar assembly and rear sub frame welding assembly. Use same installation procedure for right side.

⚠ Caution

Due to rubber bushing deformation, false torque may be exist on tightened bolt, so it is necessary to retighten the tightened bolt.

Torque: 45 ± 4 N·m

(3) Place rear connecting rod shield on rear connecting rod, install coupling nut between rear left connecting rod assembly and rear stabilizer bar assembly. Use same installation procedure for right side.

Torque: 55 ± 4.1 N·m

(4) Connect the negative battery cable.

4.9 Replacement of Rear Connecting Rod Assembly

■ **Removal**

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

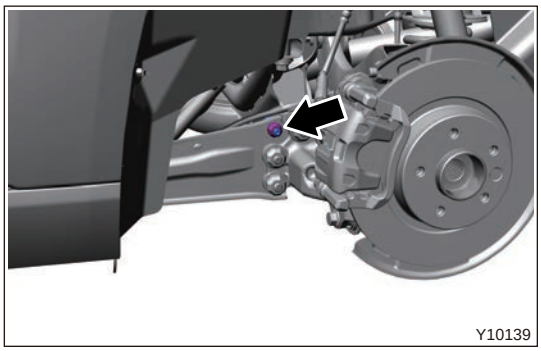
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

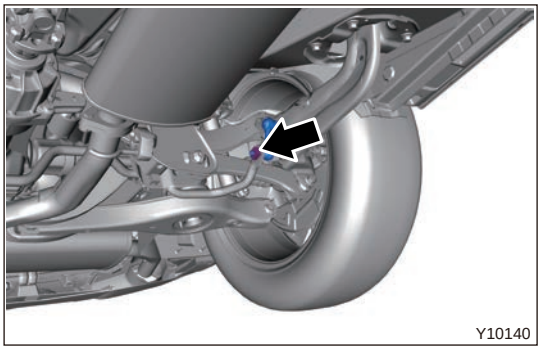
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove coupling nut between rear connecting rod assembly and rear trailing arm assembly, and disengage rear connecting rod assembly.



(4) Remove coupling nut between rear connecting rod assembly and rear stabilizer bar assembly, and remove rear connecting rod assembly.



■ **Inspection**

(1) Check rear connecting rod assembly bush for wear, cracks, deformation, damage or grease leakage. Replace it as necessary.

(2) Check if end of rear connecting rod assembly rotates smoothly. Replace it as necessary.

■ **Installation**

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Make sure that end of rear connecting rod assembly rotates smoothly without any sticking after installation.**

(1) Install coupling nut between rear connecting rod assembly and rear stabilizer bar assembly.

Torque: 55 ± 4.1 N·m

(2) Install coupling nut between rear connecting rod assembly and rear trailing arm assembly.

Torque: 55 ± 4.1 N·m

(3) Connect the negative battery cable.

4.10 Replacement of Rear Hub Bearing Assembly

■ **On-vehicle Inspection**

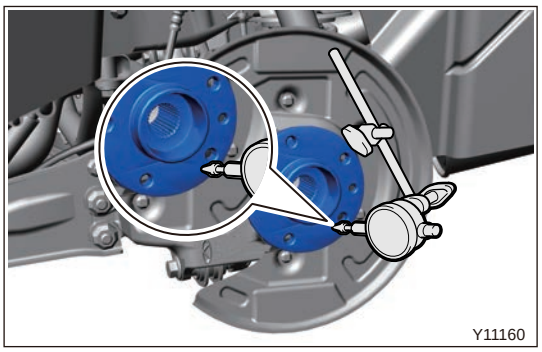
(1) Remove the rear wheel.

(2) Remove the rear brake caliper assembly.

(3) Remove the rear brake disc.

(4) Check the rear hub bearing looseness.

1) Check looseness near center of the rear hub bearing with a dial indicator.

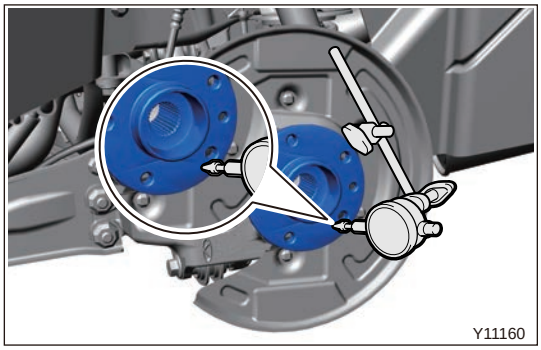


⚠ Caution

- **Ensure that dial indicator is perpendicular to measurement surface.**
- **If looseness exceeds maximum value, replace the rear hub bearing assembly.**

(5) Check the rear hub bearing runout.

1) Check runout of the rear hub bearing assembly surface with a dial indicator.



⚠ Caution

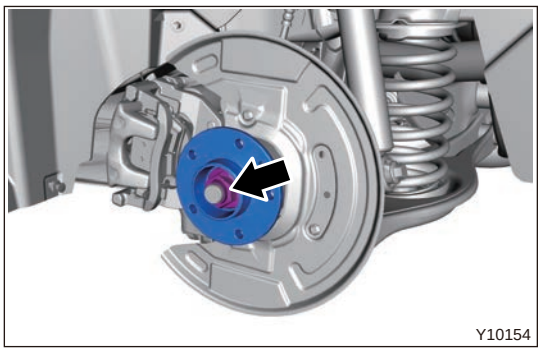
- **Ensure that dial indicator is perpendicular to measurement surface.**
- **If looseness exceeds maximum value, replace the rear hub bearing assembly.**

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear left wheel.
(4) Remove the rear left brake caliper assembly.
(5) Remove the rear left brake disc.
(6) Remove locking nut from rear left drive shaft.



(7) Remove the rear hub bearing.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Check wheel alignment after installation. Adjust wheel alignment to the standard range as necessary.**

(1) Install locking nut to rear left drive shaft.

Torque: 286 ± 23 N·m

(2) Install the rear left brake disc.
(3) Install the rear brake caliper assembly.
(4) Install the rear left wheel.
(5) Connect the negative battery cable.

4.11 Replacement of Rear Steering Knuckle

■ Removal

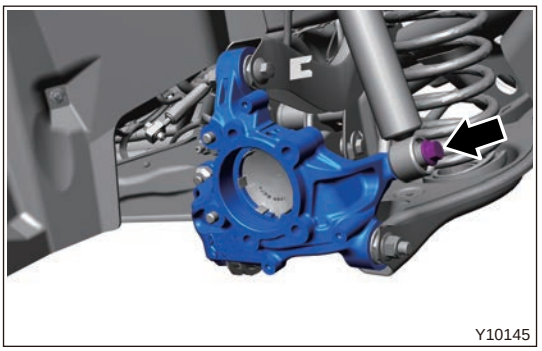
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

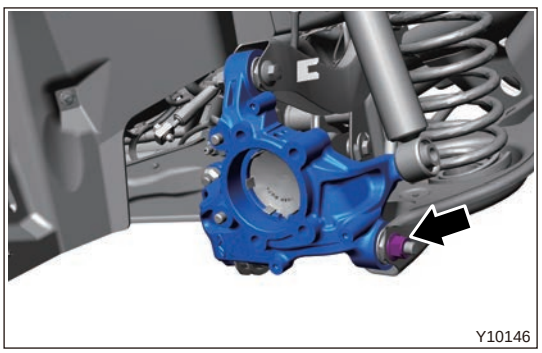
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify suspension loading parts and guide parts.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear wheel.
(4) Remove the rear brake caliper assembly.
(5) Remove the rear brake disc.
(6) Remove the rear dust guard.
(7) Remove the rear wheel speed sensor.
(8) Remove the rear hub bearing.
(9) Remove coupling bolt between rear shock absorber assembly and rear steering knuckle assembly.


Y10145

(10) Remove coupling bolt and nut between rear lower control arm assembly and rear steering knuckle assembly.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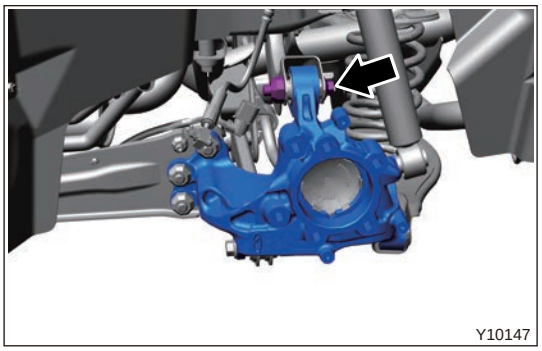
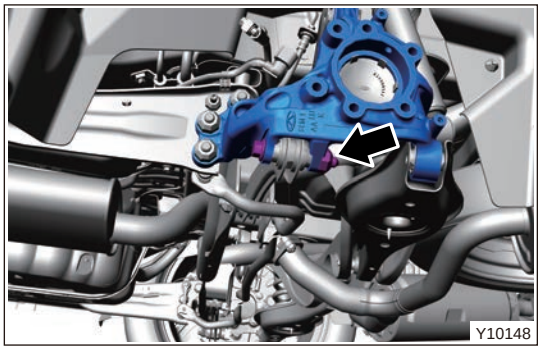
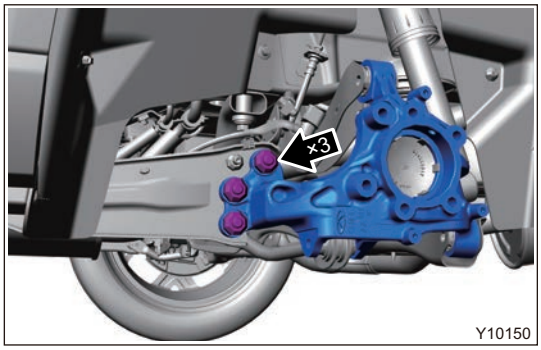
(11) Remove coupling bolt and nut between rear upper control arm assembly and rear steering knuckle assembly.


Y10147

(12) Remove coupling bolt and nut between pull rod assembly and rear steering knuckle assembly.



(13) Remove 3 coupling bolts between rear steering knuckle assembly and rear trailing arm assembly.



(14) Remove the rear steering knuckle assembly.

■ Installation

⚠ Caution

- **Be sure to tighten bolt to specified torque.**
- **Check wheel alignment after installation. Adjust wheel alignment to the standard range as necessary.**

(1) Install 3 coupling bolts between rear steering knuckle assembly and rear trailing arm assembly.

Torque: 200 ± 15 N·m

(2) Install coupling bolt and nut between pull rod assembly and rear steering knuckle assembly.

(3) Install coupling bolt and nut between rear upper control arm assembly and rear steering knuckle assembly.

Torque: 160 ± 12 N·m

(4) Install coupling bolt and nut between rear lower control arm assembly and rear steering knuckle assembly.

Torque: 165 ± 12.4 N·m

(5) Install coupling bolt between rear shock absorber assembly and rear steering knuckle assembly.

Torque: 95 ± 7.3 N·m

(6) Install the rear hub bearing.

(7) Install the rear wheel speed sensor.

(8) Install the rear dust guard.

(9) Install the rear brake disc.

(10) Install the rear brake caliper assembly.

(11) Install the rear wheel.

(12) Connect the negative battery cable.

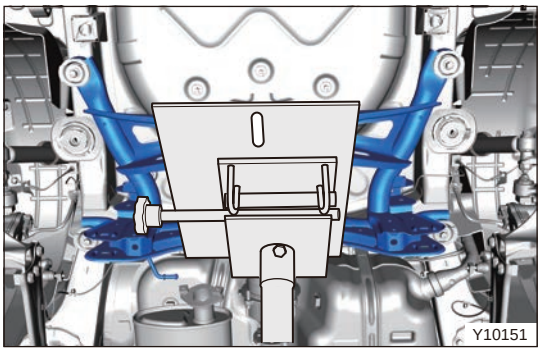
4.12 Replacement of Rear Sub Frame Welding Assembly

■ Removal

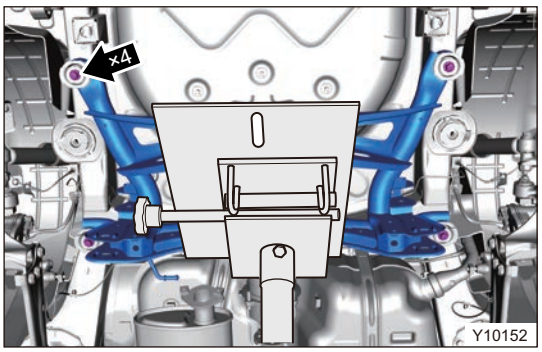
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents.**
- **Check if safety lock of lifter is locked when repairing chassis parts.**
- **It is not allowed to weld or modify bearing parts of wheel suspension and guide parts of wheel.**
- **When removing chassis parts, be sure to replace self-locking nuts and rusted nuts for safety.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear wheel.
(4) Remove the rear brake caliper assembly.
(5) Remove the rear brake disc.
(6) Remove the rear hub shaft assembly.
(7) Remove the rear steering knuckle assembly.
(8) Remove the rear lower control arm assembly.
(9) Remove the rear pull rod assembly.
(10) Remove the rear stabilizer bar assembly.
(11) Remove the rear drive shaft assembly.
(12) Remove the rear final drive assembly.
(13) Install transmission carrier to support rear sub frame assembly.



(14) Remove 4 coupling bolts between rear sub frame assembly and body.



(15) Remove the rear sub frame assembly.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torques.**
- **Bounce vehicle up and down several times to stabilize rear suspension after installation.**
- **Check wheel alignment after installation is completed. Adjust wheel alignment to standard range as necessary.**

(1) Install transmission carrier to lift rear sub frame to a proper height.
(2) Install 4 coupling bolts between rear sub frame assembly and body.

Torque: 95 ± 7.1 N·m

(3) Install the rear stabilizer bar assembly.
(4) Install the pull rod assembly.
(5) Install the rear lower control arm assembly.
(6) Install the rear steering knuckle assembly.
(7) Install the rear hub shaft assembly.
(8) Install the rear brake disc.
(9) Install the rear brake caliper assembly.
(10) Install the rear wheel.
(11) Connect the negative battery cable.

6.3 FOUR-WHEEL ALIGNMENT

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to perform wheel alignment procedures according to operating instructions of four-wheel alignment device.

(2) Periodic maintenance and service for four-wheel alignment device should be performed.

(3) After four-wheel alignment, it is necessary to recalibrate center calibration.

(4) After four-wheel alignment, it is necessary to calibrate the zero point of SAM steering angle and the motor position sensor inside EPS module.

2 System Overview

2.1 System Description

Installation of four wheels, steering mechanism, front and rear axles should have a certain relative position, and this relative position is a standard value set by manufacturer. This mounting position is adjusted and restored by wheel alignment.
In general, wheel alignment has the following 6 parameters:

(1) Check front wheel camber.

(2) Check front wheel toe-in.

(3) Check kingpin caster.

(4) Check kingpin inclination.

(5) Check rear wheel camber.

(6) Check rear wheel toe-in.

3 Parameter Operation Description

3.1 System Function Introduction

Front wheel alignment includes kingpin caster, kingpin inclination, front wheel camber and front wheel toe-in. Rear wheel alignment includes wheel camber and each rear wheel toe-in. In this way, front wheel alignment and rear wheel alignment are called wheel alignment, which is often called four-wheel alignment. Wheel alignment functions to keep vehicle driving in stable straight line and light steering, and reduce wear of tires and steering gear parts during driving.

3.2 Kingpin Caster

Looking at wheel from side, steering kingpin (the center of rotation when the wheel turns) tilts backward, which is called kingpin caster. After setting kingpin caster, there is a distance (called kingpin caster distance, which has the same principle with that of front wheel cross beam of bicycle tilting backward) between ground point of kingpin center line and ground projection point of wheel center. The ground point of wheel is located at rear end of extension line of steering kingpin, and wheel is pulled backward by rolling resistance during driving, so that the direction of wheel is naturally toward driving direction. Setting a large kingpin caster can improve straight line driving performance, and kingpin caster distance is also increased. If kingpin caster distance is too large, steering wheel will be heavy and wheel bumps will be increased due to road interference.

3.3 Kingpin Inclination

When looking at the tire from front and rear direction of vehicle, kingpin is inclined toward the inside of vehicle body. This angle is called kingpin inclination. When wheel turns around kingpin, the lowest point of wheel will fall below road surface, but in fact, the lower edge of wheel cannot fall below road surface. Instead, the steering vehicle wheel and entire front of vehicle are lifted up to a corresponding height. The gravity of vehicle has effect of returning steering vehicle wheels to original middle position, so steering wheel is easy to reset.

In addition, kingpin inclination also reduces the distance between intersection of kingpin and road to intersection of wheel center plane and ground, thereby reducing driver's force on steering wheel during steering, making steering easier and reducing the impact force transmitted from steering vehicle wheel to steering wheel. However, kingpin inclination should not be too large, otherwise it will accelerate tire wear.

3.4 Front Wheel Camber

When looking at wheel from front and rear direction, tires are not installed vertically, but slightly tilted to show an "八" shape, which is called negative camber, and when it is tilted in opposite direction, it is called positive camber. In heyday of using bias tires, camber was set to be relatively large because it made it easier to operate the steering wheel by tilting the tires to the ground. Vehicle generally sets camber to be very small, close to vertical. The use of flat radial tires for automobiles continues to grow in popularity. Due to characteristics of radial tires (large rigid tire tread pattern and wide outer tread), setting a large camber will cause tire to wear out and reduce tire friction. Also, due to continuous use of power steering mechanism, camber has been continuously reduced. Nevertheless, setting a small camber can apply appropriate lateral thrust to wheel bearings on axle.

3.5 Front Wheel Toe-in

Four-wheel alignment toe value
Toe-in, the so-called "pigeon toe", refers to the front left and front right wheels being pointed inward respectively. The purpose of adopting this structure is to correct outward rotation of wheel caused by front wheel camber. As mentioned above, due to camber, the steering wheel operation becomes more easy. On the other hand, due to the tilt of wheels, front left and front right wheels rotate to outside respectively. To correct this problem, the left and right wheels have an inward angle, thus left and right wheels can keep moving in a straight line and reducing tire wear.

4 Specifications (parameters standard for four-wheel alignment)

Items		Specified Value
Front Wheel	Front Wheel Camber	-30′ ±30′
	Kingpin Caster	6°43′ ±45′
	Kingpin Inclination	13°54′ ±45′
	Front Wheel Toe-in	8′ ±6′
Rear Wheel	Rear Wheel Camber	-1°11′ ±30′
	Rear Wheel Toe-in	10′ ±6′

5 DIAGNOSIS INFORMATION AND STEPS

5.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace them as necessary.

Symptom	Suspected Area
Vehicle pulls	Front wheel alignment (incorrect)
	Rear wheel alignment (incorrect)
Wheel shimmy	Front wheel alignment (incorrect)
	Rear wheel alignment (incorrect)
Abnormal tire wear	Tire (worn or improperly inflated)
	Front wheel alignment (incorrect)
	Rear wheel alignment (incorrect)

6 On-Vehicle Inspection

6.1 Inspection before Wheel Alignment

If following components have been removed, installed or replaced, check and perform wheel alignment procedures:

- Front control arm assembly
- Front control arm ball pin assembly
- Front steering knuckle
- Front shock absorber assembly
- Steering gear and steering tie rod
- Drive shaft
- Front sub frame welding assembly
- Rear torsion beam welding assembly

(1) Vehicle is in unloaded state.

(2) Use a lift to support and raise vehicle to a proper height.

(3) Check hub bearing for excessive clearance, and replace hub bearing as necessary.

(4) Check suspension components, steering tie rod and ball pin for wear, deformation or damage. Replace malfunctioning parts as necessary.

(5) Check shock absorber assembly for proper operation.

(6) Check if tire pressure is within specified range and adjust it to specified pressure as necessary.

Items	Front Wheel	Rear Wheel	Spare Tire
Tire Pressure (kPa) (Unloaded)	230	230	N/A

(7) Check the rim and tire.
1)Visually check rim and tire for scratches, wear or damage.
2)Perform wheel dynamic balance procedures.

6.2 Front Wheel Camber

(1) Incorrect front wheel camber will cause abnormal tire wear. Check and adjust front wheel camber as necessary.
In normal conditions, it is not necessary to adjust camber after assembling the independent suspension and wheel steering knuckle. If wheel camber is not within the tolerance due to other reasons, adjust through the coupling bolt between independent suspension and steering knuckle.

Specified Value for Front Wheel Camber:

Items	Parameter
Front Wheel Camber	-30′ ± 30′

■ Inspection

(1) Visually check driving system components for deformation and damage before adjustment. Replace deformed or damaged components as necessary.

(2) Install wheel alignment device onto front wheel, and perform inspection procedures according to operating instructions for wheel alignment device.

6.3 Front Wheel Toe-in

(1) Incorrect front wheel toe-in will cause wheel pull and abnormal tire wear. Check and adjust front wheel toe-in as necessary.
If front wheel toe-in is not within the tolerance due to other reasons, adjust the length of steering tie rod to return the toe-in to specified value.

Specified Value for Front Wheel Toe-in:

Items	Parameter
Front Wheel Toe-in	8′ ±6′

■ **Inspection**

(1) Perform inspection with four-wheel alignment device (perform inspection procedures by referring to operating instructions for four-wheel alignment device).

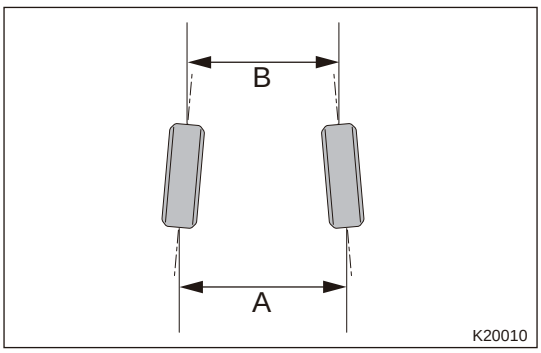
(2) Manual check:

1) Park vehicle on level ground, check if front tire pressure is within the specified range and adjust it to specified value as necessary.

2) Place marks on center position in front of front wheels, and measure distance A between marks with a tape measure.

3) Push vehicle to rotate wheels 180°, and measure distance B between marks with a tape measure when marks are turned to rear of wheels.

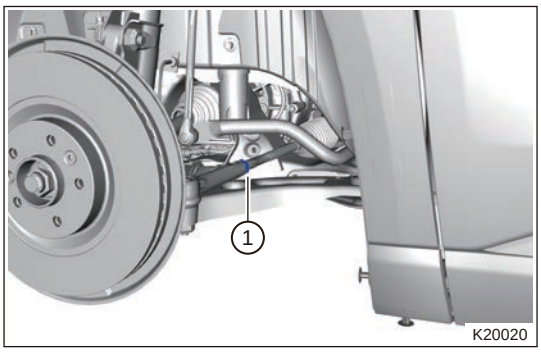
4) Calculation method: Front wheel toe-in = A - B ⩽ 1 mm.



■ **Adjustment**

(1) Make adjusting preparation for wheel alignment according to requirement of tester.

(2) Loosen the locking nut (1) of steering tie rod, and turn the tie rod to adjust the length as required until front wheel toe-in reaches the specified value.



(3) Tighten the steering tie rod locking nut (23# dual-purpose wrench) and reinstall the elastic jacket snap ring. Check if locking nut is tightened in place and if jacket position is correct.
Tightening torque： 50 ± 5 N•m

⚠ Caution
• **If elasticity of elastic jacket snap ring is not enough, replace it.**

(4) After adjusting front wheel toe-in, check steering wheel for eccentricity. If necessary, loosen the steering wheel locking nut and adjust the steering wheel to horizontal position, and then tighten the steering wheel locking nut (22# socket wrench) to specified torque.
Tightening torque： 48 ± 4 N•m

6.4 Kingpin Caster & Kingpin Inclination

(1) Kingpin caster and kingpin inclination can only be checked by using four-wheel alignment device.

Kingpin caster and kingpin inclination are assured by design structure and cannot be adjusted.

If measured value is not within the specified range, check if other components connected to steering knuckle are deformed or damaged. In addition, check the connecting part of steering knuckle for deformation or damage.

If so, replace corresponding components.

Specified Value for Kingpin Caster & Kingpin Inclination:

Items	Parameter
Kingpin Caster	6°43′ ±45′
Kingpin Inclination	13°54′ ±45′

6.5 Rear Wheel Camber

(1) Incorrect rear wheel camber will cause wheel pull and abnormal tire wear. Check and adjust rear wheel camber as necessary.

If rear wheel camber is not within the tolerance due to other reasons, adjust eccentric adjusting bolt and eccentric adjusting shim between rear lower control arm assembly and rear sub frame welding assembly to return the camber to specified value.

If rear wheel camber is not as specified, check rear suspension and wheels for damage or deformation. Replace damaged or deformed components as necessary.

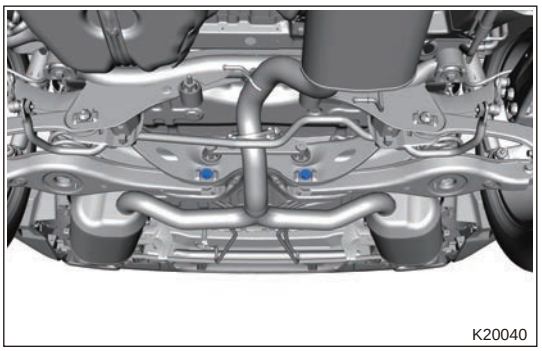
Specified Value for Rear Wheel Camber:

Items	Parameter
Rear Wheel Camber	-1°11′ ±30′

■ Adjustment

(1) Make adjusting preparation for wheel alignment according to requirement of tester.

(2) Loosen the coupling bolts (18# socket wrench) between rear lower control arm assembly and rear sub frame welding assembly, be careful that eccentric adjusting shim does not detach from groove.



(3) Rotate the eccentric adjusting shim and eccentric adjusting bolt to adjust rear wheel camber to specified value.

(4) Tighten the coupling bolts (18# socket wrench) between rear lower control arm assembly and rear sub frame welding assembly to specified torque after adjustment (adjusting method of left and right wheels is the same).

Tightening torque： 100 ± 7.5 N•m

6.6 Rear Wheel Toe-in

(1) Incorrect rear wheel toe-in will cause wheel pull and abnormal tire wear. Check and adjust rear wheel toe-in as necessary.

If rear wheel toe-in is not within the tolerance due to other reasons, adjust eccentric adjusting bolt and eccentric adjusting shim between tie rod assembly and rear sub frame welding assembly to return the toe-in to specified value.

If rear wheel toe-in is not as specified, check rear suspension and wheels for damage or deformation. Replace damaged or deformed components as necessary.

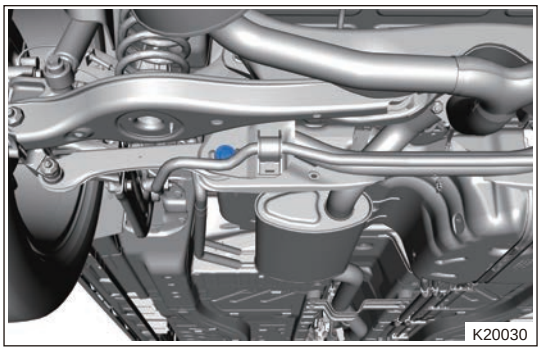
Specified Value for Rear Wheel Toe-in:

Items	Parameter
Rear Wheel Toe-in	10′ ±6′

■ Adjustment

(1) Make adjusting preparation for wheel alignment according to requirement of tester.

(2) Loosen the coupling bolts (21# socket wrench) between tie rod assembly and rear sub frame welding assembly, be careful that eccentric adjusting shim does not detach from groove.



(3) Rotate the eccentric adjusting bolt and eccentric adjusting sleeve to adjust rear wheel toe-in to specified value.

(4) Tighten the coupling bolts (21# socket wrench) between tie rod assembly and rear sub frame welding assembly to specified torque after adjustment (adjusting method of left and right wheels is the same).

Tightening torque： 130 ± 10 N•m

6.4 TIRE AND WHEEL

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Use tire pressure gauge when inflating, and never inflate according to the tire pressure indication on meter. If inflating tires using pressure values displayed from tire pressure monitoring system, inflation pressure may be higher than tire standard value, resulting in a risk of accident.

(2) If the tire pressure is too low, please resume it to normal pressure as soon as possible. Too low tire pressure will increase fuel consumption and tire wear. And seriously worn tire will cause an accident such as flat tire.

(3) Speed level of new replaced tire must meet the specified values for safe operation; otherwise the tire may blow out.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) Be sure to refer to the instruction when installing non-standard tires and rims.

(2) Use tires with standard specification and type.

(3) Avoid scratching tires and rims when removing and installing tires.

(4) Spare tire is not equipped with tire pressure sensor, so there will be malfunction in tire pressure monitoring system when spare tire is used in vehicle equipped with tire pressure monitoring system.

(5) Before assembling the tire, apply glycerin or soapy water to the rim area of tire.

(6) The four driving tires mounted on the same vehicle must be from the same manufacturer and are not allowed to be mixed.

(7) Always use torque wrench when installing tire pressure sensor, with a torque of 5 ± 0.5 N·m.

(8) Use tires only with the standard specification and type, because they have excellent reliability and skid resistance. Using a non-standard tire may lead to vehicle malfunction, which may cause an accident, resulting in serious injury or even death.

(9) Contact surface between rim and tire should be cleaned before installing a new tire.

(10) When installing wheel bolts, firstly, pre-tighten the bolts by hand, and then tighten them to the specified torque with a torque wrench.

(11) Do not apply grease to the wheel bolts.

(12) Some bad driving habits may shorten the tire life:

1) Rapid acceleration;
2) Depressing brake pedal suddenly and firmly;
3) High-speed driving;
4) Turning at excessive speed;
5) Striking curbs or other obstacles;
6) Tire pressure is too high or too low when driving vehicle.

(13) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

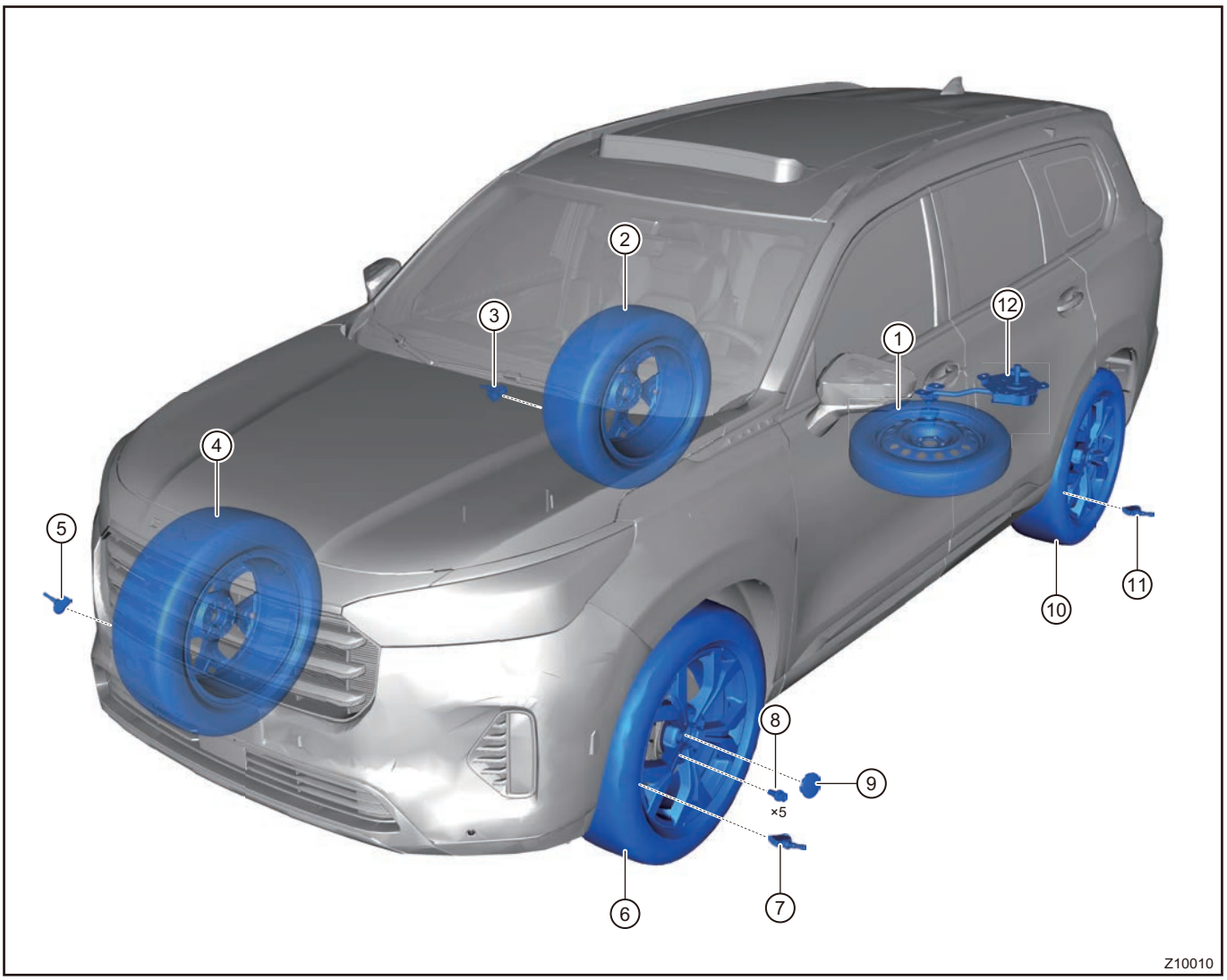
2 System Overview

2.1 System Description

Wheel is a rotating component that bears load between tire and axle. It is usually composed of two main components, rim and spoke. Rim is a component for mounting and supporting tire on wheel, and spoke is a

supporting component between axle and rim on wheel. Wheels sometimes contain hubs in addition to above components.
Tire is a rolling toroidal elastic rubber equipment assembled to vehicle on the ground. It is usually installed on metal rim, and can support vehicle body to cushion outside impact, realize contact with road surface and ensure driving performance of vehicle. Tire is often used in complex and harsh conditions, it is under a variety of deformation, load, force and high and low temperature when driving, so it must have high load-bearing performance, traction performance, buffer performance.

2.2 System Components Diagram



1	Spare Tire Assembly	7	Front Left Wheel Tire Pressure Sensor
2	Rear Right Wheel	8	Wheel Bolt
3	Rear Right Wheel Tire Pressure Sensor	9	Trim Cover
4	Front Right Wheel	10	Rear Left Wheel
5	Front Right Wheel Tire Pressure Sensor	11	Rear Left Wheel Tire Pressure Sensor
6	Front Left Wheel		

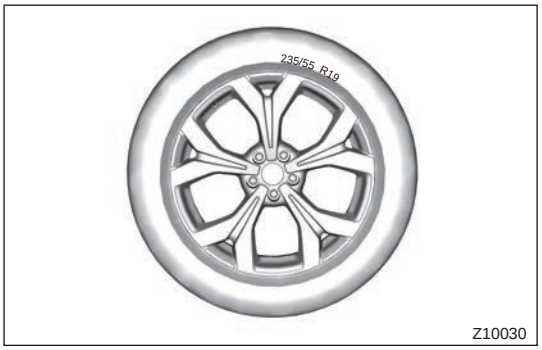
2.3 Component Operation Description

■ Tire

Tire is one of important parts of vehicle. It directly contacts with road surface and works with vehicle suspension to cushion impact of vehicle while driving. Ensure that the vehicle has good seating and riding comforts and good adhesion between wheels and road surface to improve vehicle traction, braking and trafficability and bear weight of vehicle.

■ Tire Identification

Letter and number code of tire type, size, load index and speed level are stamped on the side wall of tire as shown in the illustration.
This model is equipped with 3 sizes of tires (235/55R19, 245/45R20), and different sizes are equipped with different rim shapes, which should be subject to actual vehicle.



3 Diagnosis & Testing

3.1 Problem Symptoms Table

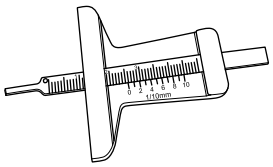
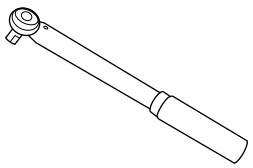
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
Wear on one side of tire	Wheel alignment (incorrect)
Wear on both sides of tire	Tire pressure (insufficient)
Tire center wear	Tire pressure (excessive)
Serrated wear	Wheel alignment (incorrect)
Severe wear on partial area of tire	Braking (too hard)
Scratches on side wall of tire	Sharp objects on road (scratched)
Excessive tire noise	Tire pressure (incorrect)
	Tire (worn)

4 Removal and Installation

4.1 Tool

■ General Tool

Tool Name	Tool Drawing
Tire Depth Gauge	 S00068
5 - 25 N·m Torque Wrench	 S00079

4.2 Wheel Replacement

■ Precautions Before Tire Replacement

⚠ Caution

- **Spare tire is not equipped with tire pressure sensor, so there will be malfunction in tire pressure monitoring system when spare tire is used in vehicle equipped with tire pressure monitoring system.**

⚠ Warning

- **Speed level of new replaced tire must meet the specified values for safe operation; otherwise the tire may blow out.**

(1) Remove the wheel.

(2) Use a tire remover to remove tires according to the instructions.

⚠ Caution

- **When removing and installing tire with tire pressure sensor, be sure to strictly refer to the Tire Pressure Monitoring section.**
- **Always use torque wrench when installing tire pressure sensor, with a torque of 5 ± 0.5 N·m.**
- **When installing wheel assembly with TPMS, align dynamic balance testing mark (light point) on tire with valve core (TPMS) position on rim.**
- **Before installing air valve, check if air valve hole of wheel is smooth without any burrs, and apply glycerin to air valve rubber surface or soak air valve into glycerin fluid, and then pull or press the locating ring of air valve by force to pass it through the air valve hole and install it into place (it is possible to use soapy water instead of glycerin).**
- **The four driving tires mounted on the same vehicle must be from the same manufacturer and are not allowed to be mixed.**
- **Before assembling the tire, apply glycerin or soapy water to the rim area of tire.**
- **When there is "dark point" mark on rim, align the dynamic balance testing mark on tire with "dark point" mark on rim.**
- **When there is no "dark point" mark on rim, align the dynamic balance testing mark on tire with the air valve.**

(3) Adjust tire pressure to specified value.

⚠ Caution

- **Before performing four wheel alignment, check the four tires pressure and adjust the pressure: it is recommended to adjust tire pressure to recommended tire pressure on door frame label.**
- **The rated inflation pressure of T-type spare tire assembly is 420 kPa, and store spare tire in isolation from 4 loaded wheels.**
- **Please replace the tires only with standard specification and type.**

(4) Check contact surface among air valve, tire and rim for leakage.

(5) Using a dynamic balancer, adjust the wheel balance.

(6) Install the wheel.

Torque: 130 ± 10 N·m

⚠ Caution

- **Avoid scratching tires and rims when removing tires.**
- **Contact surface between tire and rim should be cleaned when installing tires.**

■ Tire Inspection

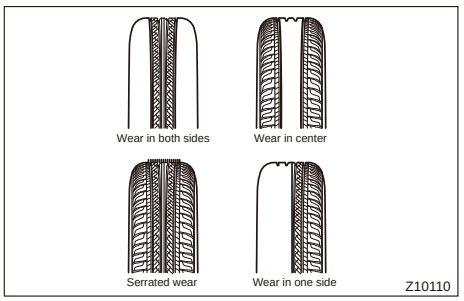
⚠ Caution

- **Be sure to refer to the instruction when installing non-standard tires and rims.**
- **Use tires with standard specification and type.**

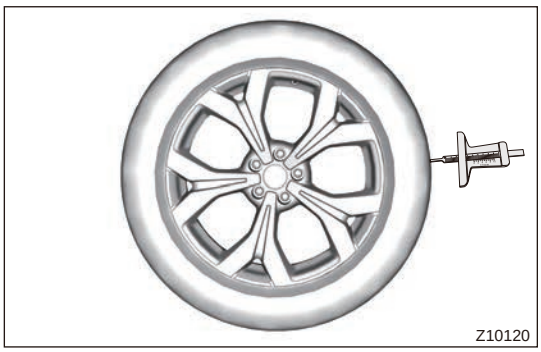
(1) Check if tires are scratched or damaged as shown in the illustration.

(2) Check if rims are scratched or damaged as shown in the illustration.

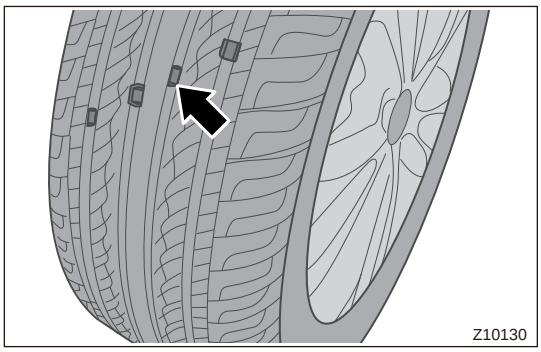
(3) Check if tires are worn abnormally as shown in the illustration.



(4) Measure the tread pattern depth with a tire depth gauge. When the depth is less than 1.6 mm, the tire should be replaced.



(5) Check the tread wear indicators. When tires are worn to the indicating mark, replace them.



(6) Use tire pressure gauge to check if pressures of all tires (including spare tire) are normal. Inflate tires to specified tire pressure as necessary.

⚠ Warning

- **Use tire pressure gauge when inflating, and never inflate according to the tire pressure indication on meter. If inflating tires using pressure values displayed from tire pressure monitoring system, inflation pressure may be higher than tire standard value, resulting in a risk of accident.**
- **If the tire pressure is too low, please resume it to normal pressure as soon as possible. Too low tire pressure will increase fuel consumption and tire wear. And seriously worn tire will cause an accident such as flat tire.**

(7) Check air valve for leakage.

■ Removal

(1) Stop vehicle at a level surface and apply parking brake.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Using a tire wrench, loosen the wheel mounting bolts.
(5) Firmly support and raise the vehicle to a proper height.
(6) Using a tire wrench, remove 5 wheel mounting bolts (17# socket wrench).

(7) Remove the wheel.

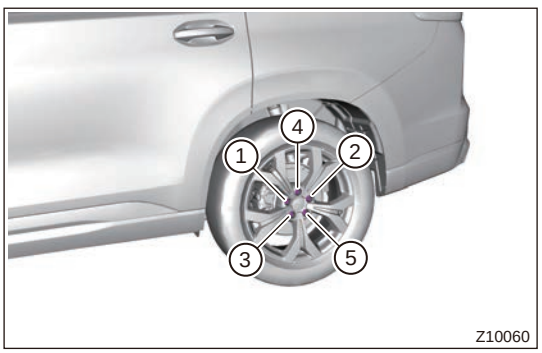
⚠ Caution

When removing and installing the wheel with tire pressure sensor, the tire pressure monitoring section must be strictly referred to.

■ Installation

(1) Anti-corrosion and anti-rust treatment is conducted on the contact surface between wheel and brake disc.
(2) Install the wheel and pre-tighten the wheel mounting bolts by hand.
(3) Using a torque wrench, tighten the wheel mounting bolts evenly to the specified torque in the order shown in the illustration (17# socket wrench).

Torque: 130 ± 10 N·m



(4) Connect the negative battery cable.

■ Tire Inflation

- Do not inflate tires with high tire temperature, which will cause serious damage to the tire, even blowouts, resulting in accidents.

- Do not inflate tires depending on values displayed from tire pressure monitoring system. Tire pressure monitoring system can monitor tire pressure and temperature in real time only when vehicle speed is more than 30 km/h. If inflating tires using pressure values displayed from tire pressure monitoring system, inflation value may be higher than tire standard value, which will cause accidents.
- When vehicle is driving normally, heat is generated in the tire due to friction, which will cause tire pressure to increase. Exposure of tires to the sunlight may also cause an increase in air pressure, resulting in a change in tire pressure. For every 10°C increase in tire temperature, tire pressure will increase by about 0.1 bar.

■ Wheel Balance

⚠ Caution

- **Dynamic balancer must be calibrated before adjusting wheel balance.**
- **Remove impurities inside tread pattern and original balance blocks to ensure wheel balance.**

(1) Remove the wheel.

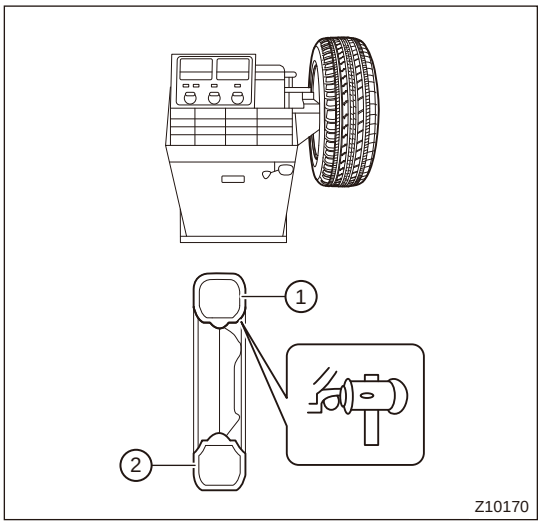
(2) Adjust tire pressure to specified value.

(3) Install wheel with balance block removed to balancer. Install the balance shaft with mounting surface of wheel facing inward, choose a suitable taper body, and firmly lock the wheels using a locking device (- align the taper body with center hole, otherwise data may be incorrect).

(4) Turn on the power source of balancer, and input parameters such as the measured distance from rim to balancer, rim width and rim diameter.

(5) Put down the wheel protector, and proceed to balance test procedure automatically (start button should be pushed for some balancers). When measurement is completed, the unbalanced weight for both sides of tire will be displayed on the balancer automatically, and the wheel brakes automatically until it stops. Do not open the protector before stopping. Failure to do this may lead to an accident.

(6) According to the measurement result, corresponding balance blocks should be installed on the outside (1) and inside (2) of rim edge as shown in the illustration.



(7) Perform test again after assembly is completed, until the balancer displays 0.

(8) After dynamic balance is completed, remove the wheel.

⚠ Caution

- **Balance block must be installed on aluminum rim.**
- **Ambient temperature should be higher than 25°C when installing balance block. If temperature cannot be guaranteed, heat the balance block so that the temperature is between 25°C and 38°C when installing it.**
- **Install balance block properly, weight difference between balance blocks should be 5g.**
- **DO NOT reuse the balance block.**
- **Both inside and outside of balance block are paste type.**
- **Requirement for residual imbalance: Outside ⩽ 10 g; inside ⩽ 10 g.**
- **Max. outside balance block weight: 110 g.**
- **Max. inside balance block weight: 110 g.**

4.3 Tire Rotation

■ Description

Front and rear tires operate at different loads and perform different steering, driving and braking functions. For these reasons, different wear rate is formed, causing irregular wear patterns. These effects can be reduced by rotating tires at regular time.
Advantages of tire rotation:

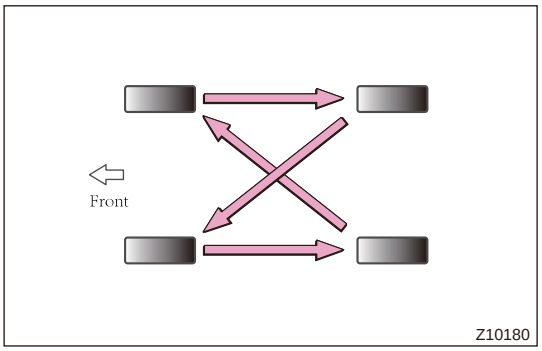
- Improving tread life;
- Maintaining traction levels;
- Maintaining a smooth and quiet driveability.

⚠ Caution

Chery recommends that you should rotate tires every 10000 km (Optimal tire rotation mileage is 5000 - 7000 km). However, the best suitable time for tire rotation differs depending on driver’ s driving habits and road conditions.

■ Rotation Method

(1) Perform tire rotation as shown in the illustration.



⚠ Caution

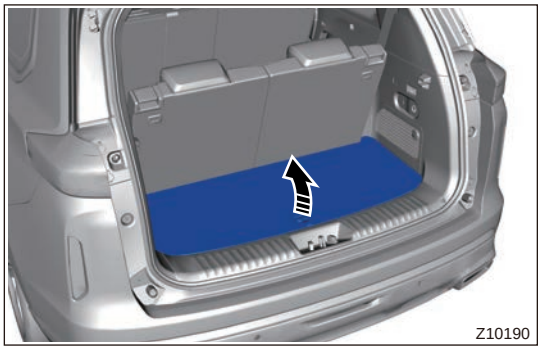
- **Perform tire pressure self-learning after tire rotation.**

4.4 Spare Tire Replacement

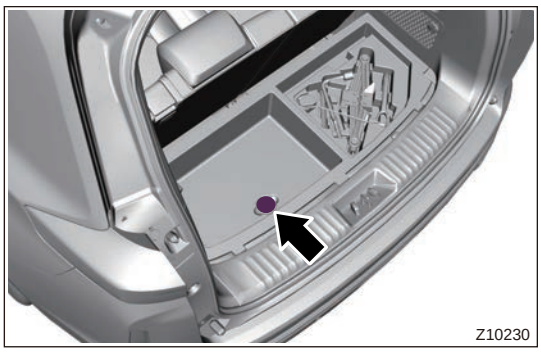
■ Removal

(1) Stop vehicle at a level surface and apply parking brake.

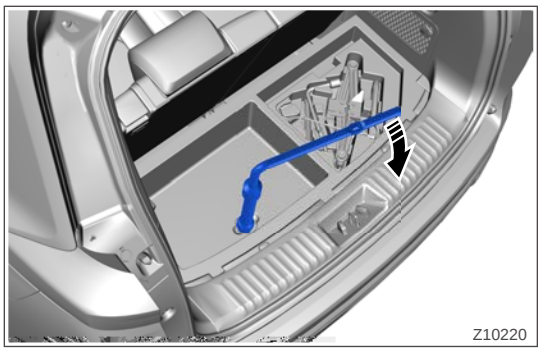
(2) Open luggage compartment and lift storage box cover.



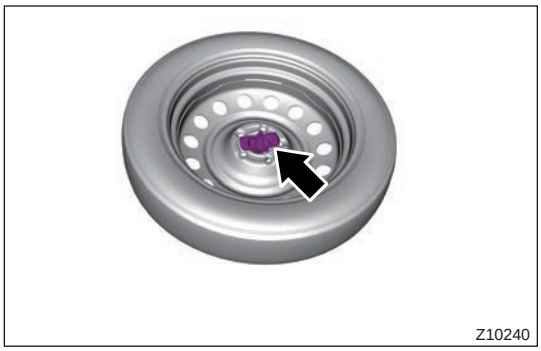
(3) Using an interior crow plate, carefully pry off spare tire regulator plastic plug (interior crow plate).



(4) Install extended wrench of on-board tools (located in plastic storage cover) to hexagon head of spare tire regulator. Rotate the hexagon head counterclockwise until spare tire drops to ground from the trunk bottom (-extended wrench of on-board tools).



(5) Remove spare tire regulator lug from center hole of spare tire wheel, and remove the spare tire.

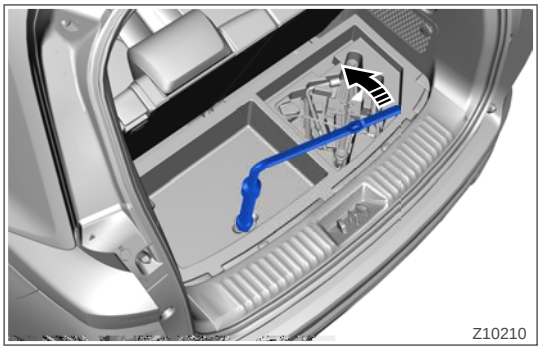


■ Installation

(1) Place the spare tire assembly with A side facing upward, and insert spare tire regulator lug into the center hole of spare tire wheel.

(2) Install extended wrench of on-board tools (located in plastic storage cover) to hexagon head of spare tire regulator. Rotate the hexagon head clockwise (-extended wrench of on-board tools).

Tightening torque: 20 ± 3 N·m



(3) Install spare tire regulator plastic plug (interior crow plate).

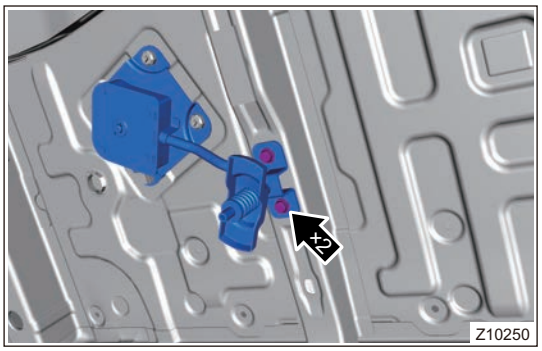
(4) Install storage box cover and close luggage compartment.

4.5 Replacement of Spare Tire Regulator

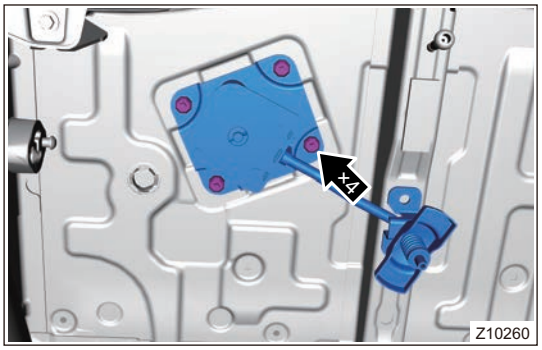
■ Removal

(1) Remove the spare tire assembly.

(2) Raise the vehicle to proper position and remove 2 bolts from small bracket (13# socket wrench).



(3) Remove 4 nuts between spare tire regulator and vehicle body (13# socket wrench).



(4) Remove the spare tire regulator.

■ Installation

(1) Install the spare tire regulator to a proper position of under body.

(2) Install 4 nuts between spare tire regulator and vehicle body (13# socket wrench).

Tightening torque: 25 ± 4 N·m

(3) Install 2 bolts on small bracket and lower the vehicle (13# socket wrench).

Tightening torque: 25 ± 4 N·m

(4) Install the spare tire assembly.

6.5 TIRE PRESSURE MONITORING SYSTEM (TPMS)

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

(2) Be sure to wear necessary safety equipment to prevent accidents, when removing tire pressure sensor.

(3) If the tire pressure is too low, please resume it to normal pressure as soon as possible. Too low tire pressure will increase fuel consumption and tire wear. And seriously worn tire will cause an accident such as flat tire.

(4) When a high temperature alarm occurs, stop vehicle to cool the tire naturally, otherwise there is a danger of accident. When tire temperature is too high, never cool the tire by pouring cold water, otherwise, tire may be damaged, resulting in an accident.

(5) Always use torque wrench when installing tire pressure sensor, common wrench cannot guarantee a torque of 5 ± 0.5 N·m. If the torque is relatively low, air leakage may occur, resulting in a risk of danger; if the torque is relatively high, tire pressure sensor or related components may be damaged, resulting in a risk of danger.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) Operate carefully to avoid damaging tire pressure sensor, when removing tire pressure sensor.

(2) Avoid dropping the sensor. If tire pressure sensor is dropped from a place 1 m high to the ground, it is interpreted as fault in tire pressure sensor.

(3) Tire pressure sensor must be installed on clean and dry hub.

(4) Valve cap must be on the valve, except inflation, deflation, air pressure inspection, etc.

(5) During installation, do not contact the tire pressure sensor with used tools, to avoid damage to the tire pressure sensor.

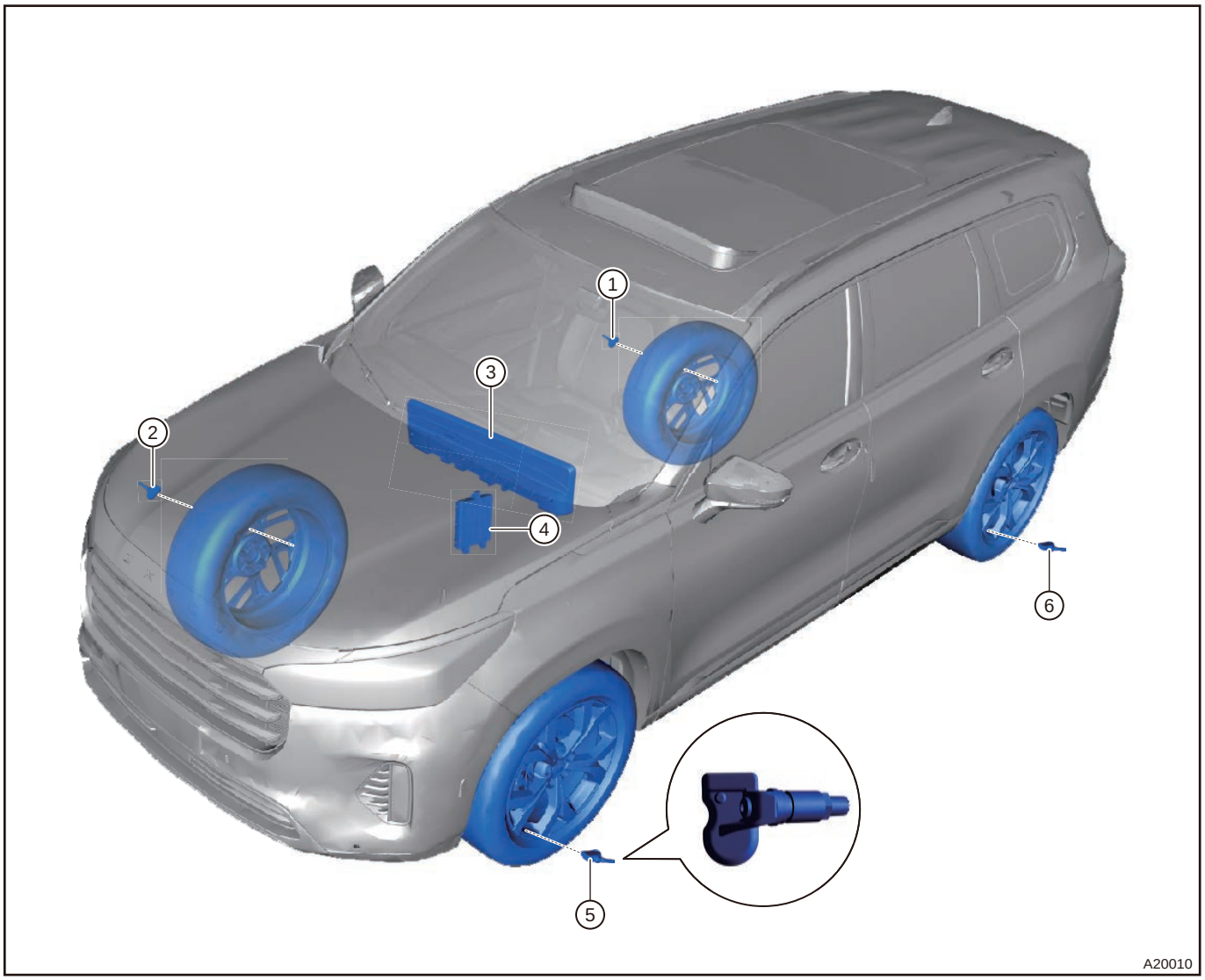
(6) Sensor air pressure inlet cannot be covered partially or completely by lubricant or other materials.

(7) Tightening speed : ⩽ 30 rpm; Installation torque: 5 ± 0.5 N·m when installing tire pressure sensor.

(8) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

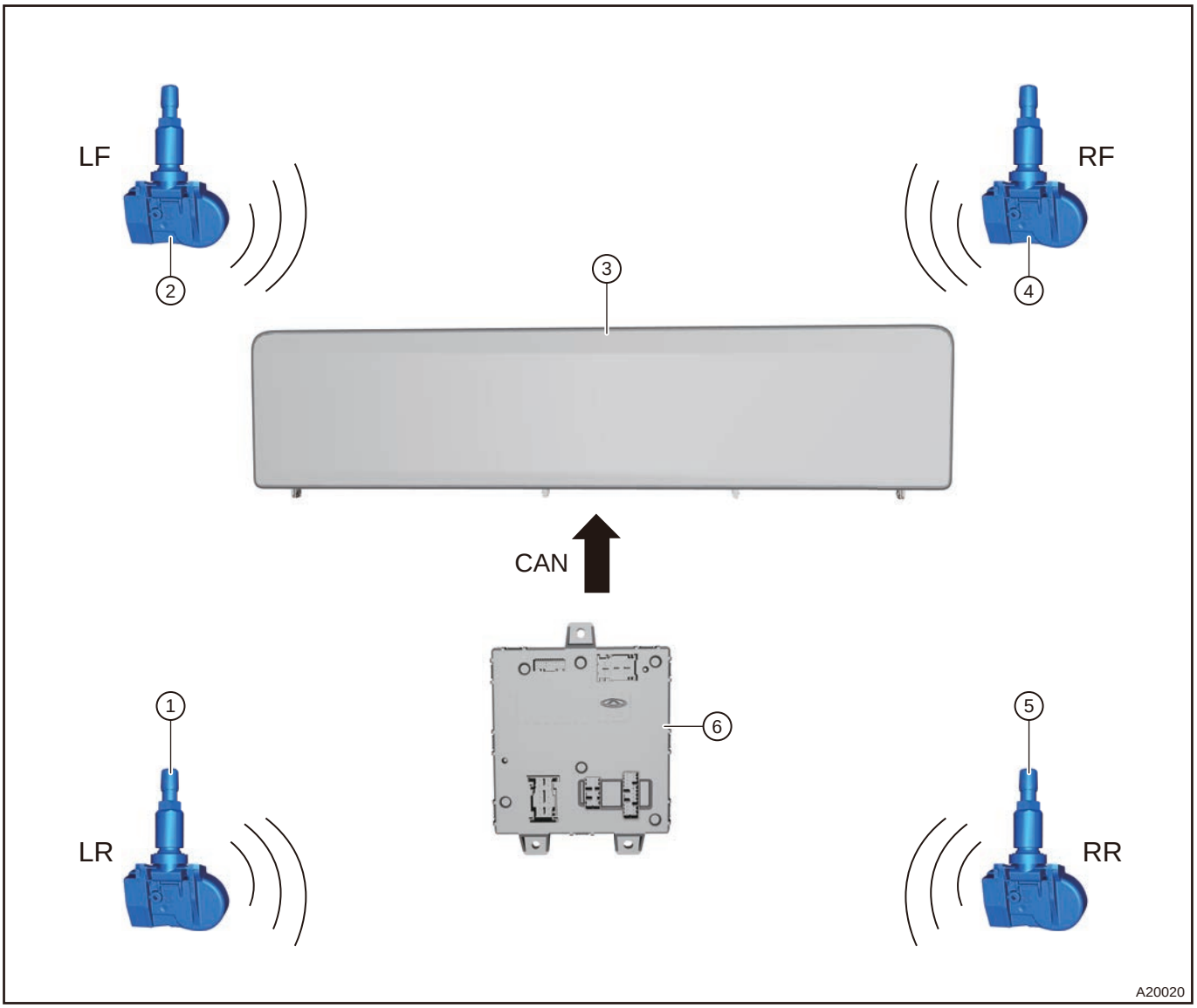
2.1 System Components Diagram



1	Rear Right Tire Pressure Sensor	4	Body Control Module
2	Front Right Tire Pressure Sensor	5	Front Left Tire Pressure Sensor
3	Dual LCD	6	Rear Left Tire Pressure Sensor

Tire Pressure Monitoring System (TPMS) is an active safety device, which can monitor tire pressure and temperature in real time and display on dual LCD. When tire pressure and temperature are abnormal, tire pressure monitoring system will warn the driver of driving danger.

2.2 System Schematic Diagram



1	Rear Left Tire Pressure Sensor	4	Front Right Tire Pressure Sensor
2	Front Left Tire Pressure Sensor	5	Rear Right Tire Pressure Sensor
3	Dual LCD	6	Body Control Module

Tire pressure sensor is the transmitting terminal of tire information, body control module is the receiving terminal of tire information, meter is the display terminal of tire information, and tire pressure sensor is the core of tire pressure monitoring system. Tire pressure sensor is installed on rim, which collects data such as pressure, temperature inside tire, and sends these data to body control module as radio-frequency signal. The wireless communication frequency between tire pressure sensor and body control module is 433 MHZ. The body control module receives radio-frequency signal sent from tire pressure sensor and processes these data. Body control module processes data of tire pressure sensor, then sends them to meter via CAN bus. Tire pressure value and temperature value are displayed on meter via CAN bus signal. When tire pressure is too high or too low, or temperature is too high, it informs driver of abnormal tire.

2.3 Tire Pressure Monitoring System (TPMS) Alarm Information

■ Initial Mode

BCM has not learned any sensor ID in the initial mode after delivery. In the initial mode, TPMS module only processes the positioning information of sensor.

■ Operation Mode

After successfully learning tire pressure ID, the system is in operation mode. In the operation mode, TPMS module processes the positioning information and tire pressure information of sensor.

■ Warning Strategy

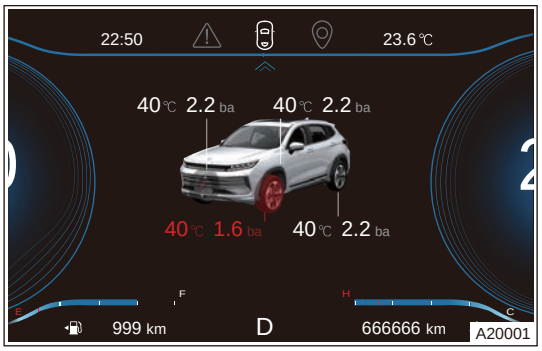
The processing of warning function requires the system to be in operation mode.

- Unlearning/loss/low battery is as system failure.
- High pressure/low pressure/rapid leakage/high temperature is as function logic.
- Priority order: Unlearning >loss >low battery >rapid leakage >high pressure =low pressure >high temperature

Warning light is combination type signal light (single light) that illuminates when above warning is sent. The light continuously turns on after flashing for 75 s when system is faulty, and it continuously turns on without flashing when pressure/temperature alarm is sent.

■ Low Pressure Alarm

When vehicle tire pressure is less than 1.72 bar, and the vehicle is continuously driving for more than 5 minutes with a speed higher than 25 Km/h, the system will send a low pressure alarm. With ENGINE START STOP switch turned from OFF to ON position, the system will also send a low pressure alarm if tire pressure displayed on meter is no more than 1.84 bar. When there is a low pressure alarm, the waring light remains on and normal screen switches into tire pressure screen directly: The tire with low pressure (e.g., front left tire) symbol turns red and its tire pressure and temperature will be displayed.



⚠ Caution

- **If the tire pressure is too low, please resume it to normal pressure as soon as possible. Too low tire pressure will increase fuel consumption and tire wear. And seriously worn tire will cause an accident such as flat tire.**

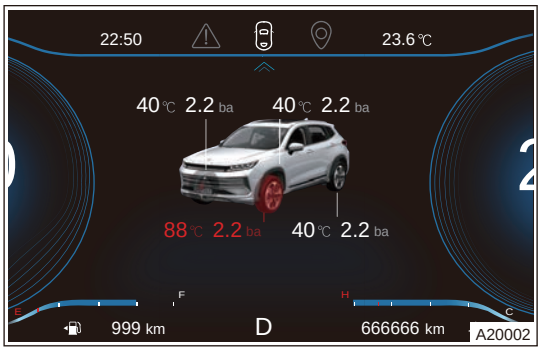
When the vehicle tire pressure resumes to alarm value 0.2 bar or more (0.2 bar threshold is used to remove jitter) and vehicle is continuously driving with a speed higher than 25 Km/h, the system will deactivate the low pressure alarm automatically within 5 minutes.

■ High Pressure Alarm

Trigger condition: When the ignition state is in ON/START and the tire pressure value of a certain tire is higher than or equal to threshold value, a high pressure alarm will be generated.
Off condition: When the current alarm tire pressure value is no more than 0.2 bar of alarm value (0.2 bar threshold is used to remove jitter), low pressure alarm at this position is canceled.

■ High Temperature Alarm

Trigger condition: Take front left wheel as an example, when temperature of front left wheel reaches higher than high temperature alarm threshold (75 ℃), the system will send high temperature alarm, front left wheel symbol will be red, the tire pressure and temperature values will be displayed and tire pressure warning light remains on. When there is a high temperature alarm, the warning light remains on and normal screen switches to tire pressure screen directly: The tire with high temperature (e.g., front right tire) symbol will be red and its tire pressure and temperature values will be displayed.



⚠ Caution

- **When a high temperature alarm occurs, stop vehicle to cool the tire naturally, otherwise there is a danger of accident. When tire temperature is too high, never cool the tire by pouring cold water, otherwise, tire may be damaged, resulting in an accident.**

Off condition: When the vehicle wheel temperature is lower than alarm value -5℃ and the vehicle is continuously driving with a speed higher than 25 Km/h, the system will deactivate high temperature alarm automatically within 5 minutes. The system stores the history DTCs.

■ Missing Signal Alarm

Trigger conditions:

(1) During parking: If vehicle speed is less than 20 Km/h, sensor will enter the parking state, and the transmission period is 1 hour. Ignition switch is in OFF. If the tire pressure signal at a certain position is not received for a continuous period of 5 hours, the position judges signal missing. When the message is received, the timing is cleared and restarted. When vehicle speed is higher than 25 Km/h, it enters the running mode timing, the parking mode timing is cleared. The meter system will also switch to tire pressure monitoring system display screen automatically.

(2) During running: If vehicle speed is higher than 25 Km/h, sensor will enter the running state, and the transmission period is 1 minutes. Vehicle speed is more than 25 km/h, if the tire pressure signal at a certain position is not received for a continuous period of 9 minutes, the position judges signal missing. When the message is received, the timing is cleared and restarted. When vehicle speed is less than 25 Km/h and duration exceeds 10 minutes, tire pressure sensor will enter the parking mode and transmission cycle will become 1 hour. At this time, the receiving end needs to change the timing strategy. When vehicle speed is less than 25 Km/h and duration exceeds 10 minutes, the strategy of signal missing alarm will switch to parking mode strategy, and the count of running mode will be cleared.

Off condition: The signal missing alarm of the sensor that miss signal is canceled after receiving the information of sensor. At the same time, the tire pressure sensor counter and unit time timer are cleared.

■ High Pressure Display

If the tire pressure is higher than 3.40 bar, the tire pressure will be displayed as –; but the temperature will be displayed normally. If the tire pressure is less than 3.20 bar, it will resume normal display within 5 minutes.

Hint:
If the alarm is caused high tire pressure, just resume it to range between 2.0 bar and 2.4 bar.

■ Automatic Positioning Learning

For using process of terminal user, if the tire position is changed or TPMS sensor is replaced, the part will automatically identify new TPMS sensor or locate the corresponding relationship between the actual installation location of TPMS sensor and the display, without manual operation.
Functional requirements:

(1) BCM needs to obtain ABS tooth position information from vehicle network;

(2) ABS tooth position information message cycle: 20 ms;

(3) Number of teeth position for each turn: Front axle for 44 teeth, rear axle for 44 teeth;

(4) ABS tooth position information message format: 0 → 254 → 0.

Positioning mode:

- Vehicle speed is more than 20 km/h (8 g), and TPMS sensor enters the standard operation mode, in this mode: In case of no pressure change, send 1 package of tire pressure information every minute; In case of pressure change ⩽ 10 KPA, immediately send 1 package of tire pressure information.

- Vehicle speed is more than 30 km/h (12 g), and TPMS sensor sends a frame of positioning information every 12 seconds.
- The positioning information has been sent for 30 times or the vehicle speed is less than 30 km/h to enter the standard operation mode.

Positioning output:

- If positioning is successful: If it is different from the ID in original system, ID code will be re-stored and the tire pressure information of the modified position will be set as the default value 0xff. Use the updated TPMS ID to receive tire pressure signal and interpret the information sent from tire pressure sensor. If it is same with system, it is not necessary to re-store the ID codes.
- If the positioning fails, the old TPMS ID is used to receive tire pressure signal.

⚠ Caution

- **If two or more sensors are replaced, tire pressure position displayed on meter may be inconsistent with actual position within 10 minutes during driving. And it will be updated to correct position after successful positioning within 10 minutes.**
- **During automatic positioning, ID stored in receiver defaults to previous ID and corresponding position. If tire rotation is performed, pressure and temperature display position and low/high temperature alarm position of meter may be inconsistent with actual position. And it will be updated to correct position after successful positioning.**

2.4 Precautions for Maintaining Tire Pressure Monitoring System

■ Active Condition for Tire Pressure Monitoring System

No.	Conditions to Be Met
1	IGN-ON
2	Vehicle continuously drives with a speed higher than 25 km/h for more than 45 seconds.

When the ENGINE START STOP switch is in IGN-ON and the vehicle is driving continuously with a speed more than 25 km/h for more than 45 seconds, the tire pressure monitoring system can start normally. When the ENGINE START STOP switch is not in IGN-ON, body control module cannot receive radio frequency signal from tire pressure sensor; when the vehicle speed fails to reach 25 km/h or driving period is very short, tire pressure sensor will not send a radio frequency signal.

- With vehicle stopped, the meter does not display tire pressure and temperature information when the ENGINE START STOP switch is turned to IGN-ON from IGN-OFF.
- When the ENGINE START STOP switch is turned to IGN-ON and the vehicle is driving continuously with a speed higher than 25 km/h for more than 45 seconds, tire pressure information for 4 wheels will be displayed.
- Tire pressure sensor and BCM communicates with each other via radio frequency signal. If there are strong electromagnetic interference or other electrical devices are added on the vehicle, tire pressure signal reception may be affected, resulting in tire pressure monitoring system alarm. It is not recommended to add electrical products personally.
- If there is large variation in tire pressure, tire pressure sensor will send a radio frequency signal suddenly. If the ENGINE START STOP switch is turned to IGN-ON, tire pressure monitoring system will process the signal sent from tire pressure sensor immediately.

■ Tire Inflation

- Do not inflate tires depending on values displayed from tire pressure monitoring system. Tire pressure monitoring system can monitor tire pressure and temperature in real time only when vehicle speed is more than 25 km/h. If inflating tires using pressure values displayed from tire pressure monitoring system, inflation value may be higher than tire standard value, which will cause accidents.

  Do not inflate tires with high tire temperature, which will cause serious damage to the tire, even blowouts, resulting in accidents.

■ Tire Pressure Sensor

- When system is faulty or disabled, check tire pressure sensor and judge if it is the tire pressure sensor of automobile manufacturer. If tire pressure sensor of other manufacturers is used by customer,

configuration and learning for tire pressure sensor cannot be performed and system is abnormal or disabled.

- Tire pressure sensor is integrated with functions of common air valve, and inflating/deflating operation is the same as common air valve. Use genuine sensor fittings, without replacing components inside of sensor. After maintenance, install genuine waterproof cap of tire pressure sensor correctly. Do not reuse disposed tire pressure sensor components, otherwise air leakage may be caused, resulting in a possibility of danger. When performing inflation/deflation and tire removal operations, it is not necessary to remove nut from the sensor. If the tire pressure sensor nut is removed with tire pressure higher than atmosphere pressure, there is possibility of danger.
- Tire pressure sensor should be installed from inside of rim, sensor should be installed firmly to rim and check carefully; Use 11 mm socket to install sensor nuts with a torque of 5 ± 0.5 N·m.

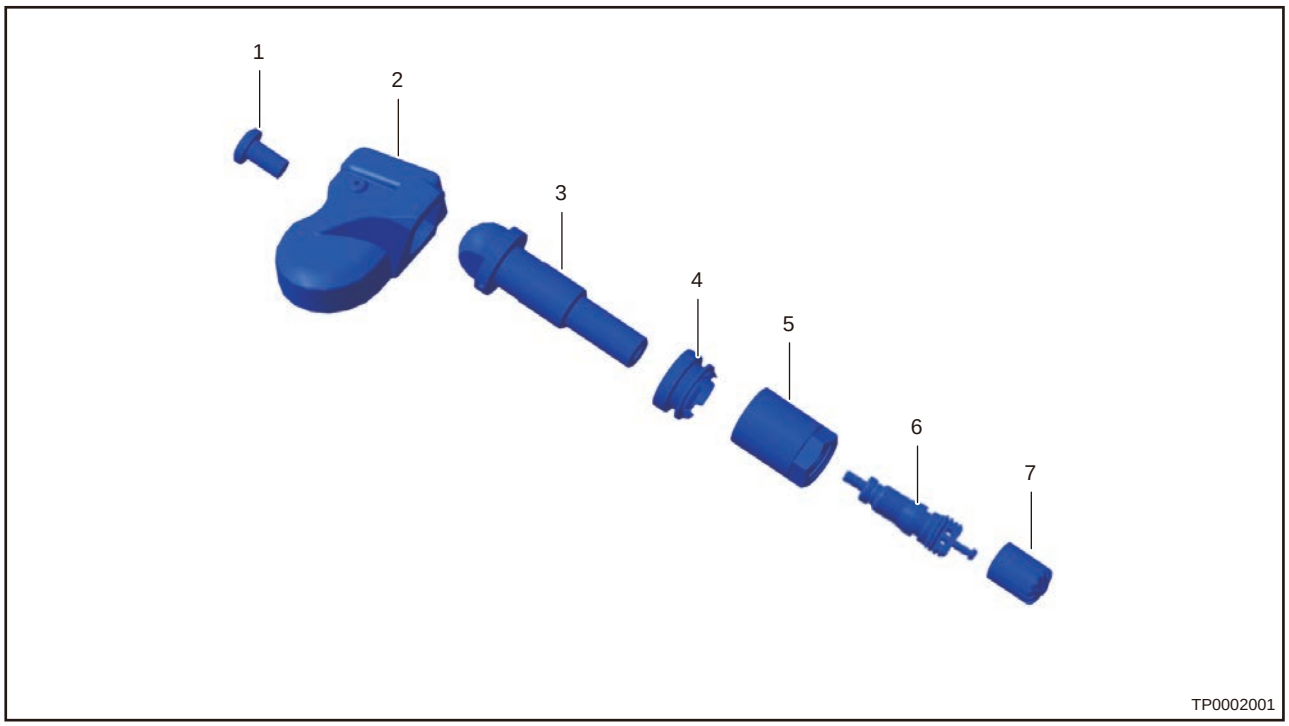
■ Increased Tire Pressure Value

- When vehicle is driving normally, heat is generated in the tire due to friction, which will cause tire pressure to increase. For every 10°C increase in tire temperature, tire pressure will increase by about 0.1 bar.

■ Tires Replacement

- If replacing tires with tire pressure monitoring system with ones without tire pressure monitoring system, system malfunction alarm will occur. If replacing with tire equipped with tire pressure sensor, system malfunction alarm still will occur without performing configuration and learning. Spare tire is not equipped with tire pressure sensor, so tire pressure monitoring system is still malfunctioning when spare tire is used in vehicle with tire pressure monitoring system.
- When replacing tire, perform operations following assembly specification of tire pressure, to avoid damaging tire pressure sensor during replacement. For installation and removal of tire, refer to Installation and Removal of Tire Pressure Sensor sections. Never allow tire bead breaker and tire tread to squeeze the sensor.

2.5 Component Operation Description



1	Screw	5	Valve Stem Cover
2	Sensor	6	Valve Core
3	Valve Stem	7	Valve Cap
4	Seal Washer and Seal Ring Assembly		

■ Tire Pressure Sensor

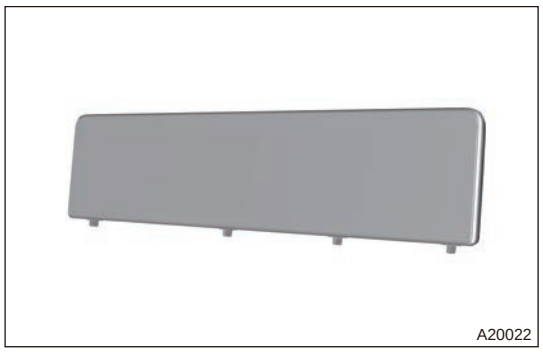
Tire pressure sensor can monitor tire pressure and temperature, and send tire pressure and temperature information to body control module. When tire pressure is too high or too low and temperature is too high, instrument cluster will inform driver of abnormal tire.


A20023

- When system is faulty or disabled, firstly eliminate wireless interference from electrical devices added by customer, such as electronic dog and drive recorder. Then check tire pressure sensor to determine if EXEED VX genuine tire pressure sensor is installed. If tire pressure sensor of other manufacturers (Non EXEED VX genuine tire pressure sensor) is used by customer, configuration and learning for tire pressure sensor cannot be performed and system is abnormal or disabled.
- Do not remove the tire pressure sensor when it is not faulty. Tire pressure sensor is integrated with functions of common air valve, and inflating/deflating operation is the same as common air valve. Use genuine sensor fittings, without replacing components inside of sensor. After maintenance, install genuine waterproof cap of tire pressure sensor correctly. Do not reuse disposed tire pressure sensor components, otherwise air leakage may be caused, resulting in a possibility of danger. When performing inflation/deflation and tire removal operations, it is not necessary to remove nut from the sensor. If the tire pressure sensor nut is removed with tire pressure higher than atmosphere pressure, there is possibility of danger.
- Always use torque wrench when installing tire pressure sensor, with a torque of 5 ± 0.5 N·m. If the torque is relatively low, air leakage may occur, resulting in a risk of danger; if the torque is relatively high, tire pressure sensor or related components may be damaged, resulting in a risk of danger.

■ Dual LCD

Body control module processes data of tire pressure sensor, then sends them to dual LCD via CAN bus. Tire pressure value and temperature value are displayed on dual LCD via CAN bus signal. When tire pressure is too high or too low, or temperature is too high, it informs driver of abnormal tire.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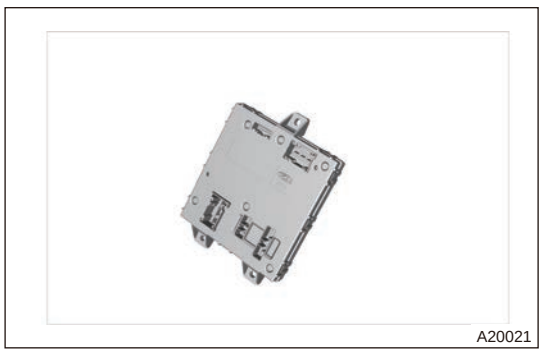
■ Body Control Module

Body control module receives radio-frequency signal sent from tire pressure sensor, processes these data and sends them to dual LCD via CAN bus.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3 Diagnosis & Testing

3.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area	Troubleshooting
Low pressure alarm (warning light remains on, malfunctioning wheel symbol turns red)	Tire pressure is less than 1.72 bar	Check and charge tire pressure to 2.2 bar (with an error limit of 0.1 bar)
	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Body Control Module (BCM) damage	Replace body control module and perform sensor learning
	Tire pressure system set	Check and repair
High temperature alarm (warning light remains on, wheel symbol turns red)	Tire temperature is higher than 75 ˚C	Cool down naturally
	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Body Control Module (BCM) damage	Replace body control module and perform sensor learning
	Tire pressure system set	Check and repair
System malfunction alarm (warning light remains on after flashing for 75 seconds)	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Incorrect sensor configuration and learning when replacing with new wheel (spare tire included)	Perform configuration and learning
	Electromagnetic interference/shield	Eliminate shielded objects outside of tire/strong electromagnetic radio interference
	Body Control Module (BCM) damage	Replace
	Tire pressure system set	Check and repair
All tire pressure information cannot be displayed (all tire pressure information for four wheels display as “–”)	Display status cannot be reached	Vehicle speed is more than 30 Km/h for 45 seconds
	Replaced tire pressure sensor is not configured correctly, sensor is not learned	Perform configuration and learning
	Body Control Module (BCM) damage	Replace body control module and perform sensor learning
	Electromagnetic interference/shield	Eliminate shielded objects outside of tire/strong electromagnetic radio interference
	Four sensors are not installed or all of them are damaged (very rare)	Reinstall or replace

Symptom	Suspected Area	Troubleshooting
Certain tire pressure information cannot be displayed (certain tire pressure information displays as “–”)	Tire pressure sensor function is disabled	Replace, perform configuration and learning
	Incorrect sensor configuration and learning when replacing with new wheel (spare tire included)	Perform configuration and learning
	Electromagnetic interference/shield	Eliminate shielded objects outside of tire/strong electromagnetic radio interference
	Body Control Module (BCM) damage	Replace body control module and perform sensor learning
	Tire pressure system set	Check and repair

3.2 Diagnosis Tools

■ Diagnostic Tester

When using diagnostic tester:

- Connect diagnostic tester (the latest software) to diagnostic interface for communication with vehicle.
- Diagnostic interface is located at driver side instrument panel crossmember.
- Diagnostic interface uses a trapezoidal design which can hold 16 terminals.

■ Digital Multimeter

When using digital multimeter:

- Troubleshoot electrical malfunctions and wire harness system.
- Look for basic malfunction.
- Measure voltage, current and resistance.

3.3 Diagnostic Help

- Connect diagnostic tester (the latest software) to diagnostic interface, and make it communicate with vehicle electronic module through data network.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If DTC cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Visually check the related wire harness.
- Check and clean all system grounds related to the latest DTCs.
- If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.4 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in tire pressure monitoring system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Start engine, drive vehicle at 30 km/h or more and perform road test with diagnostic tester connected to diagnostic interface.
- Turn ENGINE START STOP switch to ON, and check DTCs in system again.
- If DTC is detected, it indicates current malfunction.

- If no DTC is detected, malfunction indicated by DTC is intermittent. Please refer to Intermittent DTC Troubleshooting.

3.5 Intermittent DTC Troubleshooting

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Check tire pressure sensors and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
C1020-87	Wheel-Sensor Mute Failure FL
C1021-87	Wheel-Sensor Mute Failure FR
C1022-87	Wheel-Sensor Mute Failure RL
C1023-87	Wheel-Sensor Mute Failure RR
C1050-00	Low Tire Pressure FL
C1051-00	Low Tire Pressure FR
C1052-00	Low Tire Pressure RL
C1053-00	Low Tire Pressure RR
C1054-00	High Tire pressure FL
C1055-00	High Tire pressure FR
C1056-00	High Tire pressure RR
C1057-00	High Tire pressure RL
C1058-00	High Tire Temp FL
C1059-00	High Tire Temp FR
C105A-00	High Tire Temp RL
C105B-00	High Tire Temp RR
C105C-00	Wheel-Sensor Battery Low FL
C105D-00	Wheel-Sensor Battery Low FR
C105E-00	Wheel-Sensor Battery Low RL
C105F-00	Wheel-Sensor Battery Low RR
C1060-00	Wheel-Sensor Not Matched
C1061-00	Invalid Wheel Tick Number Received

DTC	DTC Definition
C1062-00	Wheel Tick Number Not Received
C1603-00	Wheel-Sensor Not All learned

3.7 DTC Diagnosis Procedure

■ Wheel Sensor Mute Failure

DTC	**C1020-87**	**Wheel-Sensor Mute Failure FL**
DTC	**C1021-87**	**Wheel-Sensor Mute Failure FR**
DTC	**C1022-87**	**Wheel-Sensor Mute Failure RL**
DTC	**C1023-87**	**Wheel-Sensor Mute Failure RR**

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1020-87	Wheel-Sensor Mute Failure FL	Vehicle speed is more than 25 km/h for 45 seconds	• Tire pressure sensor fails to send RF signal or the sent signal is too weak. • The reception effect of body control module is poor, and no RF signal is received.
C1021-87	Wheel-Sensor Mute Failure FR		
C1022-87	Wheel-Sensor Mute Failure RL		
C1023-87	Wheel-Sensor Mute Failure RR		

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check power supply voltage of body control module**

(a) Using a digital multimeter, measure voltage between power supply terminal of body control module and ground.

(b) Power supply voltage should be not less than 12 V.

NG → **Check and repair battery and power supply system**

OK

2	**Check body control module ground circuit**

(a) Check if the body control module ground is loose or corroded.

NG → **Tighten or replace body control module ground circuit**

OK

3	**Check configuration of tire pressure monitoring system**

(a) After configuration is finished, drive vehicle with a speed higher than 25 km/h for a period of time.

NG → **Reconfigure tire pressure sensor of malfunctioning wheel**

OK

4	**Check tire pressure sensor of malfunctioning wheel**

(a) After replacement, perform configuration and test.

NG → **Replace tire pressure sensor of malfunctioning wheel**

OK

5	**Check Body Control Module (BCM)**

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Repair or replace Body Control Module (BCM)**

■ Low Tire Pressure

DTC	**C1050-00**	**Low Tire Pressure FL**
DTC	**C1051-00**	**Low Tire Pressure FR**
DTC	**C1052-00**	**Low Tire Pressure RL**
DTC	**C1053-00**	**Low Tire Pressure RR**

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1050-00	Low Tire Pressure FL	Vehicle speed is more than 25 km/h for 45 seconds	• Perform BCM function configuration, learning function is not finished.
C1051-00	Low Tire Pressure FR		
C1052-00	Low Tire Pressure RL		
C1053-00	Low Tire Pressure RR		

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check power supply voltage of body control module**

(a) Using a digital multimeter, measure voltage between power supply terminal of body control module and ground.

(b) Power supply voltage should be not less than 12 V.

NG → **Check and repair battery and power supply system**

OK

2	Check body control module ground circuit

(a) Check if the body control module ground is loose or corroded.

NG → **Tighten or replace body control module ground circuit**

OK

3	Check configuration of tire pressure monitoring system

(a) After configuration is finished, drive vehicle with a speed higher than 25 km/h for a period of time.

NG → **Reconfigure tire pressure sensor of malfunctioning wheel**

OK

4	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal.**

NG → **Replace tire pressure sensor of malfunctioning wheel**

■ **High Tire Pressure**

DTC	**C1054-00**	**High Tire pressure FL**
DTC	**C1055-00**	**High Tire pressure FR**
DTC	**C1056-00**	**High Tire pressure RR**
DTC	**C1057-00**	**High Tire pressure RL**

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1054-00	High Tire pressure FL	Vehicle speed is more than 25 km/h for 45 seconds	• Sensor operates abnormally, and RF data sent shows a malfunction in sensor.
C1055-00	High Tire pressure FR		
C1056-00	High Tire pressure RR		
C1057-00	High Tire pressure RL		

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	Check power supply voltage of body control module

(a) Using a digital multimeter, measure voltage between power supply terminal of body control module and ground.
(b) Power supply voltage should be not less than 12 V.

NG → **Check and repair battery and power supply system**

OK

2	Check body control module ground circuit

(a) Check if the body control module ground is loose or corroded.

NG → **Tighten or replace body control module ground circuit**

OK

3	Check configuration of tire pressure monitoring system

(a) After configuration is finished, drive vehicle with a speed higher than 25 km/h for a period of time.

NG → **Reconfigure tire pressure sensor of malfunctioning wheel**

OK

4	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

5	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

6	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

■ **High Tire Temp**

DTC	**C1058-00**	**High Tire Temp FL**
DTC	**C1059-00**	**High Tire Temp FR**
DTC	**C105A-00**	**High Tire Temp RL**
DTC	**C105B-00**	**High Tire Temp RR**

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1058-00	High Tire Temp FL	Vehicle speed is more than 25 km/h for 45 seconds	• Sensor operates abnormally, and RF data sent shows a malfunction in sensor.
C1059-00	High Tire Temp FR		
C105A-00	High Tire Temp RL		
C105B-00	High Tire Temp RR		

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check power supply voltage of body control module**

(a) Using a digital multimeter, measure voltage between power supply terminal of body control module and ground.
(b) Power supply voltage should be not less than 12 V.

NG → **Check and repair battery and power supply system**

OK

2	**Check body control module ground circuit**

(a) Check if the body control module ground is loose or corroded.

NG → **Tighten or replace body control module ground circuit**

OK

3	**Check configuration of tire pressure monitoring system**

(a) When the temperature of one or more tires is higher than 75 ˚C and the vehicle is continuously driving with a speed higher than 25 km/h for certain period of time, the system will send a high temperature alarm.

(b) When a high temperature alarm occurs, stop vehicle to cool the tire naturally, otherwise there is a danger of accident.

(c) When tire temperature is too high, never cool the tire by pouring cold water, otherwise, tire may be damaged, resulting in an accident.

(d) When the vehicle is continuously driving with a speed higher than 25 km/h for certain period of time and tire temperature is less than 75 ˚C, the high temperature alarm can be deactivated automatically.

NG → **Reconfigure tire pressure sensor of malfunctioning wheel**

OK

4	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

5	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

6	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

■ **Wheel Sensor Battery Low**

DTC	C105C-00	Wheel-Sensor Battery Low FL
DTC	C105D-00	Wheel-Sensor Battery Low FR
DTC	C105E-00	Wheel-Sensor Battery Low RL
DTC	C105F-00	Wheel-Sensor Battery Low RR

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C105C-00	Wheel-Sensor Battery Low FL	Vehicle speed is more than 25 km/h for 45 seconds	• Battery is depleted.
C105D-00	Wheel-Sensor Battery Low FR		

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C105E-00	Wheel-Sensor Battery Low RR		
C105F-00	Wheel-Sensor Battery Low RL		

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	**Check power supply voltage of body control module**

(a) Using a digital multimeter, measure voltage between power supply terminal of body control module and ground.

(b) Power supply voltage should be not less than 12 V.

NG → **Check and repair battery and power supply system**

OK

2	**Check body control module ground circuit**

(a) Check if the body control module ground is loose or corroded.

NG → **Tighten or replace body control module ground circuit**

OK

3	**Check configuration of tire pressure monitoring system**

(a) If tire pressure information of malfunctioning wheel is still not displayed, it is necessary to replace tire pressure sensor.

NG → **Reconfigure tire pressure sensor of malfunctioning wheel**

OK

4	**Check tire pressure sensor of malfunctioning wheel**

(a) After replacement, perform configuration and test.

OK → **System detection is normal**

NG → **Replace tire pressure sensor of malfunctioning wheel**

5	**Check tire pressure sensor of malfunctioning wheel**

(a) After replacement, it is necessary to perform configuration.

OK	System detection is normal
NG	Replace tire pressure sensor of malfunctioning wheel

6	Check tire pressure sensor of malfunctioning wheel

(a) After replacement, it is necessary to perform configuration.

OK	System detection is normal
NG	Replace tire pressure sensor of malfunctioning wheel

■ **Wheel-Sensor Not Matched**

DTC	C1060-00	Wheel-Sensor Not Matched
DTC	C1061-00	Invalid Wheel Tick Number Received
DTC	C1062-00	Wheel Tick Number Not Received
DTC	C1063-00	Wheel-Sensor Not All learned

DTC	DTC Definition	DTC Detection Condition	Possible Cause
C1060-00	Wheel-Sensor Not Matched	Vehicle speed is more than 25 km/h for 45 seconds	• Sensor failure • Signal interference • BCM failure • Wheel speed sensor failure • Manual learning
C1061-00	Invalid Wheel Tick Number Received		
C1062-00	Wheel Tick Number Not Received		
C1063-00	Wheel-Sensor Not All learned		

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

1	Check power supply voltage of body control module

(a) Using a digital multimeter, measure voltage between power supply terminal of body control module and ground.

(b) Power supply voltage should be not less than 12 V.

NG	Check and repair battery and power supply system

OK

2	Check body control module ground circuit

(a) Check if the body control module ground is loose or corroded.

NG	Tighten or replace body control module ground circuit

OK

3	Calibrate tire pressure sensor manually

(a) Calibrate the tire pressure sensor manually.

NG → Calibrate the sensor manually

OK

4	Check wheel speed sensor, signal interference

(a) If manual calibration of tire pressure sensor still fails to solve the problem, check wheel speed sensor and whether there is signal interference around the wheel (snow chain, etc.).

OK → Replace wheel speed sensor,remove signal interference

OK

5	Check tire pressure sensor

(a) Check the tire pressure sensor.

NG → Replace tire pressure sensor

OK

6	Check body control module

(a) After replacement, perform configuration and test.

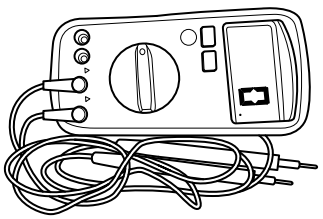
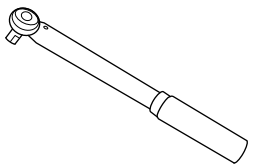
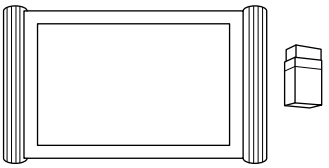
OK → System detection is normal

NG → Replace body control module

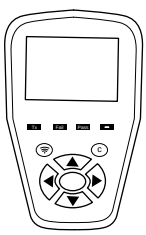
4 On-vehicle Service

4.1 Tool

■ General Tool

Tool Name	Tool Drawing
Digital Multimeter	 S00002
5 - 25 N·m Torque Wrench	 S00079
Diagnostic Tester	 S00001

■ Special Tool

Tool Name	Part No.	Tool Drawing
Low Frequency Trigger	/	 S00069

4.2 Replacement of Tire Pressure Sensor

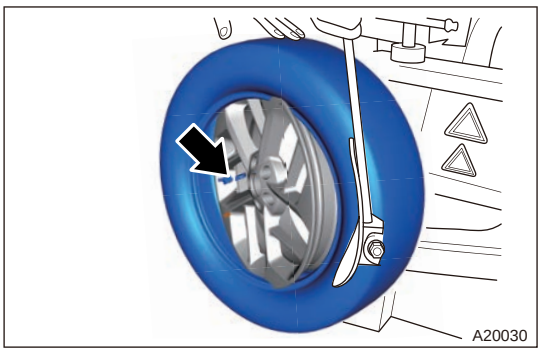
■ Removal

⚠ Caution

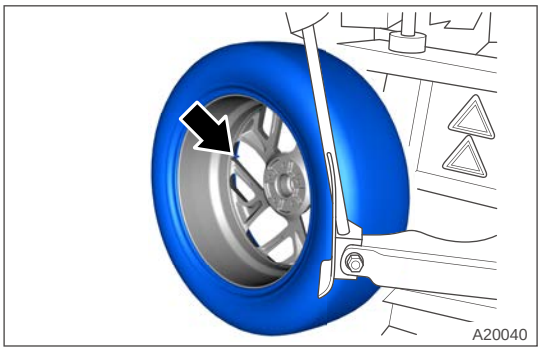
- **Avoid dropping the sensor. If tire pressure sensor is dropped from a place 1 m high to the ground, it is interpreted as fault in tire pressure sensor.**
- **Valve cap must be on the valve, except inflation, deflation, air pressure inspection, etc.**
- **During removal, do not contact the tire pressure sensor tools used, to avoid damage to the tire pressure sensor.**
- **Sensor air pressure inlet cannot be covered partially or completely by lubricant or other materials.**
- **During tire bead breaking, follow the operation specification, never damage the tire pressure sensor.**
- **Both crowbar and tire cannot contact with sensor!**

(1) Remove wheel from vehicle and deflate tire completely.

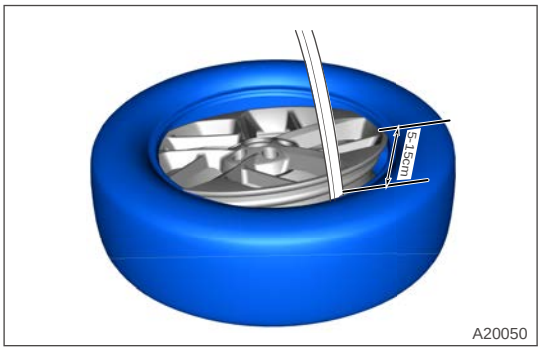
(2) Keep one side with tire pressure sensor 30 cm away from separation shovel, and put shovel block between rim and tire, then depress the pedal to separate rim and tire.



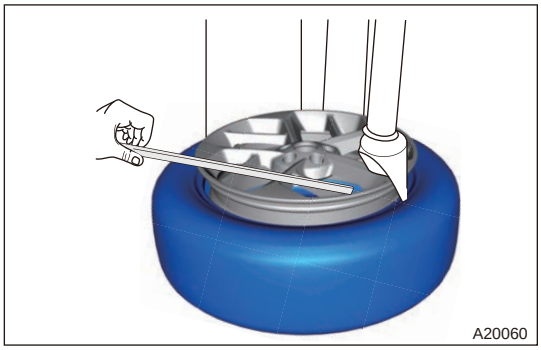
(3) Turn over tire to keep one side with tire pressure sensor 30 cm away from separation shovel, and put shovel block between rim and tire, then depress the pedal to separate rim and tire.



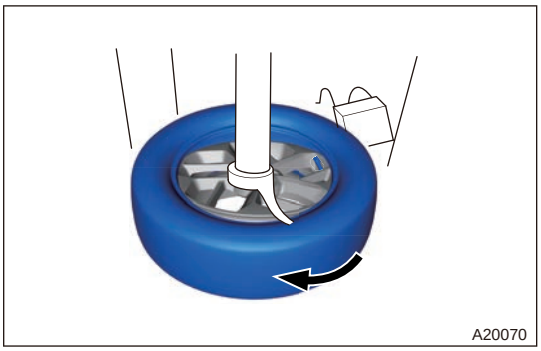
(4) Lock tire on wheel, lower replacer head and keep it 5 - 15 cm away from sensor.



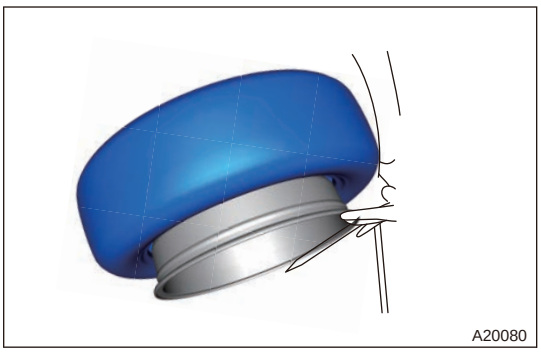
(5) Use crowbar to pry out outside tire, and sleeve it to replacer head, then take away crowbar.



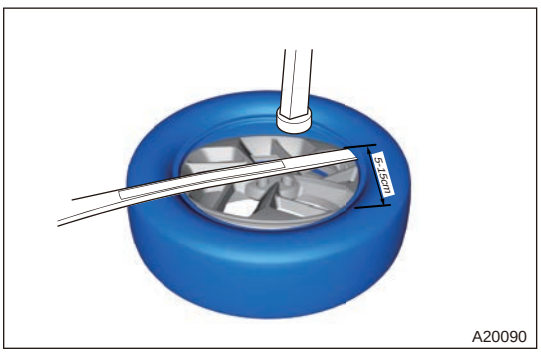
(6) Rotate wheel, and the movable direction of wheel should be the direction that replacer head is gradually kept away from tire pressure sensor, then remove upper part of tire.



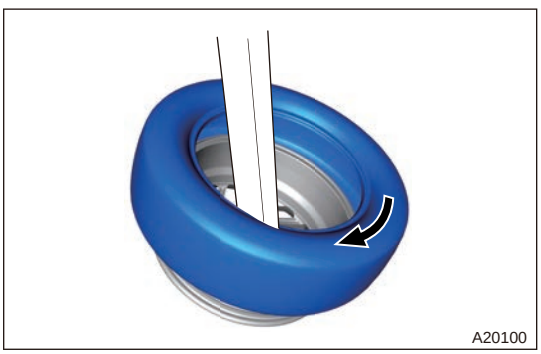
(7) Lift tire and pry out lower part of tire using crowbar.



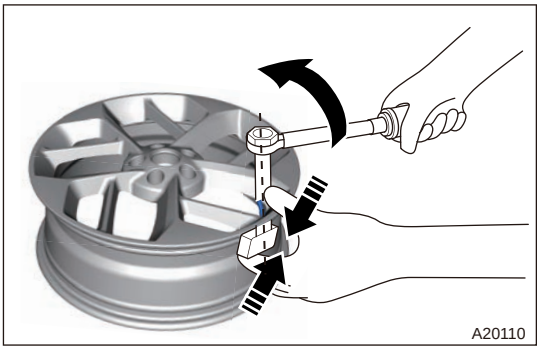
(8) Lower replacer head and pry out lower side tire tread using crowbar, then sleeve it on replacer head and keep it 5 - 15 cm away from sensor.



(9) Rotate wheel, and the movable direction of wheel should be the direction that replacer head is gradually kept away from tire pressure sensor, then pry out tire completely.



(10) Using an appropriate tool, rotate nut counterclockwise until it separates from tire pressure sensor completely.

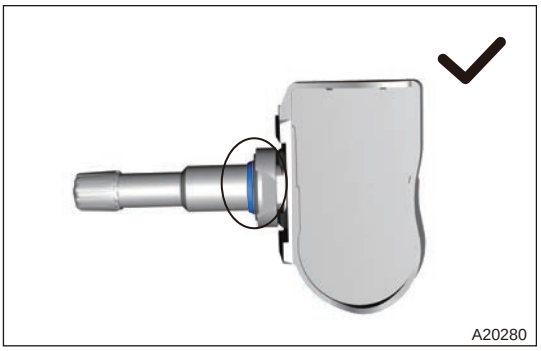


(11) Remove tire pressure sensor from wheel hub.

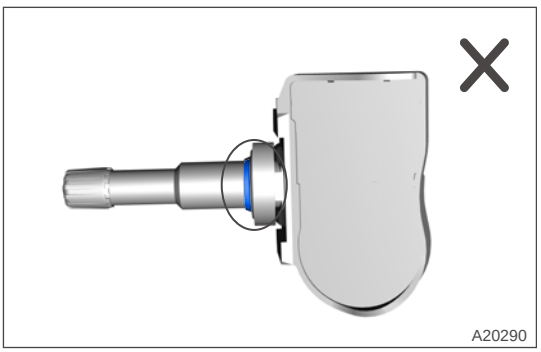
■ Inspection

(1) When removing sensor body, first check if seal washer cutout plane is parallel with the polyester plane. If they are not parallel and there is an angle between two planes, turn seal washer to make seal washer cutout plane parallel with polyester plane.

(2) If seal washer cutout plane is parallel with polyester plane, it indicates that assembly is qualified.

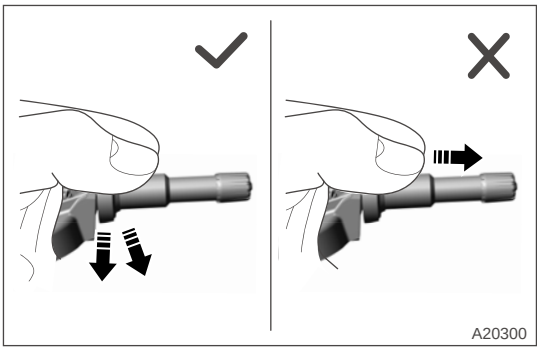


(3) If seal washer cutout plane is not parallel with polyester plane and there is a large angle between two planes, it indicates that assembly is not qualified.

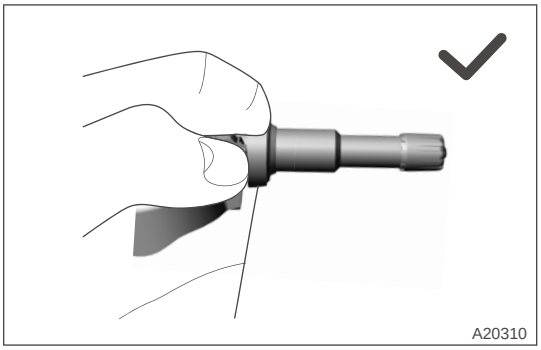


■ Adjustment

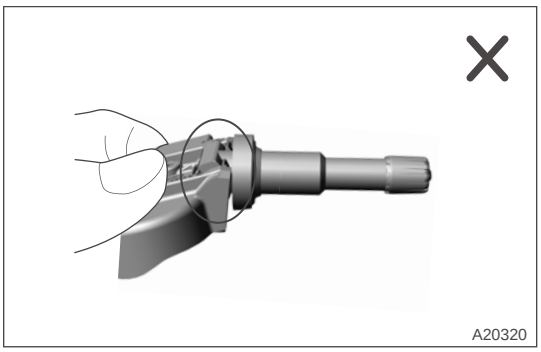
(1) Press root of valve stem using middle part of your thumb with a downward force in groove direction, so that root of valve stem can be seated in the groove fully; then, keep middle part of thumb pressed against valve stem and tip part of thumb pressed against the seal washer with a vertical downward force applied along seal washer, so that the valve stem can bend to maximum angle. It is not allowed to apply horizontal force along the seal washer.



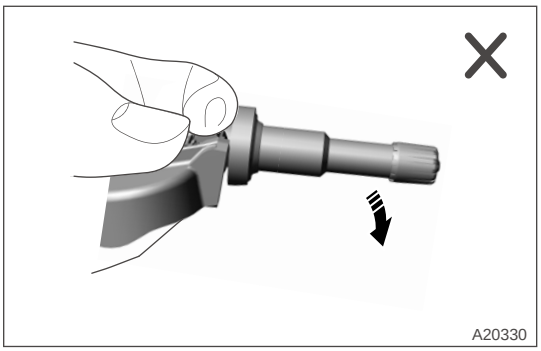
(2) If root of valve stem enters groove completely and valve stem bends to limit, it indicates that assembly is qualified.



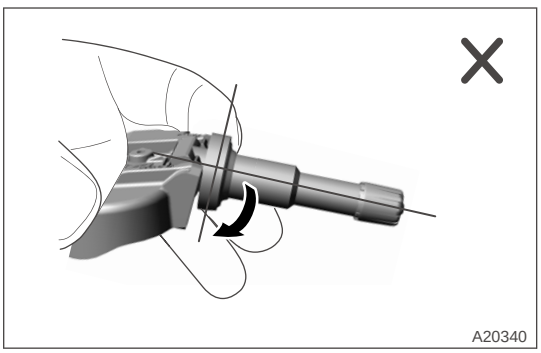
(3) If root of valve stem dose not enter groove fully and valve stem dose not bend to limit, it indicates that assembly is not qualified.



(4) If valve stem dose not bend to limit, it indicates that assembly is not qualified.



(5) If seal washer plane is not perpendicular to valve stem after a horizontal force is applied along the seal washer, it indicates that assembly is not qualified.

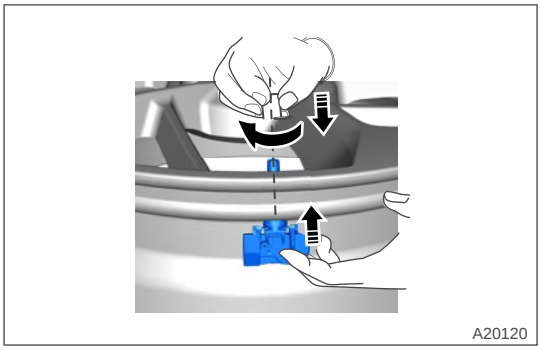


■ **Installation**

⚠ Caution

- **Avoid dropping the sensor. If tire pressure sensor is dropped from a place 1 m high to the ground, it is interpreted as fault in tire pressure sensor.**
- **Tire pressure sensor must be installed on clean and dry hub.**
- **Valve cap must be on the valve, except inflation, deflation, air pressure inspection, etc.**
- **During installation, do not contact the tire pressure sensor with used tools, to avoid damage to the tire pressure sensor.**
- **Sensor air pressure inlet cannot be covered partially or completely by lubricant or other materials.**
- **Always use torque wrench when installing tire pressure sensor, common wrench cannot guarantee a torque of 8 ± 1 N·m. If the torque is relatively low, air leakage may occur, resulting in a risk of danger; if the torque is relatively high, tire pressure sensor or related components may be damaged, resulting in a risk of danger.**
- **Required tightening speed: ⩽ 30 rpm; Assembly torque: 8 ± 1 N·m.**

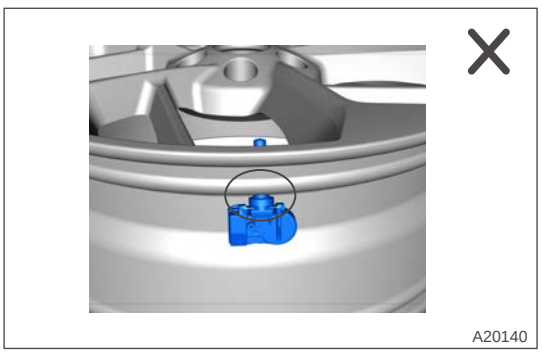
(1) Align tire pressure sensor with fixing hole on wheel hub and hold the tire pressure sensor vertically with four fingers of the left hand in upward direction, never apply inward component force in horizontal direction; hold the outer edge of rim with left thumb, and apply a downward force to press both sides of sensor housing firmly against the rim. Pass the valve stem into rim along valve hole center axis, and insertion direction is from inward to outward of tire assembly. Tighten the nut with right hand in clockwise direction until the tire pressure sensor is fixed without any movement.


A20120

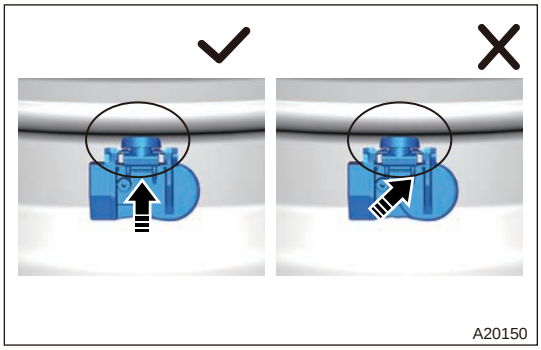
(2) If valve stem is fully seated into the groove, sensor is fully fixed without any movement and sensor housing is pressed against rim firmly, it indicates that assembly is qualified.


A20130

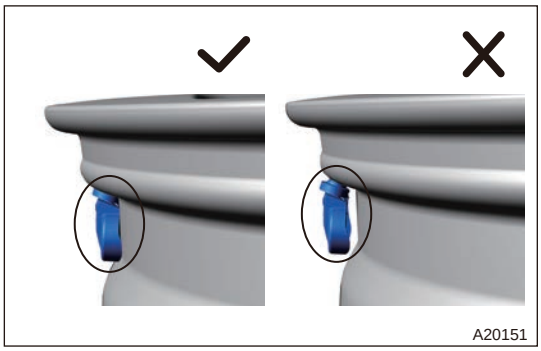
(3) If the pretightened nut is not tightened into place with too much valve stem screw exposed and sensor is not fixed, it indicates that assembly is unqualified.


A20140

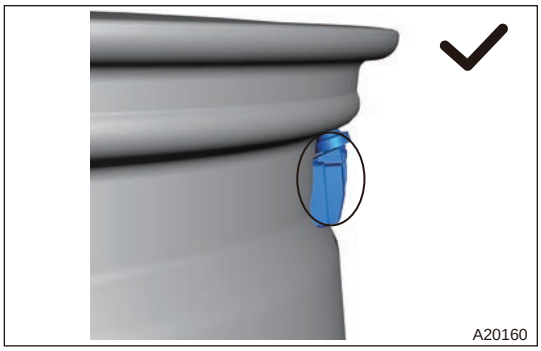
(4) If the sensor valve stem slides out form metal groove after a horizontal inward component force is applied, it indicates that assembly is unqualified.



(5) If right side of sensor is not pressed against the rim firmly, it indicates that assembly is unqualified.

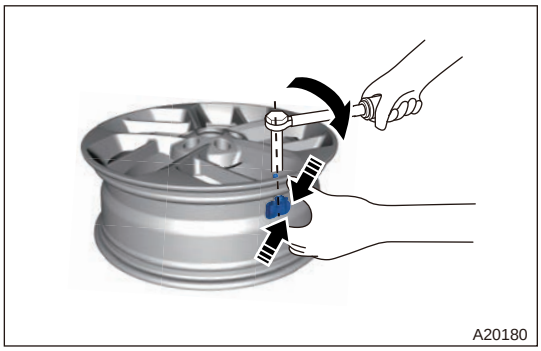


(6) If left side of sensor is pressed against the rim firmly, it indicates that assembly is qualified.

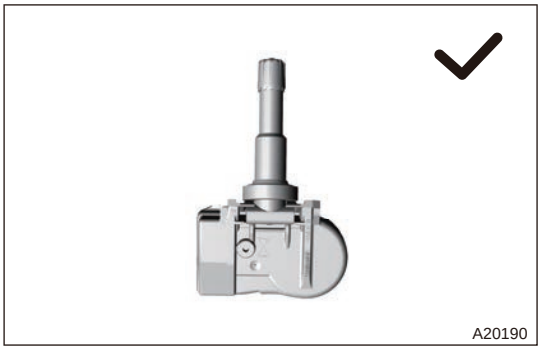


(7) If left side of sensor is not pressed against the rim firmly, it indicates that assembly is unqualified.

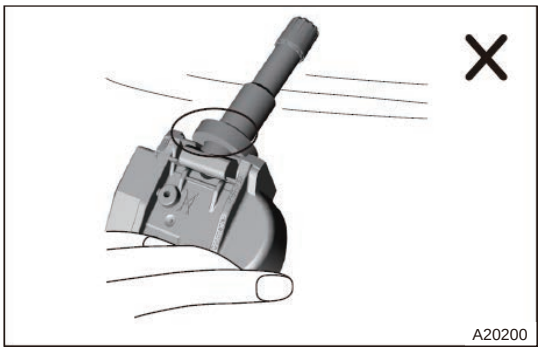
(8) Hold bottom part of the sensor using four fingers of left hand with a upward force. Hold the rim edge with left thumb with a downward force. Press the tire pressure sensor against the rim firmly, and keep the sensor position fixed during tightening process. The axis of manual torque wrench sleeve should be overlaped with that of valve stem without any angle. Start the fitting button to tighten the nut in clockwise direction, and the tightening process is finished after torque reaches 5 ± 0.5 N·m. Do not tighten the nut again after it is tightened.



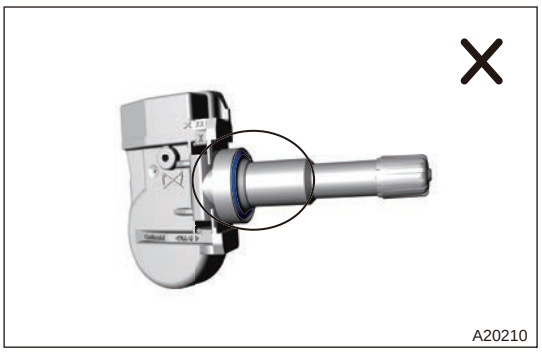
(9) If valve stem is fully seated in metal groove, sensor is fully fixed without any movement and both sides of the sensor housing are pressed against rim firmly, it indicates that assembly is qualified.



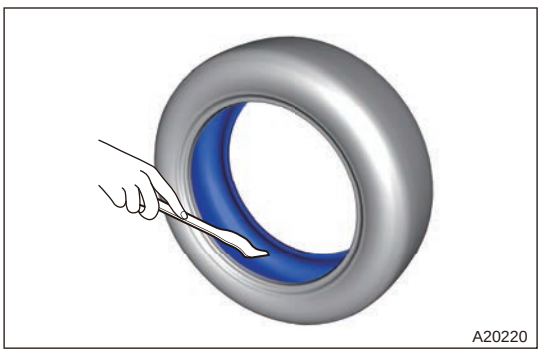
(10) If valve stem slides out of metal groove, it indicates that assembly is unqualified.



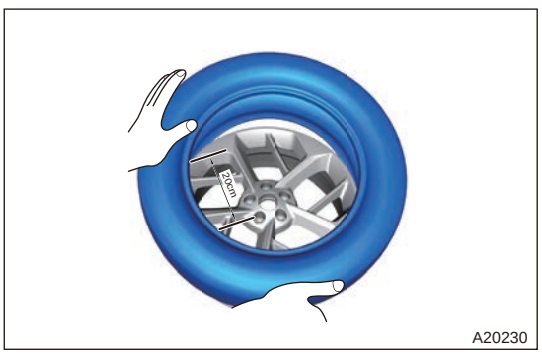
(11) If seal washer and seal ring are deformed or damaged due to excessive torque, it indicates that assembly is unqualified.



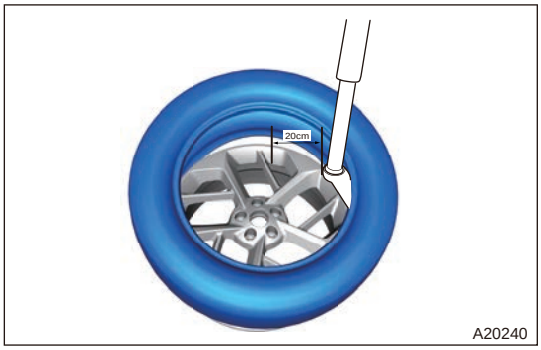
(12) Installation is the same as common tire. Before loading tire, apply soapy water or glycerin to tire bead along inner circle.



(13) Put tire on hub and keep intersection between hub and tire edge 15 - 20 cm away from valve stem.

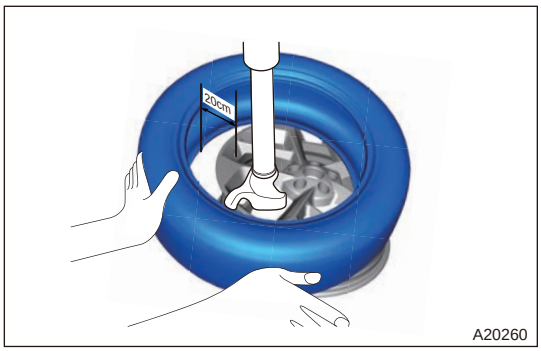


(14) Install bottom tire to make sure the distance between intersection and valve stem is about 20 cm.



(15) Rotate wheel to install one side of tire into hub. Rotation direction of wheel should be the direction that makes replacer head get farther and farther away from sensor.

(16) Put another side of tire in place, so that intersection between tire edge and hub is 20 cm away from valve stem.



(17) Rotate wheel to install another side of tire into hub.

⚠ Caution

- **Be sure to observe the operation regulation to prevent tire pressure sensor from being damaged.**
- **Both crowbar and tire cannot contact with sensor.**
- **Confirm that distance between intersection and valve stem is proper.**

4.3 Tire Pressure Sensor Learning

Hint:

- Perform tire pressure learning when rotating tire and replacing tire pressure sensor. And perform each tire sensor learning with diagnostic tester.
- Tire pressure monitoring function is turned on after BCM is replaced, then it is necessary to perform learning of tire pressure sensor again.

⚠ Caution
• **As for air bleeding method and low-frequency trigger method, only the activation type to trigger tire pressure sensor is different and other procedures are all the same.**

■ Learning with diagnostic tester (air bleeding method)

Hint:

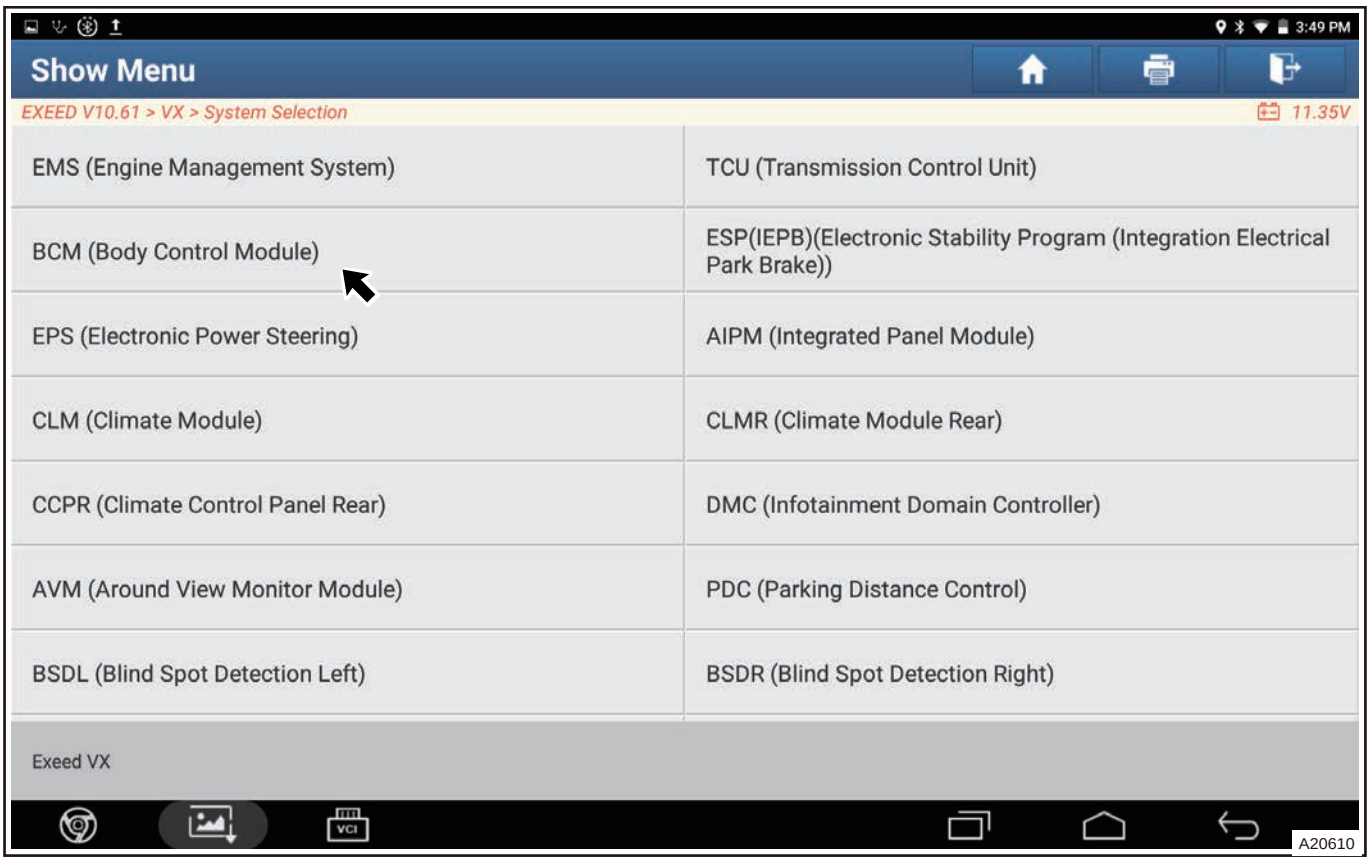
- Perform tire pressure learning when rotating tire and replacing tire pressure sensor. And perform each tire sensor learning with diagnostic tester.
- Tire pressure monitoring function is turned on after BCM is replaced, then it is necessary to perform learning of tire pressure sensor again.

Precautions	Description
Avoid error learning of tire	Learned tire must be matched with bleeding tire
	Only operate one tire every time, and do not bleed (or inflate) other tires at this time
	Keep away from other vehicles with tire pressure sensor, avoiding error learning or interference

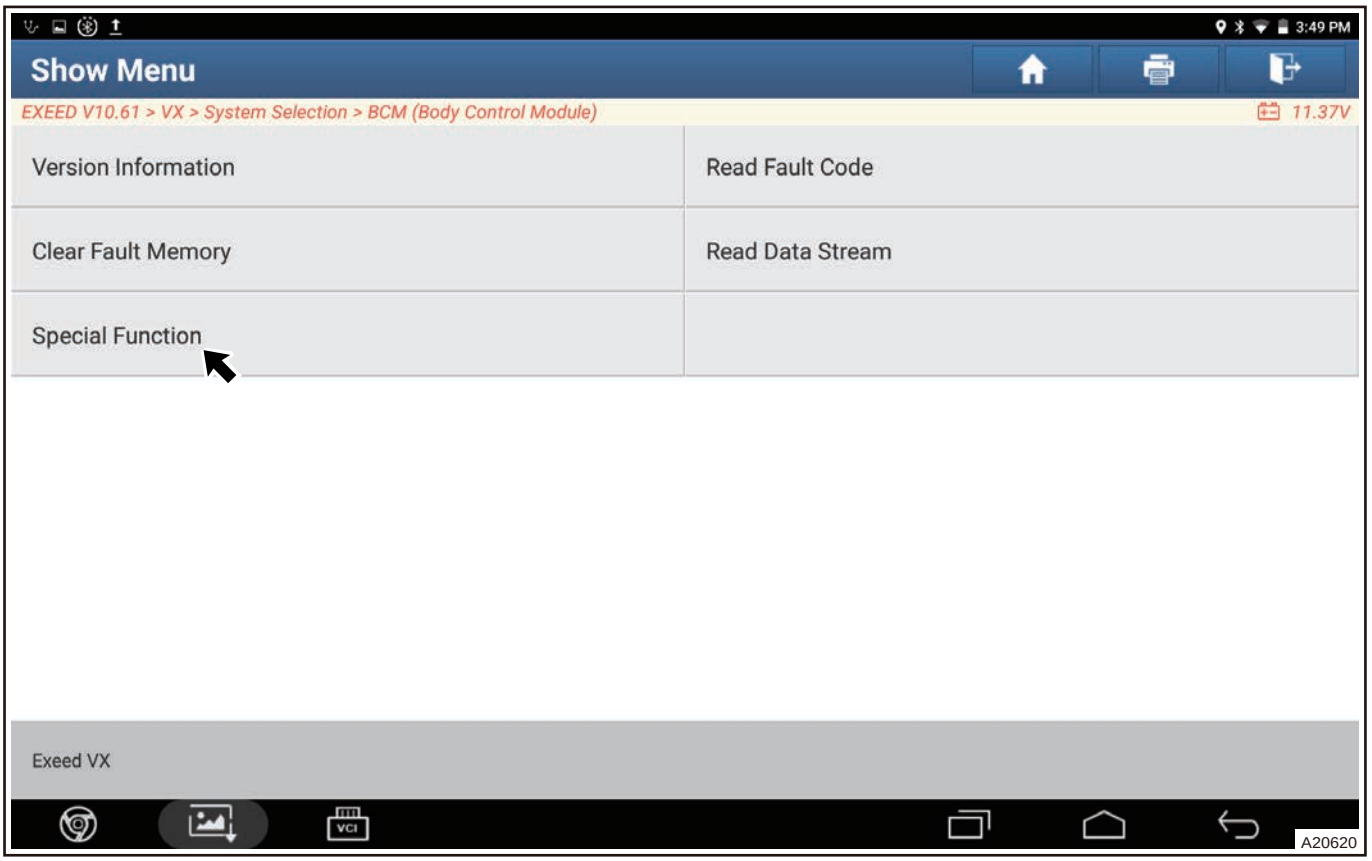
- If tire learned in system does not matched with bleeding tire, system will recognize an error, resulting in tire information displayed in instrument cluster not corresponding to actual tire information.
- When learning a tire, please do not inflate or bleed other tires. Bleeding or inflating the tire will cause error tire learning.
- When learning tire pressure monitoring system, please do not approach other vehicles equipped with tire pressure sensor and with tire pressure sensor in activated state, otherwise it may lead to error learning or failure to learn.
- After completing learning, please confirm whether four tire pressure sensor ID of actual vehicle is consistent with tire pressure sensor ID recorded by BCM.

(1) Connect diagnostic tester and turn ENGINE START STOP switch to ON.

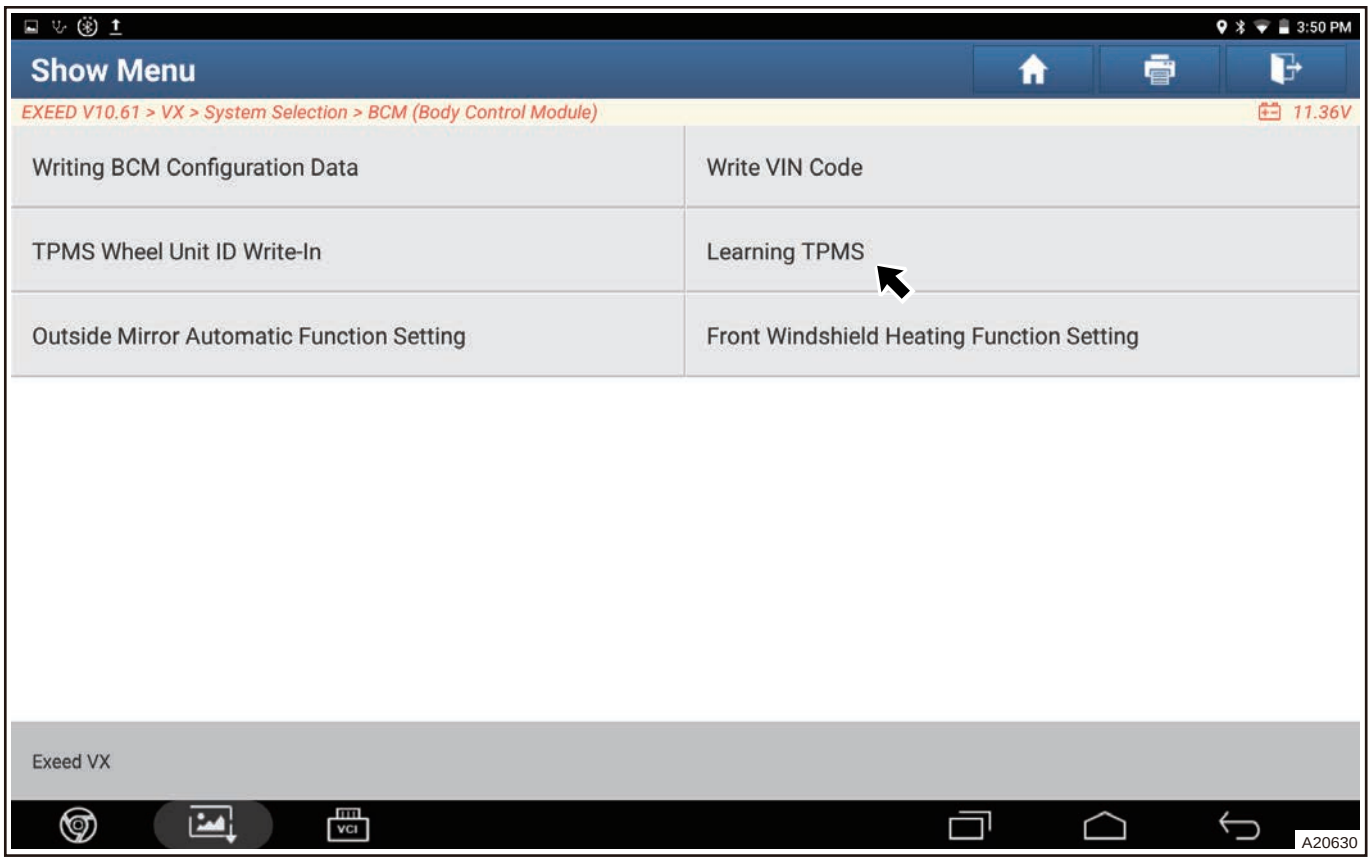
(2) Click “BCM (Body Control System)”.



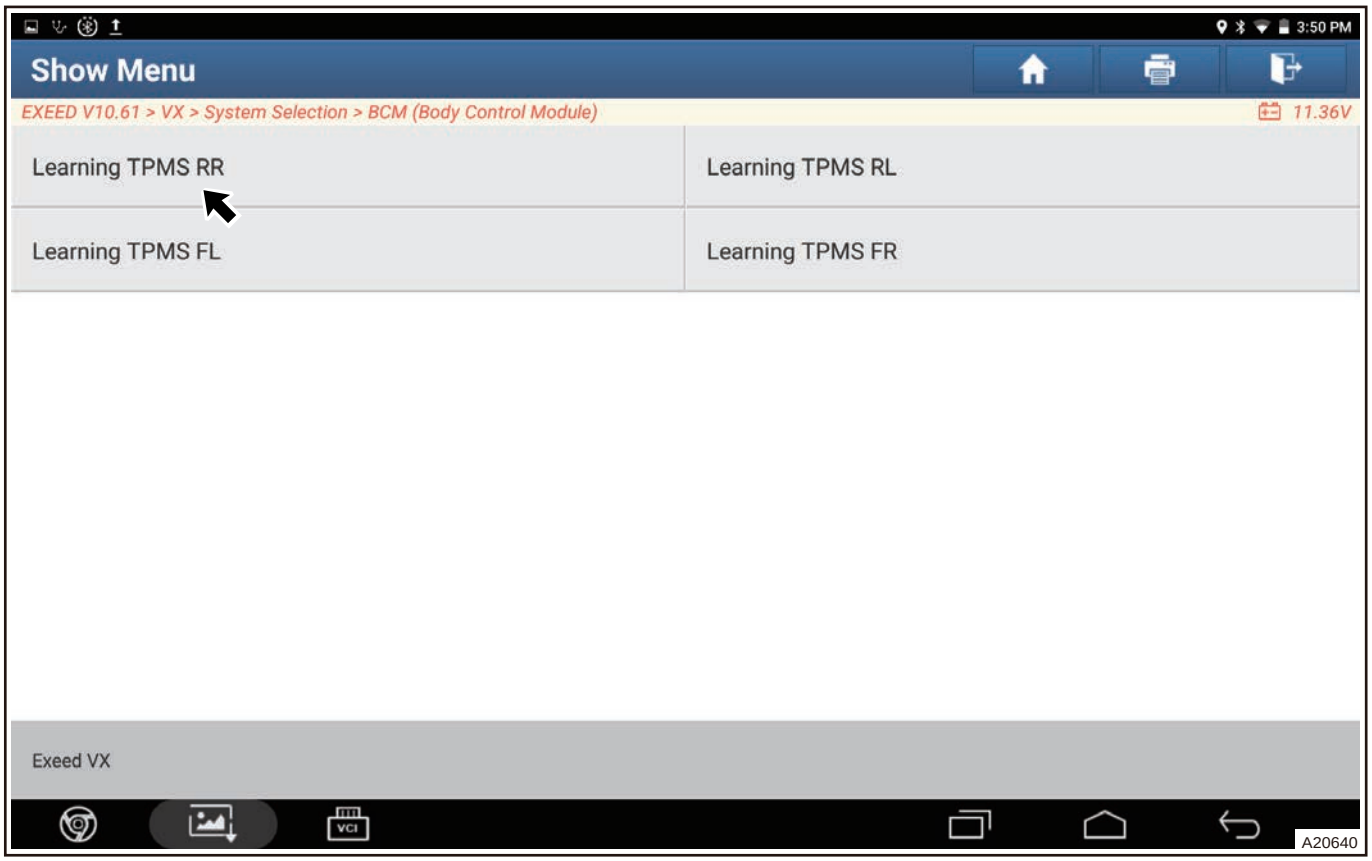
(3) Click “Special Operation”.



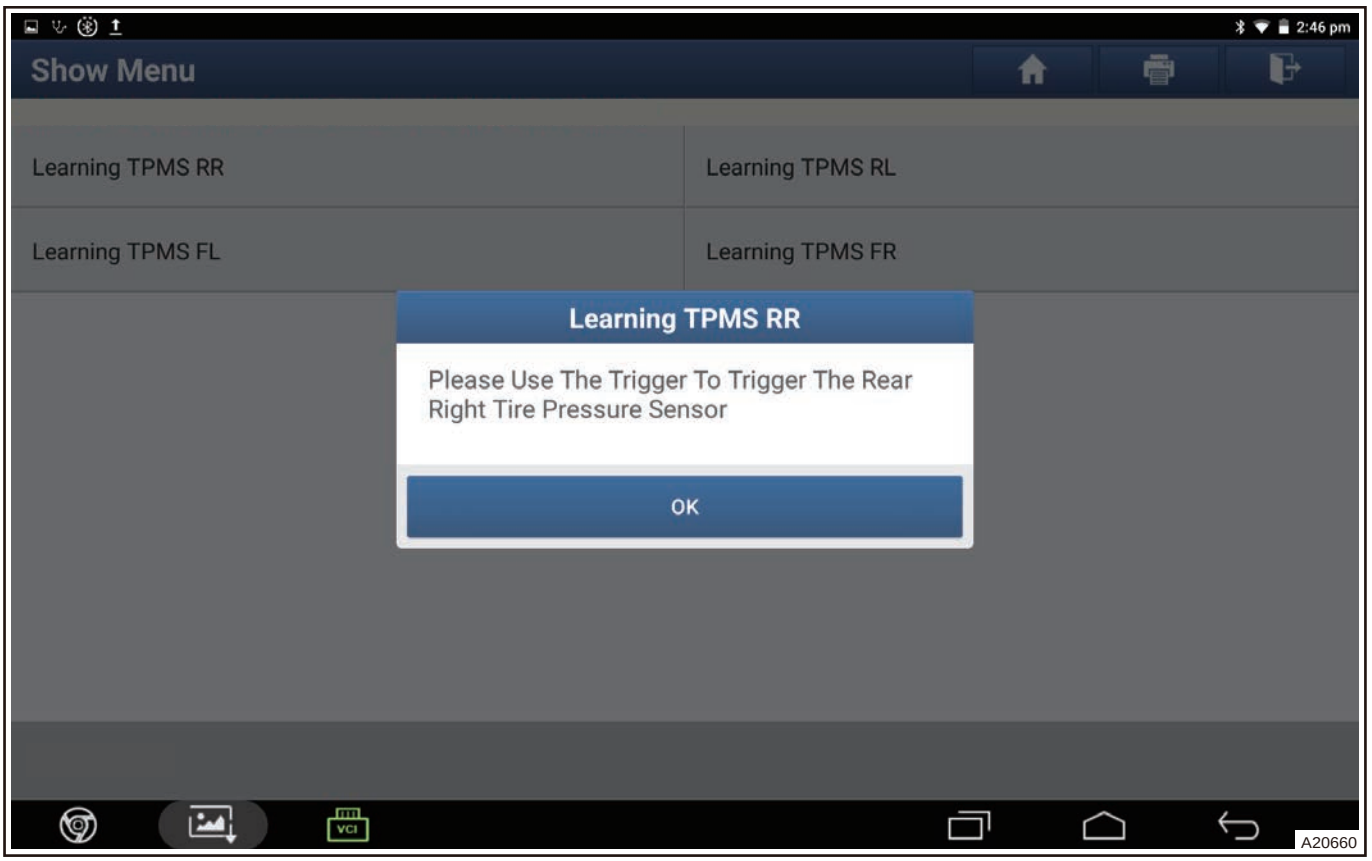
(4) Click “Tire Pressure Learning”.



(5) Click “Rear Right Tire Pressure Learning”.



(6) Operates according to prompt on diagnostic tester.



(7) When clicking “OK” button on diagnostic tester, tire pressure learning screen is displayed on meter and tire pressure warning light flashes. Perform tire pressure sensor learning when tire pressure monitoring system enters sensor learning status.

(8) Perform bleeding operation for front left wheel. After front left tire pressure sensor learning is successful, tire pressure malfunction indicator on meter goes off, front left tire pressure value is displayed and “Procedure has completed” is displayed on diagnostic tester which indicates that front left tire pressure sensor learning has been finished.

■ Use diagnostic tester to learn tire pressure sensor (tire pressure learning method for low-frequency trigger)

Meter screen display for successful tire pressure sensor learning:

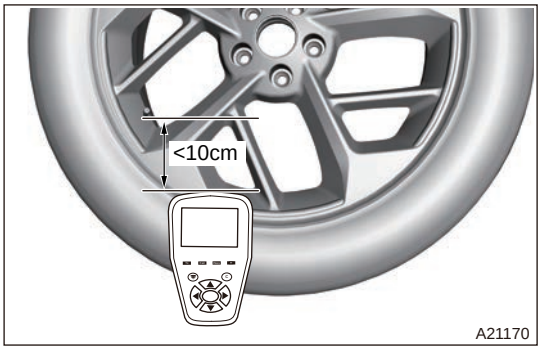
(1) Left and right turn signal lights stop blinking, and tire pressure data is displayed on meter, indicating that tire pressure learning is completed, such as left front wheel. The displayed tire pressure is 2 bar and the temperature is 40 ˚C for front left wheel, which indicate that the front left wheel is learned successfully.

⚠ Caution

- **Only after learn is successful, click "OK", otherwise learning will not be successful.**

Preparation:
There is enough pressure in tire (full loaded pressure is recommended), BCM turns on tire pressure monitoring function.

- If the malfunction is suspected in tire pressure sensor, use the low-frequency trigger to perform test.
- Distance between low-frequency trigger and tire pressure sensor is less than 10 cm. Place the antenna of low-frequency trigger near the rubber tire with tire pressure sensor on the wheel, and then press triggering button on low-frequency trigger. After the low-frequency trigger is successfully triggered, relative information about learned tire such as tire ID, pressure and temperature will be displayed.



Low Frequency Trigger Learning Process:

1	**Start**

Next

2	**ENGINE START STOP switch is in ON; but do not start vehicle**

Next

3	**Switch conventional screen to tire pressure screen on meter; Operate diagnostic tester and select "TPMS Self-learning" menu in "Special Operation"**

Next

4	**Select tire to be learned with diagnostic tester**

Next

5	**Enter tire pressure learning status, left and right turn signal lights start blinking**

Next

6	**Trigger wheel sensor to be learned using low-frequency trigger**

Next

7	**Tire pressure sensor ID, temperature and pressure values are displayed on low-frequency trigger**

Next

8	**Left and right turn signal lights stop blinking, the tire pressure data can be displayed on meter, it indicates that tire pressure learning of this tire is completed, click "OK" button on diagnostic tester to exit learning status**

Next

9	Check if other tire sensors are also learned

Yes → Step 4

No

10	Rode test: Vehicle speed is more than 30 Km/h for 45 seconds

Next

11	Select tire to be learned with diagnostic tester

No → Step 2

Yes

12	End

■ Meter Screen Display for Successful Tire Pressure Sensor Learning

(1) Left and right turn signal lights stop blinking, and tire pressure data is displayed on meter, indicating that tire pressure learning is completed, such as left front wheel.

The displayed tire pressure is 2.4 bar and the temperature is 40 ˚C for front left wheel, which indicate that the front left wheel is learned successfully.

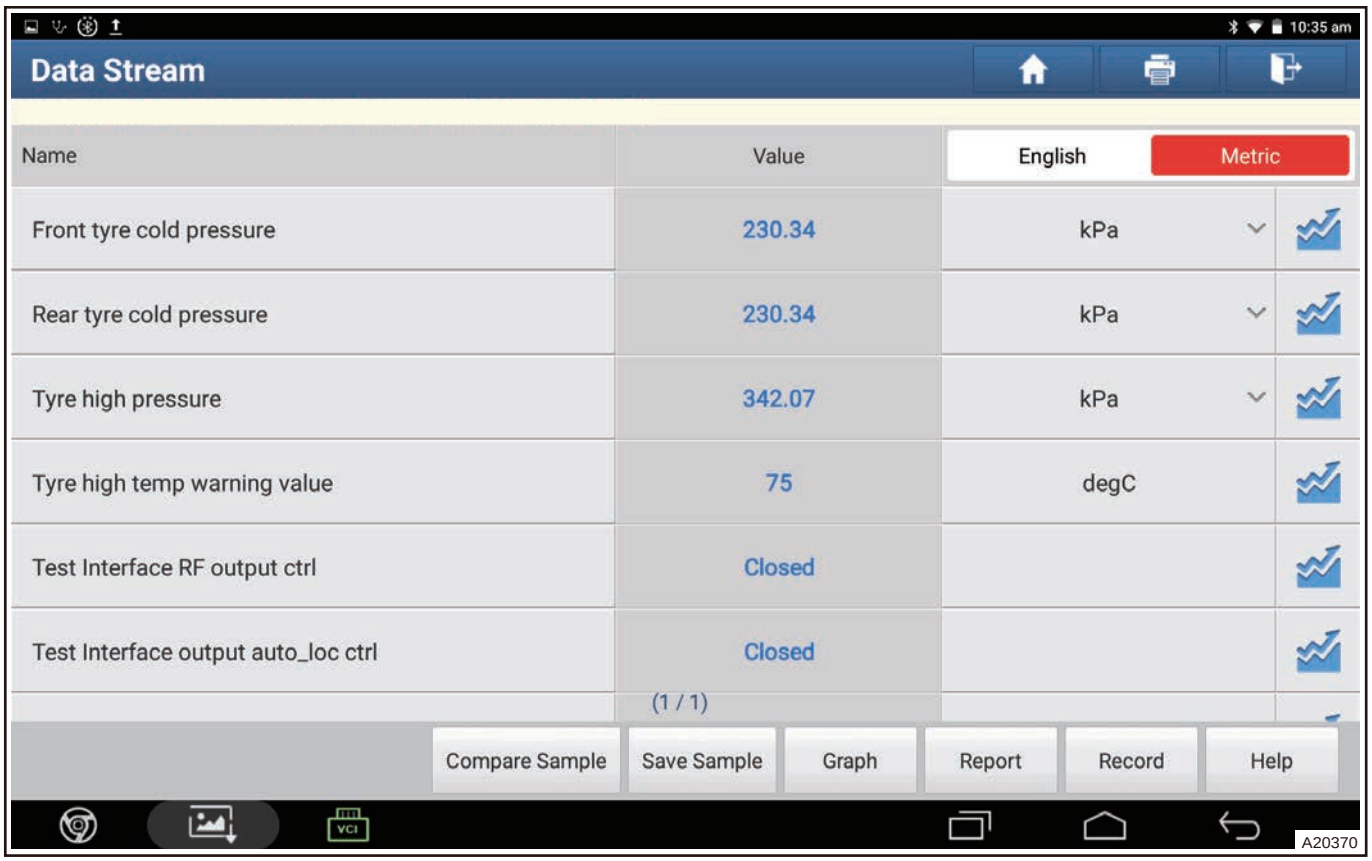
⚠ Caution

- **Only after learn is successful, click "OK", otherwise learning will not be successful.**

■ Inspection of Tire Pressure Monitoring System Learning Status

After repairing or reconfiguring tire pressure monitoring system, perform inspection of tire pressure monitoring system learning status. Select Read Data Stream to check learning status of tire pressure system.

(1) Click sensor learning status to check sensor learning status and whether learning is successful. If learning is not successful, unsuccessful learning will be displayed.



■ Automatic Positioning Learning Method

There is automatic tire pressure positioning function:
If tires are exchanged, or sensor is replaced due to damage, and the vehicle stops for more than 20 minutes, when vehicle is continuously driving with a speed higher than 25 Km/h within 45 minutes, system can automatically learn tire pressure and match it to corresponding position.

⚠ Caution

- **If two or more sensors are replaced, tire pressure position displayed on meter may be inconsistent with actual position within 10 minutes during driving. And it will be updated to correct position after successful positioning within 10 minutes.**
- **During automatic positioning, ID stored in receiver defaults to previous ID and corresponding position. If tire rotation is performed, pressure and temperature display position and low/high temperature alarm position of meter may be inconsistent with actual position. And it will be updated to correct position after successful positioning.**

BRAKE SYSTEM

BRAKE SYSTEM

7.1 FRONT BRAKE

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) DO NOT machine the brake disc, because it may make brake disc thickness less than the minimum thickness.

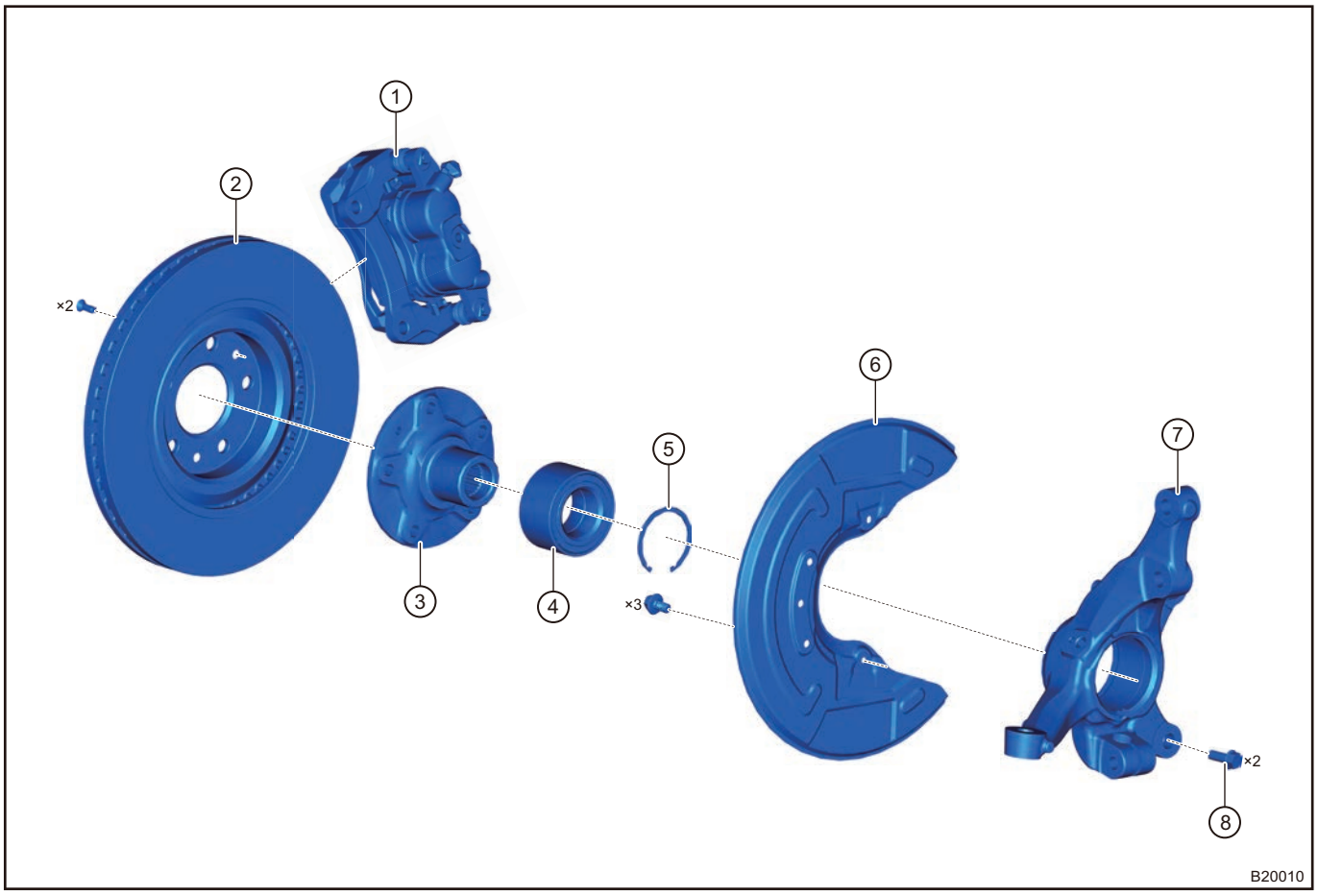
(2) After removing front brake caliper assembly, it is strictly forbidden to depress brake pedal, otherwise the brake caliper piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.

(3) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Components Diagram

■ **Front Left Steering Knuckle with Disc Brake Assembly**

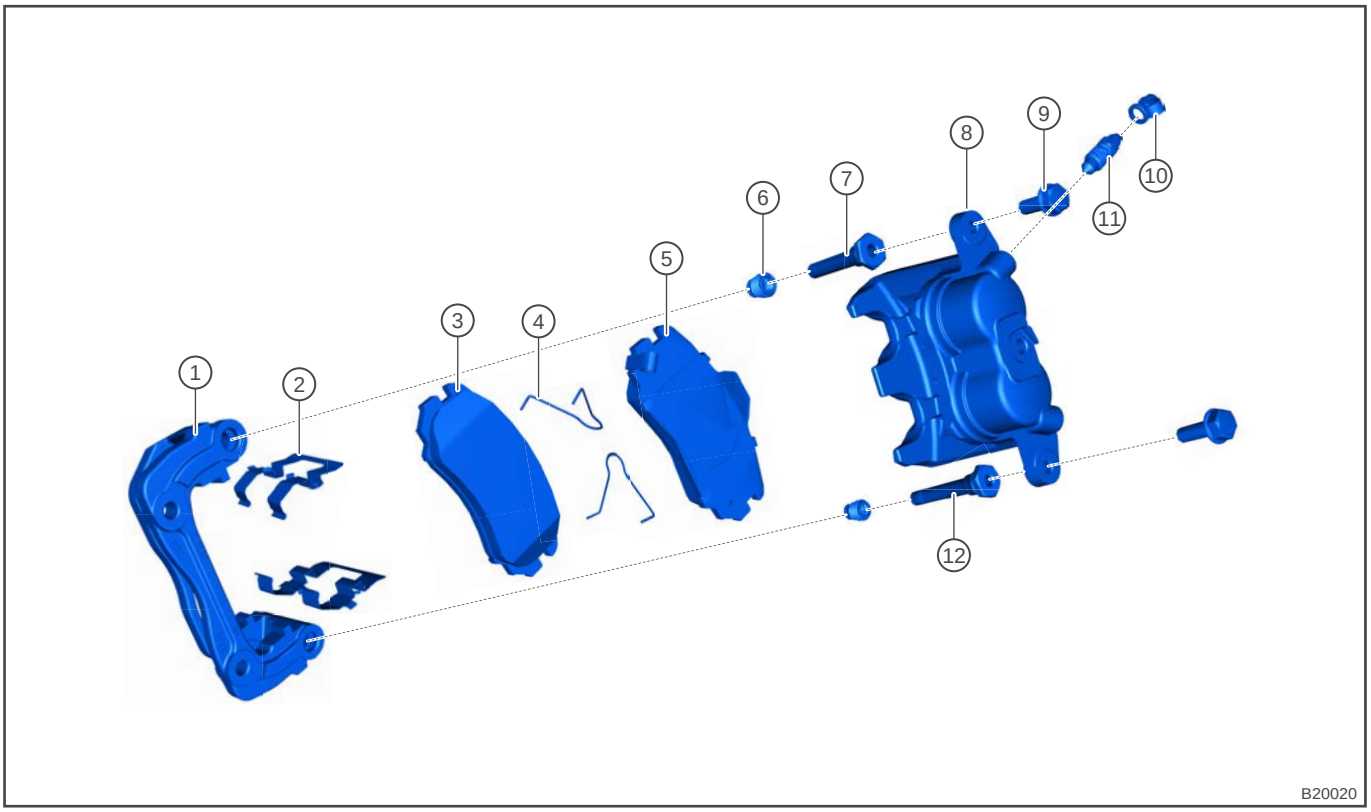


1	Front Left Brake Caliper Assembly	5	Snap Ring
2	Front Brake Disc	6	Front Left Dust Guard

3	Front Hub	7	Front Left Steering Knuckle
4	Front Hub Bearing	8	Front Brake Caliper Fixing Bolt

Front left steering knuckle with disc brake assembly is mainly composed of front left brake caliper assembly, front brake disc, front hub, front hub bearing, snap ring, etc.
Front brake disc is fixed on front hub, clamped in the middle of rear outer lining assembly/rear inner lining assembly, and rotates with wheel. Front brake caliper body assembly is connected with front brake caliper bracket (bracket is fixed on steering knuckle) through guide pin tightening bolt.

■ Front Left Brake Caliper Assembly



1	Front Brake Caliper Bracket	7	Main Guide Pin (without Bushing)
2	Front Spring Plate	8	Front Left Brake Caliper Body Assembly
3	Front Outer Lining Assembly	9	Guide Pin Tightening Bolt
4	Lining Return Spring	10	Bleeder Plug Cover
5	Front Inner Lining Assembly	11	Bleeder Plug
6	Guide Pin Dust Boot	12	Sub Guide Pin (with Bushing)

⚠ Caution

- **Main guide pin is installed on the side close to bleeder plug, and sub guide pin is installed on the side far away from bleeder plug. Incorrect installation method will lead to abnormal sound on bumpy road.**

Front left brake caliper assembly is mainly composed of front brake caliper bracket, front left brake caliper body assembly, guide pin, guide pin dust boot, etc. When braking, brake fluid of brake master cylinder enters brake caliper assembly of each wheel through hydraulic line. A force acting on brake caliper assembly piston pushes brake caliper assembly piston and it' s inner lining assembly to move to the left and press it onto brake disc, so brake disc applies a rightward reaction force to brake caliper assembly piston, making brake caliper assembly piston and brake caliper body assembly move to the right along guide pin until outer lining

assembly is also pressed onto brake disc. At this time, lining assemblies on both sides are pressed on brake disc, and brake disc is clamped to make it brake.

2.2 Brake Disc Specifications

■ **Front Disc Brake**

Description	Minimum Thickness (mm)
Front Brake Disc	26
Front Brake Lining	2

3 DIAGNOSIS & TESTING

3.1 Problem Symptoms Table

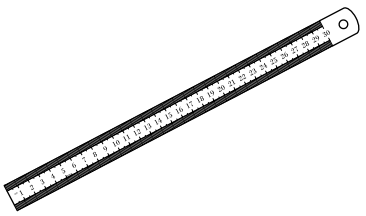
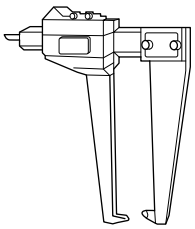
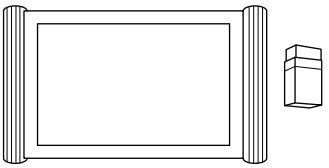
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Braking deviation	Oily lining assembly
	Uneven brake disc wear
	Brake caliper body assembly failure (piston stuck)
Brake shakes	Hub bearing is damaged
	Uneven brake disc wear
	Steering/suspension part is loose
	Uneven lining assembly wear
	Brake caliper assembly fixing bolt is loose
Abnormal noise occurs during braking	Spring plate is damaged
	Hub bearing is damaged
	Abnormal brake disc wear
	Oily lining assembly
	Steering/suspension part is loose
	Abnormal lining assembly wear
	Brake caliper assembly fixing bolt is loose
Brake stuck	Minimum brake pedal free play
	Poor returning of guide pin (deformed or damaged)
	Brake caliper body assembly failure (piston stuck)

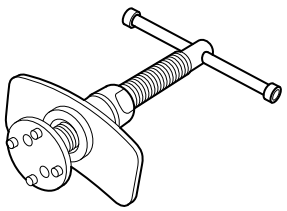
4 On-vehicle Service

4.1 Tools

■ General Tools

Tool Name	Tool Drawing
Caliper	 S00044
Thickness measurement caliper	 S00082
Diagnostic tester	 S00001

■ Special Tool

Tool Name	Part No.	Tool Drawing
Brake Cylinder Release Tool	ECH-0005	 S00076

4.2 Brake Bleeding

Hint:

- Be sure to perform brake bleeding after replacing hydraulic parts related to brake.
- An assistant will be required to assist when bleeding brake system.
- There are 2 methods for brake bleeding, and specific operation procedures are as follows:

■ Manual Bleeding

⚠ Caution

- **When performing bleeding procedures for brake system, wear safety glasses.**
- **Be careful when bleeding air, as brake fluid at high pressure may spray out from bleeder screw.**

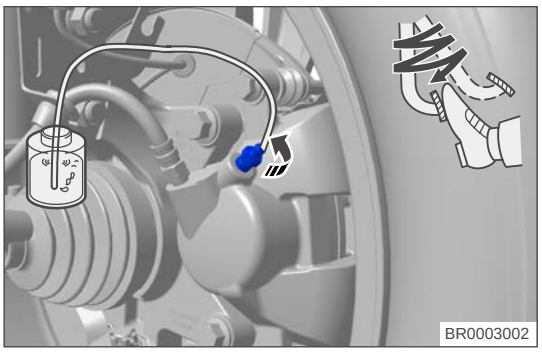
⚠ Warning

- **Before removing brake fluid reservoir, wipe off any dust and other foreign matters on brake fluid reservoir to prevent them from entering.**
- **Use fresh, clear and well-sealed brake fluid with specified type.**
- **DO NOT allow the brake fluid to adhere to any paint surface, such as vehicle body. If brake fluid leaks onto any paint surface, immediately wash it off.**
- **During bleeding, do not depress brake pedal repeatedly at any time with bleeder screw opened. Otherwise, air amount in the system will increase to make an extra bleeding.**
- **DO NOT drain the brake fluid in brake fluid reservoir while bleeding brake system.**

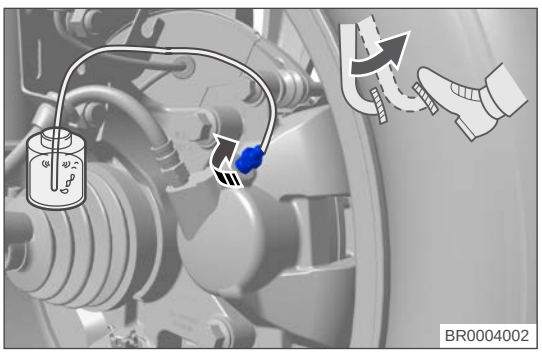
(1) Fill brake fluid reservoir with brake fluid to a proper level.

(2) Loosen bleeder screw cap and connect a clear plastic hose to bleeder screw. Submerge the end of hose into container.

(3) Have an assistant depress brake pedal 3 to 4 times repeatedly; and depress and hold it at a lower position, then loosen the bleeder screw.



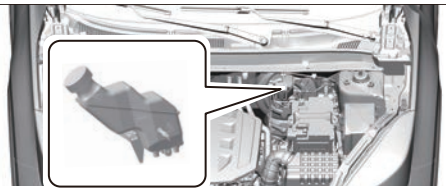
(4) Tighten bleeder screw every time brake pedal goes down quickly, then release the brake pedal.



(5) Repeat above steps, and use the same procedures to bleed brake line of each wheel in order of rear left wheel, front left wheel, front right wheel and rear right wheel, until no air exists in brake system.

Empty sign: A stream of fresh brake fluid flows into clear container without bubbles.

Hint:
During bleeding of brake system, make sure brake fluid level in brake fluid reservoir is always near “MAX” mark. Check brake fluid level at all times during bleeding. Add brake fluid as necessary.



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(6) Check and adjust the brake fluid level to “MAX” mark.

(7) Check the brake pedal braking effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding procedures for brake system again as necessary.

(8) Test vehicle to confirm that brakes operate properly with good depressing feel.

■ Bleeding brake using diagnostic tester

Hint:
To reach sufficient pressure in hydraulic regulator, brake pedal needs to be depressed repeatedly during whole process.

⚠ Warning

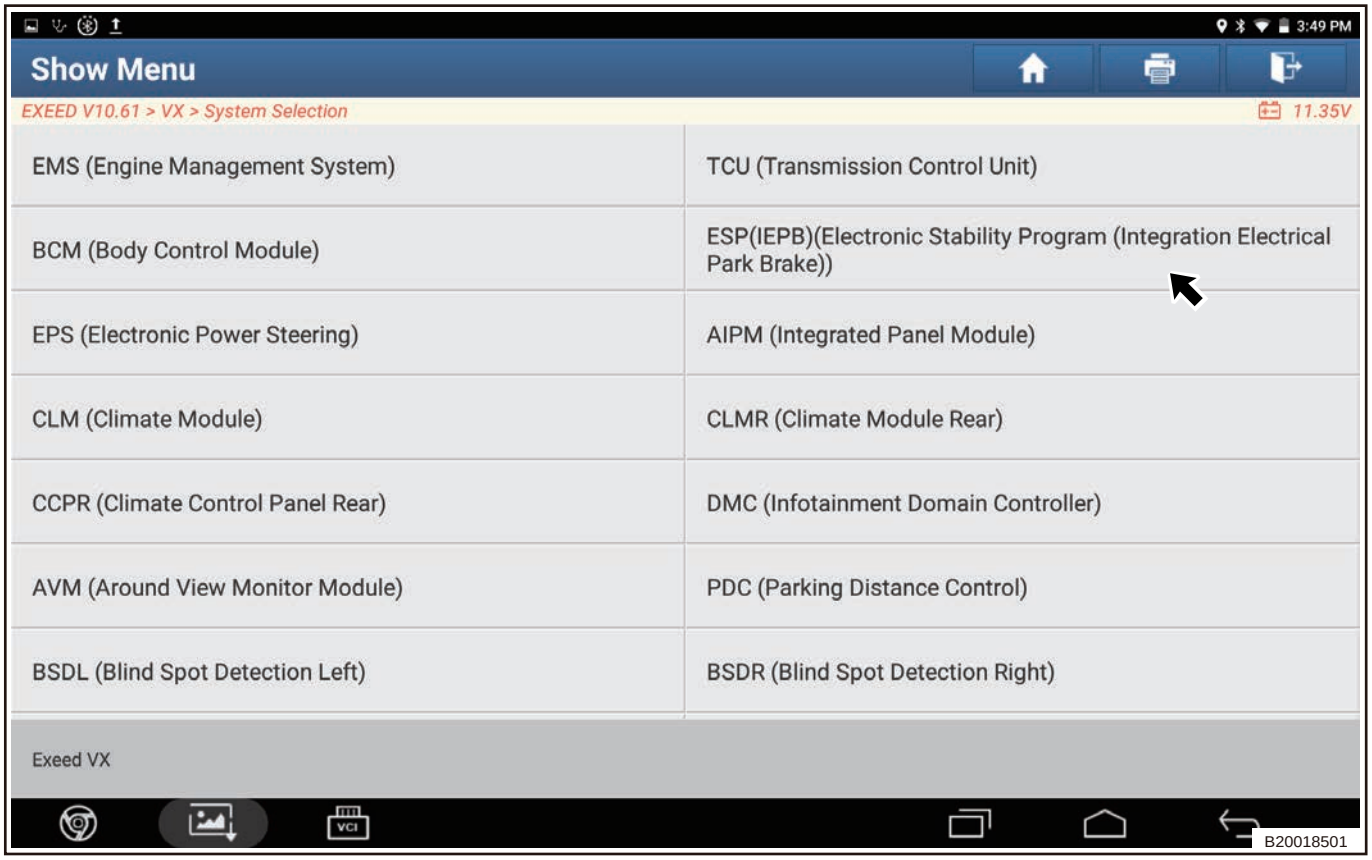
- **Check that battery voltage should not be less than 12 V.**
- **Bleeding order must be rear left/front left/front right/rear right.**
- **If it is necessary to repeat part or whole bleeding procedure, be sure to wait for 5 minutes to cool solenoid valve down, otherwise solenoid valve may be damaged due to overheat.**
- **During bleeding, do not depress brake pedal repeatedly at any time with bleeder screw opened. Otherwise, air amount in the system will increase to make an extra bleeding.**
- **Depress brake pedal repeatedly with a frequency of 0.5 times per second in the whole bleeding process.**

(1) Fill brake fluid reservoir with brake fluid to a proper level.

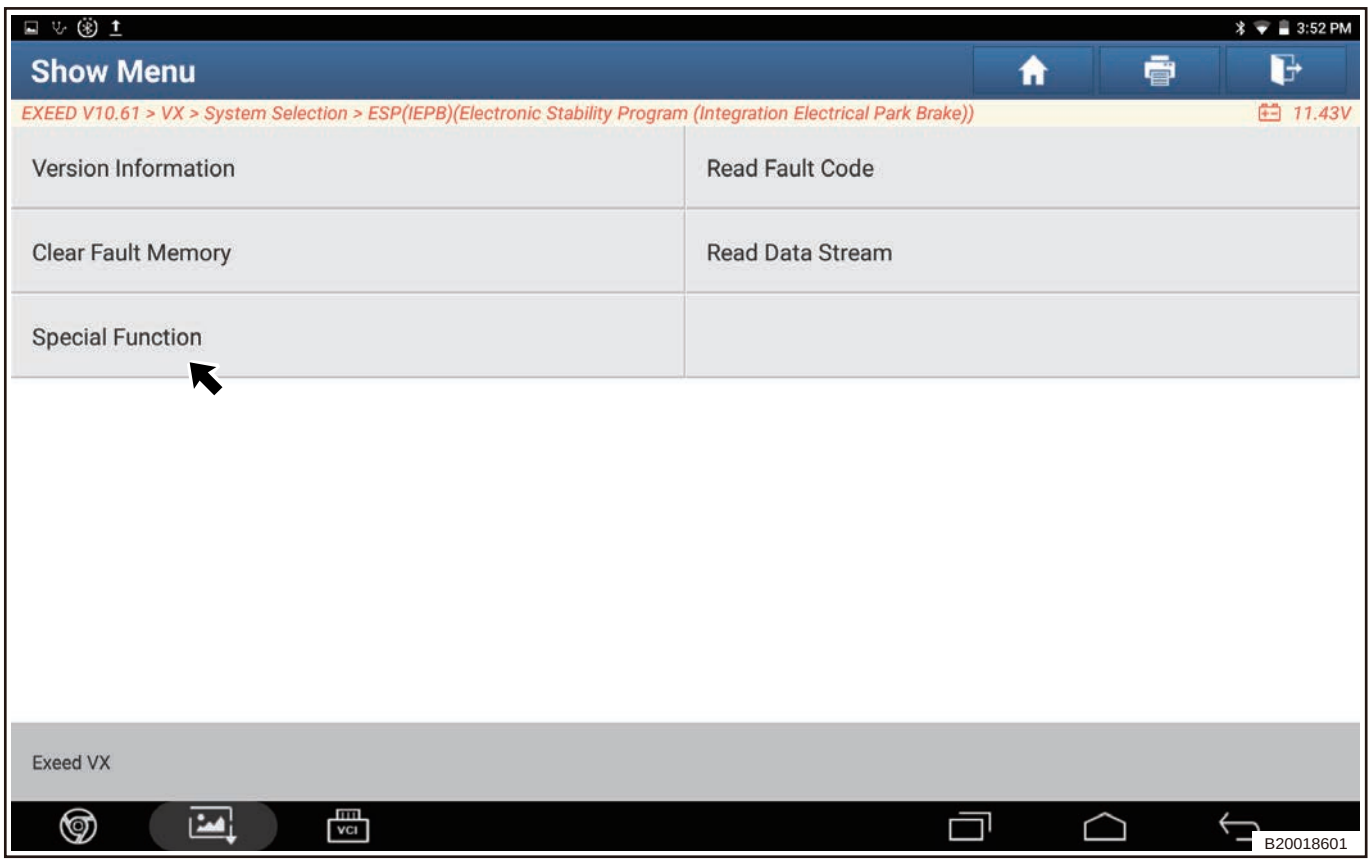
(2) Depress brake pedal more than 20 times with engine stopped.

(3) Turn ENGINE START STOP switch to “ON”, and connect the diagnostic tester.

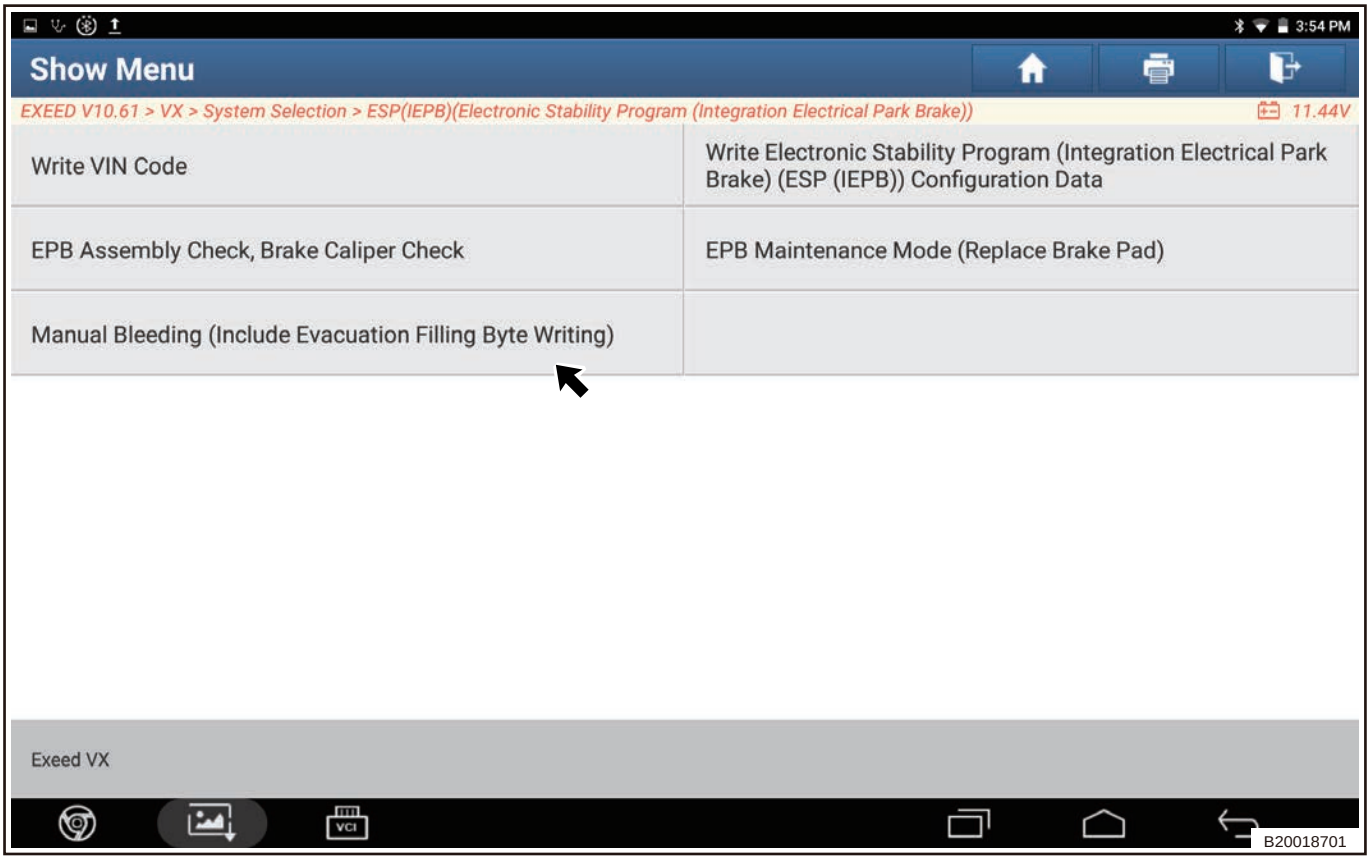
1) Click “ESP (iEPB) Electronic Stability Control Module (Integration Electric Parking Brake)”.



2) Click “Special Function”.

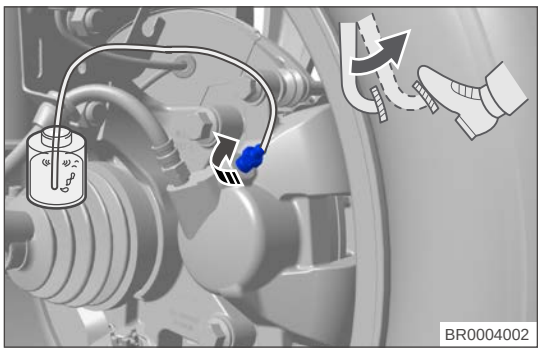


3) Click “Manual Bleeding”.



4) Click OK, please select [Phase 1: Bleed the wheel rear left] on Diagnostic program screen, then perform bleeding operation for rear left wheel.

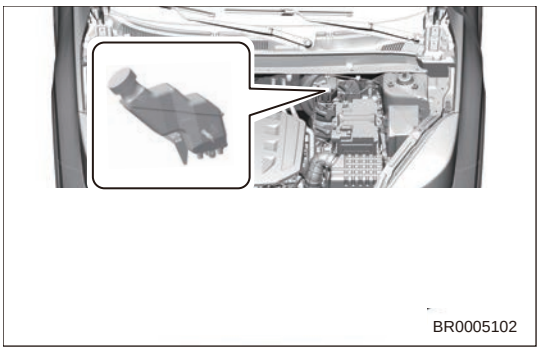
(4) Tighten bleeder screw every time brake pedal goes down quickly, then release the brake pedal.



(5) Repeat above steps, and use the same procedures to bleed brake line of each wheel in order of rear left wheel, front left wheel, front right wheel and rear right wheel, until no air exists in brake system.

Empty sign: A stream of fresh brake fluid flows into clear container without bubbles.

Hint:
During bleeding of brake system, make sure brake fluid level in brake fluid reservoir is always near “MAX” mark. Check brake fluid level at all times during bleeding. Add brake fluid as necessary.



(6) Check and adjust the brake fluid level to “MAX” mark.

(7) Check the brake pedal braking effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding procedures for brake system again as necessary.

(8) Test vehicle to confirm that brakes operate properly with good depressing feel.

4.3 Replace Front Disc Brake Assembly

■ On-vehicle Inspection

⚠ Caution

- **Use well-sealed DOT4 brake fluid specified by EXEED. DO NOT use oily solution, otherwise brake system seal may be damaged.**
- **Brake fluid may damage paint surface. If brake fluid spills on paint surface, wash it off immediately with water.**
- **DO NOT use gasoline, kerosene, alcohol, engine oil, transmission oil or any other fluid that contains mineral oil to clean the system components. These kinds of fluid will damage the rubber cover and seal.**
- **During servicing, be sure to clean the grease or other foreign matter on the outer surface of brake caliper assembly, brake lining, brake disc and wheel hub.**
- **When operating brake disc and brake caliper, be careful not to damage brake disc and brake caliper and scratch or cut brake shoe linings.**

(1) Check conditions of tires and wheels. Damaged or worn wheels and tires can cause a pull, shudder, vibration and a condition similar to sudden braking.

(2) If noise occurs while braking, check suspension components. Bounce the vehicle up and down several times and check suspension or steering components for any looseness, wear or damage.

(3) Check brake fluid level and condition.

- If brake fluid level is low, check ESP (iEPB) control unit assembly, brake caliper, brake line, brake master cylinder assembly and brake fluid reservoir, etc. for leakage.
- If brake fluid is contaminated, drain a certain amount of fluid for inspection. Replace with new fluid as necessary.

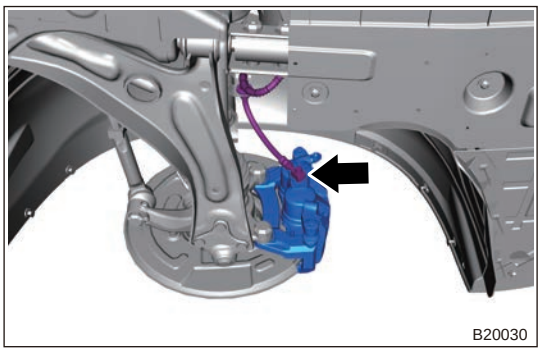
■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.
- Be sure to perform brake system bleeding after removing/replacing hydraulic parts related to brake system.

(1) Remove the front left wheel.

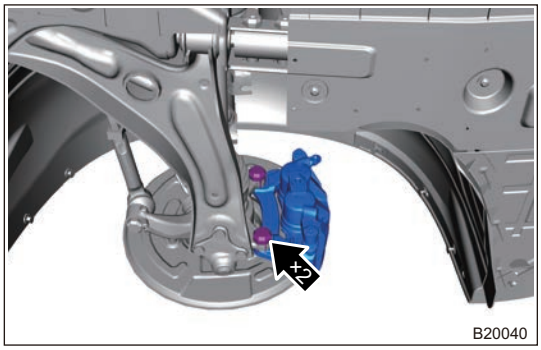
(2) Loosen coupling bolt (arrow) between front left brake hose assembly and front left brake caliper assembly.



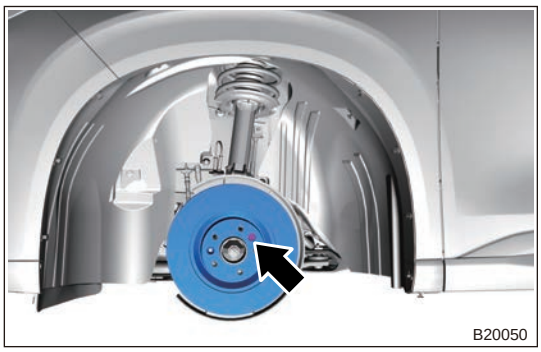
⚠ Caution

- **After removing brake hose, perform sealing treatment to prevent foreign matter from entering.**
- **DO NOT allow any foreign matter such as dirt and dust to enter brake hose from joint parts.**

(3) Remove 2 coupling bolts (arrow) between front left brake caliper assembly and front left steering knuckle, remove front left brake caliper assembly.



(4) Remove fixing screw (arrow) from front left brake disc.



(5) Remove the front left brake disc.

■ Inspection

(1) Check brake caliper fixing bracket and brake caliper guide pin set.

- Clean the contact surfaces of brake caliper fixing bracket and brake lining support shims with brake cleaner. Check for deformation, cracks, rust and foreign matter which is difficult to remove.
- Check brake caliper guide pin rubber dust boot for deformation, cracks, wear and foreign matter which is difficult to remove.
- Install the brake caliper guide pin and its rubber dust boot to brake caliper fixing bracket. Brake caliper guide pin set should move smoothly without sticking when pushing it with hand; otherwise replace it.
- After installing the brake lining, check if it is easy to drop (due to insufficient elasticity of support shim). Replace as necessary.

(2) Check the brake lining.

- Visually check the brake lining for flatness, and also check for excessive wear. If the condition of lining cannot be confirmed accurately only by visual inspection, perform physical inspection as necessary.
- Measure the minimum brake lining thickness. When the minimum thickness of brake lining is 2mm or less, replace the brake linings.
- When replacing the excessively worn brake linings (inner and outer), it is also necessary to replace the linings on opposite side of vehicle as well as unchecked linings to maintain proper braking performance. If it is unnecessary to replace brake linings, be sure to reinstall brake linings to original positions.

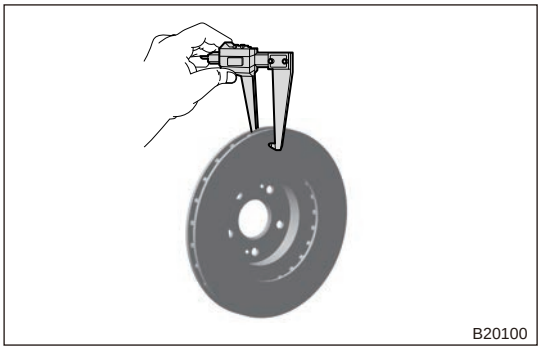
(3) Check the brake disc.

- Minor scratch or wear on brake disc surface is acceptable. If severe scratch or deformation exists, the brake disc must be replaced.
- Excessive wear of brake disc may cause poor contact between brake lining and surface of brake disc. If protrusion on the brake disc is not removed before installing new brake lining, it will cause abnormal wear of brake disc.
- It is normal that the surface of brake disc is worn when replacing brake lining. If cracks or burned spots exist, the brake disc must be replaced.

(4) Check the brake disc thickness.

Check the brake disc thickness.

Minimum thickness: 26mm



⚠ Caution

- **If it is less than the minimum thickness due to wear, replace brake disc.**
- **DO NOT machine the brake disc, because it may make brake disc thickness less than the minimum thickness.**

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torque.**
- **Be sure to add brake fluid to a proper level after installation.**
- **Be sure to perform bleeding procedures for brake system after installation.**
- **Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.**

(1) Install the front brake disc.
(2) Install 1 fixing screw of front brake disc.

Torque: 19 ± 3 N m

(3) Install the front left brake caliper assembly.
(4) Tighten coupling bolt between front left brake hose assembly and front left brake caliper assembly.

Torque: 44 ± 6 N·m

(5) Install 2 coupling bolts (thread locking glue shall be applied) between front left brake caliper assembly and front left steering knuckle.

Torque: 165 ± 12 N m

(6) Install the front left wheel.

4.4 Replace Lining Assembly

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.
- Be sure to perform brake system bleeding after removing/replacing hydraulic parts related to brake system.

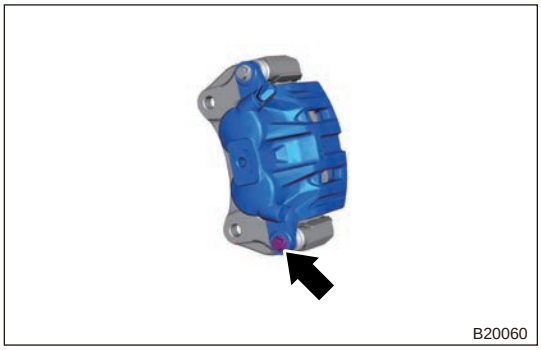
■ Removal

⚠ Caution

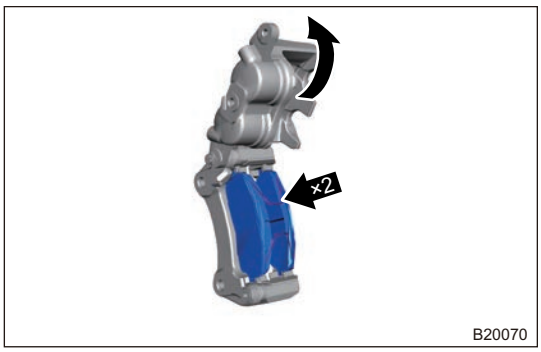
- **After removing front brake caliper assembly, it is strictly forbidden to depress brake pedal, otherwise the brake caliper piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.**

(1) Remove the front left wheel.

(2) Remove 1 guide pin tightening bolt between front left brake caliper body assembly and front brake caliper bracket.

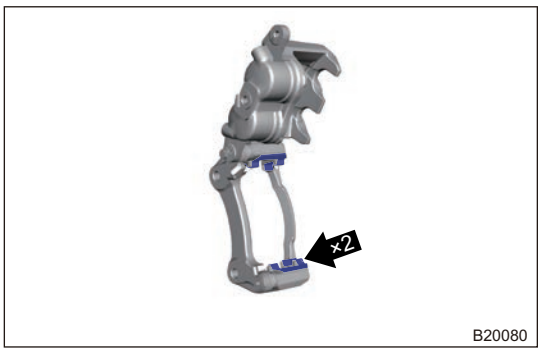


(3) Slowly lift up front left brake caliper body assembly and remove 2 lining return springs.



(4) Remove the front outer/inner lining assembly.

(5) Remove 2 front spring plates.

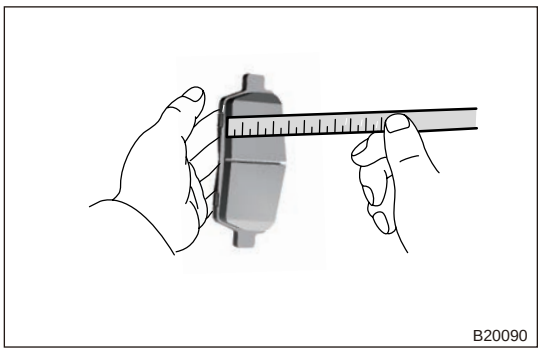


■ Inspection

(1) Visually check lining assembly for flatness, and also check for excessive wear. If the condition of lining assembly cannot be confirmed only by visual inspection, perform physical inspection as necessary.

(2) If it is less than the minimum thickness due to wear, replace lining assembly.

Minimum thickness: 2mm



(3) When replacing lining assembly, it is necessary to replace front outer/inner lining assembly as well as lining on the other side of vehicle to maintain proper braking performance.

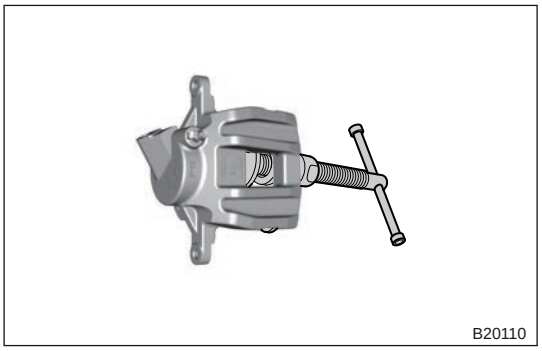
(4) If it is unnecessary to replace lining assembly, be sure to reinstall brake linings to original positions.

■ Installation

⚠ Caution

- **Be sure to tighten fixing bolts to specified torques during installation.**
- **Be sure to add brake fluid to a proper level after installation.**
- **Be sure to perform bleeding procedures for brake system after installation.**
- **Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.**

(1) Using brake cylinder release tool, slightly retract brake caliper piston.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(2) Install 2 front spring plates.
(3) Install the front outer/inner lining assembly.
(4) Install 2 lining return springs and put front left brake caliper body assembly down slowly.
(5) Install 1 guide pin tightening bolt (thread locking glue shall be applied) between front left brake caliper body assembly and front brake caliper bracket.

Tightening torque: 22 - 32 N·m

(6) Install the front left wheel.

7.2 REAR BRAKE

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) DO NOT machine the brake disc, because it may make brake disc thickness less than the minimum thickness.

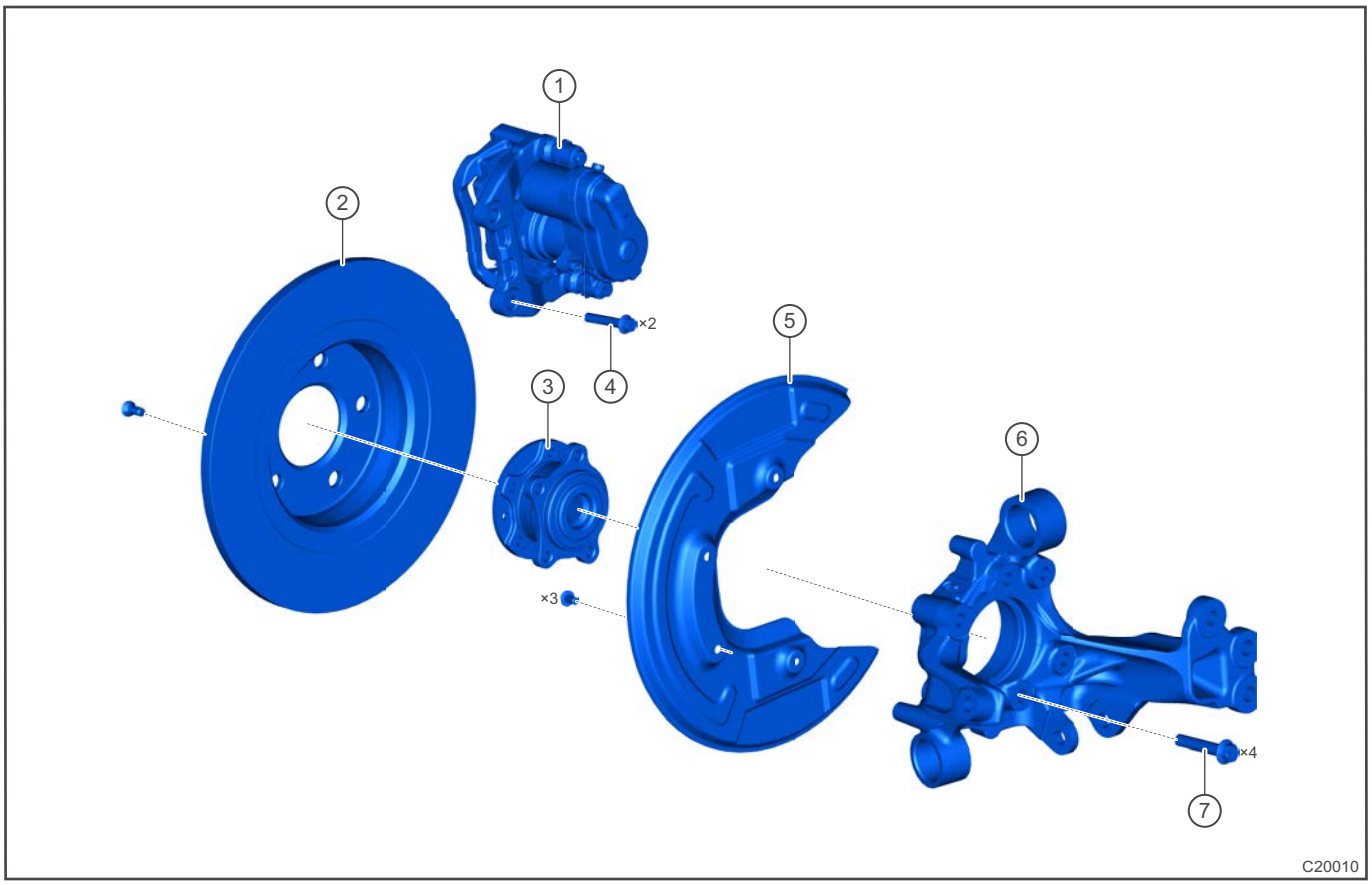
(2) After removing front brake caliper assembly, it is strictly forbidden to depress brake pedal, otherwise the brake caliper piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.

(3) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Components Diagram

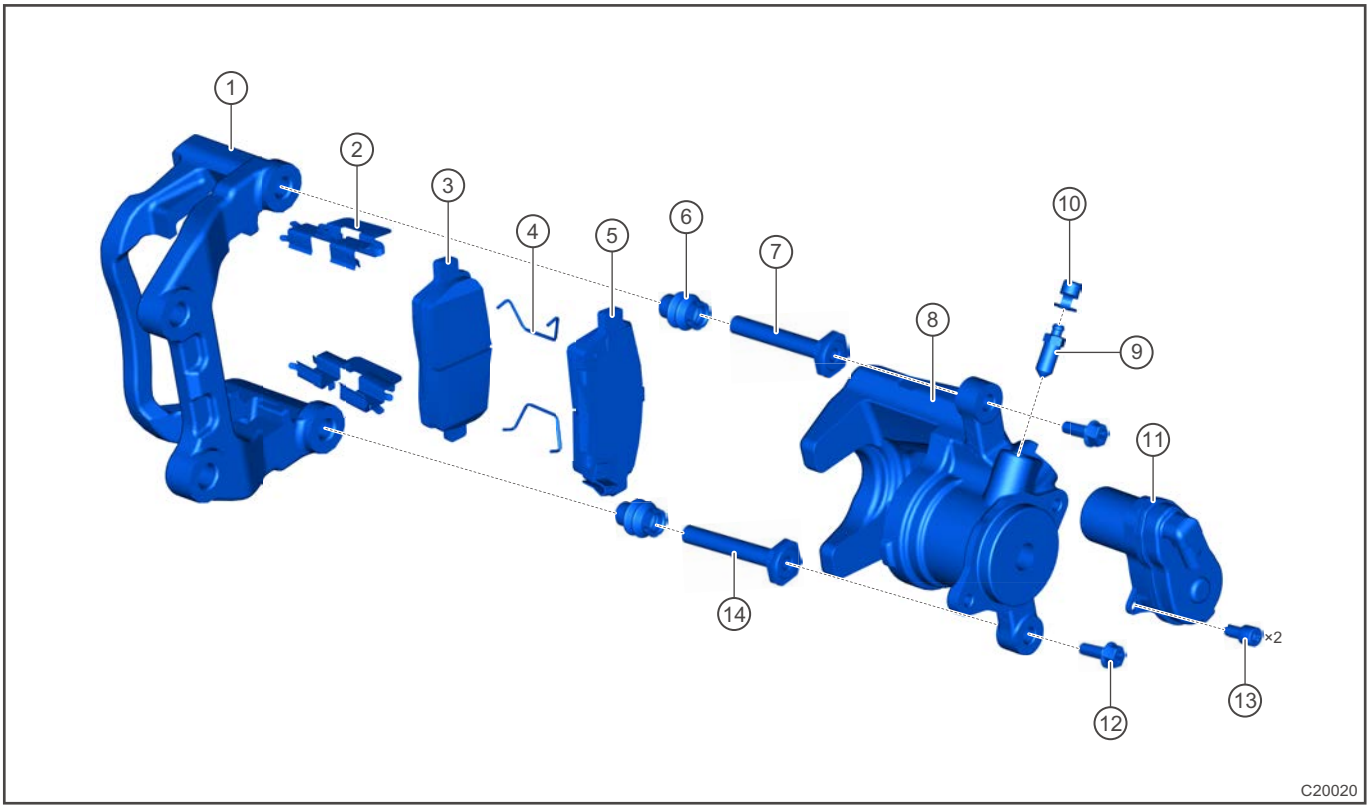
■ **Rear Left Brake Assembly**



1	Rear Left Brake Caliper Assembly	5	Rear Left Dust Guard
2	Rear Brake Disc	6	Rear Left Steering Knuckle
3	Rear Hub Bearing Unit	7	Hub Bearing Fixing Bolt x 4
4	Brake Caliper Mounting Bolt x 2		

Rear left brake assembly is mainly composed of rear left brake caliper assembly, rear brake disc, front hub, rear hub bearing unit, etc.
Rear brake disc is fixed on rear hub bearing unit, clamped in the middle of rear outer lining assembly/rear inner lining assembly, and rotates with wheel. Rear brake caliper body assembly is connected with rear brake caliper bracket (bracket is fixed on steering knuckle) through guide pin tightening bolt.

■ **Rear Left Brake Caliper Assembly**



1	Rear Brake Caliper Bracket	8	Rear Left Brake Caliper Body Assembly
2	Rear Spring Plate x 2	9	Drain Plug
3	Rear Outer Lining Assembly	10	Drain Plug Cover
4	Lining Return Spring x 2	11	Electronic Control Execution Unit
5	Rear Inner Lining Assembly	12	Guide Pin Tightening Bolt
6	Guide Pin Dust Boot	13	Electronic Control Execution Unit Mounting Bolt x 2
7	Main Guide Pin	14	Sub Guide Pin

⚠ Caution

- **Main guide pin is installed on the side close to bleeder plug, and sub guide pin is installed on the side far away from bleeder plug. Incorrect installation method will lead to abnormal sound on bumpy road.**

Rear left brake caliper assembly is mainly composed of rear brake caliper bracket, rear left brake caliper body assembly, electronic control execution unit, guide pin, guide pin dust boot, etc. When braking, brake fluid of brake master cylinder enters brake caliper assembly of each wheel through hydraulic line. A force acting on brake caliper assembly piston pushes brake caliper assembly piston and it’ s inner lining assembly to move to the left and press it onto brake disc, so brake disc applies a rightward reaction force to brake caliper assembly piston, making brake caliper assembly piston and brake caliper body assembly move to the right along guide pin until outer lining assembly is also pressed onto brake disc. At this time, lining assemblies on both sides are pressed on brake disc, and brake disc is clamped to make it brake.

2.2 Brake Disc Specifications

■ **Rear Disc Brake**

Description	Minimum Thickness (mm)
Rear Brake Disc	9
Rear Brake Lining	2

3 DIAGNOSIS & TESTING

3.1 Problem Symptoms Table

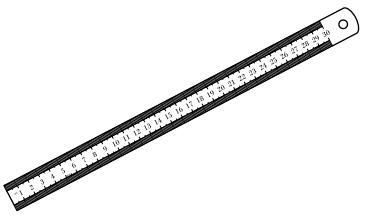
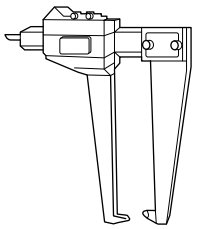
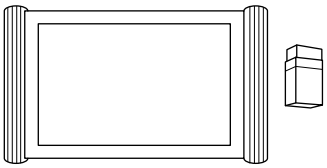
Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Braking deviation	Oily lining assembly
	Uneven brake disc wear
	Brake caliper body assembly failure (piston stuck)
Brake shakes	Hub bearing is damaged
	Uneven brake disc wear
	Steering/suspension part is loose
	Uneven lining assembly wear
	Brake caliper assembly fixing bolt is loose
Abnormal noise occurs during braking	Spring plate is damaged
	Hub bearing is damaged
	Abnormal brake disc wear
	Oily lining assembly
	Steering/suspension part is loose
	Abnormal lining assembly wear
	Brake caliper assembly fixing bolt is loose
Brake stuck	Minimum brake pedal free play
	Poor returning of guide pin (deformed or damaged)
	Brake caliper body assembly failure (piston stuck)

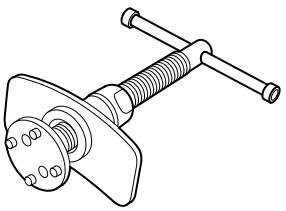
4 On-vehicle Service

4.1 Tools

■ General Tools

Tool Name	Tool Drawing
Caliper	 S00044
Thickness Measurement Caliper	 S00082
Diagnostic Tester	 S00001

■ Special Tool

Tool Name	Part No.	Tool Drawing
Brake Cylinder Release Tool	ECH-0005	 S00076

4.2 Brake Bleeding

Hint:

- Be sure to perform brake bleeding after replacing hydraulic parts related to brake.
- An assistant will be required to assist when bleeding brake system.
- There are 2 methods for brake bleeding, and specific operation procedures are as follows:

■ Manual Bleeding

⚠ Caution

- **When performing bleeding procedures for brake system, wear safety glasses.**
- **Be careful when bleeding air, as brake fluid at high pressure may spray out from bleeder screw.**

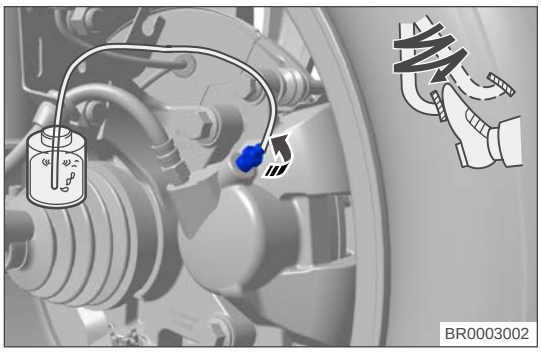
⚠ Warning

- **Before removing brake fluid reservoir, wipe off any dust and other foreign matters on brake fluid reservoir to prevent them from entering.**
- **Use fresh, clear and well-sealed brake fluid with specified type.**
- **DO NOT allow the brake fluid to adhere to any paint surface, such as vehicle body. If brake fluid leaks onto any paint surface, immediately wash it off.**
- **During bleeding, do not depress brake pedal repeatedly at any time with bleeder screw opened. Otherwise, air amount in the system will increase to make an extra bleeding.**
- **DO NOT drain the brake fluid in brake fluid reservoir while bleeding brake system.**

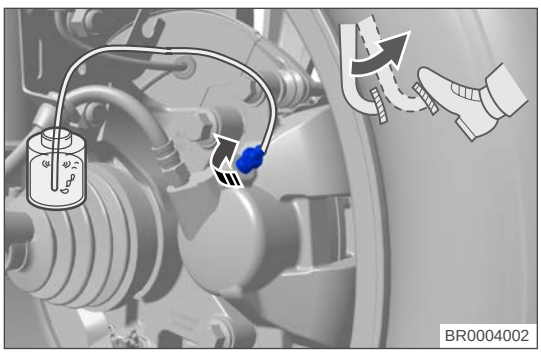
(1) Fill brake fluid reservoir with brake fluid to a proper level.

(2) Loosen bleeder screw cap and connect a clear plastic hose to bleeder screw. Submerge the end of hose into container.

(3) Have an assistant depress brake pedal 3 to 4 times repeatedly; and depress and hold it at a lower position, then loosen the bleeder screw.



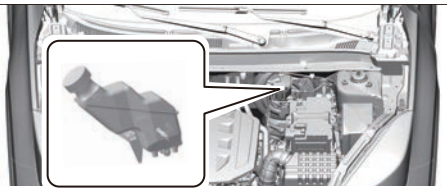
(4) Tighten bleeder screw every time brake pedal goes down quickly, then release the brake pedal.



(5) Repeat above steps, and use the same procedures to bleed brake line of each wheel in order of rear left wheel, front left wheel, front right wheel and rear right wheel, until no air exists in brake system.

Empty sign: A stream of fresh brake fluid flows into clear container without bubbles.

Hint:
During bleeding of brake system, make sure brake fluid level in brake fluid reservoir is always near "MAX" mark. Check brake fluid level at all times during bleeding. Add brake fluid as necessary.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(6) Check and adjust the brake fluid level to "MAX" mark.

(7) Check the brake pedal braking effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding procedures for brake system again as necessary.

(8) Test vehicle to confirm that brakes operate properly with good depressing feel.

■ Bleeding brake using diagnostic tester

Hint:
To reach sufficient pressure in hydraulic regulator, brake pedal needs to be depressed repeatedly during whole process.

⚠ Warning

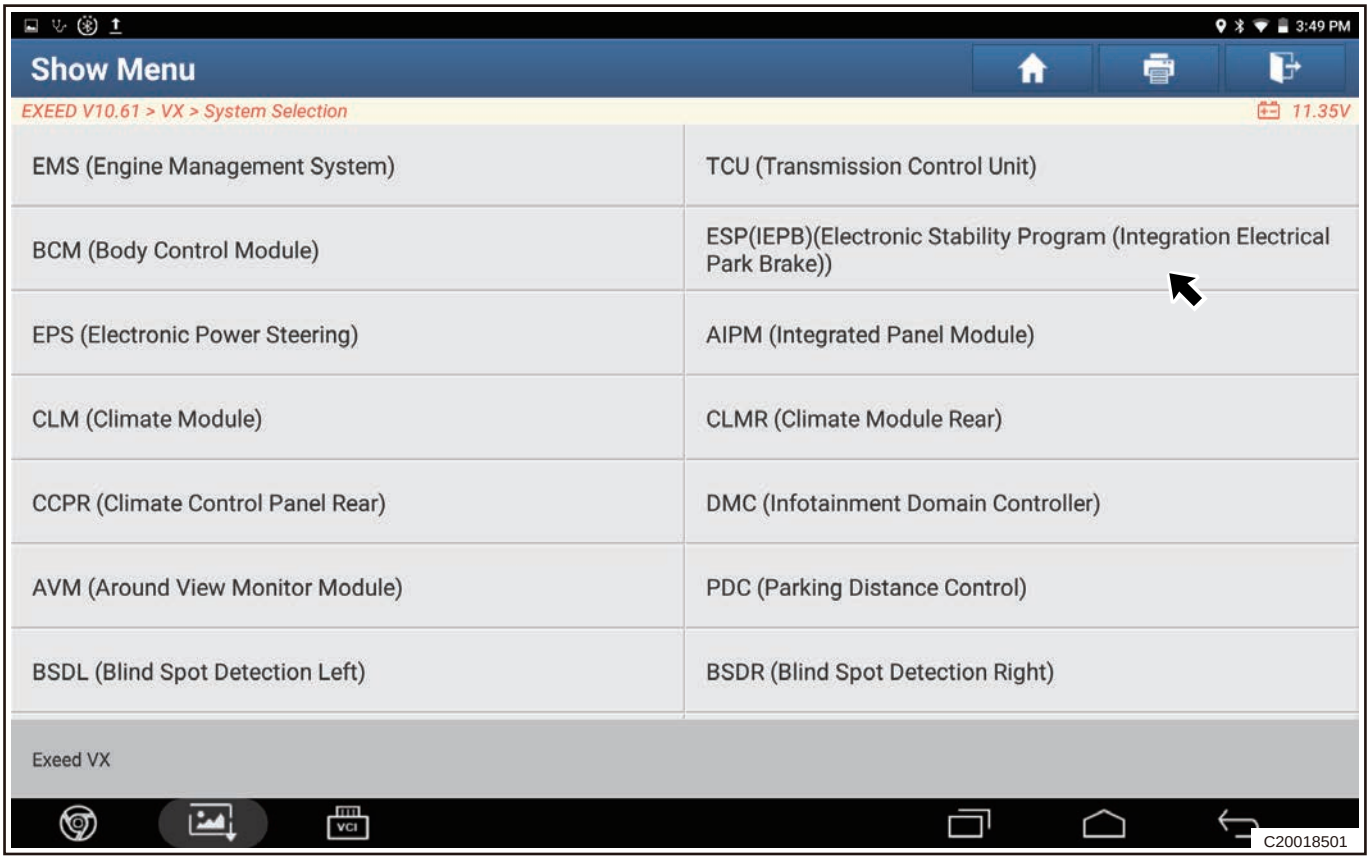
- **Check that battery voltage should not be less than 12 V.**
- **Bleeding order must be rear left/front left/front right/rear right.**
- **If it is necessary to repeat part or whole bleeding procedure, be sure to wait for 5 minutes to cool solenoid valve down, otherwise solenoid valve may be damaged due to overheat.**
- **During bleeding, do not depress brake pedal repeatedly at any time with bleeder screw opened. Otherwise, air amount in the system will increase to make an extra bleeding.**
- **Depress brake pedal repeatedly with a frequency of 0.5 times per second in the whole bleeding process.**

(1) Fill brake fluid reservoir with brake fluid to a proper level.

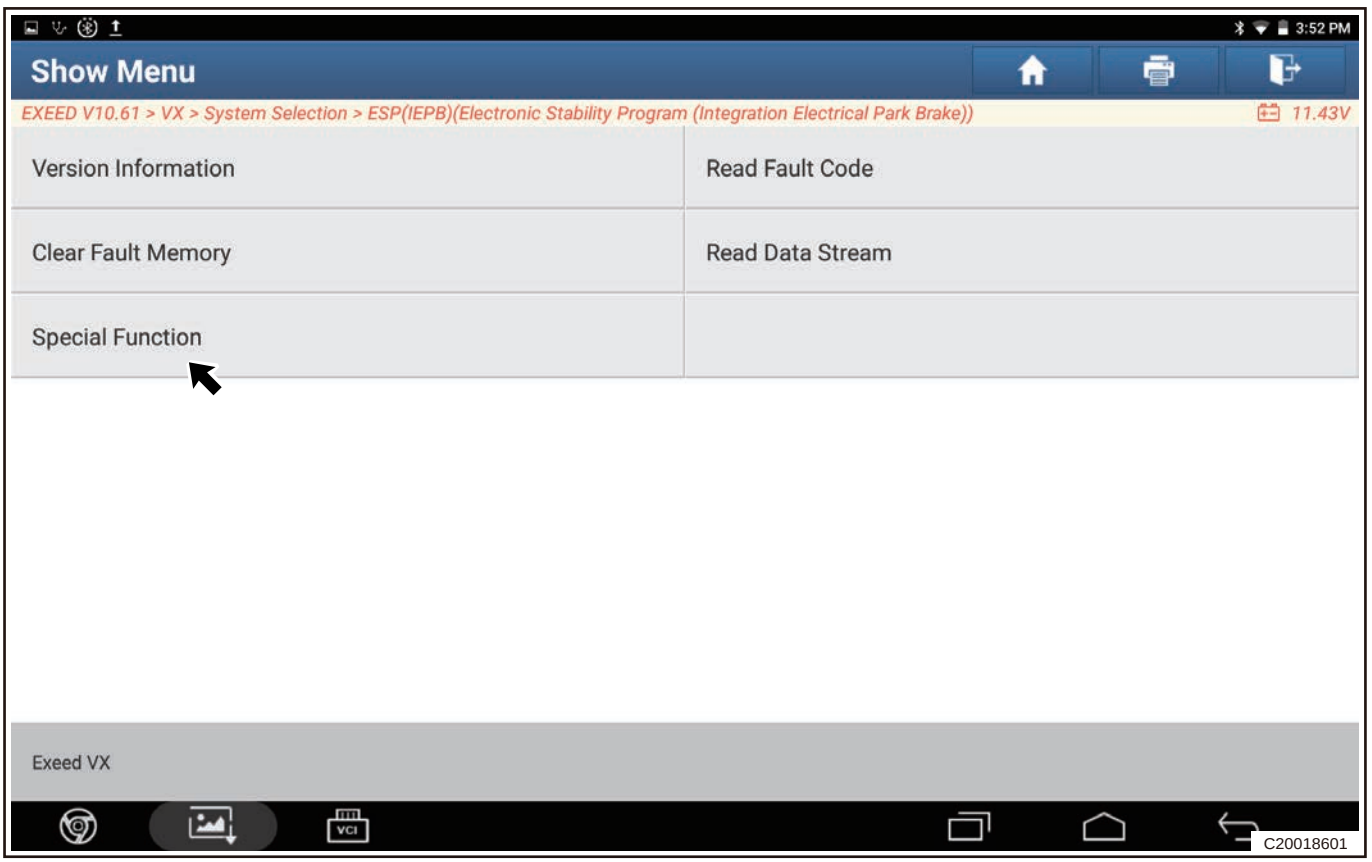
(2) Depress brake pedal more than 20 times with engine stopped.

(3) Turn ENGINE START STOP switch to "ON", and connect the diagnostic tester.

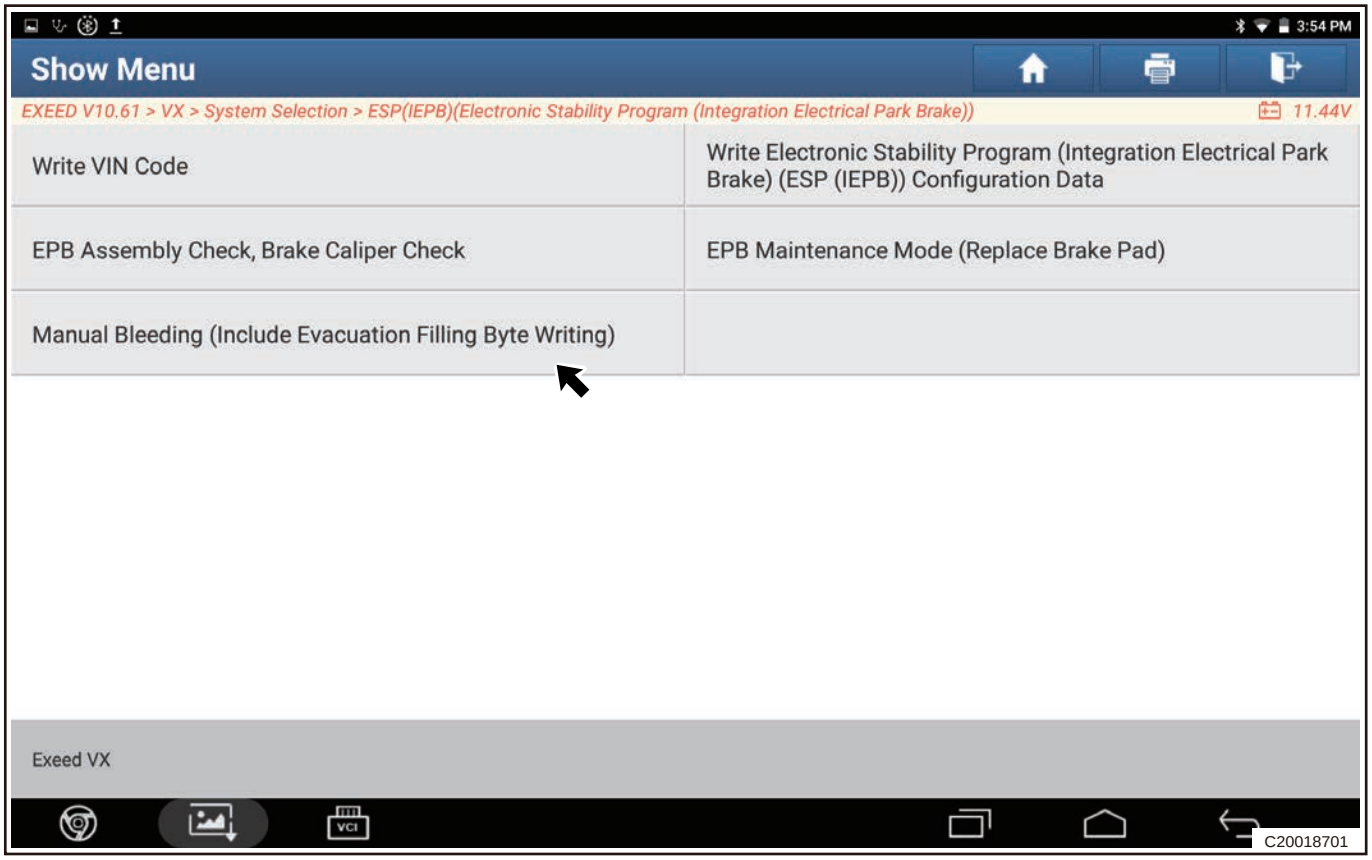
1) Click “ESP (iEPB) Electronic Stability Control Module (Integration Electric Parking Brake)”.



2) Click “Special Function”.

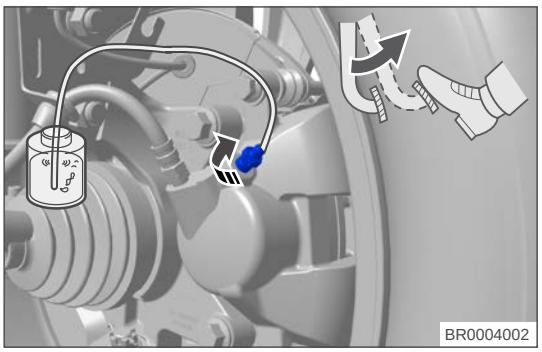


3) Click “Manual Bleeding”.



4) Click OK, please select [Phase 1: Bleed the wheel rear left] on Diagnostic program screen, then perform bleeding operation for rear left wheel.

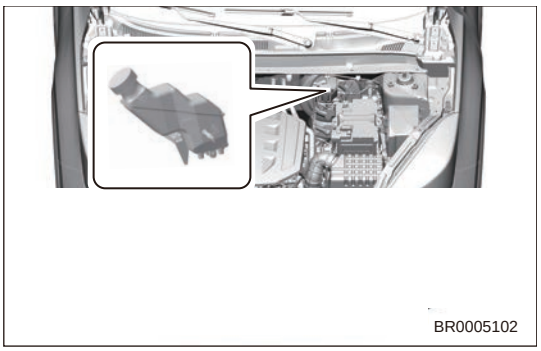
(4) Tighten bleeder screw every time brake pedal goes down quickly, then release the brake pedal.



(5) Repeat above steps, and use the same procedures to bleed brake line of each wheel in order of rear left wheel, front left wheel, front right wheel and rear right wheel, until no air exists in brake system.

Empty sign: A stream of fresh brake fluid flows into clear container without bubbles.

Hint:
During bleeding of brake system, make sure brake fluid level in brake fluid reservoir is always near “MAX” mark. Check brake fluid level at all times during bleeding. Add brake fluid as necessary.



(6) Check and adjust the brake fluid level to “MAX” mark.

(7) Check the brake pedal braking effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding procedures for brake system again as necessary.

(8) Test vehicle to confirm that brakes operate properly with good depressing feel.

4.3 Replace Rear Left Brake Assembly

■ On-Vehicle Inspection

⚠ Caution

- **Use well-sealed DOT4 brake fluid specified by EXEED. DO NOT use oily solution, otherwise brake system seal may be damaged.**
- **Brake fluid may damage paint surface. If brake fluid spills on paint surface, wash it off immediately with water.**
- **DO NOT use gasoline, kerosene, alcohol, engine oil, transmission oil or any other fluid that contains mineral oil to clean the system components. These kinds of fluid will damage the rubber cover and seal.**
- **During servicing, be sure to clean the grease or other foreign matter on the outer surface of brake caliper assembly, brake lining, brake disc and wheel hub.**
- **When operating brake disc and brake caliper, be careful not to damage brake disc and brake caliper and scratch or cut brake shoe linings.**

(1) Check conditions of tires and wheels. Damaged or worn wheels and tires can cause a pull, shudder, vibration and a condition similar to sudden braking.

(2) If noise occurs while braking, check suspension components. Bounce the vehicle up and down several times and check suspension or steering components for any looseness, wear or damage.

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Caution

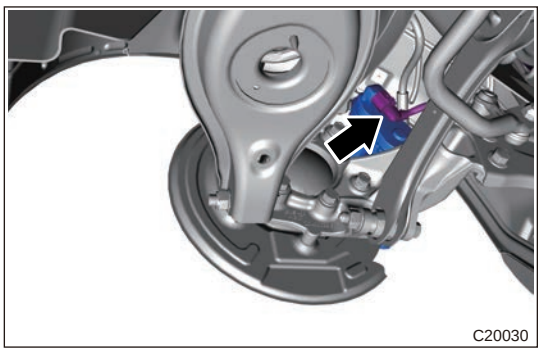
- **Be sure to perform brake system bleeding after removing/replacing hydraulic parts related to brake system.**
- **Before removing rear disc brake assembly, it is necessary to use diagnostic tester to perform "Enter PBC Maintenance Mode".**
- **After removing rear brake assembly, it is strictly forbidden to depress brake pedal, otherwise the brake caliper piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

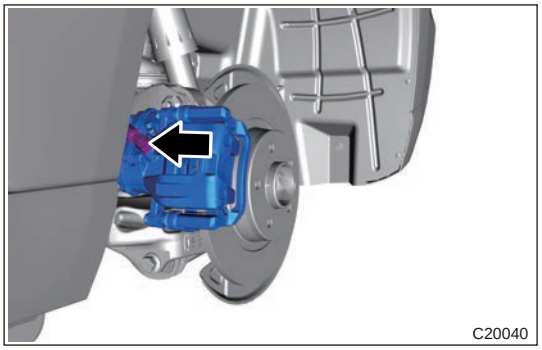
(2) Disconnect the negative battery cable.

(3) Remove the rear left wheel.

(4) Disconnect the integrated caliper motor wire harness connector plug (arrow).


C20030

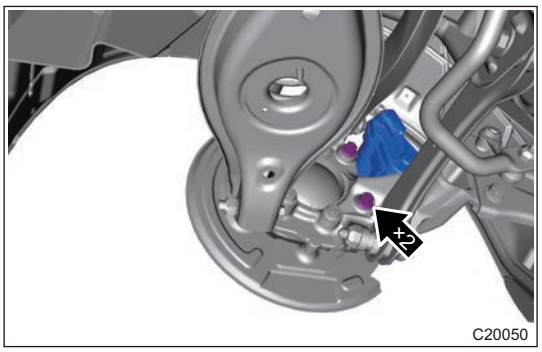
(5) Remove coupling bolt (arrow) between rear left brake hose assembly and rear left brake caliper assembly.



⚠ Caution

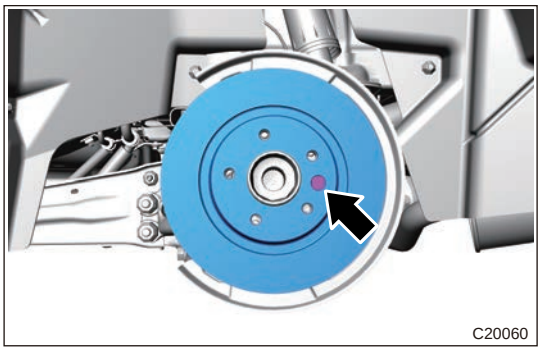
- **When removing coupling bolt, be careful not to drop 2 gaskets.**
- **DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as brake fluid is corrosive.**
- **After removing brake line, perform sealing treatment to prevent foreign matter from entering.**
- **DO NOT allow any foreign matter such as dirt and dust to enter brake line from joint parts.**

(6) Remove 2 brake caliper mounting bolts (arrow) between rear left brake caliper assembly and rear left steering knuckle.



(7) Remove the rear left brake caliper assembly.

(8) Remove 1 fixing screw (arrow) on rear brake disc and remove rear left brake disc.



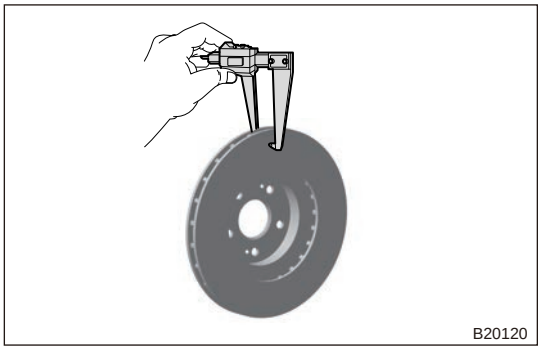
■ Inspection

Rear Brake Disc

(1) Visually check front brake disc for flatness, and also check for excessive wear. If the condition of front brake disc cannot be confirmed only by visual inspection, perform physical inspection as necessary.

(2) If it is less than the minimum thickness due to wear, replace front brake disc.

Minimum thickness: 9 mm



⚠ Caution

- **DO NOT machine the brake disc, because it may make brake disc thickness less than the minimum thickness.**

(3) Slight scratch on the surface of rear brake disc is a normal phenomenon. If crack, severe scratch, deformation and burned spots are found, the brake disc must be replaced.

(4) Abnormal wear of rear brake disc may cause poor contact between new lining assembly and surface of rear brake disc, which may cause abnormal wear of lining assembly.

Rear Brake Caliper Bracket and Guide Pin Set

(1) Check if rear spring plate is deformed, cracked, rusted or elasticity is not enough (lining assembly cannot be clamped). Clean the contact surface of rear brake caliper bracket and rear spring plate with brake cleaner.

(2) Check if guide pin and guide pin dust boot are deformed, cracked and worn. Apply grease to guide pin and install guide pin dust boot to rear brake caliper bracket, and push guide pin back and forth freely without sticking.

■ Installation

⚠ Caution

- **Be sure to tighten coupling bolts and nuts to specified torque.**
- **Be sure to add brake fluid to a proper level after installation.**
- **Be sure to perform bleeding procedures for brake system after installation.**
- **Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.**
- **After installing rear disc brake assembly, it is necessary to use diagnostic tester to perform "Exit PBC Maintenance Mode".**

(1) Install the rear brake disc.

(2) Install 1 fixing screw of rear brake disc.

Torque: 19 ± 3 N m

(3) Install the rear left brake caliper assembly.

(4) Install 2 brake caliper mounting bolts (thread locking glue shall be applied) between rear left brake caliper assembly and rear left steering knuckle.

Torque: 165 ± 12 N m

(5) Install coupling bolt between rear left brake hose assembly and rear left brake caliper assembly.

Torque: 44 ± 6 N m

Hint:

- When connecting bolt, be sure to install 2 gaskets that were removed.

(6) Connect the electronic control execution unit wire harness connector.

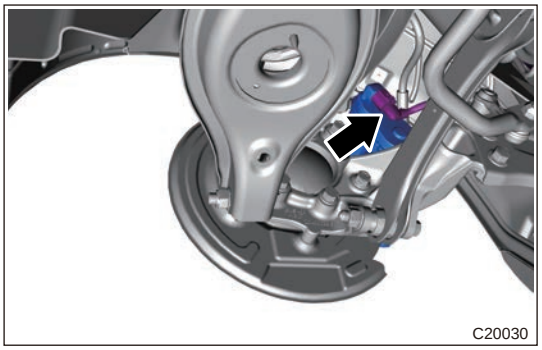
(7) Install the rear left wheel.

(8) Connect the negative battery cable.

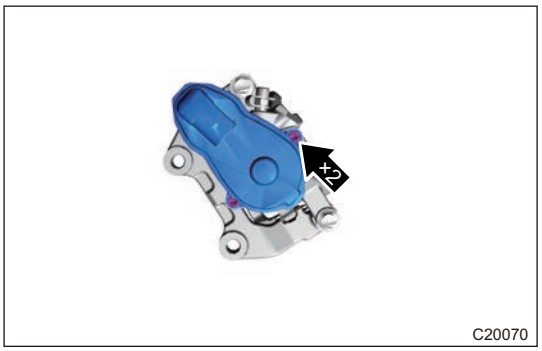
4.4 Replace electronic control execution unit

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear left wheel.
(4) Disconnect the electronic control execution unit wire harness connector.


C20030

(5) Remove 2 mounting bolts between electronic control execution unit and rear left brake caliper assembly.


C20070

(6) Remove the electronic control execution unit.

Hint:
- Remove electronic control execution unit and be careful not to damage motor seal ring.

■ Installation

(1) Install the electronic control execution unit.
(2) Install 2 mounting bolts between electronic control execution unit and rear left brake caliper assembly.
Tightening torque: 9 - 11 N·m
(3) Connect the electronic control execution unit wire harness connector.
(4) Install the rear left wheel.
(5) Connect the negative battery cable.

4.5 Replace lining assembly

Hint:
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

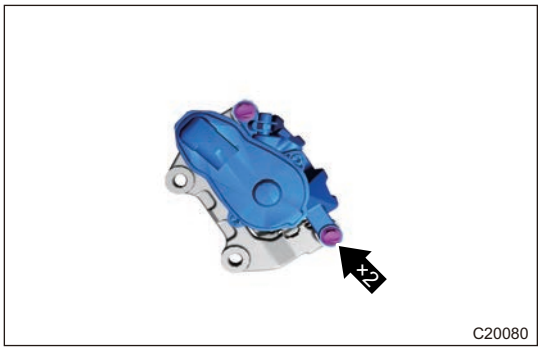
■ Removal

⚠ Caution

- **Before removing rear left brake caliper body assembly, it is necessary to use diagnostic tester to perform "Enter PBC Maintenance Mode".**
- **After removing rear brake caliper assembly, it is strictly forbidden to depress brake pedal, otherwise the brake caliper piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.**

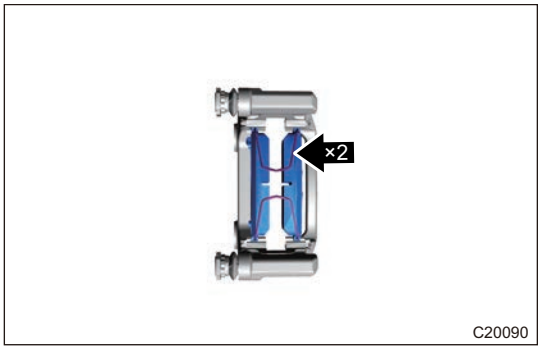
(1) Remove the rear left wheel.

(2) Remove 2 guide pin tightening bolts (arrow) between rear left brake caliper body assembly and rear brake caliper bracket.



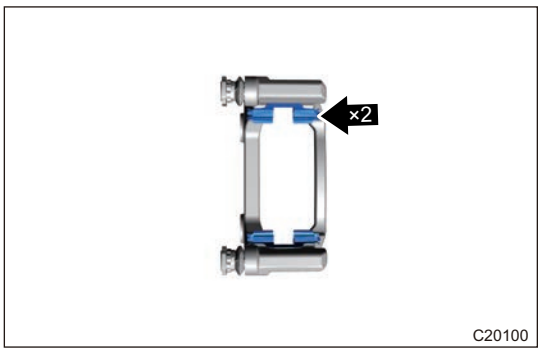
(3) Remove the rear left brake caliper body assembly.

(4) Remove 2 lining return springs.



(5) Remove rear outer/inner lining assembly.

(6) Remove 2 rear spring plates.



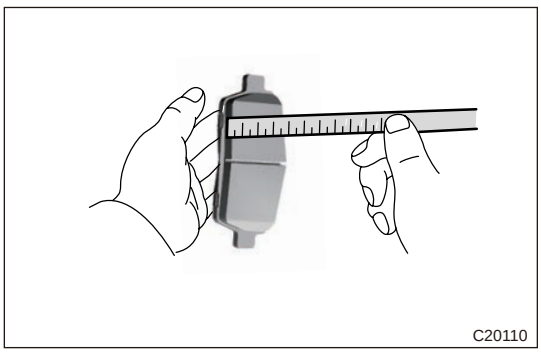
■ Inspection

Lining Assembly

(1) Visually check lining assembly for flatness, and also check for excessive wear. If the condition of lining assembly cannot be confirmed only by visual inspection, perform physical inspection as necessary.

(2) If it is less than the minimum thickness due to wear, replace lining assembly.

Minimum thickness: 2 mm



(3) When replacing lining assembly, it is necessary to replace rear outer/inner lining assembly as well as lining on the other side of vehicle to maintain proper braking performance.

(4) If it is unnecessary to replace lining assembly, be sure to reinstall brake linings to original positions.

■ **Installation**

⚠ Caution

- **Be sure to tighten fixing bolts to specified torques during installation.**
- **Be sure to add brake fluid to a proper level after installation.**
- **Be sure to perform bleeding procedures for brake system after installation.**
- **Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.**
- **Before installing brake linings, completely retract brake caliper piston back into bore of brake caliper.**
- **Depress brake pedal several times to secure brake linings to brake disc in order to ensure safety after installing brake linings and before moving vehicle.**
- **Replace the brake linings in pairs. DO NOT replace one alone.**
- **DO NOT install inner and outer linings in reverse.**
- **Be sure to perform "Exit Parking Brake Maintenance Mode" using diagnostic tester after installation.**

(1) Install 2 rear spring plates.

(2) Install the rear outer/inner lining assembly.

(3) Install 2 lining return springs.

(4) Install the rear left brake caliper body assembly.

(5) Install 2 guide pin tightening bolt (thread locking glue shall be applied) between rear left brake caliper body assembly and rear brake caliper bracket.

Tightening torque: 22 - 32 N·m

(6) Install the rear left wheel.

7.3 HYDRAULIC BRAKE

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) After removing brake line, perform sealing treatment to prevent foreign matter from entering.

(2) DO NOT allow any foreign matter such as dirt and dust to enter brake line from joint parts.

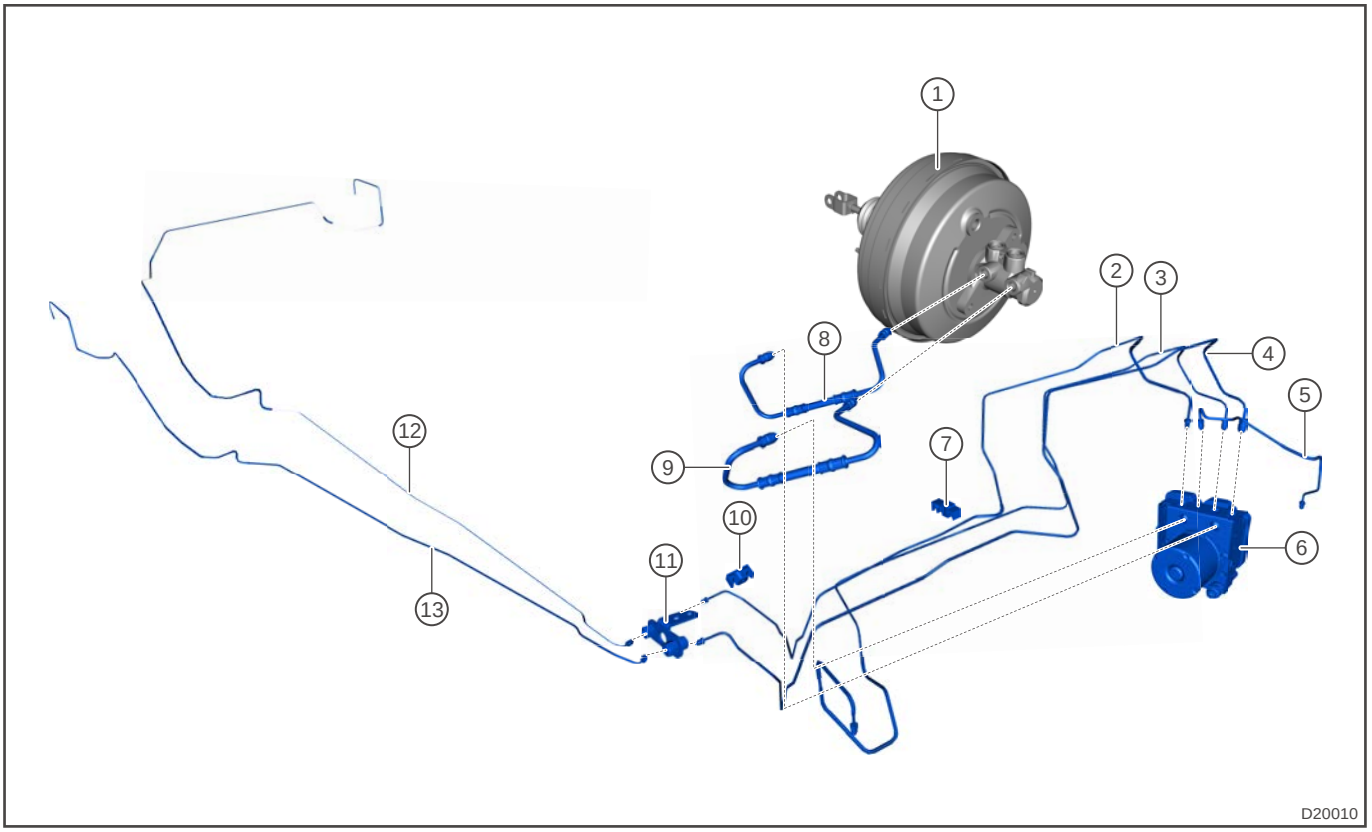
(3) DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose assembly, as brake fluid is corrosive.

(4) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Components Diagram

■ **Brake system**

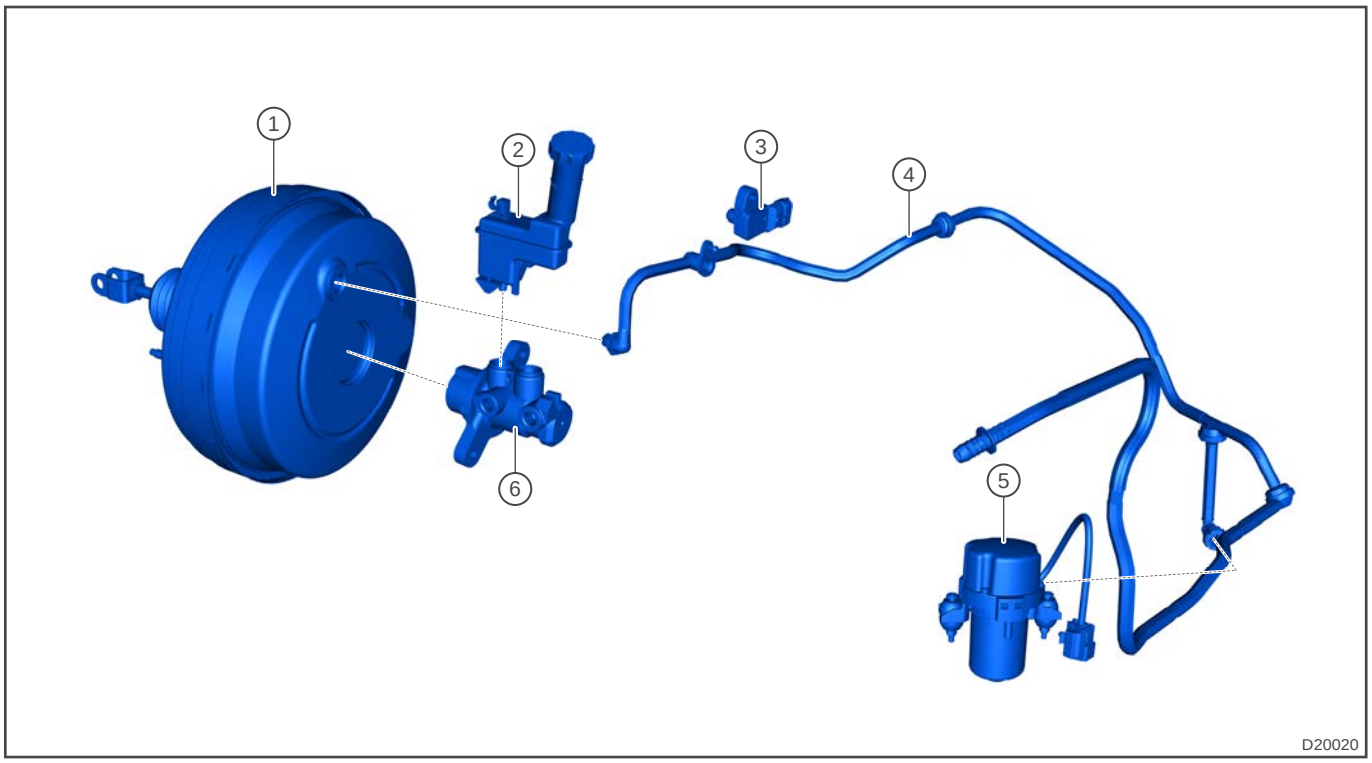


1	Vacuum Booster with Brake Master Cylinder Assembly	8	Pump Front Pipe I Assembly
2	Rear Left Pipe I Assembly	9	Pump Front Pipe II Assembly
3	Front Right Pipe Assembly	10	Pipe Clamp
4	Rear Left Pipe I Assembly	11	Pipeline Connector
5	Front Left Pipe Assembly	12	Rear Left Brake II

6	ESP Control Module Assembly	13	Rear Right Brake II
7	Pipe Clamp		

Brake system adopts hydraulic transmission device, and mainly consists of ESP controller assembly, vacuum booster with master cylinder assembly, brake master cylinder assembly, brake fluid reservoir assembly, hydraulic line (brake hose, brake pipe), brake caliper assembly, vacuum pump assembly, etc.
When brake pedal assembly is depressed, brake master cylinder assembly piston is pushed forward, and brake fluid pressure in brake master cylinder assembly is increased. Brake fluid enters brake caliper assembly of each wheel through hydraulic line, and brake caliper assembly piston is pushed outward to allow the force of depressing brake pedal to be transmitted to wheel brake caliper assembly, and push wheel brake caliper assembly to brake.
When brake pedal assembly is released, brake master cylinder assembly piston will return under the action of oil pressure and return spring, brake caliper assembly piston and wheel brake caliper assembly will return to release the brake on wheel.

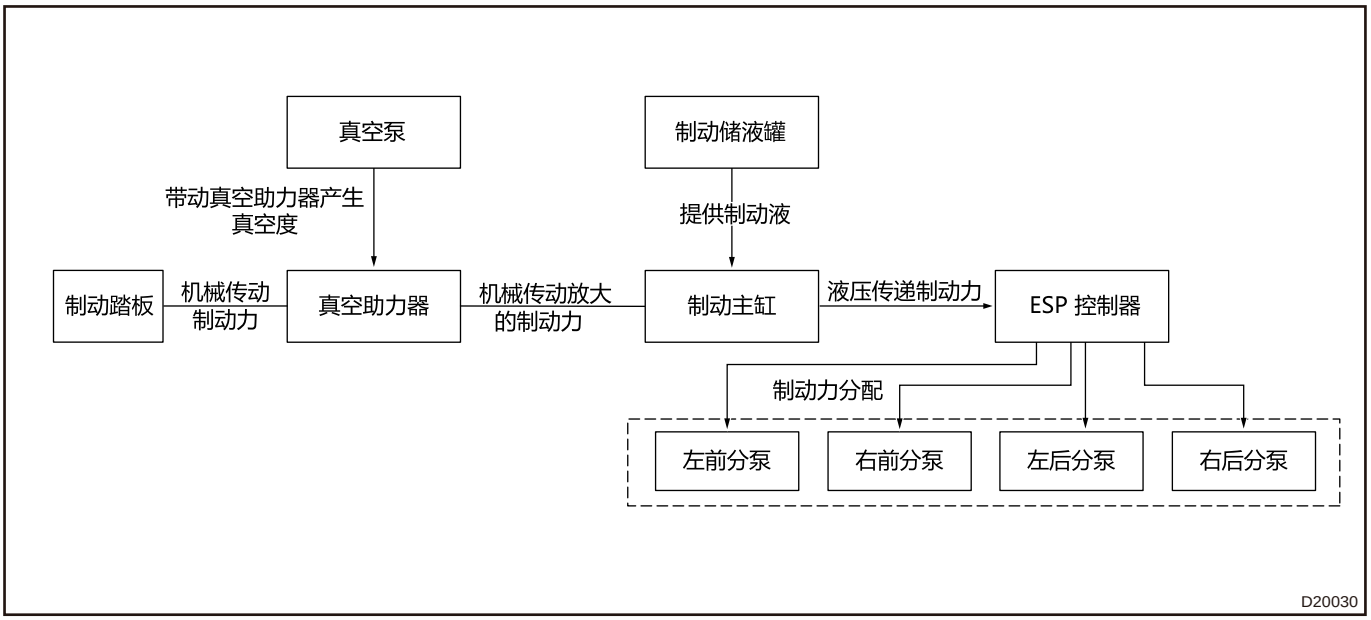
■ **Vacuum booster with brake master cylinder assembly**



1	Vacuum Booster Assembly	4	Vacuum Brake Hose Assembly
2	Brake Fluid Reservoir	5	Vacuum Pump Assembly
3	Vacuum Pipeline Pressure Sensor Assembly	6	Brake Master Cylinder Assembly

Vacuum booster system is mainly composed of vacuum booster assembly, brake master cylinder assembly, brake fluid reservoir assembly, vacuum pump assembly, atmospheric pressure sensor, etc.
Vacuum booster is a component that uses vacuum (negative pressure) to increase force applied by driver to brake pedal assembly.
Vacuum booster is generally located between brake pedal assembly and brake master cylinder assembly. For easy installation, it is usually combined with master cylinder as a set, and part of master cylinder is penetrated into vacuum booster housing.

2.2 System Schematic Diagram

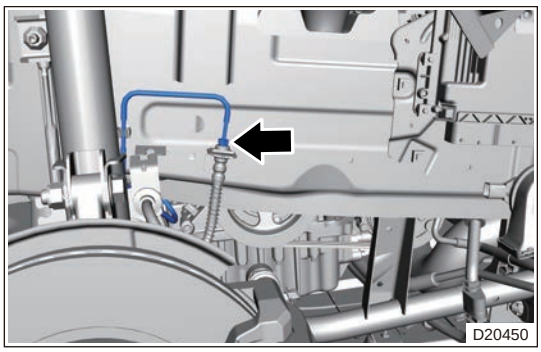


When vacuum booster can not obtain vacuum or obtained vacuum is insufficient (at high altitude, low temperature, etc.), it will lead to poor assistance of brake system. Vacuum booster system monitors vacuum changes in vacuum booster through atmospheric pressure sensor, judges operating time of vacuum pump through logic and provides appropriate auxiliary power for brake system. Thereby ensuring that it can provide driver with sufficient braking assistance effect under various working conditions.

2.3 Components Operation Description

■ Brake Fluid Level Sensor

The float in brake fluid reservoir rises/falls according to brake fluid level.
When brake fluid level is on "MAX (maximum)" mark on brake fluid reservoir, the float in brake fluid reservoir rises.
When brake fluid level is on "MIN (minimum)" mark on brake fluid reservoir, the float in brake fluid reservoir falls.
When brake fluid level is below "MIN (minimum)" mark on brake fluid reservoir, brake system malfunction indicator on instrument cluster will come on.



3 DIAGNOSTIC INFORMATION AND STEPS

3.1 Problem Symptoms Table

Hint:

- Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

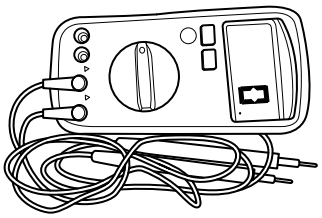
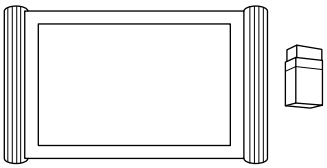
Symptom	Possible Cause
Poor braking effect	Brake fluid quality
	Air in brake system
	Uneven brake disc wear
	Brake master cylinder assembly failure

Symptom	Possible Cause
	Vacuum booster assembly failure
	Uneven lining assembly wear
	Minimum brake pedal free play
	Brake system leakage (fluid or pressure)

4 On-vehicle Service

4.1 Tools

■ General Tools

Tool Name	Tool Drawing
Digital multimeter	 S00002
Diagnostic tester	 S00001

4.2 Brake Bleeding

Hint:

- Be sure to perform brake bleeding after replacing hydraulic parts related to brake.
- An assistant will be required to assist when bleeding brake system.
- There are 2 methods for brake bleeding, and specific operation procedures are as follows:

■ Manual Bleeding

⚠ Caution

- **When performing bleeding procedures for brake system, wear safety glasses.**
- **Be careful when bleeding air, as brake fluid at high pressure may spray out from bleeder screw.**

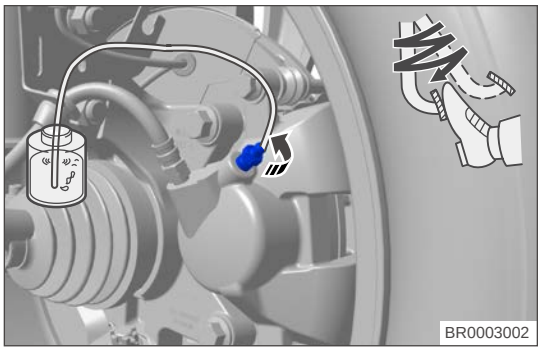
⚠ Warning

- **Before removing brake fluid reservoir, wipe off any dust and other foreign matters on brake fluid reservoir to prevent them from entering.**
- **Use fresh, clear and well-sealed brake fluid with specified type.**
- **DO NOT allow the brake fluid to adhere to any paint surface, such as vehicle body. If brake fluid leaks onto any paint surface, immediately wash it off.**
- **During bleeding, do not depress brake pedal repeatedly at any time with bleeder screw opened. Otherwise, air amount in the system will increase to make an extra bleeding.**
- **DO NOT drain the brake fluid in brake fluid reservoir while bleeding brake system.**

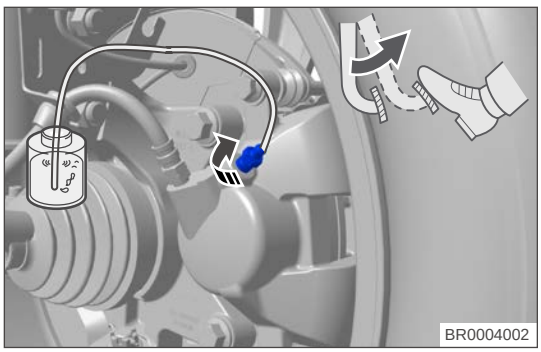
(1) Fill brake fluid reservoir with brake fluid to a proper level.

(2) Loosen bleeder screw cap and connect a clear plastic hose to bleeder screw. Submerge the end of hose into container.

(3) Have an assistant depress brake pedal 3 to 4 times repeatedly; and depress and hold it at a lower position, then loosen the bleeder screw.



(4) Tighten bleeder screw every time the brake pedal goes down quickly, then release the brake pedal.



(5) Repeat above steps, and use the same procedures to bleed brake line of each wheel in order of rear left wheel, front left wheel, front right wheel and rear right wheel, until no air exists in brake system.

Empty sign: A stream of fresh brake fluid flows into clear container without bubbles.

Hint:
During bleeding of brake system, make sure brake fluid level in brake fluid reservoir is always near "MAX" mark. Check brake fluid level at all times during bleeding. Add brake fluid as necessary.

(6) Check and adjust the brake fluid level to "MAX" mark.

(7) Check the brake pedal braking effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding procedures for brake system again as necessary.

(8) Test vehicle to confirm that brakes operate properly with good depressing feel.

4.3 Replacement of Brake Pedal Assembly

■ Removal

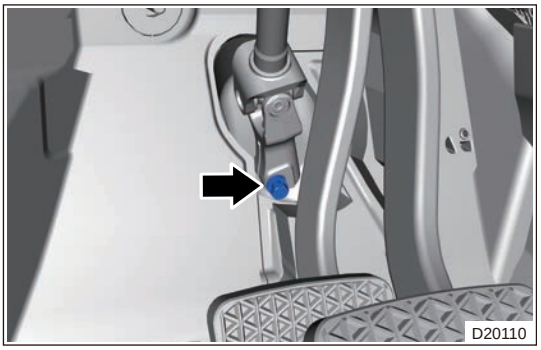
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

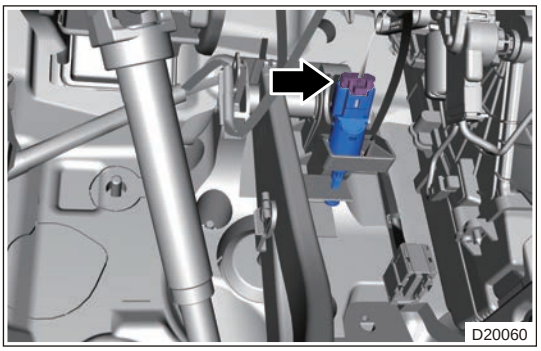
(3) Remove the instrument panel left soundproof board assembly.

(4) Fix steering wheel body with steering wheel bracket (with front wheel straight ahead).

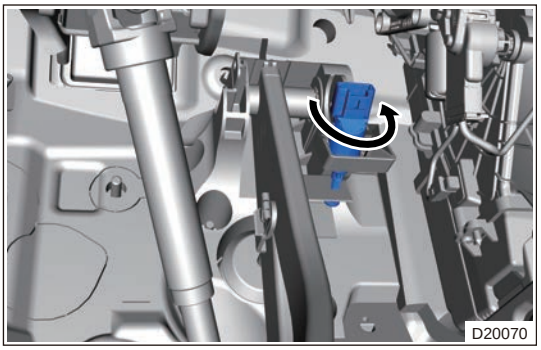
(5) Remove steering column tightening bolt, and disconnect connection between intermediate shaft assembly and steering gear body.



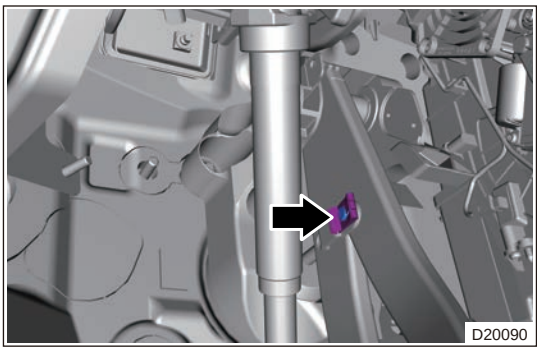
(6) Disconnect the brake light switch connector (arrow).



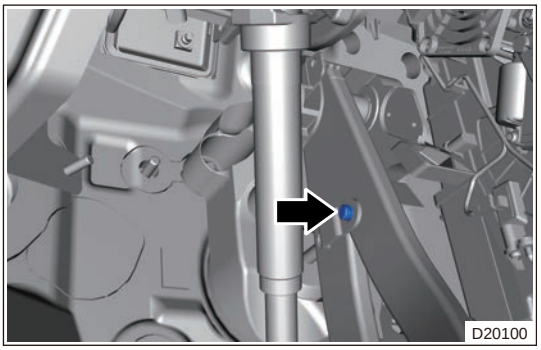
(7) Press switch by hand and turn it 90° counterclockwise to remove brake switch.



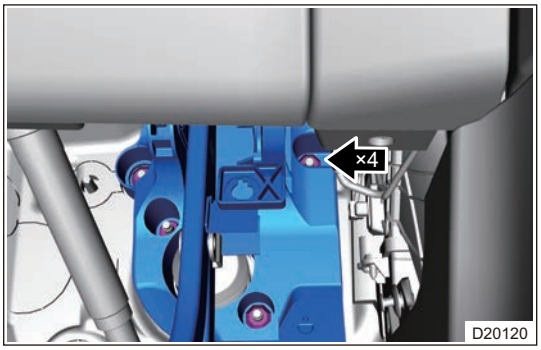
(8) Remove lock pin (arrow) between vacuum booster assembly and brake pedal assembly.



(9) Remove lock shaft between vacuum booster assembly and brake pedal assembly.



(10) Remove 4 fixing nuts (arrow) between vacuum booster assembly and brake pedal assembly.



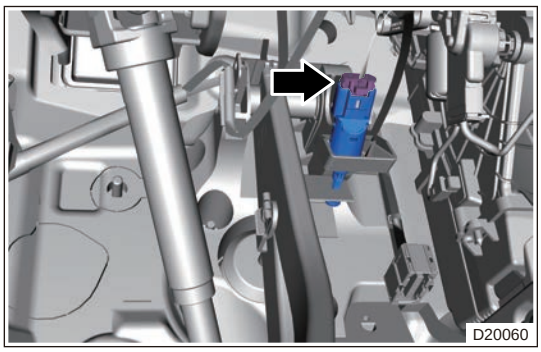
(11) Remove the brake pedal assembly.

■ Inspection

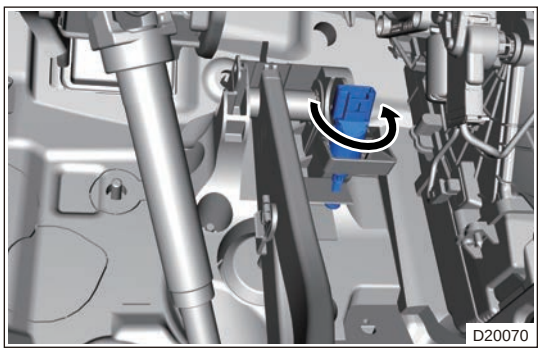
Brake Switch Assembly

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the brake light switch assembly connector.

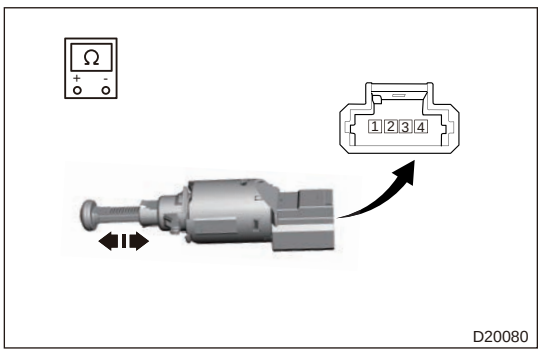


(3) Press switch by hand and turn it 90° counterclockwise to remove brake switch assembly.



(4) Using ohm band of digital multimeter, measure brake switch assembly terminal.

Multimeter Connection	Switch Condition	Specified Condition
Terminal 1 - Terminal 2	Brake pedal depressed	⩽ 1 Ω
Terminal 3 - Terminal 4	Brake pedal depressed	∞
Terminal 1 - Terminal 2	Brake pedal released	∞
Terminal 3 - Terminal 4	Brake pedal released	⩽ 1 Ω



If measurement result is not as specified, replace brake switch assembly.

Brake Pedal Assembly

(1) Brake pedal free play inspection:

- Stop engine. Depress brake pedal several times until there is no vacuum in vacuum booster (depress brake pedal until resistance is felt), then release brake pedal.
- Reasonable range of brake pedal free play: 5 - 10 mm.

(2) Brake pedal height inspection:

- Turn over carpet and measure the distance between brake pedal center and dash panel.
- Loosen the vacuum booster push rod locking nut and rotate the vacuum booster push rod clockwise or counterclockwise to adjust brake pedal height to specified value.

■ Installation

⚠ Caution

- **Be sure to tighten fixing plug and nut to specified torque during installation.**
- **Check that brake light operates normally after installation.**
- **Check if brake pedal free travel is within normal range after installing brake pedal.**
  Normal range: ＜25 mm

(1) Install the brake pedal assembly.

(2) Install 4 fixing nuts between vacuum booster assembly and brake pedal assembly.

Torque: 23 ± 2 N·m

(3) Install lock shaft between vacuum booster assembly and brake pedal assembly.

(4) Install lock pin between vacuum booster assembly and brake pedal assembly.

(5) Install brake switch assembly, press switch by hand and turn it 90° clockwise.

(6) Connect the brake light switch assembly connector.

(7) Connect intermediate shaft assembly and steering gear body, and install steering column tightening bolt.

Tightening torque: 40 ± 3 N·m

(8) Install the electronic accelerator pedal assembly.

(9) Install A/C to instrument panel left A/C outlet pipe assembly.

(10) Install the instrument panel left soundproof board assembly.

4.4 Replacement of Brake Fluid Reservoir Assembly

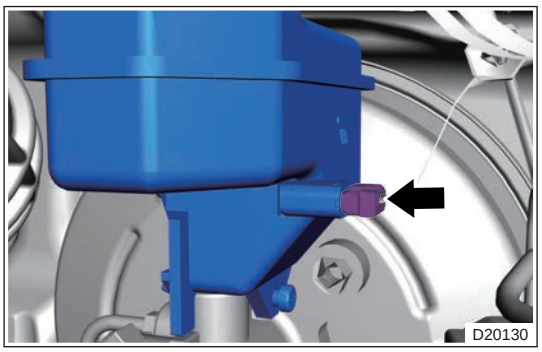
Hint:

- Be sure to perform brake system bleeding after removing/replacing hydraulic parts related to brake system.

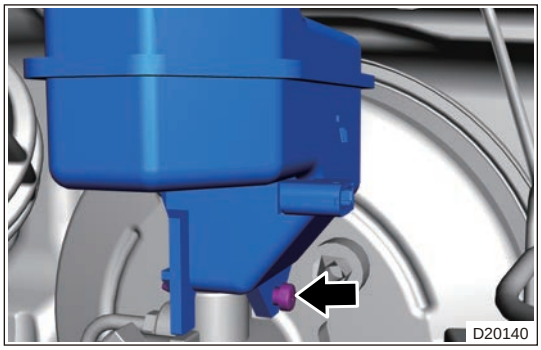
■ Removal

(1) Remove the engine compartment fuse and relay box lower cover.

(2) Disconnect the brake fluid level sensor connector.



(3) Remove fixing pin between brake fluid reservoir and brake master cylinder assembly.



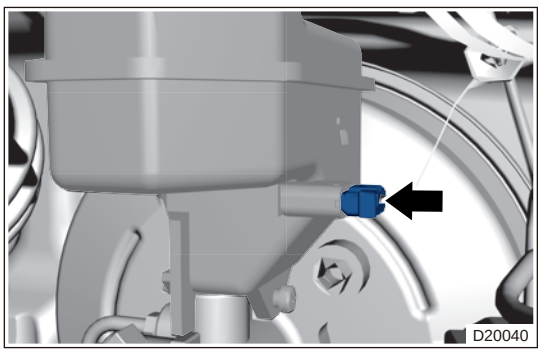
(4) Remove the brake fluid reservoir.

■ **Inspection**

Brake Fluid Level Sensor

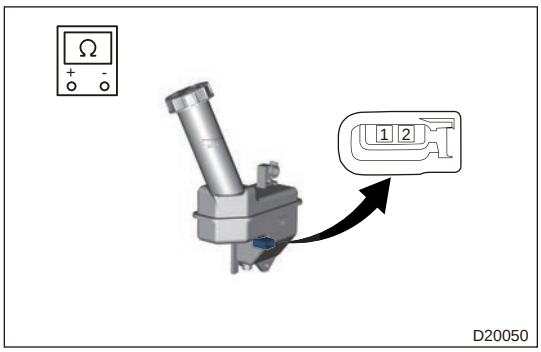
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the brake fluid level sensor connector.



(3) Using ohm band of digital multimeter, measure brake fluid level sensor terminal.

Multimeter Connection	Brake Fluid Level	Specified Condition
Terminal 1 - Terminal 2	MAX	∞
Terminal 1 - Terminal 2	MIN	⩽ 1 Ω



If measurement result is not as specified, replace brake fluid reservoir assembly.

■ **Installation**

(1) Install the brake fluid reservoir assembly.

(2) Install fixing pin between brake fluid reservoir and brake master cylinder assembly.

Tightening torque: 2 - 5 N·m

(3) Connect the brake fluid level sensor connector.

(4) Install the engine compartment fuse and relay box lower cover.

4.5 Replacement of Brake Master Cylinder Assembly

Hint:

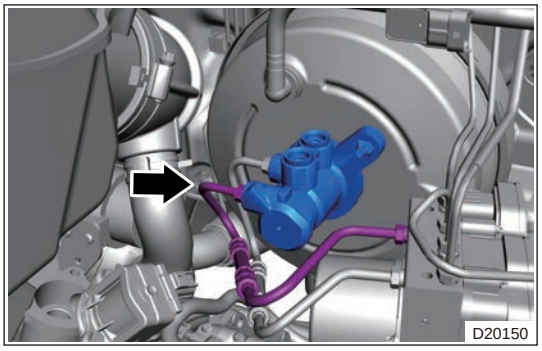
- Be sure to perform brake system bleeding after removing/replacing hydraulic parts related to brake system.

■ **Removal**

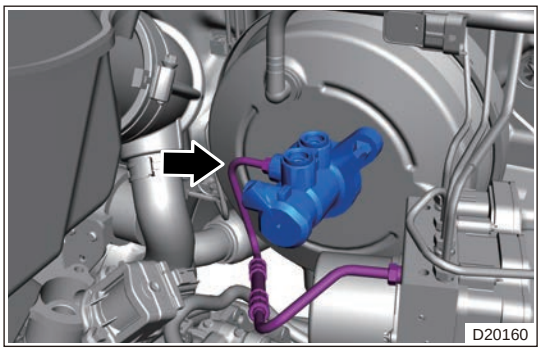
(1) Remove the battery tray.

(2) Remove the brake fluid reservoir.

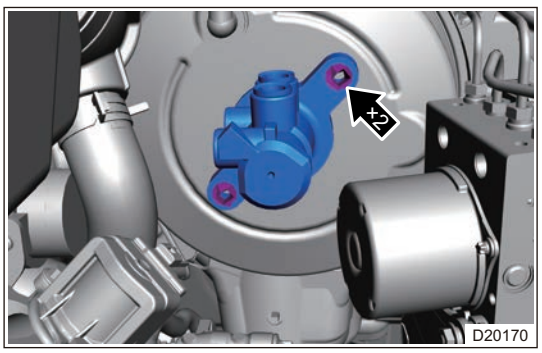
(3) Loosen fixing nut between pump front pipe II assembly and brake master cylinder assembly.



(4) Loosen tightening nut between pump front pipe I assembly and brake master cylinder assembly.



(5) Remove 2 fixing bolts between brake master cylinder assembly and vacuum booster assembly.



(6) Remove the brake master cylinder assembly.

■ **Installation**

(1) Install the brake master cylinder assembly.

(2) Install 2 fixing bolts between brake master cylinder assembly and vacuum booster assembly.

Tightening torque: 15 ± 3 N·m

(3) Tighten tightening nut between pump front pipe I assembly and brake master cylinder assembly.

Tightening torque: 17 ± 3 N·m

(4) Tighten tightening nut between pump front pipe II assembly and brake master cylinder assembly.

Tightening torque: 17 ± 3 N·m

(5) Install the brake fluid reservoir.

(6) Install the battery tray.

4.6 Replacement of Vacuum Booster Assembly

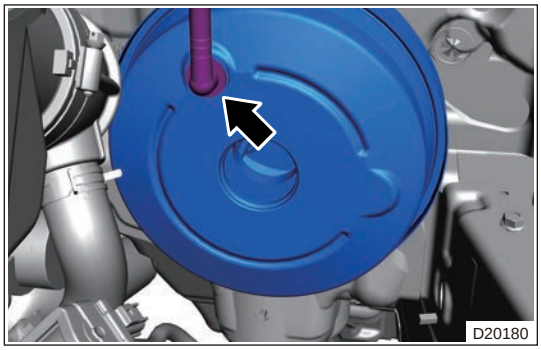
■ **Removal**

(1) Remove the automatic brake pedal assembly.

(2) Remove the brake master cylinder assembly.

(3) Remove the ESP controller assembly.

(4) Disconnect connection between vacuum brake hose assembly and vacuum booster assembly.



(5) Remove the vacuum booster assembly.

■ Inspection

Vacuum Booster Assembly

(1) Air tightness inspection:

- Start engine and stop it after 1 or 2 minutes, disconnect the negative battery cable, and then slowly depress brake pedal several times. Check that each pedal depression amount becomes less than the previous depression.
- Start engine, depress and hold pedal, and then stop engine. Depress and hold pedal for 30 seconds, and check that pedal reserve distance does not change.

(2) Operation inspection:

- Stop engine and disconnect negative battery cable.
- Depress the pedal several times and check that pedal reserve distance does not change.
- Depress and hold pedal, and then start engine. Check that pedal can only be depressed slightly.

■ Installation

(1) Install the vacuum booster assembly.
(2) Connect vacuum brake hose assembly and vacuum booster assembly.
(3) Install the ESP controller assembly.
(4) Install the brake master cylinder assembly.
(5) Install the automatic brake pedal assembly.

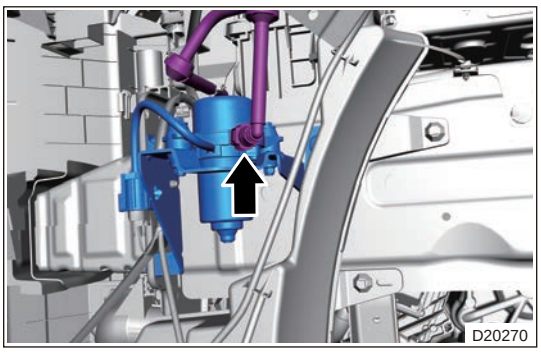
4.7 Replacement of Vacuum Pump Assembly

■ Removal

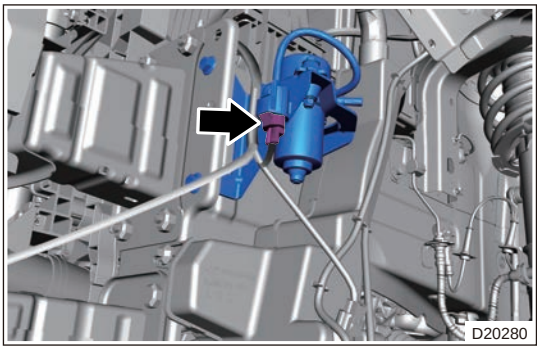
⚠ Caution

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **Try to prevent body paint surface from being scratched during removal and installation.**

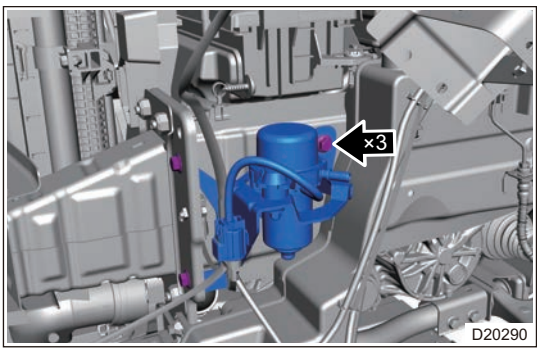
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left wheel.
(4) Remove the front left wheel house protector body.
(5) Disconnect connector (arrow) between vacuum pump assembly and vacuum brake hose assembly.



(6) Disconnect the vacuum pump assembly connector (arrow).



(7) Remove 3 fixing bolts from vacuum pump assembly.



(8) Remove the vacuum pump assembly.

■ Installation

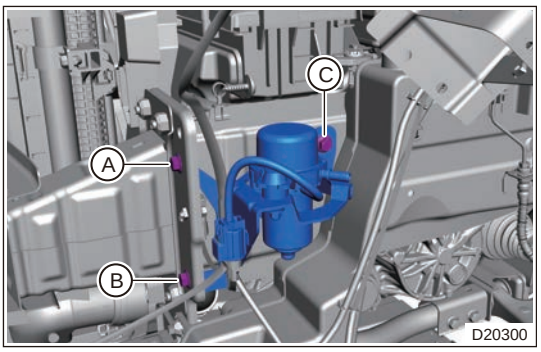
⚠ Caution

- **Be sure to tighten fixing plug and nut to specified torque during installation.**
- **Be sure to check if vacuum pipe is clamped in place after installation. Repair or replace malfunctioning parts as necessary.**

(1) Install the vacuum pump assembly to a proper position.

(2) Install 3 fixing bolts to vacuum pump assembly.

Torque: 19 ± 3 N·m



Hint:

- When installing, install and tighten in order of A-B-C.

(3) Connect the vacuum pump connector.

(4) Connect vacuum pump and vacuum pipe.

(5) Install the front left wheel house protector body.

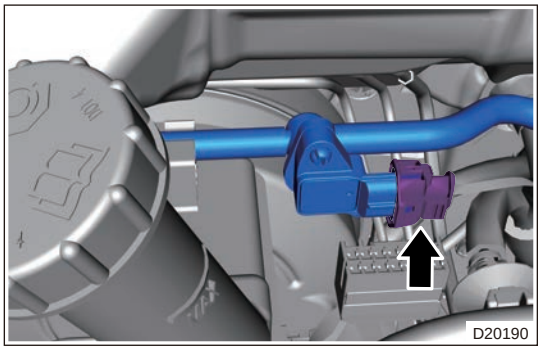
(6) Install the front left wheel.

(7) Connect the negative battery cable.

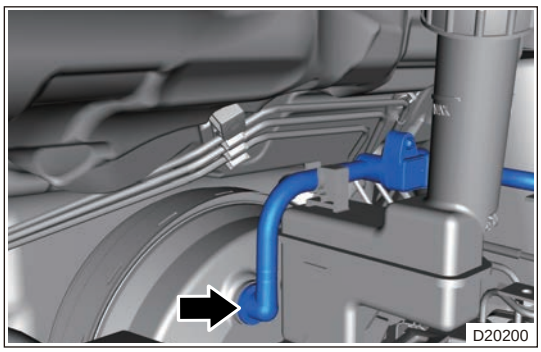
4.8 Replacement of Vacuum Pipe Assembly

■ Removal

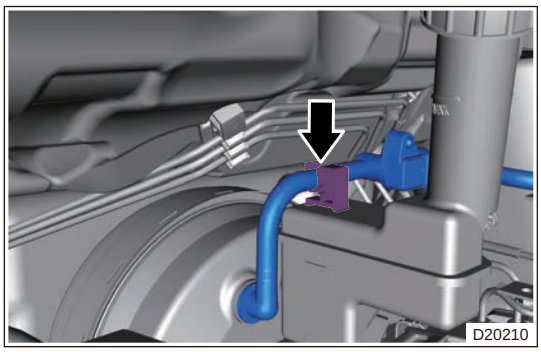
(1) Remove the air direct pipe assembly.
(2) Remove air filter assembly and intake hose I.
(3) Remove the battery tray.
(4) Disconnect the vacuum pipe pressure sensor assembly connector.



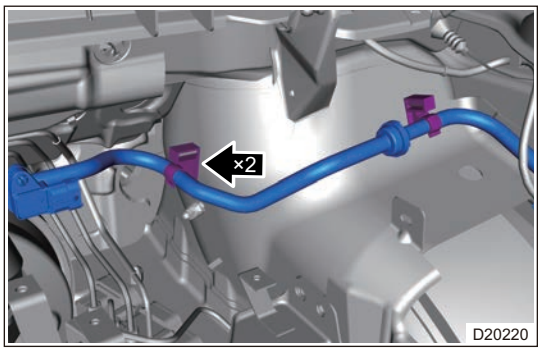
(5) Disconnect connection between vacuum brake hose assembly and vacuum booster assembly.



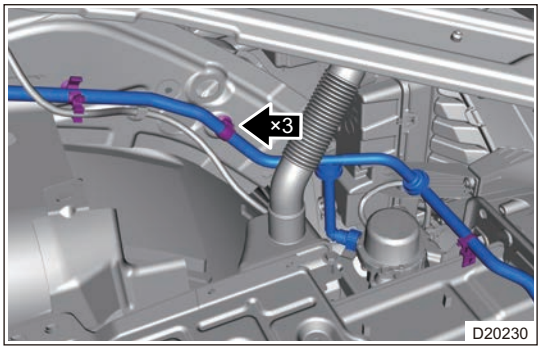
(6) Separate vacuum brake hose assembly and brake fluid reservoir pipe clamp.



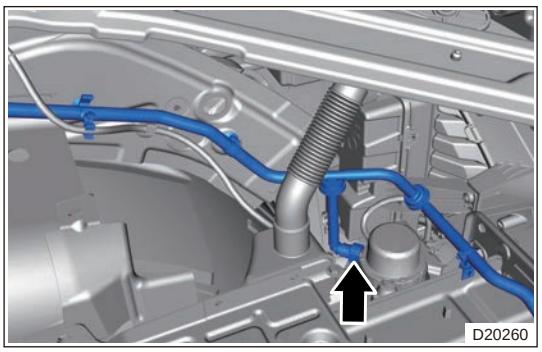
(7) Separate vacuum brake hose assembly and vehicle body pipe clamps.



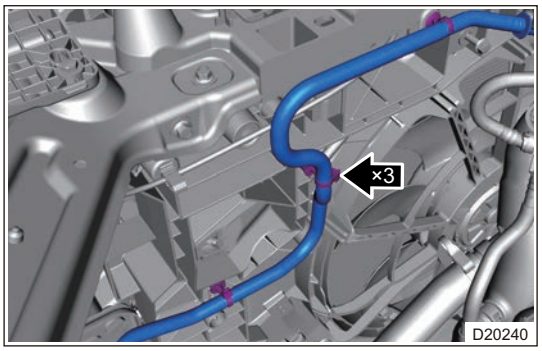
(8) Separate vacuum brake hose assembly and wire harness bracket pipe clamps.



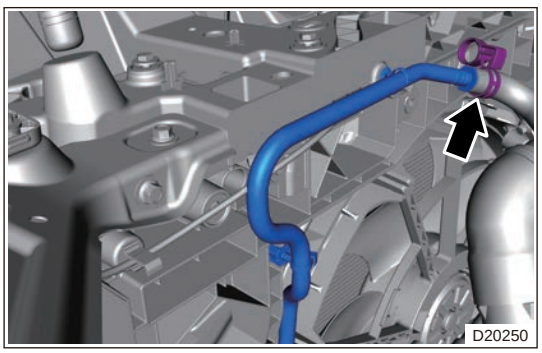
(9) Disconnect connection between vacuum brake hose assembly and vacuum pump assembly.



(10) Separate pipe clamps and front cooling mounting module.



(11) Loosen elastic clamp between vacuum brake hose assembly and engine vacuum connector.



(12) Remove the vacuum brake hose assembly.

■ Installation

(1) Install the vacuum brake hose assembly.

(2) Install elastic clamp between vacuum brake hose assembly and engine vacuum connector.

(3) Connect pipe clamp and front cooling mounting module.

(4) Connect vacuum brake hose assembly and vacuum pump assembly.

(5) Connect vacuum pipe and wire harness bracket pipe clamp.

(6) Connect vacuum pipe and vehicle body pipe clamp.

(7) Connect vacuum pipe and brake fluid reservoir pipe clamp.

(8) Connect the vacuum pipe pressure sensor assembly connector.

(9) Install the battery tray.

(10) Install air filter assembly and intake hose I.

(11) Install the air direct pipe assembly.

4.9 Replacement of Front Brake Hose Assembly

■ Removal

Hint:

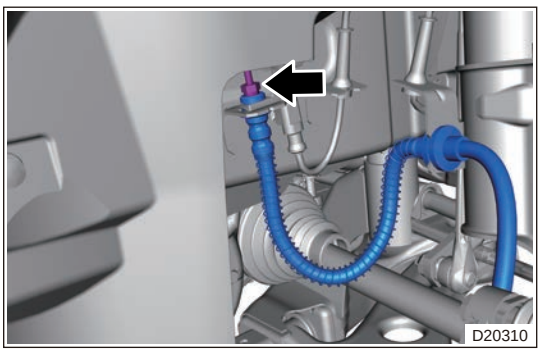
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Caution

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **Try to prevent body paint surface from being scratched during removal and installation.**

(1) Remove the front left wheel.

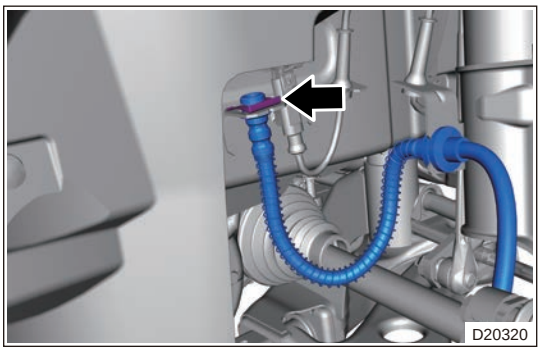
(2) Loosen coupling nut (arrow) between front left brake hose assembly and front left brake pipe.



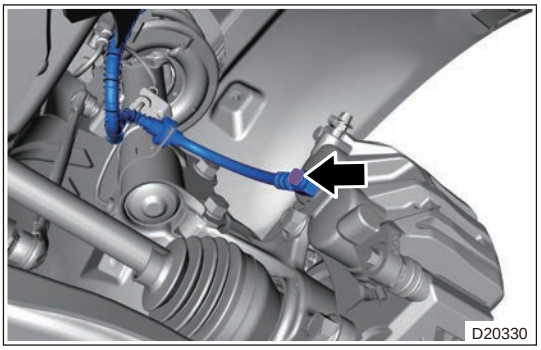
⚠ Caution

- **DO NOT allow any foreign matter such as dirt and dust to enter brake pipe from joint parts.**
- **After removing brake line, perform sealing treatment to prevent foreign matter from entering.**

(3) Remove holding reed (arrow) between front left brake hose assembly and front left pipe assembly.



(4) Loosen tightening bolt (arrow) between front left brake hose assembly and front left brake caliper assembly.



⚠ Caution

- **DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as brake fluid is corrosive.**

(5) Remove the front left brake hose assembly.

■ Installation

⚠ Caution

- **Be sure to tighten fixing plug and nut to specified torque during installation.**
- **Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.**
- **Be sure to perform bleeding procedures for brake system after installation.**
- **Be sure to add brake fluid to a proper level after installation.**

(1) Install the front left brake hose to a proper position.

(2) Install coupling plug between front left brake caliper assembly and front left brake hose assembly.

Torque: 44 ± 1 N·m

(3) Install holding reed between front left brake hose assembly and front left pipe assembly.

(4) Install coupling nut between front left brake hose assembly and front left brake pipe.

Torque: 17 ± 3 N·m

(5) Install the front left wheel.

4.10 Replacement of Rear Brake Hose Assembly

■ Removal

Hint:

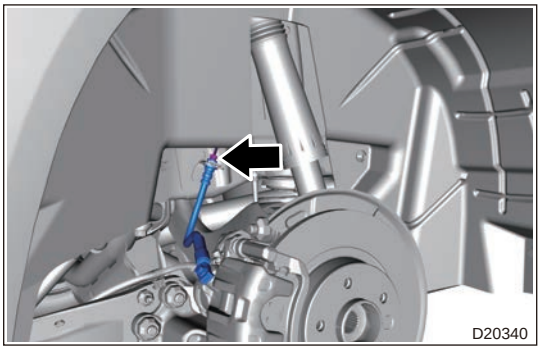
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Caution

- **Be sure to wear necessary safety equipment to prevent accidents when repairing.**
- **Try to prevent body paint surface from being scratched during removal and installation.**

(1) Remove the rear left wheel.

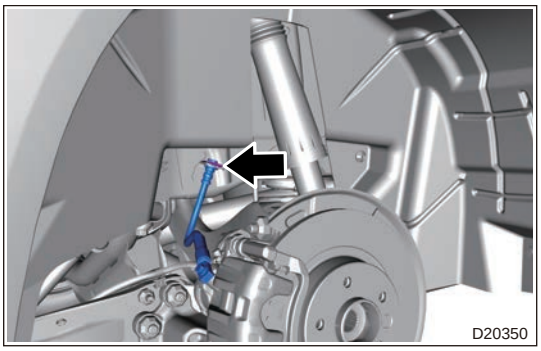
(2) Remove coupling nut (arrow) between rear left brake caliper assembly and rear left brake hose II assembly.



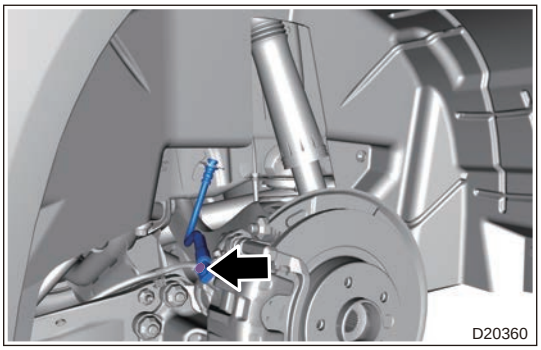
⚠ Caution

- **DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as brake fluid is corrosive.**

(3) Remove holding reed (arrow) between rear left brake hose assembly and rear left brake pipe II assembly.



(4) Remove tightening bolt (arrow) between rear left brake hose assembly and rear left brake caliper assembly.



⚠ Caution

- **When removing tightening bolt, be careful not to drop the 2 gaskets.**
- **DO NOT allow any foreign matter such as dirt and dust to enter brake pipe from joint parts.**
- **After removing brake line, perform sealing treatment to prevent foreign matter from entering.**
- **DO NOT allow brake fluid to be sprayed on your clothes or skin when removing brake hose, as brake fluid is corrosive.**

(5) Remove the rear left brake hose assembly.

■ **Installation**

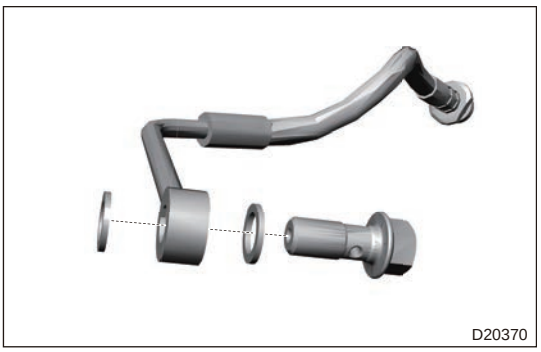
⚠ Caution

- **Be sure to tighten fixing plug and nut to specified torque during installation.**
- **Be sure to check brake system for leakage after installation. Repair or replace malfunctioning parts as necessary.**
- **Be sure to perform bleeding procedures for brake system after installation.**
- **Be sure to add brake fluid to a proper level after installation.**

(1) Install the rear left brake hose to a proper position.

(2) Install tightening bolt between rear left brake hose assembly and rear left brake caliper assembly.

Torque: 44 ± 1 N·m



Hint:

- When installing tightening bolt, be sure to install 2 gaskets.

(3) Install holding reed between rear left brake hose assembly and front left brake pipe II assembly.

(4) Install coupling nut between rear left brake caliper assembly and rear left brake hose II assembly.

Torque: 17 ± 3 N·m

(5) Install the rear left wheel.

4.11 Replacement of Brake Pipe Assembly

■ **Removal**

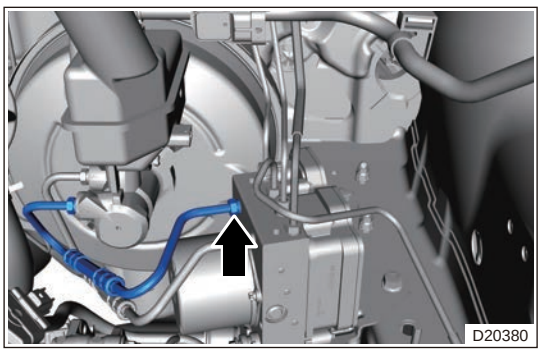
Hint:

- Be sure to perform brake system bleeding after removing/replacing hydraulic parts related to brake system.

(1) Remove the pump front pipe assembly.

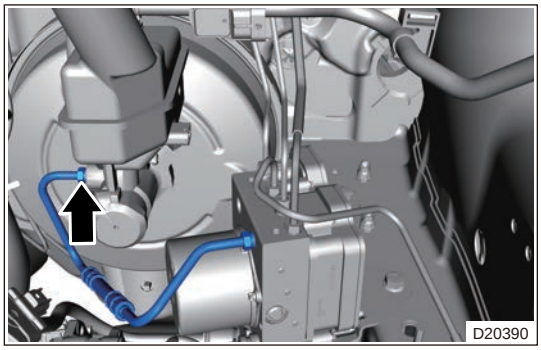
1) Remove the battery tray.

2) Loosen tightening nut (arrow) between pump front pipe II assembly and ESP controller assembly.



3) Remove the pump front pipe II assembly.

4) Loosen tightening nut (arrow) between pump front pipe I assembly and brake master cylinder assembly.

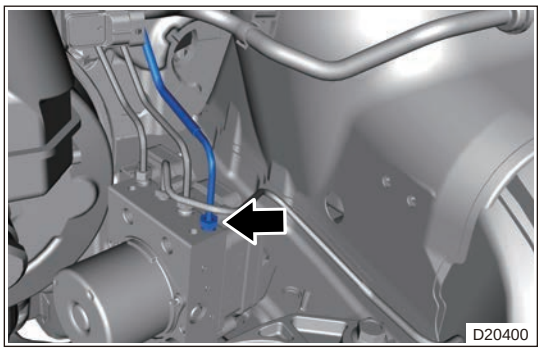


5) Remove the pump front pipe I assembly.

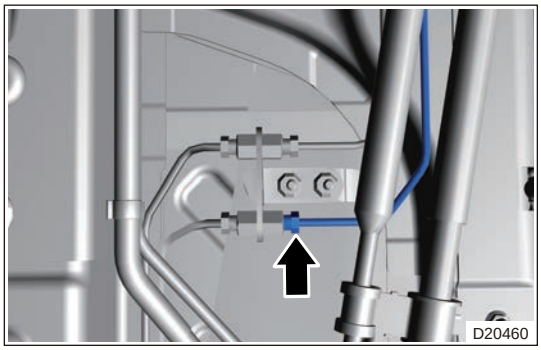
(2) Remove the rear left pipe I assembly.

1) Remove the battery tray.

2) Loosen tightening nut (arrow) between rear left pipe I assembly and ESP controller assembly.



3) Loosen tightening nut between rear left pipe I assembly and pipeline connector.



4) Remove the rear left pipe I assembly.

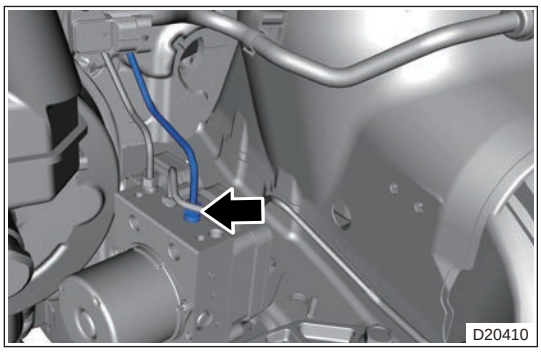
(3) Remove the front right pipe assembly.

1) Remove the battery tray.

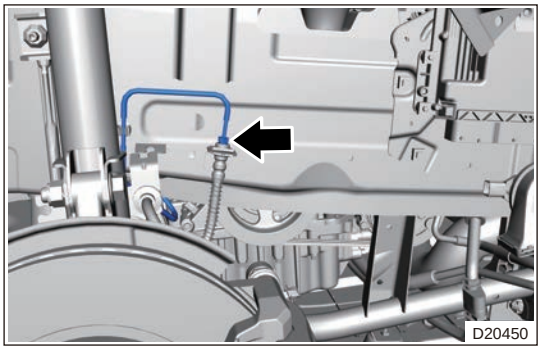
2) Remove the front right wheel.

3) Remove the front right wheel house protector body.

4) Loosen tightening nut (arrow) between front right pipe assembly and ESP controller assembly.



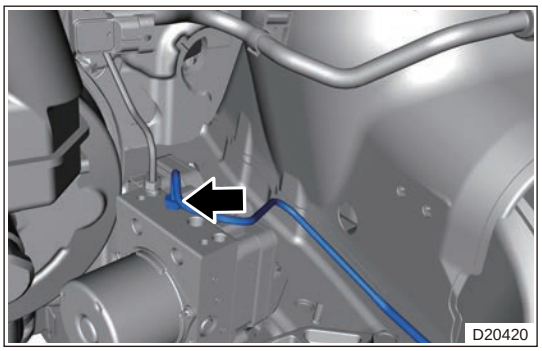
5) Loosen tightening nut (arrow) between front right pipe assembly and front right brake hose assembly.



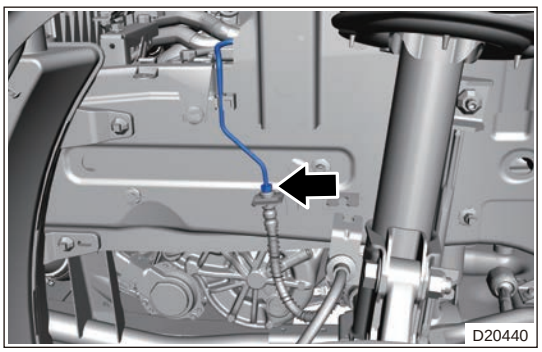
6) Remove the front right pipe assembly.

(4) Remove the front left pipe assembly.

1) Remove the front left wheel.
2) Remove the front left wheel house protector body.
3) Remove the battery tray.
4) Loosen tightening nut (arrow) between front left pipe assembly and ESP controller assembly.



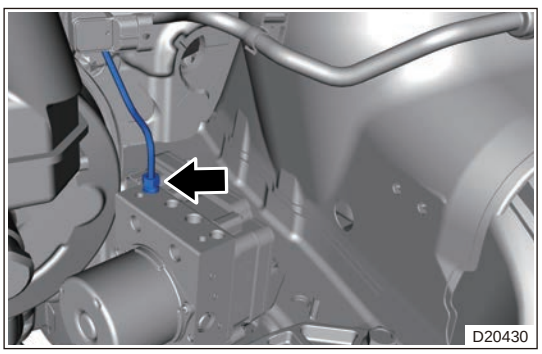
5) Loosen tightening nut (arrow) between front left pipe assembly and front left brake hose assembly.



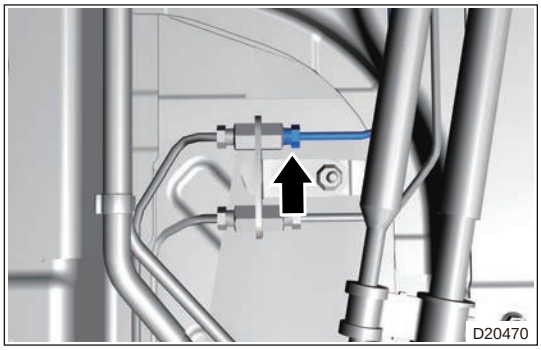
6) Remove the front left pipe assembly.

(5) Remove the rear right pipe I assembly.

1) Remove the battery tray.
2) Loosen tightening nut (arrow) between rear right pipe assembly and ESP controller assembly.



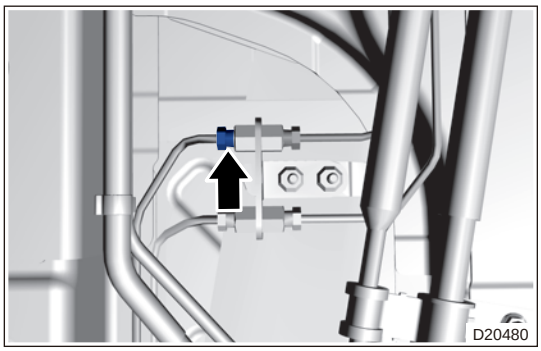
3) Loosen tightening nut (arrow) between rear right pipe assembly and front left brake hose assembly.



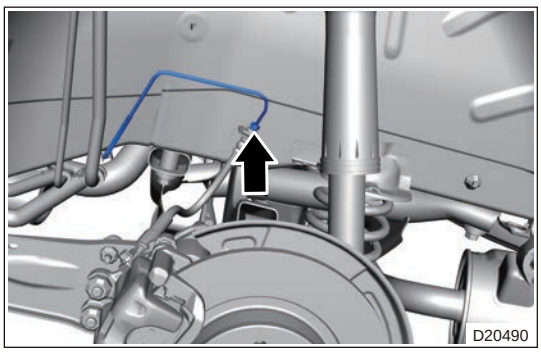
4) Remove the rear right pipe I assembly.

(6) Remove the rear left brake pipe II.

1) Remove the rear left wheel.
2) Remove the rear left wheel house protector body.
3) Remove the battery tray.
4) Loosen tightening nut (arrow) between rear left pipe II and pipeline connector.



5) Loosen tightening nut (arrow) between rear left brake pipe II and rear brake hose assembly.

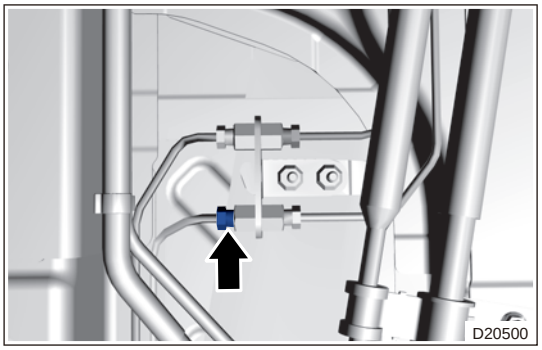


6) Remove the rear left brake pipe II.

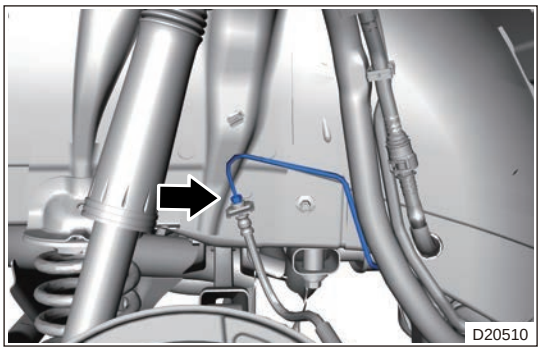
(7) Remove the rear right brake pipe II.

1) Remove the rear left wheel.
2) Remove the rear left wheel house protector body.
3) Remove the battery tray.

4) Loosen tightening nut (arrow) between rear right pipe II and pipeline connector.



5) Loosen tightening nut (arrow) between rear right brake pipe II and rear brake hose assembly.



6) Remove the rear right brake pipe II.

■ **Inspection**

Brake System Bleeding

Hint:

- An assistant will be required to assist when bleeding brake system.

⚠ Caution

- **When bleeding brake system, wear safety glasses.**
- **DO NOT drain the brake fluid in brake master cylinder assembly while bleeding brake system.**
- **When bleeding brake system, brake fluid may spray out from drain plug due to high pressure.**
- **When bleeding brake system, do not depress brake pedal repeatedly at any time with drain plug opened. Otherwise, air amount in the system will increase to make an extra bleeding.**

(1) Remove cap from brake fluid reservoir assembly and ensure that brake fluid level is between the “MIN (-Minimum)” and “MAX (Maximum)” mark on brake fluid reservoir.

(2) Raise vehicle and remove drain plug cover.

(3) Connect a clear plastic hose to drain plug and submerge the end of hose into container.

(4) Have an assistant depress brake pedal 3 to 4 times repeatedly (depress to the lower position), and keep depressing brake pedal, then loosen drain plug.

(5) Tighten drain plug every time brake pedal goes down quickly, then release the brake pedal.

(6) Ensure that brake fluid level is not lower than "MIN (minimum)" mark on brake fluid reservoir assembly.

(7) Wait for 2 seconds between 2 brake pedal depressions in order to stabilize brake fluid.

(8) Repeat above steps, and use the same procedures to bleed brake line of each wheel in order of rear left wheel, front left wheel, front right wheel and rear right wheel, until no air exists in brake system (a stream of fresh brake fluid flows into clear container without bubbles).

(9) Install drain plug cover and lower the vehicle.

(10) Check that brake fluid level is between the “MIN (Minimum)” and “MAX (Maximum)” mark on brake fluid reservoir.

(11) Check the brake pedal braking effect. If braking effect is poor or pedal is spongy, air may still exist in system. Perform bleeding for brake system again as necessary.

(12) Test vehicle to confirm that brake system operate properly with good brake pedal feel.

■ **Installation**

(1) Install the pump front pipe assembly.
1)Install the pump front pipe II assembly.
2)Tighten tightening nut between pump front pipe II assembly and brake master cylinder assembly and ESP controller assembly.

Tightening torque: 17 ± 3 N·m

3)Install the pump front pipe I assembly.
4)Tighten tightening nut between pump front pipe I assembly and brake master cylinder assembly and ESP controller assembly.

Tightening torque: 17 ± 3 N·m

5)Install the battery tray.

(2) Install the rear left pipe I assembly.
1)Install the rear left pipe I assembly.
2)Tighten tightening nut between rear left pipe I assembly and ESP controller assembly.

Tightening torque: 17 ± 3 N·m

3)Tighten tightening nut between rear left pipe I assembly and pipeline connector.

Tightening torque: 18 ± 2 N·m

4)Install the battery tray.

(3) Install the front right pipe assembly.
1)Install the front right pipe assembly.
2)Tighten tightening nut between front right pipe assembly and ESP controller assembly.

Tightening torque: 17 ± 3 N·m

3)Tighten tightening nut between front right pipe assembly and front right brake hose assembly.

Tightening torque: 17 ± 3 N·m

4)Install the battery tray.
5)Install the front right wheel house protector body.
6)Install the front right wheel.

(4) Install the front left pipe assembly.
1)Install the front left pipe assembly.
2)Tighten tightening nut between front left pipe assembly and ESP controller assembly.

Tightening torque: 18 ± 2 N·m

3)Tighten tightening nut between front left pipe assembly and front left brake hose assembly.

Tightening torque: 17 ± 3 N·m

4)Install the battery tray.
5)Install the front left wheel house protector body.
6)Install the front left wheel.

(5) Install the rear right pipe I assembly.
1)Install the rear right pipe I assembly.
2)Tighten tightening nut between rear right pipe I assembly and ESP controller assembly.

Tightening torque: 17 ± 3 N·m

3)Tighten tightening nut between rear right pipe I assembly and pipeline connector.

Tightening torque: 18 ± 2 N·m

4)Install the battery tray.

(6) Install the rear left brake pipe II.

1) Install the rear left brake pipe II.
2) Tighten tightening nut between rear left pipe II and pipeline connector.

Tightening torque: 18 ± 2 N·m

3) Tighten tightening nut between rear left brake pipe II and rear brake hose assembly.
Tightening torque: 17 ± 3 N·m

4) Install the battery tray.
5) Install the rear left wheel house protector body.
6) Install the rear left wheel.

(7) Install the rear right brake pipe II.
1) Install the rear right brake pipe II.
2) Tighten tightening nut between rear right pipe II and pipeline connector.
Tightening torque: 18 ± 2 N·m

3) Tighten tightening nut between rear right brake pipe II and rear brake hose assembly.
Tightening torque: 17 ± 3 N·m

4) Install the battery tray.
5) Install the rear right wheel house protector body.
6) Install the rear right wheel.

7.4 ELECTRONIC PARKING BRAKE SYSTEM

1 Warning and Precautions

1.1 Precaution

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

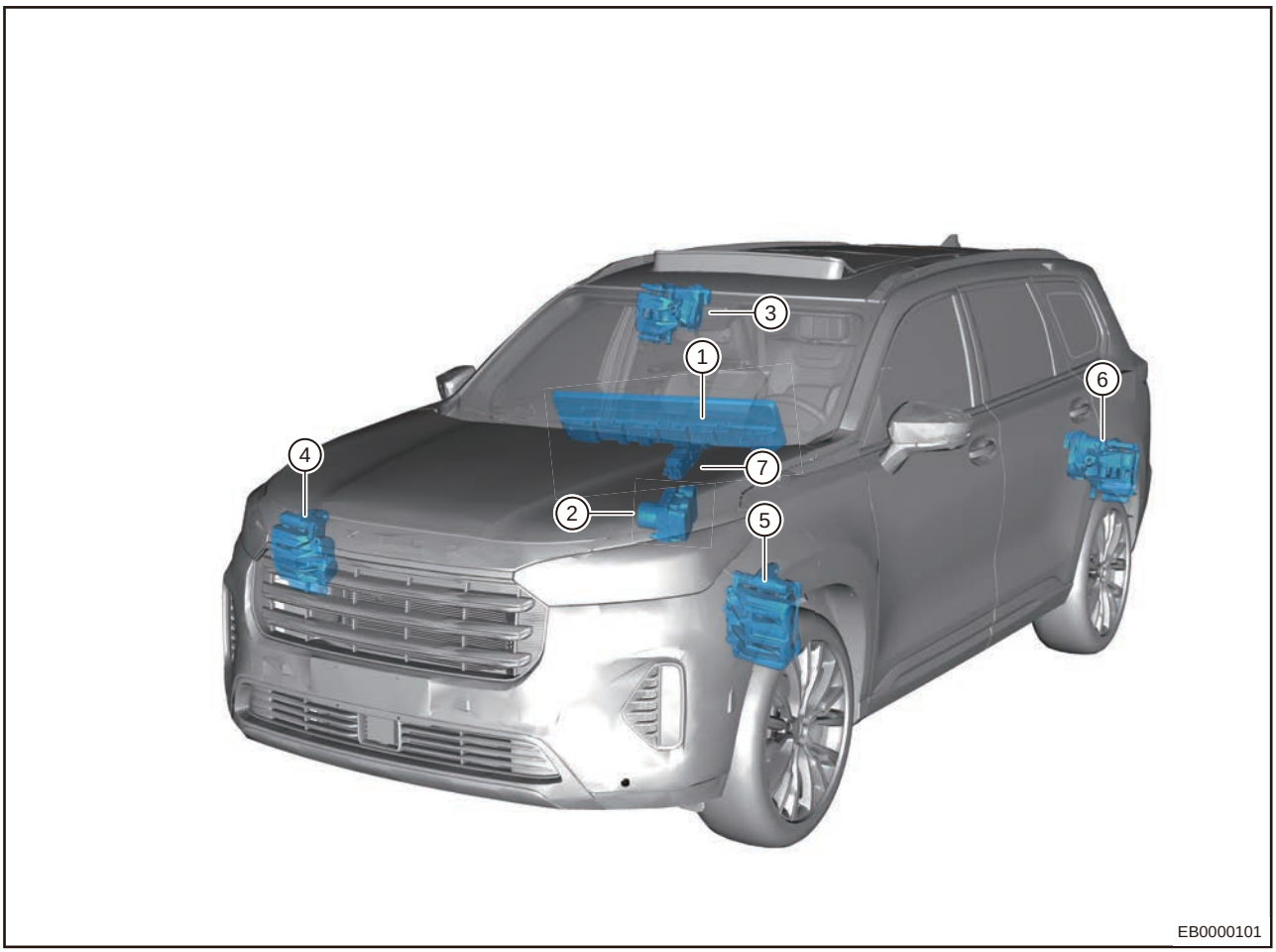
- When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.
- If parking brake cannot be released by parking brake switch manually or automatically on a slope, please try to tow vehicle to a level road or place obstacles such as stoppers in front of or rear of front wheels respectively to prevent wheel rolling, avoiding coasting accident after releasing parking brake.
- When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to cut off vehicle power supply.

2 System Overview

2.1 System Description

Electronic parking brake operation is electronic parking brake system. Electronic Parking Brake System (EPB) integrates temporary braking while driving with long-term braking after stopping. Therefore, vehicle can be stopped through electronic parking brake operation. Electronic parking brake stops vehicle through electronic parking brake operation. Its operation principle is the same as mechanical parking brake operation, which is to control vehicle stopping by friction generated from brake disc and brake lining, but control changes to electronic button from mechanical parking brake lever. Electronic parking brake has extended basic parking function to AUTO HOLD. With AUTO HOLD enabled, driver does not have to depress brake pedal for long time when stopping vehicle, and avoid unnecessary moving, that is vehicle will not slide rearward.

2.2 System Components Diagram



1	Instrument Cluster	5	Front Left Brake Caliper Assembly
2	ESP Control Module	6	Rear Left Integrated Caliper Assembly
3	Rear Right Integrated Caliper Assembly	7	Electrical Parking Brake Switch
4	Front Right Brake Caliper Assembly		

■ Electronic Parking Brake System (EPB)

Electronic Parking Brake System (EPB) is mainly used to integrate temporary braking while driving with long-term parking braking after stopping. Therefore, vehicle can be stopped through electronic parking brake operation.

- Manual parking: When engine starts or ENGINE START STOP switch is in ON mode while vehicle is stationary, pull up the electronic parking switch, the red indicator and electronic parking switch indicator come on, which indicates parking brake function is operating.
- Manual releasing: When engine starts or ENGINE START STOP switch is in ON mode while depressing brake pedal, press the electronic parking switch manually, the red indicator and electronic parking switch indicator go off, which indicates parking brake function is released.
- Automatic releasing: Fasten driver side seat belt, close driver side door. Depress accelerator pedal when button-type electronic shift module is in D or R position. Then electronic parking brake will be released automatically and red indicator goes off. When vehicle is stopped on a slope and shift module is in D or R, it is necessary to depress accelerator pedal deeply and automatic parking brake is released only when drive force is greater than the force in coasting direction.

(1) EPB is released automatically when shifting P position to D or R position.

(2) EPB is applied automatically when shifting to P position from D or R position.

Hint:

- Turn ENGINE START STOP button to OFF, and Electronic Parking Brake (EPB) achieves parking brake automatic application function.

⚠ Caution

- **Electronic parking brake can not be released when vehicle battery is depleted.**
- **With engine starting or ENGINE START STOP switch turned to ON, if parking brake can not be released manually by depressing brake pedal, depress accelerator pedal and press electronic parking brake switch to release electronic parking brake. Use this method only when parking brake can not be released manually by depressing brake pedal. Please take care when using this method.**
- **Fasten driver side seat belt and close driver side door when electronic parking brake is released automatically. Otherwise, automatic parking brake releasing conditions are not met.**
- **While electronic parking brake is applied or released, a "fizz" sound may be heard from rear of vehicle, which is generated during parking brake operation. This is normal, please rest assured use.**
- **If parking brake is applied or released while depressing the brake pedal, brake pedal may move up or down slightly, just depress brake pedal firmly.**
- **If vehicle coasts after stopping for a while, for safety, system will increase parking brake force automatically, to make vehicle stationary; during the process of increasing parking brake force, system will produce a certain operating sound, which is normal.**

⚠ Warning

- **To prevent vehicle from moving accidentally, after Electronic Parking Brake System (EPB) operates when vehicle is stopped or leaving vehicle, both red indicator and electronic parking switch indicator come on for a while and then go off. At the moment, observe if the indicators come on to make sure that electronic parking brake is applied successfully.**
- **To prevent vehicle from moving accidentally, when vehicle is in automatic parking status, it is necessary to confirm the gear position before starting vehicle by depressing accelerator pedal.**

■ Automatic Parking Function (AUTO HOLD)

Electronic parking brake system (EPB) has extended basic parking function to automatic parking function (-AUTO HOLD). With AUTO HOLD enabled, driver does not have to depress brake pedal for long time when stopping vehicle, automatic parking can be used to avoid unnecessary moving (such as coasting).

- Turning on automatic parking function: With engine started, driver side door is closed and driver side seat belt is fasten. Press automatic parking switch to start automatic parking function, meanwhile, indicator on the button illuminates, which indicates system enters automatic parking mode.
- Activating automatic parking function: When automatic parking function is on and automatic parking conditions are met, vehicle stops from moving status after depressing brake pedal, automatic parking function is activated and green indicator comes on. When vehicle is stationary and brake pedal is depressed, automatic parking function is activated and green indicator comes on when automatic parking function is turned on and automatic parking conditions are met.
- Closing automatic parking function: With automatic parking function turned on, press automatic parking switch on auxiliary fascia console to turn off automatic parking function and indicator on the button goes off, which indicates system has exited automatic parking mode. With automatic parking function activated, press automatic parking button on auxiliary fascia console to turn off automatic parking function. Both green indicator and indicator on automatic parking button go off, which indicates system has exited automatic parking mode and turned to Electronic Parking Brake (EPB) system function.
- Automatic parking releasing: Automatic parking releasing method is the same as that of electronic parking, including manual and automatic releasing operations.

⚠ Caution

- **After vehicle starts, automatic parking switch is turned on, automatic parking system can not be entered if driver side door is not closed or driver side seat belt is unfastened.**
- **With automatic parking turned on, when vehicle is stopped moving by brake and kept in stationary state, automatic parking system will apply parking brake automatically while vehicle gear is in D or R position. Shift to N in short time parking, and shift to P in long time parking.**
- **With automatic parking function turned on, when opening driver side door or unfastening driver side seat belt, it will exit automatic parking function. When driver side door is closed or driver side seat belt is fastened again, automatic parking function is turned on again.**
- **When automatic parking function is activated, open driver side door or unfasten driver side seat belt, then automatic parking turns to electronic parking.**
- **With automatic parking function activated, if it is necessary to shift gear by depressing brake pedal at this time (for example, shift N to R position). Depress the brake pedal with greater force than when the automatic parking is not turned on (as the automatic parking is operative, the pedal stroke becomes shorter).**
- **Be sure to observe safety regulations to park the vehicle properly, avoid hurting yourself and pedestrian.**
- **Be sure to turn automatic parking function off when parking the vehicle in place or driving in narrow space (for example, before driving into car washing room).**
- **This function cannot be activated during due to insufficient Brake force when brake is extremely slight or vehicle slips to stop.**
- **Automatic parking function cannot replace parking brake system.**

■ Sudden Braking Function

If foot brake is faulty, pull up and hold the electronic parking switch to forcibly apply brake through electric parking brake. The red indicator flashes with alarming sound during emergency braking. To exit emergency braking, release the electronic parking switch.

⚠ Warning

- **Turn on sudden braking function only when the foot brake is faulty or brake pedal is stuck. Because Electronic Stability Program (ESP) system and its component can not exceed the physical limit of road adhesion. Turning on emergency braking function when driving on a curve, dangerous road area, heavy traffic road or in bad weather may lead to drift, sideslip or pull. Beware of accident.**
- **Use this function with caution during normal driving. Prevent other passengers from touching this switch by mistake while driving. Otherwise it may lead to an accident.**
- **When sudden braking function is triggered, a "drone" sound will be heard, it is normal.**
- **During sudden braking, electronic parking performs braking operation in a constant deceleration, which may be different from driver's expected deceleration and the braking distance may be different as well.**

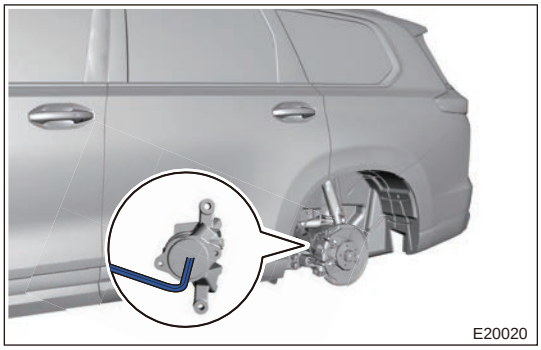
■ Electronic Parking Brake System (EPB) Emergency Release (Take left side as an example)

If parking brake cannot be released by parking brake switch manually or automatically due to unexpected circumstances (such as battery does not output voltage, parking brake system failure, etc.) during using electronic parking brake system (EPB), you need to enable electronic parking brake system (EPB) emergency releasing function to release parking brake, please follow the following steps for specific methods:

(1) Remove the rear left wheel.

(2) Remove the electronic control execution unit.

(3) Align inner bi-hexagonal wrench M8 with spline in rear left brake caliper body assembly, rotate 2-3 cycles clockwise (when operator faces spline) or stop until brake disc can rotate freely (it is normal that a large rotation force is needed due to vehicle parking brake condition).

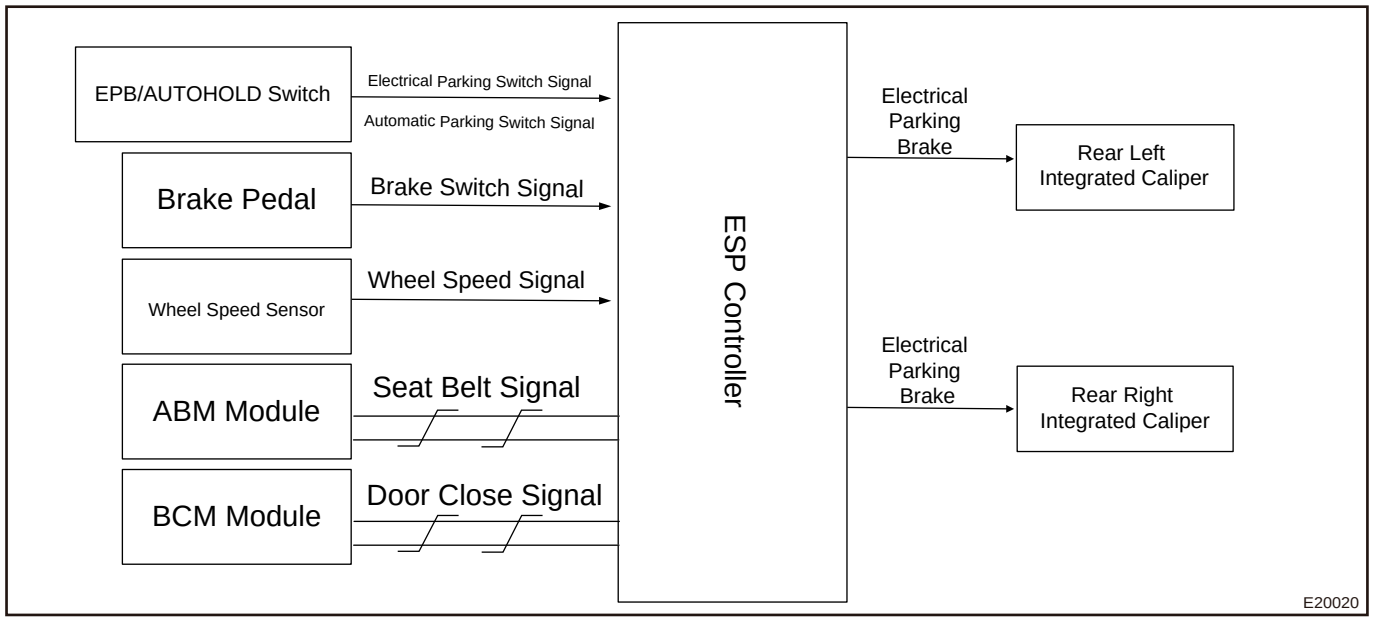


(4) The vehicle only loses parking brake function and does not affect normal braking function after releasing parking brake.

⚠ Caution

- **If parking brake cannot be released by parking brake switch manually or automatically on a slope, please try to tow vehicle to a level road or place obstacles such as stoppers in front of or rear of front wheels respectively to prevent wheel rolling, avoiding coasting accident after releasing parking brake.**

2.3 System Schematic Diagram

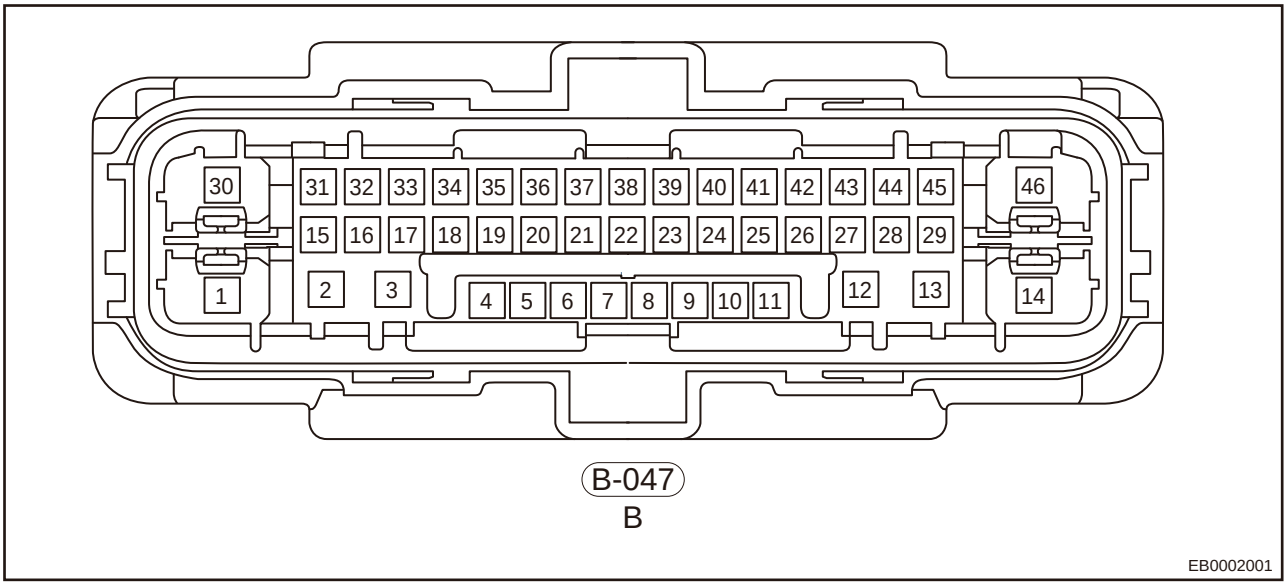


ESP controller assembly collects seat belt signal and door closed signal via CAN line, and collects electric parking switch signal, automatic parking switch signal, brake switch signal and wheel speed signal via hard-wire connection. Then, integrated caliper assembly operates according to data requirements analysis.

3 System Circuit Diagram

3.1 Module Terminal Definition

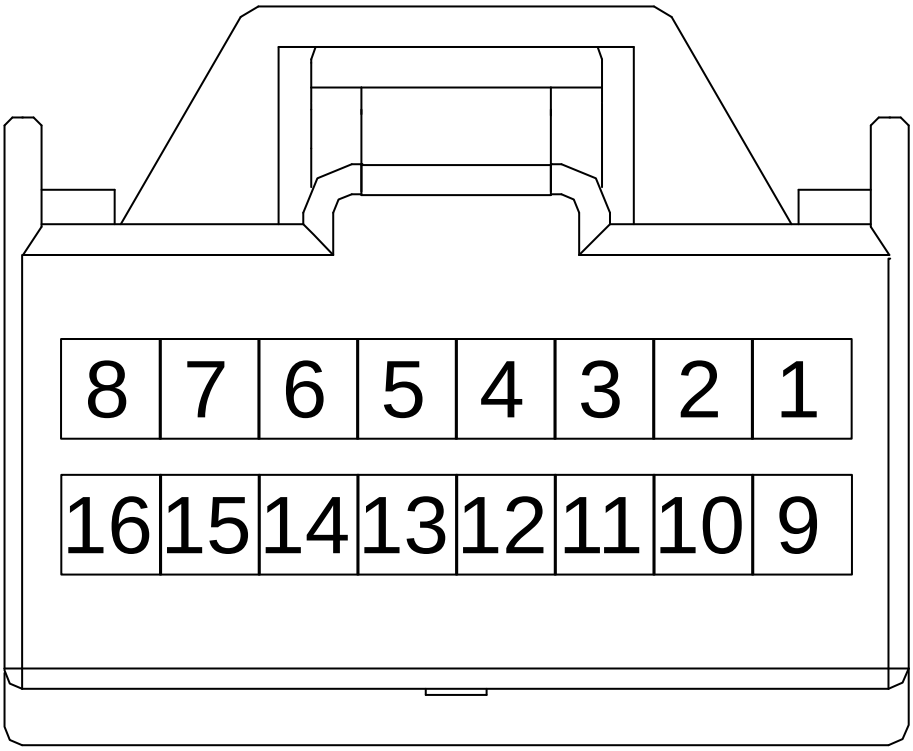
■ ESP Module Terminal Definition



Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	KL30 Power Supply	24	Front Left Wheel Speed Sensor Power Supply
2	Right EPB Motor Power Supply	25	CAN2 Low
3	Right EPB Motor Ground	26	Front Right Wheel Speed Sensor Signal
4	Reserved	27	Reserved
5	CHA High	28	Reserved
6	Reserved	29	Reserved
7	Front Left Wheel Speed Sensor Signal	30	KL30 Power Supply
8	AUTO HOLD Indicator	31	EPB Switch Pin 1
9	Reserved	32	EPB Switch Pin 4
10	HDC Switch Indicator	33	Reserved
11	CAN2 High	34	Reserved
12	Left EPB Motor Ground	35	Reserved
13	Left EPB Motor Power Supply	36	ING1 Power Supply
14	Ground	37	Rear Right Wheel Speed Sensor Signal
15	EPB Switch Pin 3	38	Brake Switch Signal
16	EPB Switch Pin 2	39	Rear Left Wheel Speed Sensor Power Supply
17	HDC Switch Signal	40	Reserved
18	EPB Indicator	41	AUTO HOLD Switch Signal

Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
19	CAN Low	42	Reserved
20	Reserved	43	ESP OFF
21	Front Right Wheel Speed Sensor Power Supply	44	Reserved
22	Rear Right Wheel Speed Sensor Power Supply	45	Reserved
23	Rear Left Wheel Speed Sensor Signal	46	Ground

■ **EPB Switch (Integrated Electric Shift Module) Terminal Definition**



EB0045001

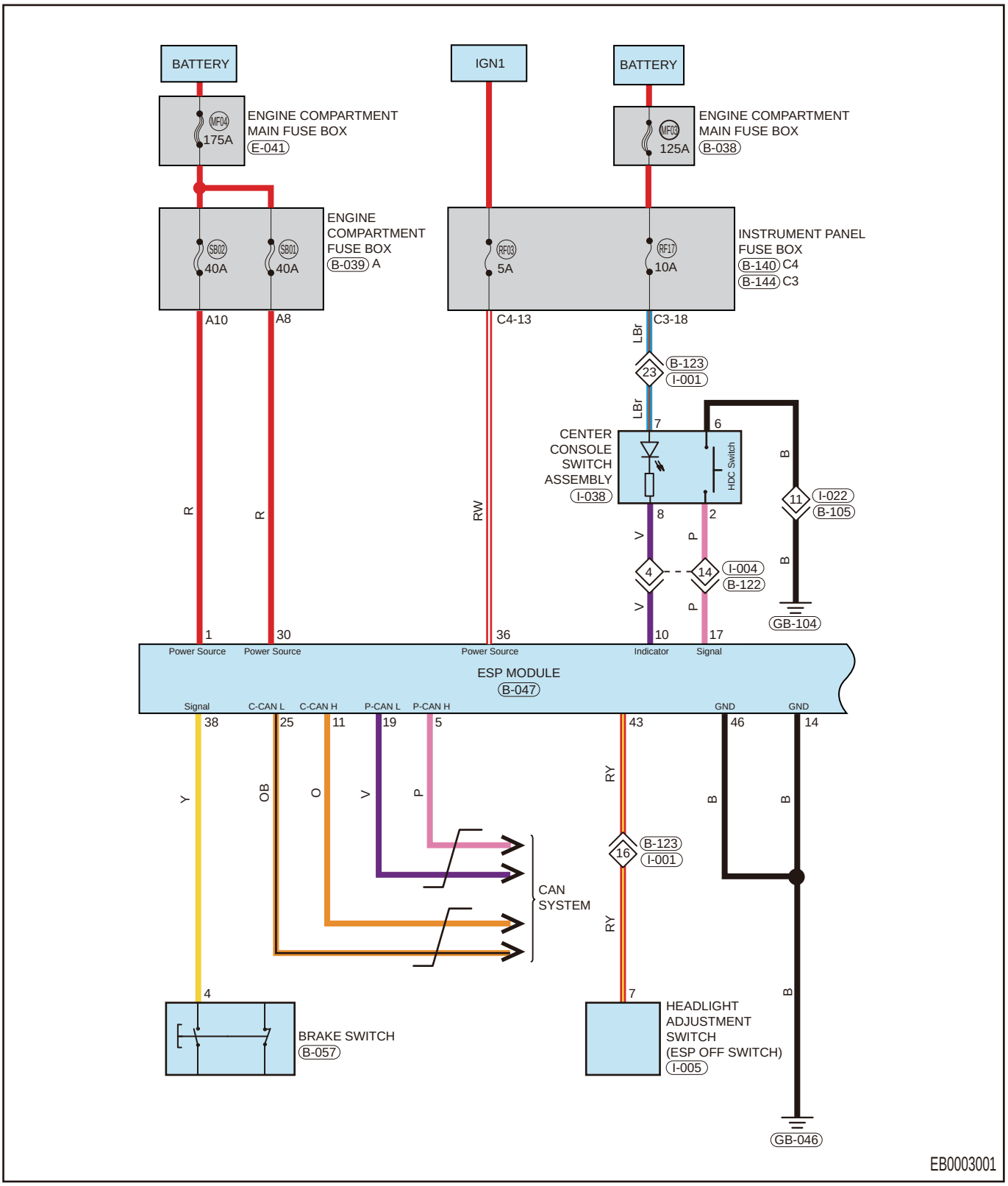
Pin	Terminal Definition	Pin	Terminal Definition
1	CAN-L	9	-
2	CAN-H	10	SW6

Pin	Terminal Definition	Pin	Terminal Definition
3	-	11	AUTOHOLD switch operation indicator drives
4	Ground	12	AUTOHOLD switch signal outputs
5	Power supply	13	SW4
6	-	14	SW3
7	Ignition signal	15	EPB switch operation indicator drives
8	-	16	SW1

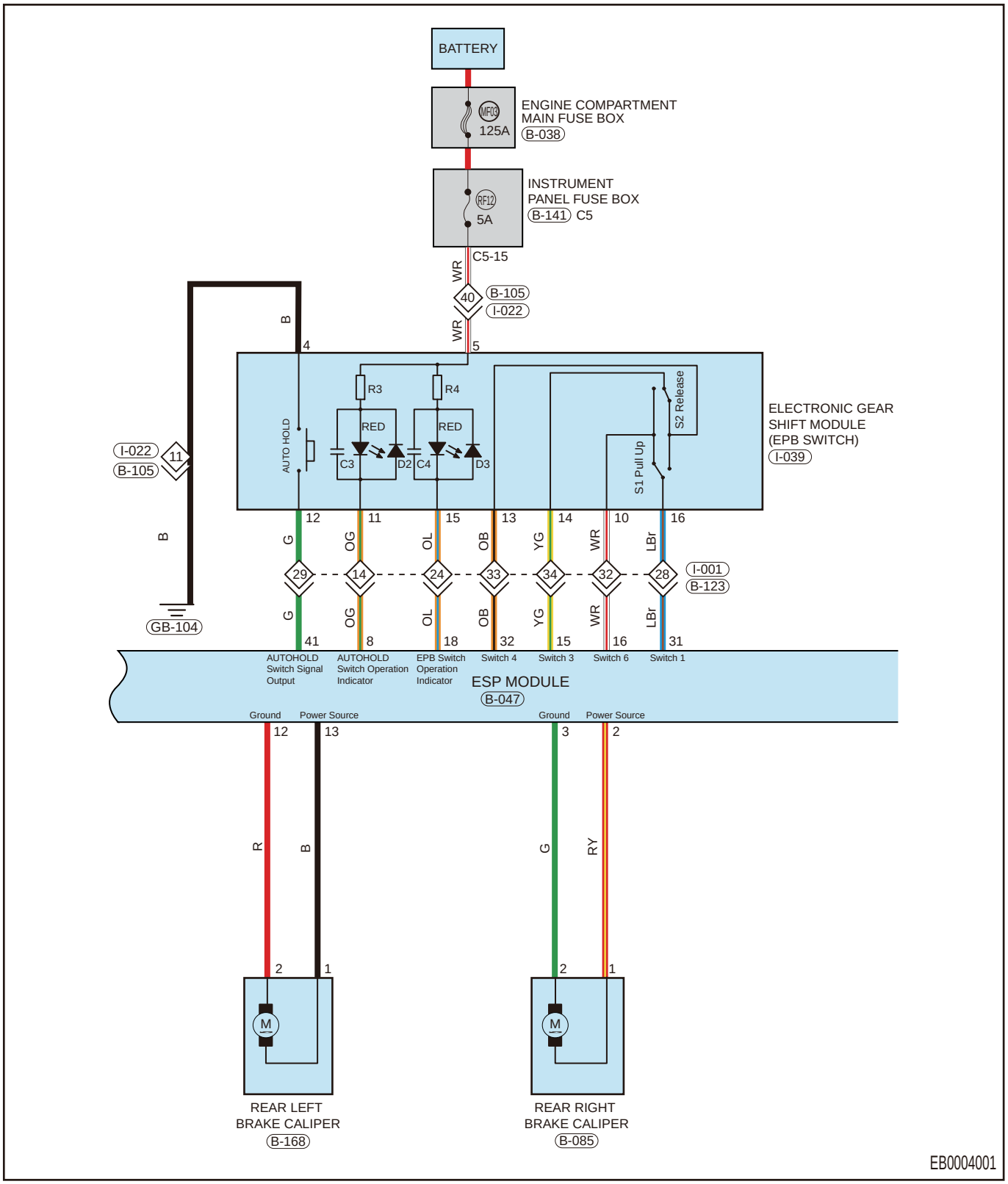
3.2 ESP Module Terminal Definition

3.3 Circuit Diagram

■ Electronic Parking Brake System 1



■ Electronic Parking Brake System 2



4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
EPB warning light illuminates	Electronic control execution unit
	ESP control module assembly
Unable to release/apply parking brake	Fuse malfunction
	Wire harness or connector failure
	ESP control module assembly
	Electronic control execution unit
	Wheel speed signal failure
Switch failed	Switch malfunction
	Fuse malfunction
	Wire harness or connector failure
	ESP control module assembly
CAN network fault	Fuse malfunction
	Wire harness or connector failure
	CGW controller assembly
	ESP controller assembly

4.2 Diagnosis Procedure

Hint:

- Use following procedures to troubleshoot the Electronic Parking Brake (EPB) system.

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

(a) Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V.

NG → **Replace battery**

OK

3	**Customer problem analysis**

NEXT

4	Read DTCs

No DTC → Repair according to Problem Symptoms Table

DTCs

5	Read DTCs (current DTC and history DTC)

No DTC → Troubleshoot according to intermittent DTC fault flow

DTCs

6	Repair according to Diagnostic Trouble Code (DTC) chart

NEXT

7	Adjust, repair or replace

NEXT

8	Conduct test and confirm malfunction has been repaired

NEXT → End

4.3 Diagnostic Help

(1) Connect diagnostic tester (the latest software) to diagnostic connector, and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of brake control system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all wire harness connectors and ground parts related to DTC.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

4.4 Intermittent Troubleshooting

If malfunction is intermittent, perform the followings:

(1) Check if connector is loose.
(2) Check if wire harness is worn, pierced, pinched or partially broken.
(3) Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
(4) If possible, try to duplicate the conditions under which DTC was set.
(5) Look for data that has changed or DTC to reset during wiggle test.
(6) Look for broken, bent, protruded or corroded terminals.

(7) Inspect the mounting areas of brake control system, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.

(8) Check and clean all wire harness connectors and ground parts related to DTC.

(9) Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Ground points are very important to normal work of circuit, and they are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures:

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic connector, and make it communicate with vehicle electronic module through data network.
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in EPB system.
- Turn the ENGINE START STOP switch to OFF and wait for several seconds.
- Turn the ENGINE START STOP switch to ON, select “Read DTC”.
- If DTC is not detected, malfunction indicated by DTC is intermittent.

4.7 Diagnostic Trouble Code (DTC) Chart

Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
C220A19	Left Actuator - Circuit High Current
C220A72	Left Actuator - Release Failed-Actuator Stuck Open
C220A73	Left Actuator - Apply Failed-Actuator Stuck Closed
C220A74	Left Actuator - Actuator Slipping (Apply Time Out)
C220A91	Left Actuator - Wrong Operating Characteristics Detect
C220A92	Left Actuator - High Mechanical Resistance
C220A93	Left Actuator - No Motor Start Detected-No Operation
C220A97	Left Actuator - Action Limited
C220B19	Right Actuator - Circuit High Current
C220B72	Right Actuator -Release Failed-Actuator Stuck Open
C220B73	Right Actuator - Apply Failed-Actuator Stuck Closed
C220B74	Right Actuator - Actuator Slipping (Apply Time Out)

DTC	DTC Definition
C220B91	Right Actuator - Wrong Operating Characteristics Detect
C220B92	Right Actuator - High Mechanical Resistance
C220B93	Right Actuator - No Motor Start Detected-No Operation
C220B97	Right Actuator - Action Limited
C220C16	Supply Voltage Too Low
C220C17	Supply Voltage Too High
C220C44	PBC (Parking Brake Control) EEPROM Fault
C220D95	EPB Assembly Test Incomplete
C220E53	EPB Maintenance Mode-Activated
C220F94	Hydraulic Brake Support Failure
C221001	EPB Button Line Failure - General Electrical Failure
C221004	EPB Button Always Pushed or Pulled
C221016	EPB Button Under Voltage
C221198	Disc Over Heat
C221211	Circuit Short To Ground of Left Rear Caliper
C221212	Circuit Short To Battery of Left Rear caliper
C221213	Circuit Open of Left Rear Caliper-Circuit Open
C221311	Circuit Short To Ground of Right Rear Caliper-Circuit Short To Ground
C221312	Circuit Short To Battery of Right Rear Caliper-Circuit Short To Battery
C221313	Circuit Open of Right Rear caliper-Circuit Open
C221400	EPB Right Actuator Failure
C221500	EPB Left Actuator Failure
C221600	APB Motor Enable Line Violation
C221701	EPB Left Actuator Electrical Failure-General Electrical Failure
C22171E	EPB Left Actuator Shunt On Line or ECU-Circuit Resistance Out of Range
C221801	EPB Right Actuator Electrical Failure-General Electrical Failure
C22181E	EPB Right Actuator Shunt On Line or ECU-Circuit Resistance Out of Range
C221901	EPB Actuator Driver Gen Electrical Failure - General Electrical Failure
C221A00	EPB Left Actuator CAT-No Sub Type Information

DTC	DTC Definition
C221B00	EPB Right Actuator CAT-No Sub Type Information
C221C00	EPB Left Actuator Unintended Run-No Sub Type Information
C221D00	EPB Right Actuator Unintended Run-No Sub Type Information
C221E44	SupervisionFail-Data Memory Failure
C222055	Configuration Variant Error
C224604	APB Power Supply Fault
C226B00	EPBASIC_GenericError-No Sub Type Information
C22AD08	Vacuum Sensor General Fault
U000500	CAN Bus Voltage High
U000700	CAN Bus Voltage Low
U007388	P CAN Bus Off
U007488	C CAN Bus Off
U010087	Lost Communication with EMS
U010187	Lost Communication with TCU
U011487	Lost Communication with AWD
U014287	Lost Communication with AVM
U015187	Lost Communication with ACM
U015587	Lost Communication with IPC
U021287	Lost Communication with SCM
U023587	Lost Communication with FRM
U040181	Invalid DLC, Alive Counter, CRC and Data Received from EMS
U040281	Invalid DLC, Alive Counter, CRC and Data Received from TCU
U041481	Invalid DLC, Alive Counter, CRC and Data Received from AWD
U042281	Invalid DLC, Alive Counter, CRC and Data Received from BCM
U042381	Invalid DLC, Alive Counter, CRC and Data Received from IPC
U042981	Invalid DLC, Alive Counter, CRC and Data Received from SCM
U043381	Invalid DLC, Alive Counter, CRC and Data Received from FRM
U044381	Invalid DLC, Alive Counter, CRC and Data Received from AVM
U045281	Invalid DLC, Alive Counter, CRC and Data Received from ACM

■ **DTC Diagnosis Procedure**

■ **System Power Supply Malfunction**

DTC	**C220C16**	**Supply Voltage Too Low**
DTC	**C220C17**	**Supply Voltage Too High**
DTC	**C224604**	**APB Power Supply Fault**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220C16	Supply Voltage Too Low	System power voltage is lower than 9V	• Battery failure • Wire harness or connector failure • Charging system failure • ESP control module failure
C220C17	Supply Voltage Too High	System power voltage is higher than 16V	
C224604	APB Power Supply Fault	• ADC values measured from two channels are unequal • RVP transistor gate can not be changed as required	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery voltage**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Using a digital multimeter, measure voltage between positive battery terminal and negative battery terminal, which is not less than 12 V.

NG → **Replace battery**

OK

2	**Check charging system**

(a) Start engine and use a digital multimeter to measure if system voltage is between 13.5 V and 14.8 V.

NG → **Repair or replace alternator or related wire harness**

OK

3	**Check EPB fuse**

(a) Turn ENGINE START STOP switch to ON.

(b) Check if fuses MF03 125A, MF04 175A in main fuse box B-038 and E-041 are blown.

(c) Check if fuses RF03 5A and RF17 10A in instrument panel fuse box B-140 and B-144, and fuses SB01 40A and SB02 40A in engine compartment fuse and relay box B-039 are blown.

NG → **Replace fuse**

OK

4	**Check EPB controller ground and power supply wire harness connector**

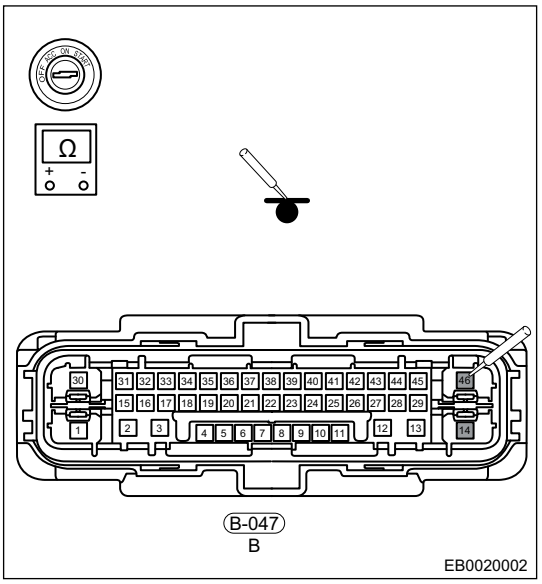
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect EPB module connector, and check if it is bent, deformed or loose.

(c) Using a multimeter, check for continuity between EPB controller B-047 (14, 46) and ground circuit.

Standard Resistance

Multimeter Connection	Condition	Specified Condition
B-047 (46) - Body ground	Always	⩽ 1 Ω
B-047 (14) - Body ground	Always	⩽ 1 Ω

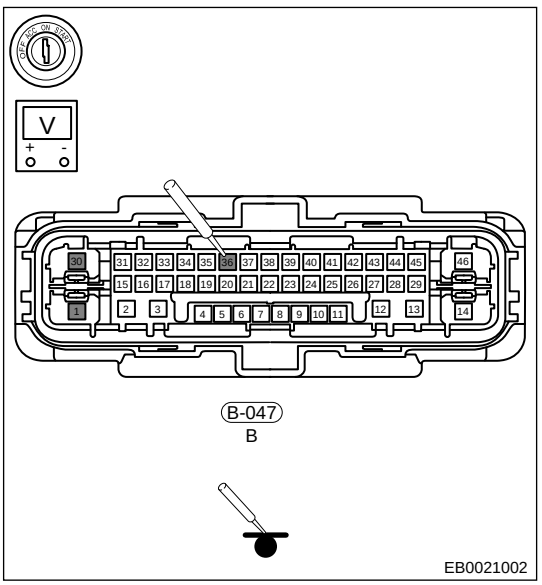


(d) Turn ENGINE START STOP switch to ON.

(e) Using a multimeter, measure voltage between terminals 1, 30 and 36 of EPB controller B-047 and body ground.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
B-047 (1) - Body ground	Always	Not less than 12 V
B-047 (30) - Body ground	Always	Not less than 12 V
B-047 (36) - Body ground	Always	Not less than 12 V



NG → **Replace or repair wire harness or connector**

OK

5	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm system operates normally
NG	Replace ESP control module assembly

■ **Assembly Failure**

DTC	C220D95	EPB Assembly Test Incomplete

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220D95	EPB Assembly Test Incomplete	EPB Assembly test is incomplete	• Assembly test is not performed or incomplete • ESP control module malfunction

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Perform assembly test

(a) Turn off power normally after performing assembly test using diagnostic tester.

2	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm system operates normally
NG	Replace ESP control module assembly

■ **System Activated Failure**

DTC	C220E53	EPB Maintenance Mode-Activated

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220E53	EPB Maintenance Mode-Activated	EPB maintenance mode does not exit	• Maintenance mode does not exit • ESP control module malfunction

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Perform assembly test**

(a) Turn off power normally after performing assembly test using diagnostic tester.

NG → **Replace electronic control execution unit**

OK

2	**Reconfirm DTCs**

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **System Malfunction**

DTC	**C221901**	**EPB Actuator Driver Gen Electrical Failure - General Electrical Failure**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221901	EPB Actuator Driver Gen Electrical Failure - General Electrical Failure	Unexpected monitoring in ASIC RCP mode is in continuously active state	• EPB motor hardware failure • ABS / ESC hardware failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the electronic control execution unit connector.
(d) Check if related wire harnesses are worn, pinched or broken.
(e) Check if related connector terminals are loose, broken, bent or corrosive.

NG → **Repair or replace related wire harness or connector**

OK

2	Perform electronic control execution unit active test

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Brake Disc Over Heat Failure**

DTC	C221198	Disc Over Heat

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221198	Disc Over Heat	• If BTM is turned off through software parameters or diagnostic software, it will set this failure • If temperature of at least one brake disc is higher than certain threshold, it will set this failure	• Mechanical stuck • ECU internal fault

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Perform electronic control execution unit active test

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

2	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Motor Drive Chip Failure**

DTC	C221600	APB Motor Enable Line Violation

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221600	APB Motor Enable Line Violation	This failure is caused by PBCSW failure	• EPB switch failure • Wire harness or connector failure • ESP module assembly failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Perform ignition cycle again

(a) Use diagnostic tester to clear DTCs.
(b) Read DTC in “ABS/ESP (Anti-lock Braking System/Electronic Stability Program)” again with diagnostic tester.
(c) Check if the same DTCs are still output.

OK → **Intermittent failure**

NG

2	Check EPB switch and control circuit

(a) Check EPB switch and control circuit.

NG → **Repair or replace switch or control circuit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK	**Conduct test and confirm system operates normally**
NG	**Replace ESP control module assembly**

■ **EPB Switch Fault**

DTC	**C221001**	**EPB Button Line Failure-General Electrical Failure**
DTC	**C221004**	**EPB Button Always Pushed or Pulled-System Internal Failure**
DTC	**C221016**	**APB Button Under Voltage**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221001	EPB Button Line Failure-General Electrical Failure	Electrical Line of EPB button connection failure	• EPB switch failure • Wire harness or connector failure • System power supply failure • ESP module assembly failure
C221004	EPB Button Always Pushed or Pulled-System Internal Failure	EPB button is pushed or pulled for long time	
C221016	APB Button Under Voltage	EPB button voltage is below specified value	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check battery voltage**

(a) Standard voltage: Not less than 12 V.

NG	**Repair or replace charging system or battery**

OK

2	**Check EPB switch**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

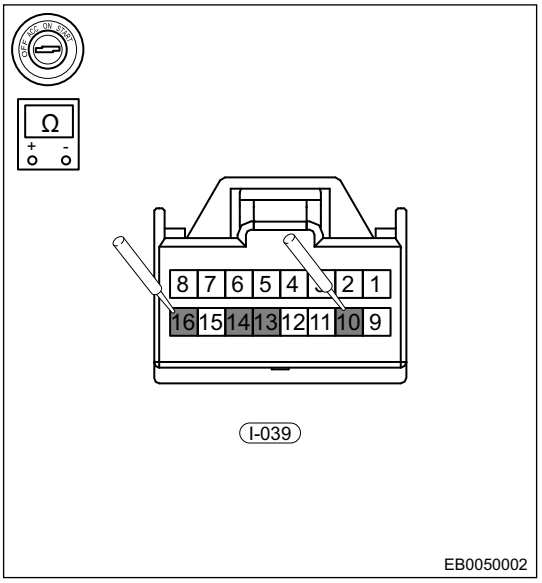
(c) Disconnect the EPB switch connector I-039.

(d) Check if EPB switch is stuck or pushed in by other objects.

(e) When EPB switch is not pressed, using a digital multimeter, check if continuity between EPB switch I-039 (10), (16), (13) and (14) is normal according to the table below.

Standard Resistance

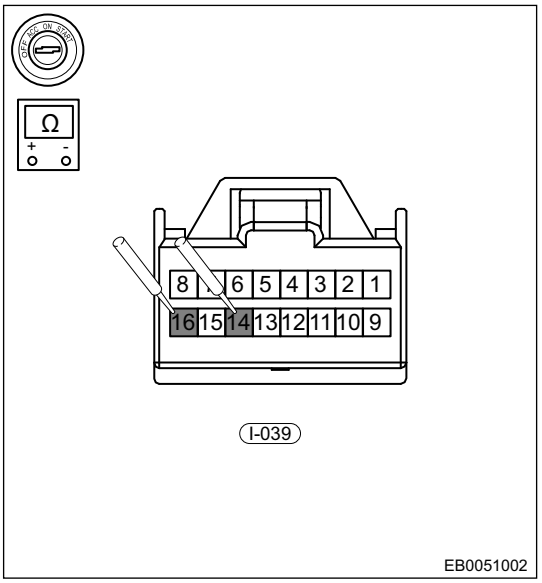
Multimeter Connection	Detection Condition	Specified Condition
I-039 (10) - I-039 (16)	Always	⩽ 1 Ω
I-039 (13) - I-039 (14)	Always	⩽ 1 Ω



(f) When EPB switch is pressed, using a digital multimeter, check if continuity between EPB switch I-039 (14) and (16) is normal according to the table below.

Standard Resistance

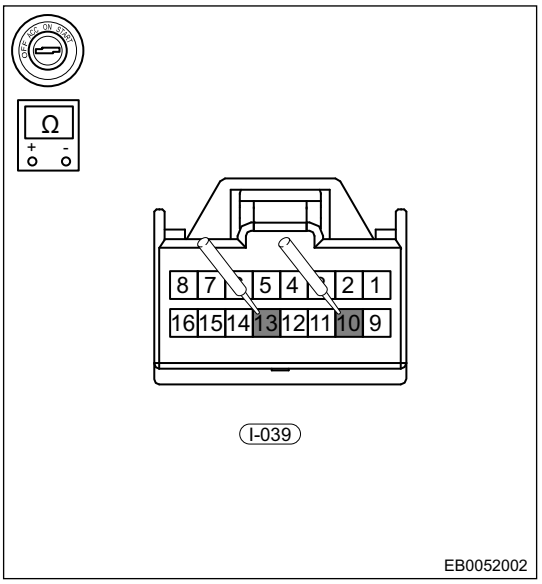
Multimeter Connection	Detection Condition	Specified Condition
I-039 (14) - I-039 (16)	Always	⩽ 1 Ω



(g) When EPB switch is pulled, using a digital multimeter, check if continuity between EPB switch I-039 (10) and (13) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
I-39 (10) - I-039 (13)	Always	⩽ 1 Ω



NG → **Replace EPB switch**

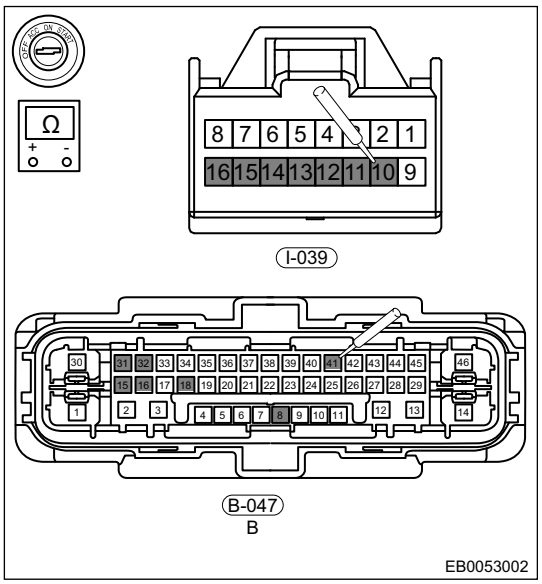
OK ↓

3	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the EPB switch connector I-039.
(d) Disconnect the ESP control module assembly B-047.
(e) Check if related wire harnesses are worn, pinched or broken.
(f) Check if related connector terminals are loose, broken, bent or corrosive.
(g) Using a digital multimeter, measure ESP control module assembly connector B-047 (8, 15, 16, 18, 31, 32 and 41) and EPB switch connector I-039 (10, 11, 12, 13, 14, 15 and 16) according to table below.

Standard Resistance

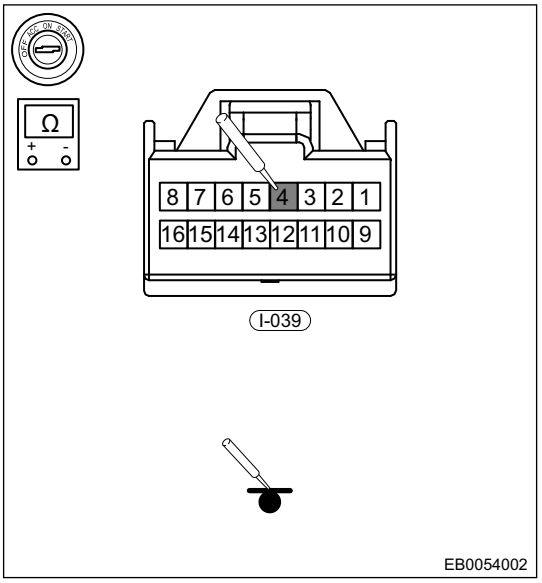
Multimeter Connection	Detection Condition	Specified Condition
B-047 (32) - I-039 (13)	Always	⩽ 1 Ω
B-047 (15) - I-039 (14)	Always	⩽ 1 Ω
B-047 (16) - I-039 (10)	Always	⩽ 1 Ω
B-047 (31) - I-039 (16)	Always	⩽ 1 Ω
B-047 (18) - I-039 (15)	Always	⩽ 1 Ω
B-047 (8) - I-039 (11)	Always	⩽ 1 Ω
B-047 (41) - I-039 (12)	Always	⩽ 1 Ω



(h) Using a digital multimeter, check if continuity between EPB switch connector I-039 (4) and body ground is normal according to the table below.

Standard Resistance

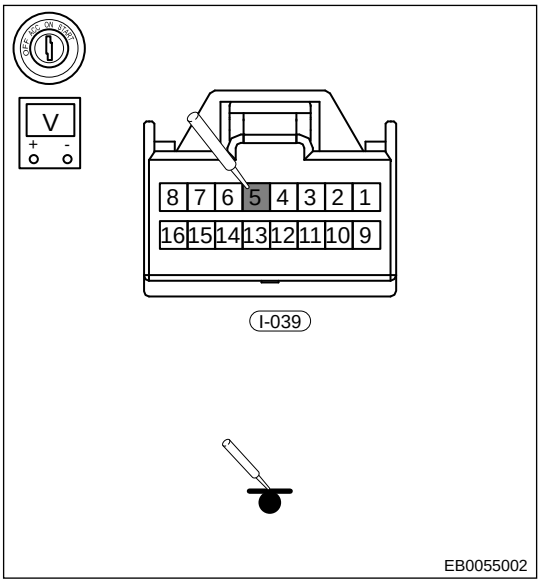
Multimeter Connection	Detection Condition	Specified Condition
I-039 (4) - Body ground	Always	⩽ 1 Ω



(i) Using a digital multimeter, check if voltage between EPB switch connector I-039 (5) and body ground is normal according to the table below.

Standard Voltage

Multimeter Connection	Detection Condition	Specified Condition
I-039 (5) - Body ground	Ignition switch ON	Not less than 12 V



NG → **Repair/replace related wire harness or connector**

OK

4	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **ECU Motor Drive Failure**

DTC	**C221B00**	**EPB Right Actuator CAT-No Sub Type Information**
DTC	**C221A00**	**EPB Left Actuator CAT-No Sub Type Information**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221B00	EPB Right Actuator CAT-No Sub Type Information	During circulation motor coupling test (CMCT), H bridge of EPB right motor failure occurs	• EPB motor failure • Wire harness or connector failure • ABS / ESC hardware failure
C221A00	EPB Left Actuator CAT-No Sub Type Information	During circulation motor coupling test (CMCT), H bridge of EPB left motor failure occurs	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

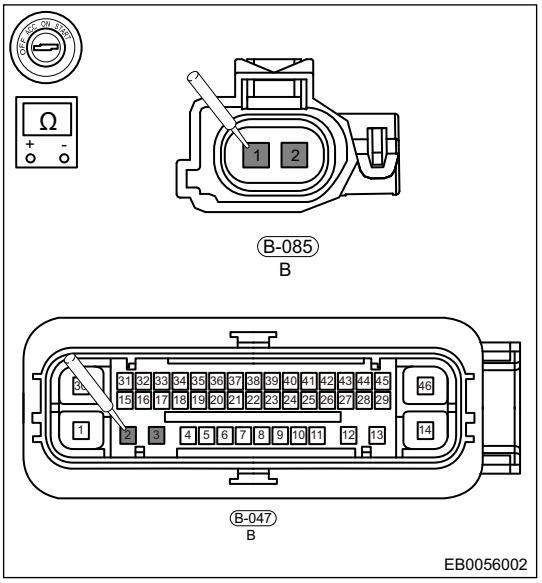
(e) Check if related wire harnesses are worn, pinched or broken.

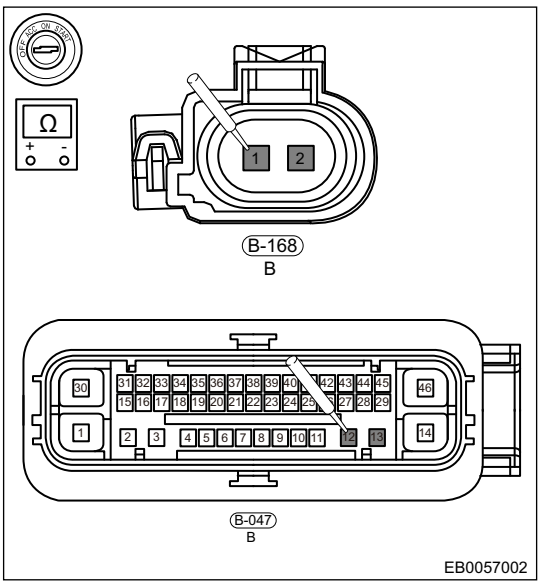
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω

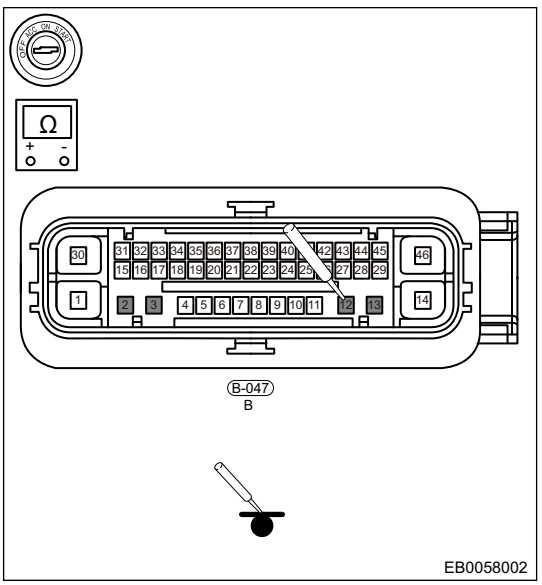




(h) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and body ground is normal according to table below.

Standard Resistance

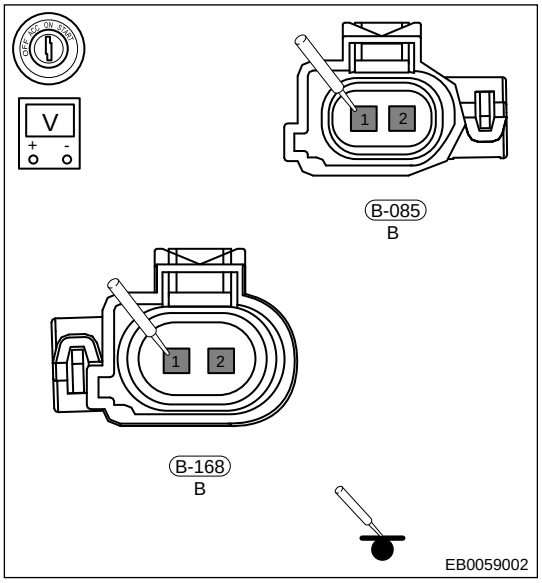
Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - Body ground	Always	∞
B-047 (3) - Body ground	Always	∞
B-047 (12) - Body ground	Always	∞
B-047 (13) - Body ground	Always	∞



(i) Connect the negative battery cable.
(j) Turn ENGINE START STOP switch to ON.
(k) Using a digital multimeter, check if voltage between electronic control execution unit connectors B-085 (1, 2), B-168 (1, 2) and body ground is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-085 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-085 (2) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (2) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair/replace related wire harness or connector**

OK

2	Perform electronic control execution unit active test

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Actuator - Action Limited Failure**

DTC	C220A97	Left Actuator - Action Limited
DTC	C220B97	Right Actuator - Action Limited

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A97	Left Actuator - Action Limited	EPB software detects that left motor current and voltage signal are abnormal	• Actuator failure • Wire harness or connector failure • Manual parking release via switch operation frequency is too high • ESP module assembly failure
C220B97	Right Actuator - Action Limited	EPB software detects that right motor current and voltage signal are abnormal	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

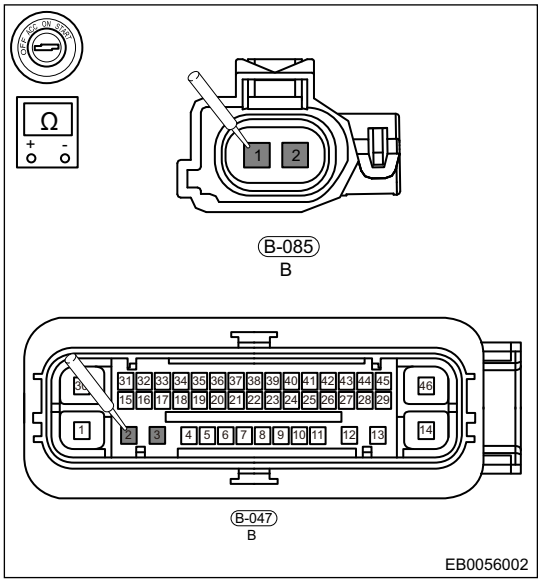
(e) Check if related wire harnesses are worn, pinched or broken.

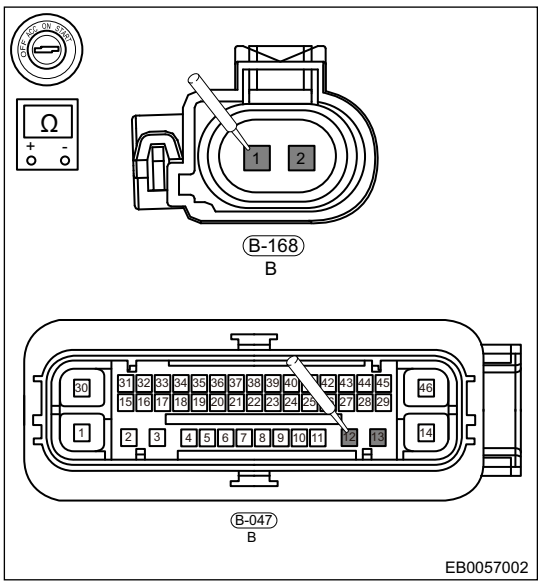
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω

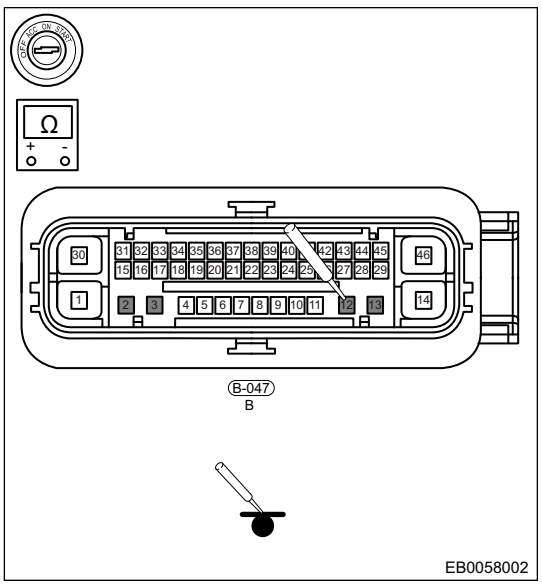




(h) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and body ground is normal according to table below.

Standard Resistance

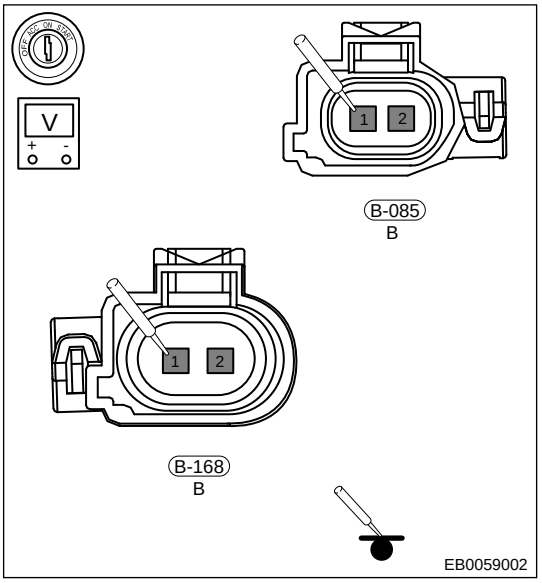
Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - Body ground	Always	∞
B-047 (3) - Body ground	Always	∞
B-047 (12) - Body ground	Always	∞
B-047 (13) - Body ground	Always	∞



(i) Connect the negative battery cable.
(j) Turn ENGINE START STOP switch to ON.
(k) Using a digital multimeter, check if voltage between electronic control execution unit connectors B-085 (1, 2), B-168 (1, 2) and body ground is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-085 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-085 (2) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (2) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair/replace related wire harness or connector**

OK

2	Perform electronic control execution unit active test

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Actuator Unintended Run Failure**

DTC	C221D00	EPB Right Actuator Unintended Run-No Sub Type Information
DTC	C221C00	EPB Left Actuator Unintended Run-No Sub Type Information

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221D00	EPB Right Actuator Unintended Run-No Sub Type Information	EPB right actuator rotates unexpectedly	• Wire harness or connector failure • EPB motor hardware failure • ABS / ESC hardware failure
C221C00	EPB Left Actuator Unintended Run-No Sub Type Information	EPB left actuator rotates unexpectedly	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

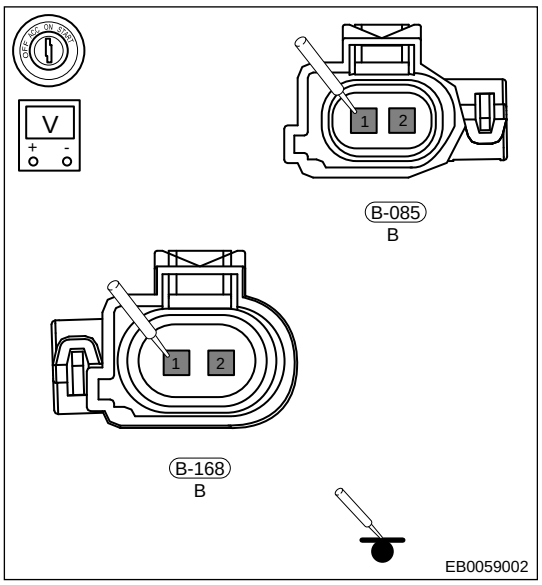
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect electronic control execution unit connectors B-168, B-085.
(d) Disconnect the ESP control module assembly B-047.
(e) Check if related wire harnesses are worn, pinched or broken.
(f) Check if related connector terminals are loose, broken, bent or corrosive.
(g) Connect the negative battery cable.
(h) Turn ENGINE START STOP switch to ON.
(i) Using a digital multimeter, check if voltage between electronic control execution unit connectors B-085 (1, 2), B-168 (1, 2) and body ground is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-085 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-085 (2) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (2) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair/replace related wire harness or connector**

OK

2	Perform electronic control execution unit active test

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Actuator - Apply Failure**

DTC	**C220A73**	**Left Actuator - Apply Failed-Actuator Stuck Closed**
DTC	**C220A74**	**Left Actuator - Actuator Slipping (Apply Time Out)**
DTC	**C220B74**	**Right Actuator - Actuator Slipping (Apply Time Out)**
DTC	**C220B73**	**Right Actuator - Apply Failed-Actuator Stuck Closed**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A73	Left Actuator - Apply Failed-Actuator Stuck Closed	EPB software detects that motor is clamping for a certain time, but cannot reach target parking force	• Wire harness or connector failure • Actuator failure • ESP control module malfunction
C220A74	Left Actuator - Actuator Slipping (Apply Time Out)	Left actuator can not return to target position	
C220B74	Right Actuator - Actuator Slipping (Apply Time Out)	Right actuator can not return to target position	
C220B73	Right Actuator - Apply Failed-Actuator Stuck Closed	EPB software detects that motor is clamping for a certain time, but cannot reach target parking force	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery voltage

(a) Standard voltage: Not less than 12 V.

NG → **Repair or replace charging system or battery**

OK

2	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

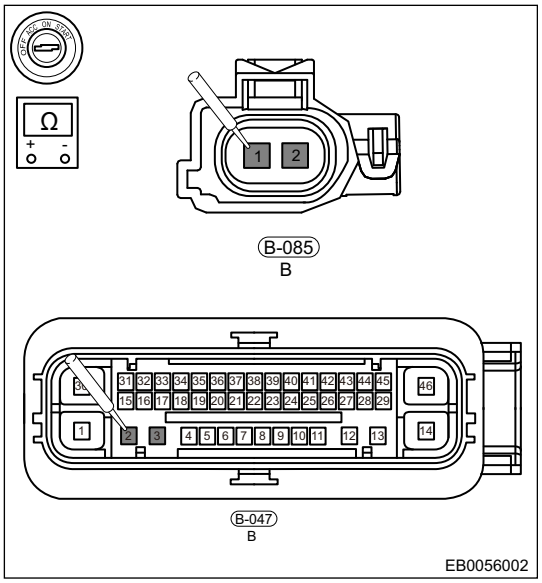
(e) Check if related wire harnesses are worn, pinched or broken.

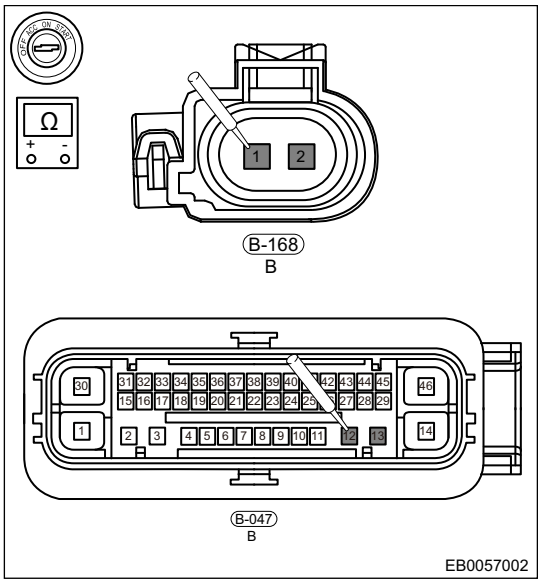
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω





NG → **Repair/replace related wire harness or connector**

OK

3	Check electronic control execution unit

(a) Using a digital multimeter, check if resistance between electronic control execution unit (1) and (2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
Electronic control execution unit (1) - Electronic control execution unit (2)	Always	1.1 Ω-1.6 Ω

NG → **Replace electronic control execution unit**

OK

4	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.

(b) Use diagnostic tester to clear DTCs.

(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Actuator - Release Failed**

DTC	C220A72	Left Actuator - Release Failed-Actuator Stuck Open
DTC	C220B72	Right Actuator -Release Failed-Actuator Stuck Open

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A72	Left Actuator - Release Failed-Actuator Stuck Open	EPB software detects that left motor is performing releasing for a certain time, but cannot return to target position	• Wire harness or connector failure • Actuator failure • ESP control module malfunction
C220B72	Right Actuator -Release Failed-Actuator Stuck Open	EPB software detects that right motor is performing releasing for a certain time, but cannot return to target position	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

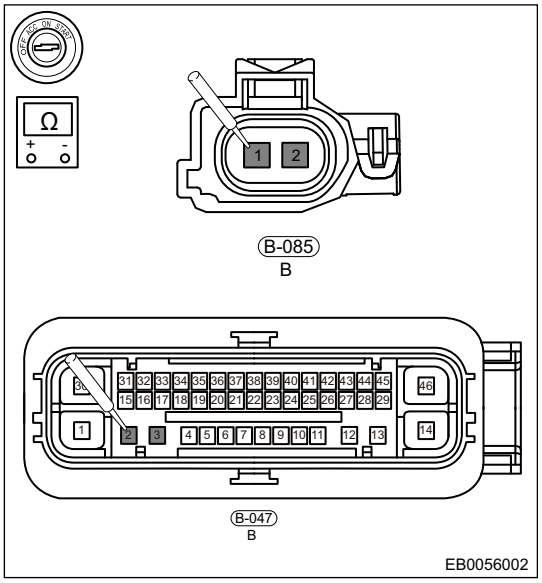
(e) Check if related wire harnesses are worn, pinched or broken.

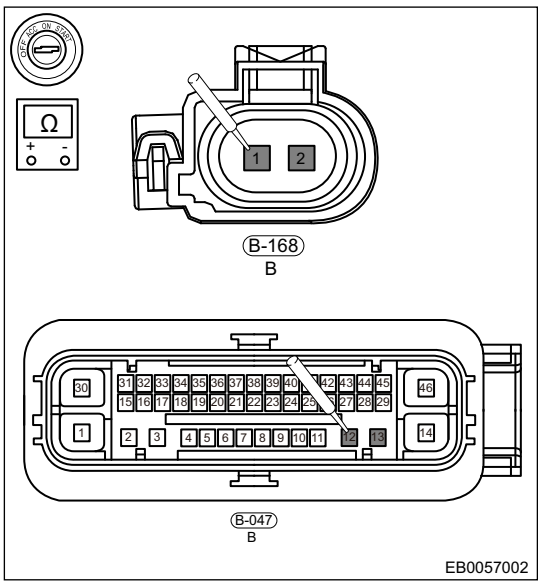
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω





NG → **Repair/replace related wire harness or connector**

OK

2	Check electronic control execution unit

(a) Using a digital multimeter, check if resistance between electronic control execution unit (1) and (2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
Electronic control execution unit (1) - Electronic control execution unit (2)	Always	1.1 Ω-1.6 Ω

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm system operates normally
NG	Replace ESP control module assembly

■ **Actuator - No Motor Start Detected-No Operation**

DTC	C220A93	Left Actuator - No Motor Start Detected-No Operation
DTC	C220B93	Right Actuator - No Motor Start Detected-No Operation

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A93	Left Actuator - No Motor Start Detected-No Operation	When ESP related functions are detected, left actuator operation will be limited	• Wire harness or connector failure • Actuator failure • ESP control module malfunction
C220B93	Right Actuator - No Motor Start Detected-No Operation	When ESP related functions are detected, right actuator operation will be limited	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

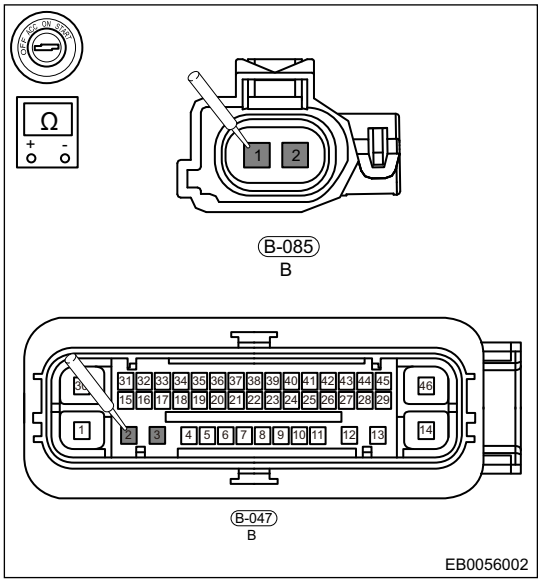
(e) Check if related wire harnesses are worn, pinched or broken.

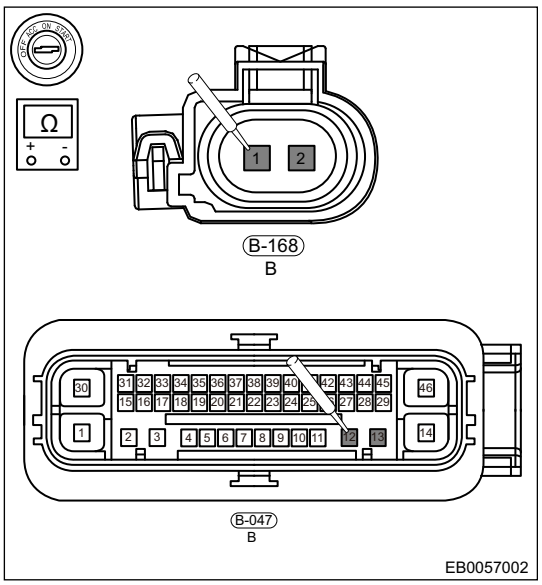
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω





NG → **Repair/replace related wire harness or connector**

OK

2	Check electronic control execution unit

(a) Using a digital multimeter, check if resistance between electronic control execution unit (1) and (2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
Electronic control execution unit (1) - Electronic control execution unit (2)	Always	1.1 Ω-1.6 Ω

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm system operates normally
NG	Replace ESP control module assembly

■ **Actuator - Circuit Current Above Threshold**

DTC	C220A19	Left Actuator - Circuit Current Above Threshold
DTC	C220B19	Right Actuator - Circuit Current Above Threshold

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A19	Left Actuator - Circuit Current Above Threshold	Left actuator current is more than 300 ms when starting	• Wire harness or connector failure • Actuator failure • ESP control module malfunction
C220B19	Right Actuator - Circuit Current Above Threshold	Right actuator current is more than 300 ms when starting	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

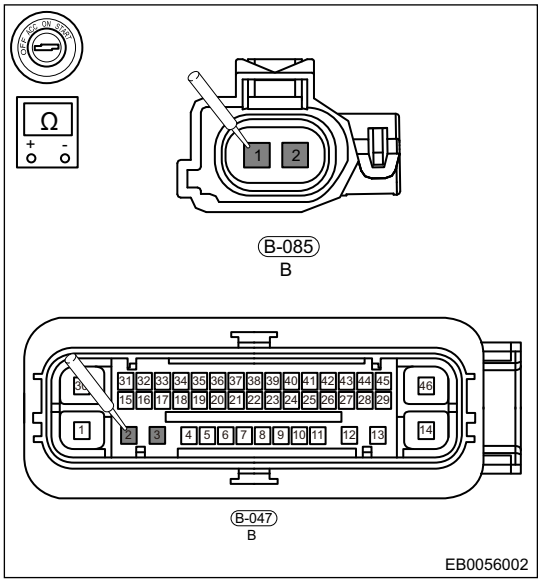
(e) Check if related wire harnesses are worn, pinched or broken.

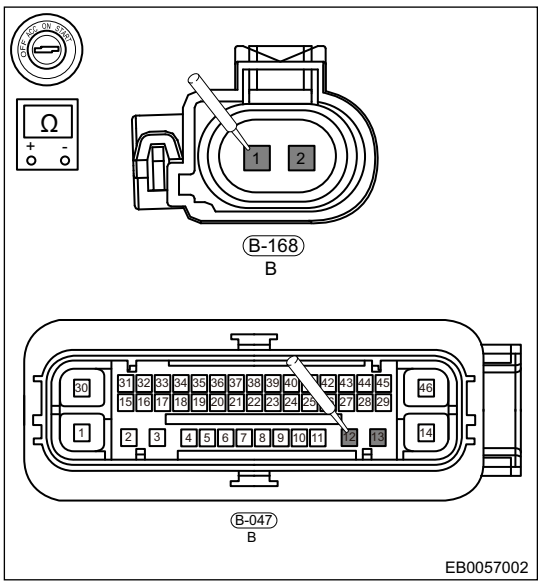
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω

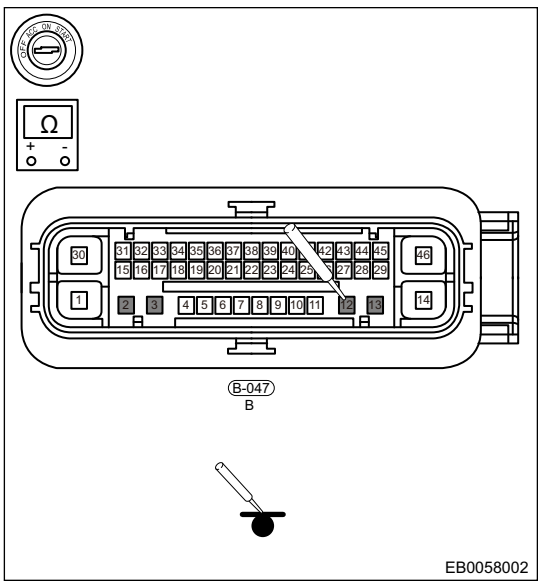




(h) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and body ground is normal according to table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - Body ground	Always	∞
B-047 (3) - Body ground	Always	∞
B-047 (13) - Body ground	Always	∞
B-047 (12) - Body ground	Always	∞



NG → **Repair/replace related wire harness or connector**

OK

2	Check electronic control execution unit

(a) Using a digital multimeter, check if resistance between electronic control execution unit (1) and (2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
Electronic control execution unit (1) - Electronic control execution unit (2)	Always	1.1 Ω-1.6 Ω

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.

(b) Use diagnostic tester to clear DTCs.

(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Actuator - Circuit Current Above Threshold**

DTC	C220A92	Left Actuator - High Mechanical Resistance
DTC	C220B92	Right Actuator - High Mechanical Resistance

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A92	Left Actuator - High Mechanical Resistance	Left actuator internal mechanical resistance exceeds the threshold	• Actuator failure • ESP control module malfunction
C220B92	Right Actuator - High Mechanical Resistance	Right actuator internal mechanical resistance exceeds the threshold	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Perform electronic control execution unit active test

(a) Perform rear left/right brake caliper active tester.

NG → Replace electronic control execution unit

OK

2	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → Conduct test and confirm system operates normally

NG → Replace ESP control module assembly

■ **Actuator - Wrong Operating Characteristics**

DTC	C220A91	Left Actuator - Wrong Operating Characteristics Detect
DTC	C220B91	Right Actuator - Wrong Operating Characteristics Detect

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220A91	Left Actuator - Wrong Operating Characteristics Detect	Left actuator can not return to target static force	• Wire harness or connector failure • Actuator failure • ESP control module malfunction
C220B91	Right Actuator - Wrong Operating Characteristics Detect	Right actuator can not reach target static force	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

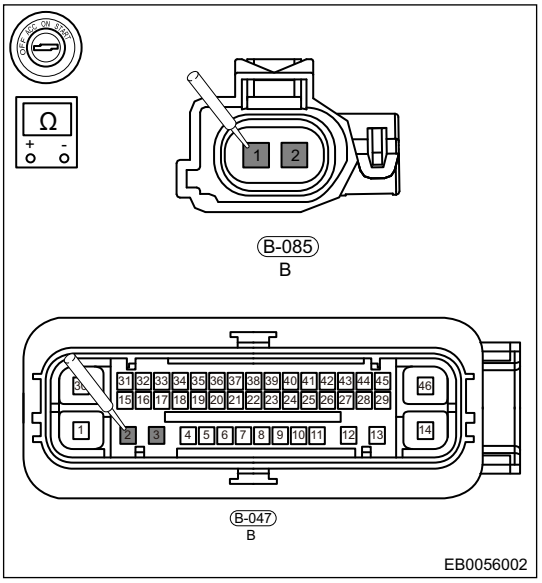
(e) Check if related wire harnesses are worn, pinched or broken.

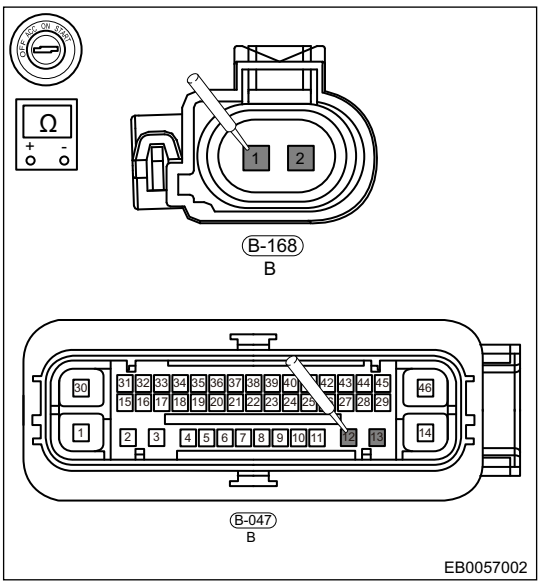
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω





NG → **Repair/replace related wire harness or connector**

OK

2	Check electronic control execution unit

(a) Using a digital multimeter, check if resistance between electronic control execution unit (1) and (2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
Electronic control execution unit (1) - Electronic control execution unit (2)	Always	1.1 Ω-1.6 Ω

NG → **Replace electronic control execution unit**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Actuator Failure**

DTC	C221400	EPB Right Actuator Failure
DTC	C221801	EPB Right Actuator Electrical Failure-General Electrical Failure
DTC	C22181E	EPB Right Actuator Shunt On Line or ECU-Circuit Resistance Out of Range
DTC	C221500	EPB Left Actuator Failure
DTC	C221701	EPB Left Actuator Electrical Failure-General Electrical Failure
DTC	C22171E	EPB Left Actuator Shunt On Line or ECU-Circuit Resistance Out of Range

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221400	EPB Right Actuator Failure	During each locking or releasing cycle, perform mechanical clamping for MGU or EPB main shaft	• Wire harness or connector failure • EPB motor hardware failure • ABS / ESC hardware failure
C221801	EPB Right Actuator Electrical Failure-General Electrical Failure	• EPB right motor short circuit is detected • Drain electrode of one or more transistors monitors that voltage exceeds the threshold	
C22181E	EPB Right Actuator Shunt On Line or ECU-Circuit Resistance Out of Range	When EPB is locked or released, current measurement monitor is in active state	
C221500	EPB Left Actuator Failure	During each locking or releasing cycle, perform mechanical clamping for MGU or EPB main shaft	
C221701	EPB Left Actuator Electrical Failure-General Electrical Failure	• EPB left motor short circuit is detected • Drain electrode of one or more transistors monitors that voltage exceeds the threshold	

DTC	DTC Definition	Detection Condition	Possible Cause
C22171E	EPB Left Actuator Shunt On Line or ECU-Circuit Resistance Out of Range	When EPB is locked or released, current measurement monitor is in active state	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Perform electronic control execution unit active test**

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

2	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

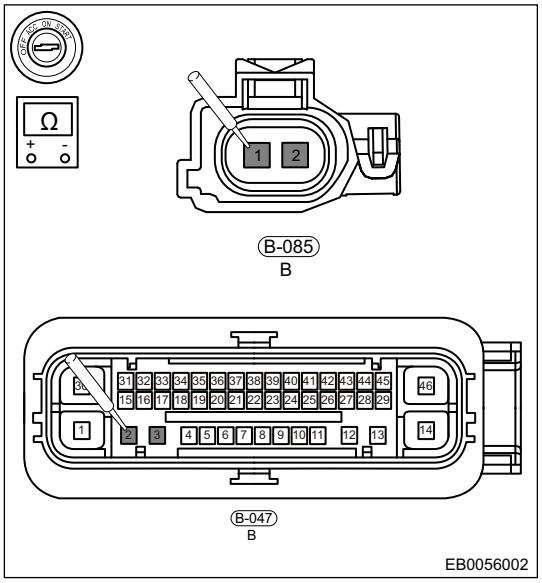
(e) Check if related wire harnesses are worn, pinched or broken.

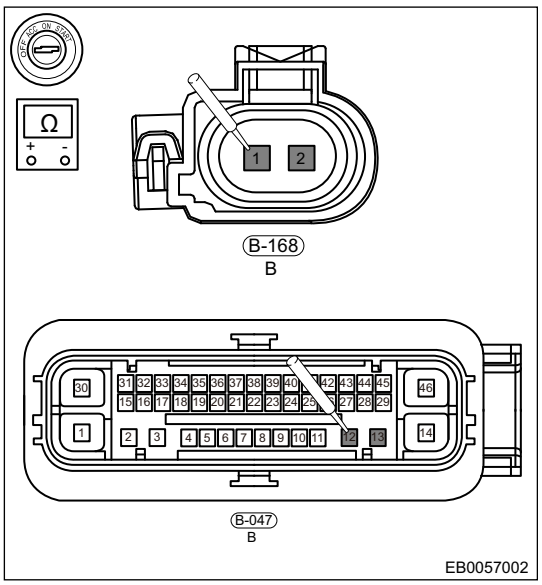
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω

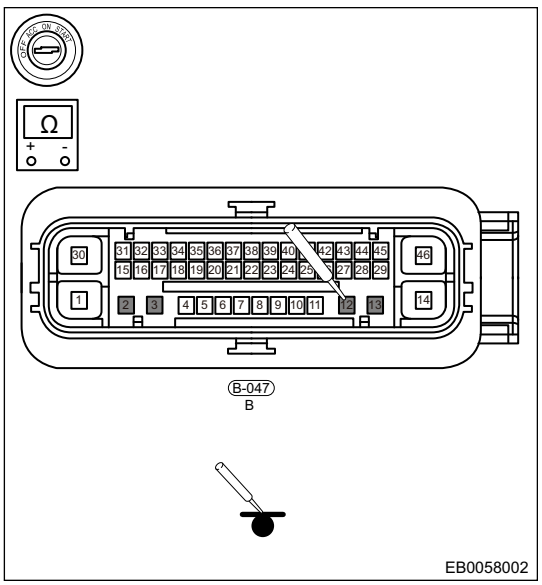




(h) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and body ground is normal according to table below.

Standard Resistance

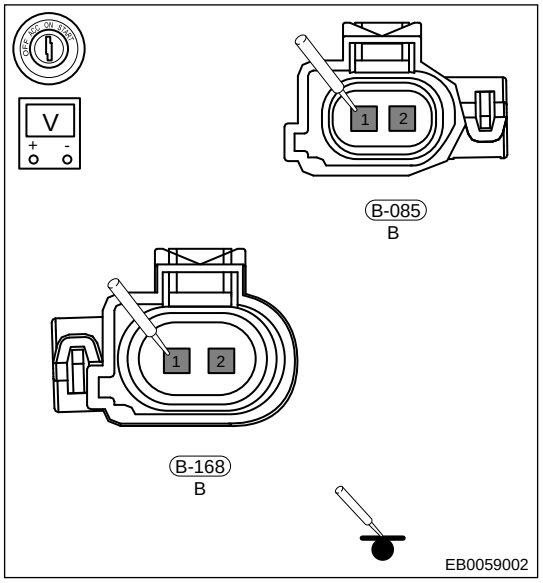
Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - Body ground	Always	∞
B-047 (3) - Body ground	Always	∞
B-047 (13) - Body ground	Always	∞
B-047 (12) - Body ground	Always	∞



(i) Connect the negative battery cable.
(j) Turn ENGINE START STOP switch to ON.
(k) Using a digital multimeter, check if voltage between electronic control execution unit connectors B-085 (1, 2), B-168 (1, 2) and body ground is normal according to the table below.

Standard Voltage

Multimeter Connection	Detection Condition	Specified Condition
B-085 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-085 (2) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (2) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair/replace related wire harness or connector**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Electrical Caliper - Circuit Failure**

DTC	**C221211**	**Circuit Short To Ground of Left Rear Caliper**
DTC	**C221212**	**Circuit Short To Battery of Left Rear caliper**
DTC	**C221213**	**Circuit Open of Left Rear Caliper-Circuit Open**
DTC	**C221311**	**Circuit Short To Ground of Right Rear Caliper-Circuit Short To Ground**
DTC	**C221312**	**Circuit Short To Battery of Right Rear Caliper-Circuit Short To Battery**
DTC	**C221313**	**Circuit Open of Right Rear caliper-Circuit Open**

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221211	Circuit Short To Ground of Left Rear Caliper	Left EPB motor circuit short to ground	• Wire harness or connector failure • ESP module assembly failure
C221212	Circuit Short To Battery of Left Rear caliper	Left EPB motor circuit short to power supply	

DTC	DTC Definition	Detection Condition	Possible Cause
C221213	Circuit Open of Left Rear Caliper - Circuit Open	Left EPB motor circuit open	
C221311	Circuit Short To Ground of Right Rear Caliper-Circuit Short To Ground	Right EPB motor circuit short to ground	
C221312	Circuit Short To Battery of Right Rear Caliper-Circuit Short To Battery	Right EPB motor circuit short to power supply	
C221313	Circuit Open of Right Rear caliper-Circuit Open	Right EPB motor circuit open	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Perform electronic control execution unit active test**

(a) Perform rear left/right brake caliper active tester.

NG → **Replace electronic control execution unit**

OK

2	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect electronic control execution unit connectors B-168, B-085.

(d) Disconnect the ESP control module assembly B-047.

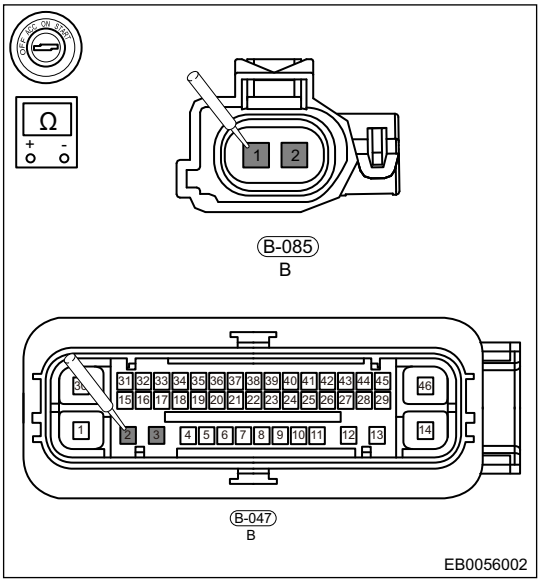
(e) Check if related wire harnesses are worn, pinched or broken.

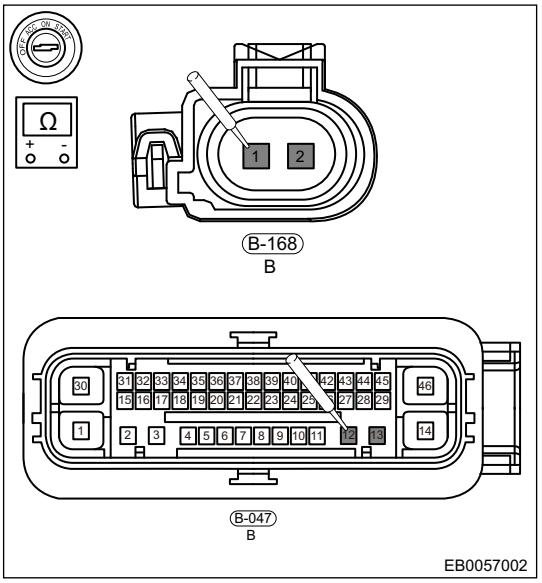
(f) Check if related connector terminals are loose, broken, bent or corrosive.

(g) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and electronic control execution unit connectors B-085 (1, 2), B-085 (1, 2) is normal according to the table below.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - B-085 (1)	Always	⩽ 1 Ω
B-047 (3) - B-085 (2)	Always	⩽ 1 Ω
B-047 (13) - B-168 (1)	Always	⩽ 1 Ω
B-047 (12) - B-168 (2)	Always	⩽ 1 Ω

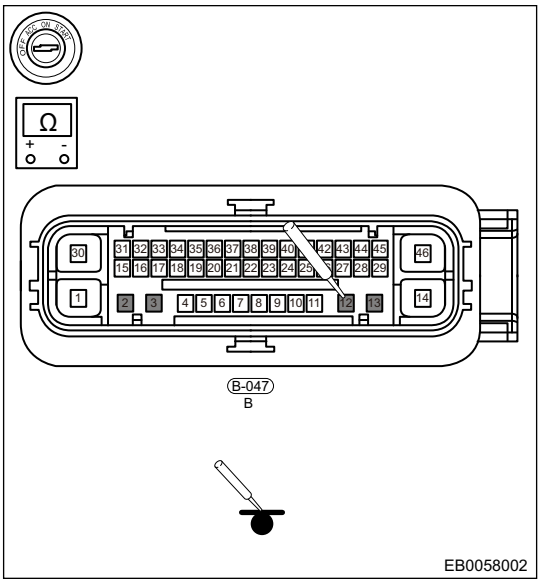




(h) Using a digital multimeter, check if continuity between ESP control module assembly connector B-047 (2, 3, 12, 13) and body ground is normal according to table below.

Standard Resistance

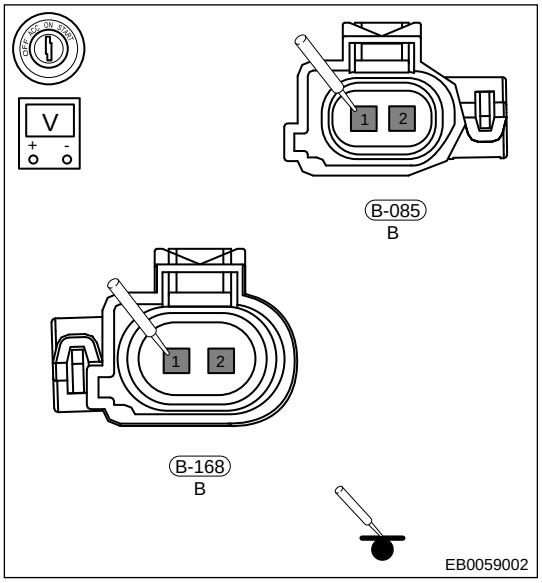
Multimeter Connection	Detection Condition	Specified Condition
B-047 (2) - Body ground	Always	∞
B-047 (3) - Body ground	Always	∞
B-047 (13) - Body ground	Always	∞
B-047 (12) - Body ground	Always	∞



(i) Connect the negative battery cable.
(j) Turn ENGINE START STOP switch to ON.
(k) Using a digital multimeter, check if voltage between electronic control execution unit connectors B-085 (1, 2), B-168 (1, 2) and body ground is normal according to the table below.

Standard Voltage

Multimeter Connection	Detection Condition	Specified Condition
B-085 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-085 (2) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (1) - Body ground	ENGINE START STOP switch ON	0 V
B-168 (2) - Body ground	ENGINE START STOP switch ON	0 V



NG → **Repair/replace related wire harness or connector**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **EEPROM Failed**

DTC	C220C44	PBC (Parking Brake Control) EEPROM Fault

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220C44	PBC (Parking Brake Control) EEPROM Fault	Invalid eeprom data or eeprom checksum error	• Intermittent failure • ESP module assembly failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Clear DTC and reset ECU

(a) Clear DTC, conduct test and confirm if it is intermittent failure.

OK → **Perform intermittent failure repair**

NG

2	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Hydraulic Brake Support Failure**

DTC	C220F94	Hydraulic Brake Support Failure

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C220F94	Hydraulic Brake Support Failure	ESP hydraulic cannot be reached within the scheduled time	• Intermittent failure • ESP module assembly failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Clear DTC and reset ECU

(a) Clear DTC, conduct test and confirm if it is intermittent failure.

OK → **Perform intermittent failure repair**

NG

2	Check ESP hydraulic actuator

NG → **Replace ESP control module assembly**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK	**Conduct test and confirm system operates normally**
NG	**Replace ESP control module assembly**

■ **Software Execution Error**

DTC	C221E44	SupervisionFail-Data Memory Failure

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C221E44	SupervisionFail-Data Memory Failure	• PBC accesses prohibited zone • Check writing result when EEPROM writing process is completed. After writing, invalid unit will cause read back error	• Intermittent failure • ESP module software failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Clear DTC and reset ECU**

(a) Clear DTC, conduct test and confirm if it is intermittent failure.

OK	**Perform intermittent failure repair**

NG

2	**Check for module software failure**

NG	**Replace ESP control module assembly**

OK

3	**Reconfirm DTCs**

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK	**Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **Software Execution Error**

DTC	C222055	Configuration Variant Error

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C222055	Configuration Variant Error	• NVM has no response • EEPROM reading failure • There is no valid configuration • VAR parameter is out of range • Incompatible configuration is not shown in the configuration table	• No configuration or configuration error • ESP module software failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Clear DTC and reset ECU

(a) Clear DTC, conduct test and confirm if it is intermittent failure.

OK → **Perform intermittent failure repair**

NG

2	Check if module configuration is normal

NG → **Perform module configuration again**

OK

3	Reconfirm DTCs

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester to clear DTCs.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm system operates normally**

NG → **Replace ESP control module assembly**

■ **ASIC Control Chip Failure**

DTC	C226B00	EPBASIC_GenericError-No Sub Type Information

Description

DTC	DTC Definition	Detection Condition	Possible Cause
C226B00	EPBASIC_GenericError-No Sub Type Information	• CRC failure is detected in OTP data • During cycle operation, CRC failure (used to disposal data) is not set • Asic detects watchdog failure • If overcurrent is detected in GPIO, the ACT_OFF_LS_A overcurrent of GPIO PIN in ASIC system will be set in the memory	Module hardware failure

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Clear DTC and reset ECU

(a) Clear DTC, conduct test and confirm if it is intermittent failure.

OK → **Perform intermittent failure repair**

NG

2	Check if module is normal.

NG → **Replace ESP control module assembly**

OK → **Conduct test and confirm system operates normally**

■ **Lost Communication Failure**

DTC	U010087	Lost Communication with EMS
DTC	U010187	Lost Communication with TCU
DTC	U011487	Lost Communication with AWD
DTC	U014287	Lost Communication with AVM
DTC	U015187	Lost Communication with ACM
DTC	U015587	Lost Communication with IPC

DTC	U021287	Lost Communication with SCM
DTC	U023587	Lost Communication with FRM
DTC	U040181	Invalid DLC, Alive Counter, CRC and Data Received from EMS
DTC	U040281	Invalid DLC, Alive Counter, CRC and Data Received from TCU
DTC	U041481	Invalid DLC, Alive Counter, CRC and Data Received from AWD
DTC	U042281	Invalid DLC, Alive Counter, CRC and Data Received from BCM
DTC	U042381	Invalid DLC, Alive Counter, CRC and Data Received from IPC
DTC	U042981	Invalid DLC, Alive Counter, CRC and Data Received from SCM
DTC	U043381	Invalid DLC, Alive Counter, CRC and Data Received from FRM
DTC	U043381	Invalid DLC, Alive Counter, CRC and Data Received from AVM
DTC	U045281	Invalid DLC, Alive Counter, CRC and Data Received from ACM

For communication failure, refer to CAN communication system.

■ **Controller BUS OFF Failure**

DTC	U000500	CAN Bus Voltage High
DTC	U000700	CAN Bus Voltage Low
DTC	U007388	P CAN Bus Off
DTC	U007488	C CAN Bus Off

Description

DTC	DTC Definition	DTC Detection Condition	Possible Cause
U000500	CAN Bus Voltage High	ENGINE START STOP switch ON	• Wire harness or connector failure • EPB control module fault
U000700	CAN Bus Voltage Low		
U007388	P CAN Bus Off		
U007488	C CAN Bus Off		

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check EPB control module wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.
(b) Connect the negative battery cable.
(c) Disconnect the EPB control module connector B-047.
(d) Check if EPB control module wire harness is damaged, pierced, pinched or broken.
(e) Check EPB module connector for bending, broken terminals.
(f) Check EPB module pin for bending, breakage, corrosion.

NG → **Repair or replace related wire harness and connector**

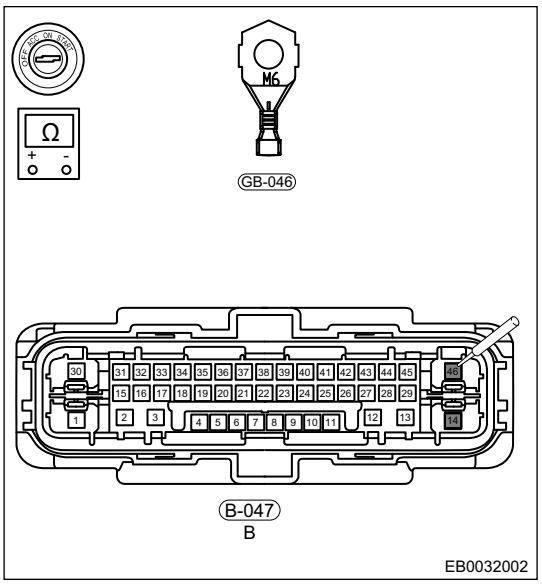
OK

2	Check EPB control module ground circuit

(a) Turn ENGINE START STOP switch to OFF.

(b) Using a multimeter, check for continuity between EPB control module B-047(46) and ground GB-046, B-047 (14) and ground GB-046.

Multimeter Connection	Condition	Specified Condition
B-047 (46) - GB-046	Always	⩽ 1 Ω
B-047 (14) - GB-046	Always	⩽ 1 Ω



NG → **Repair or replace wire harness or connector**

OK

3	Check power supply circuit of EPB control module

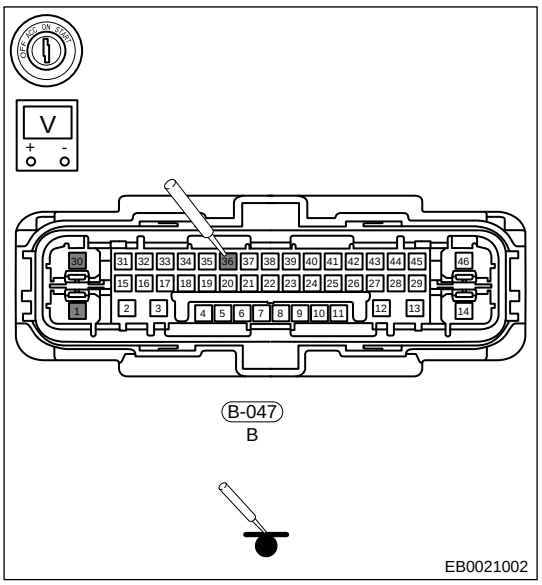
(a) Turn ENGINE START STOP switch to ON.

(b) Using a multimeter, measure power supply voltage of EPB control module.

(c) Check for 12 V voltage in EPB control module connectors B-047 (1), (30), (36) separately.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
B-047 (1) - Body ground	ENGINE START STOP switch ON	Not less than 12 V
B-047 (30) - Body ground	ENGINE START STOP switch ON	Not less than 12 V
B-047 (36) - Body ground	ENGINE START STOP switch ON	Not less than 12 V



NG → **Repair or replace related wire harness and connector**

OK

4	Check CAN network

(a) Turn ENGINE START STOP switch to OFF.

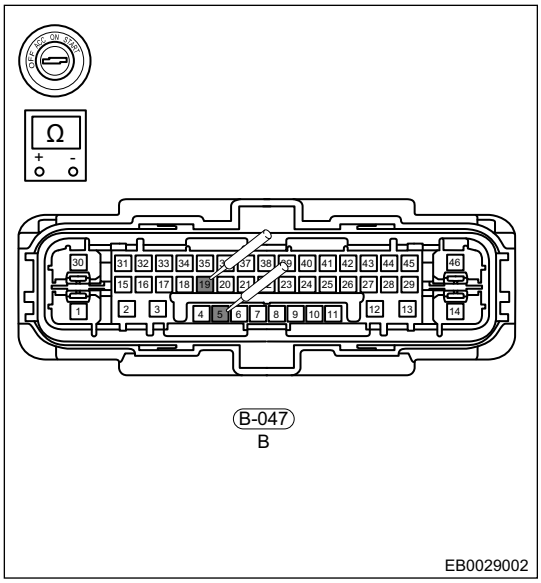
(b) Disconnect the negative battery cable.

(c) Disconnect the EPB module connector B-047.

(d) Using a multimeter, measure if CAN resistance between EPB module connectors B-047 (5) and B-047 (19) is 60 Ω.

Standard Resistance

Multimeter Connection	Condition	Specified Condition
B-047 (5) - B-047 (19)	Always	Approximately 60 Ω

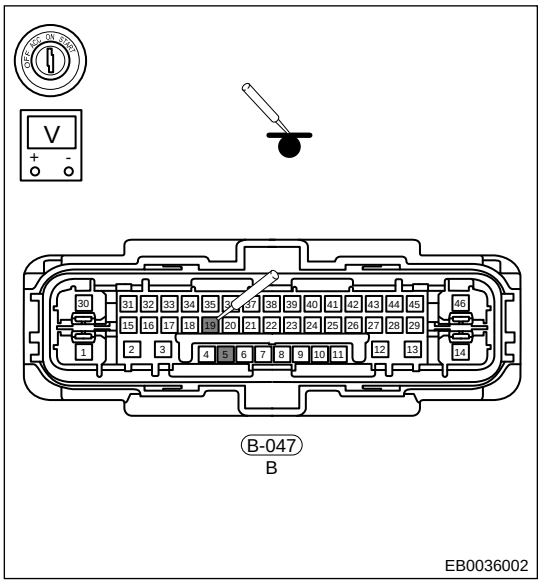


(e) Turn ENGINE START STOP switch to ON.

(f) Using a multimeter, measure voltage of CAN network.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
B-047 (5) - Body ground	ENGINE START STOP switch ON	Between 2.5 V and 3.5 V
B-047 (19) - Body ground	ENGINE START STOP switch ON	Between 1.5 V and 2.5 V



NG → Repair or replace CAN network wire harness

OK

5	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Check if the same DTCs are still output.

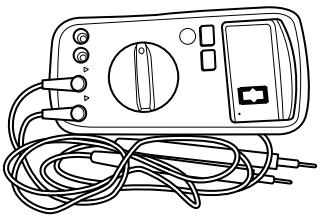
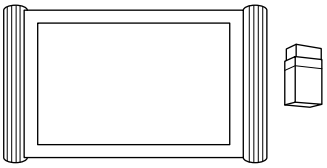
OK → Same DTC is not output

NG → **Replace EPB control module assembly**

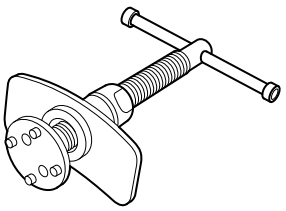
5 On-vehicle Service

5.1 Tool

■ **General Tool**

Tool Name	Part No.	Tool Drawing
Digital Multimeter	-	 RCH000206
Diagnostic tester	-	 S00001

■ **Special Tool**

Tool Name	Part No.	Tool Drawing
Brake Cylinder Release Tool	ECH-0005	 S00076

5.2 EPB System

■ On-vehicle Inspection

⚠ Caution

- **EPB system must be repaired by professional technicians who have trained and mastered maintenance skills and only use original parts for replacement.**
- **Before perform a fault diagnosis of EPB system, it is necessary to confirm that vehicle CAN interface can be connected properly.**
- **Note following when connecting EPB wire harness: Turn ENGINE START STOP switch off before disconnecting wire harness connector, make sure that connector is dry and clean and avoid any foreign material entering; Wire harness must be installed in place horizontally and vertically in order to avoid damaging connector.**
- **If EPB motor fuse need to be replaced, make sure that it is exactly the same with original model, including shape and parameters, and ensure that connection is fully in place.**

(1) Inspect friction material thickness of brake linings on both sides visually, replace it when minimum value is less than 2 mm.

(2) When brake lining is worn to limit state, there will be mechanical alarm, and the brake lining should be replaced.

(3) It is necessary to replace 4 brake linings of left and right brake calipers when replacing brake linings.

(4) If removed brake lining can be reused, it must be installed at original position when it is reinstalled.

(5) During warranty period of brake lining, it is not possible to replace brake lining with different wear thickness. If friction material thickness is less than 2mm in warranty period, brake lining should be replaced, and check brake caliper for dragging at the same time.

(6) Check EPB wire harness for aging or damage, replace as necessary.

5.3 Integrated Caliper Motor

■ Removal

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing integrated caliper motor.**
- **Remove integrated caliper motor without damaging motor seal ring and replace it when necessary.**
- **When removing integrated caliper motor, do not allow foreign matter enter into motor.**

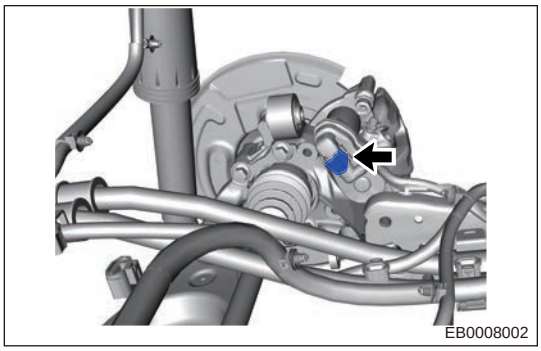
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

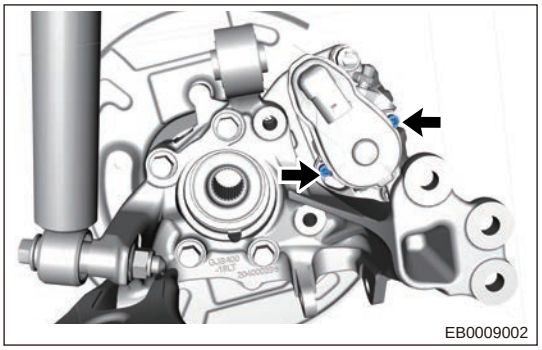
(3) Remove the rear tires.

(4) Remove the integrated caliper motor.

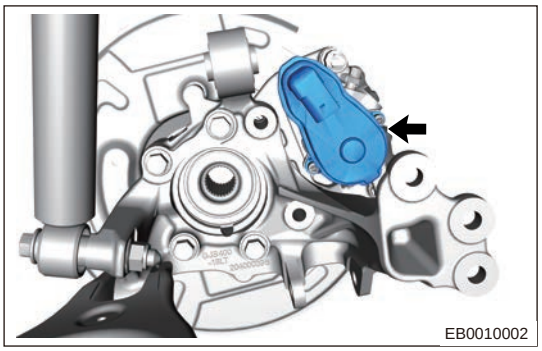
1) Disconnect the integrated caliper motor wire harness connector (arrow).



2) Remove 2 fixing bolts (arrows) from left integrated caliper motor.


EB0009002

3) Remove the integrated caliper motor (arrow).


EB0010002

⚠ Caution

- **Save the removed parking actuator properly to avoid dust or water polluting grease and seal rings.**

■ EPB Brake Caliper Emergency Release

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

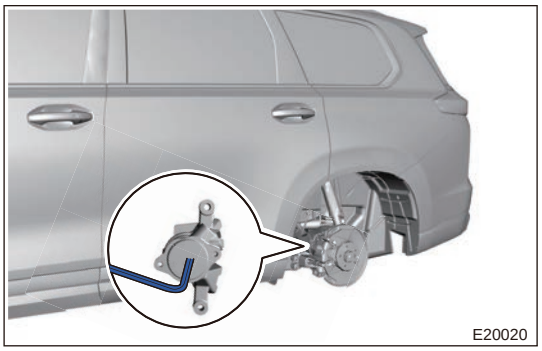
⚠ Caution

- **If parking brake cannot be released by parking brake switch manually or automatically due to unexpected circumstances (such as battery does not output voltage, parking brake system failure, etc.) during using EPB system, you need to enable parking emergency releasing function to release parking brake, please follow the following steps for specific methods.**
- **If this malfunction occurs on a slope, please try to tow vehicle to a level road or place obstacles such as rocks in front of or rear of front wheels respectively to prevent wheel rolling, avoiding coasting accident after releasing rear wheel brake urgently.**
- **Be sure to wear safety equipment to prevent accidents, when EPB brake caliper emergency releasing.**

(1) Remove the rear tires.

(2) Remove the electronic control execution unit.

(3) Align inner bi-hexagonal wrench M8 with spline in EPB caliper, rotate 2-3 cycles clockwise (when operator faces spline) or stop until brake disc can rotate freely. It is normal that a large rotation force is needed due to vehicle parking brake condition.


E20020

(4) The vehicle only loses parking function and does not affect normal braking function after releasing parking brake.

⚠ Caution

- **Emergency release is highly specialized, it is recommend to perform by Chery 4S shop professionals.**

■ Installation

(1) Install rear left integrated caliper motor and tighten 2 fixing bolts.

Tightening torque: 10 ± 1.0 N•m

(2) Connect the rear left integrated caliper motor wire harness connector.

(3) Install the rear left tire.

(4) Connect the negative battery cable.

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing integrated caliper motor.**
- **When installing integrated caliper motor, remove sediment, dust and other foreign objects that are on matching surface of parking actuator and on head of parking caliper.**
- **When installing integrated caliper motor, check whether the o-ring of parking caliper head is invalid or abnormal. Please replace it in time.**
- **When installing integrated caliper motor, parking caliper head and actuator motor must be tightly coupled, tighten fixing bolts to specified torque.**
- **When installing integrated caliper motor, check whether the o-ring seal is extruded between parking actuator and parking caliper, if it is extruded, should be reinstalled.**
- **When installing integrated caliper motor, manual parking clamp and release must be performed to confirm if parking function is normal.**

5.4 Rear Brake Lining

■ Removal

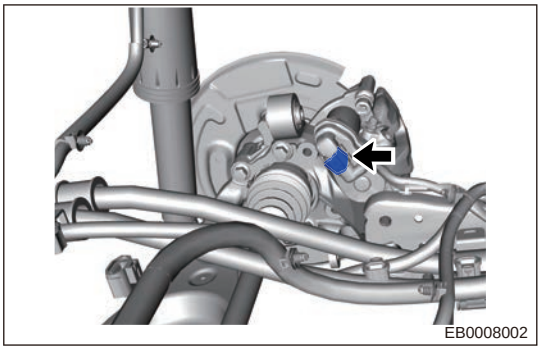
⚠ Caution

- **When worn minimum value of brake lining is 2 mm, replace 4 brake linings of left and right brake calipers.**
- **DO NOT perform "Exit Maintenance Mode" using diagnostic tester during vehicle maintenance.**
- **After removing EPB caliper set, it is strictly forbidden to depress brake pedal, otherwise the piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.**
- **After completing replacing new brake lining, make sure to perform "Exit Parking Brake Maintenance Mode" with diagnostic tester.**
- **When installing integrated caliper motor, check whether the o-ring seal is extruded between parking actuator and parking caliper, if it is extruded, should be reinstalled.**
- **When installing integrated caliper motor, manual parking clamp and release must be performed to confirm if parking function is normal.**

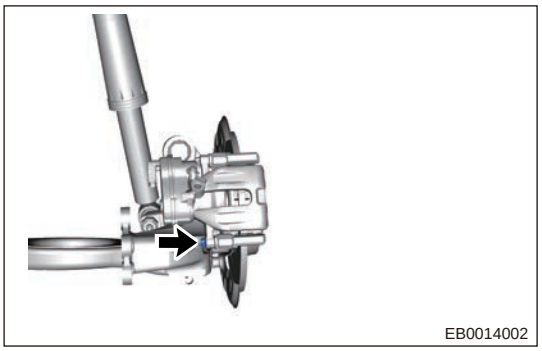
(1) Use diagnostic tester to enter parking brake maintenance mode.

(2) Remove the rear wheel brake lining.

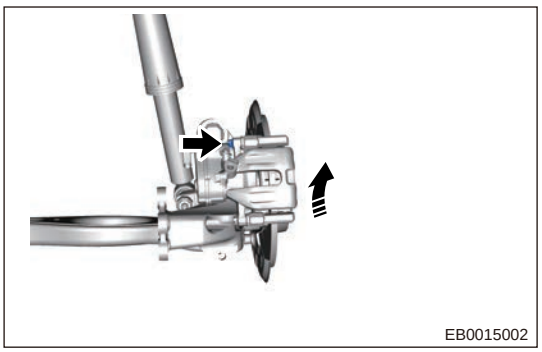
1) Disconnect the integrated caliper motor wire harness connector (arrow).


EB0008002

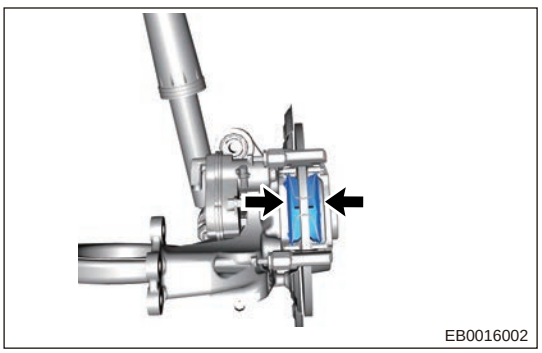
2) Remove the lower fixing bolt (arrow) from single guide pin.


EB0014002

3) Flip the parking caliper around another guide pin (-arrow) and use hook to lift the caliper.


EB0015002

4) Remove the brake lining (arrow) that needs to be replaced.


EB0016002

⚠ Caution

- **After removing EPB caliper set, it is strictly forbidden to depress brake pedal, otherwise the piston will rush out of cylinder hole and the brake fluid will come out and pollute brake disc and other parts.**
- **Move caliper equipped with spring diaphragm slowly during this process, spring may flick the brake lining and drop on the foot.**

■ Installation

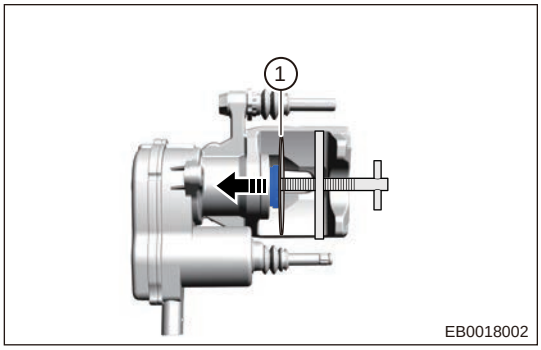
⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing rear brake linings.**

(1) Install the rear wheel brake lining.

1) A thin sheet of steel (1) or old brake lining is added to the piston end to prevent damaging anti-rotating tooth of end surface.

2) Use special tool to press piston along the direction of hand as shown in figure to push piston back to bottom of cylinder hole.



3) Install new brake lining.

4) Install brake caliper bolt in place.

(2) Connect EPB connector and install wheel.

(3) Perform “Exit Maintenance Mode” using diagnostic tester.

⚠ Caution

- **When replacing brake lining, check whether piston dust boot and guide pin dust boot is broken, and whether the spring plate is deformed or damaged, replace it when necessary.**
- **After completing replacing new brake lining, make sure to perform “Exit Parking Brake Maintenance Mode” with diagnostic tester.**
- **After installing rear brake linings, two manual parking and release are carried out to make the brake lining fully in contact with the brake disc.**

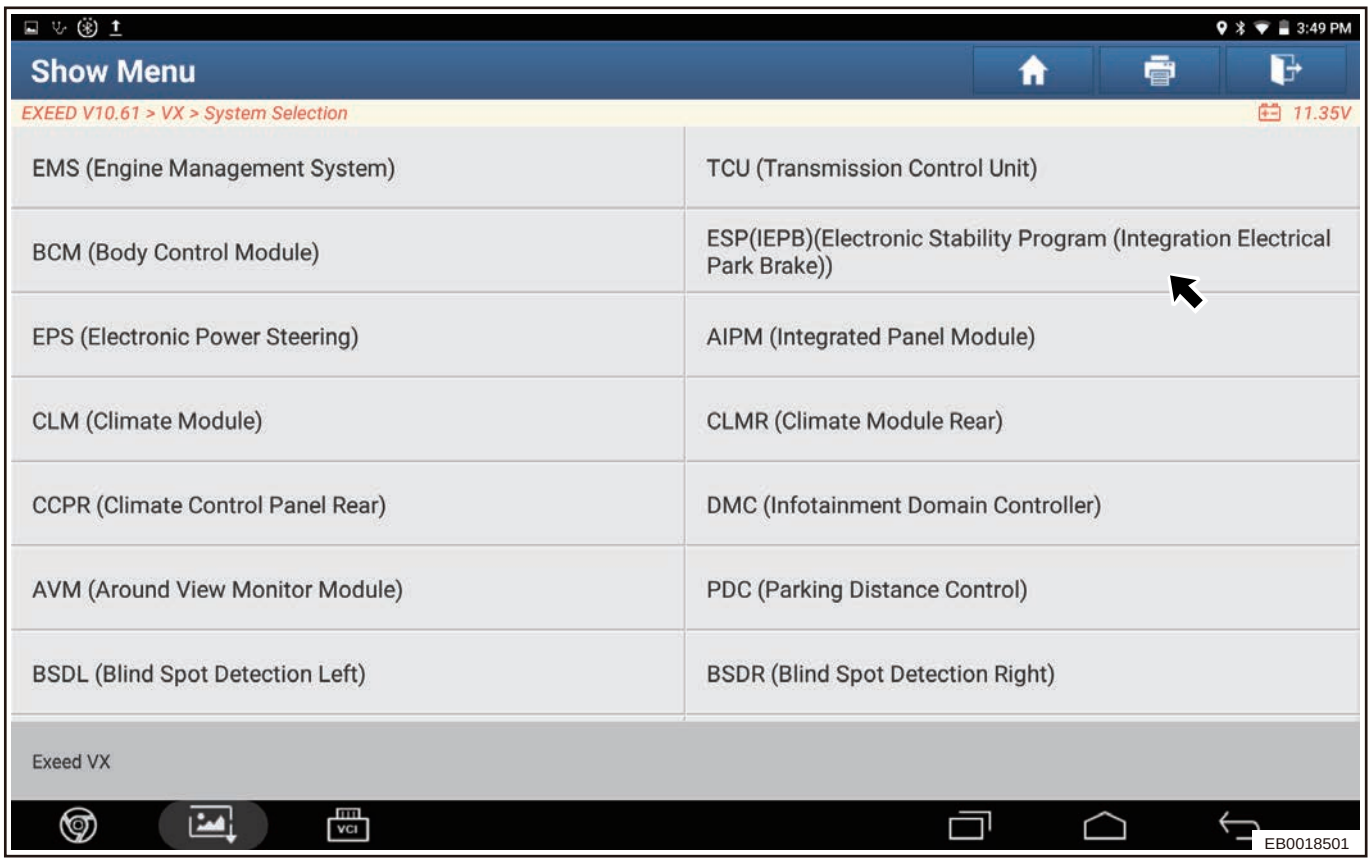
■ Test

(1) Rear brake calipers release and clamp test.

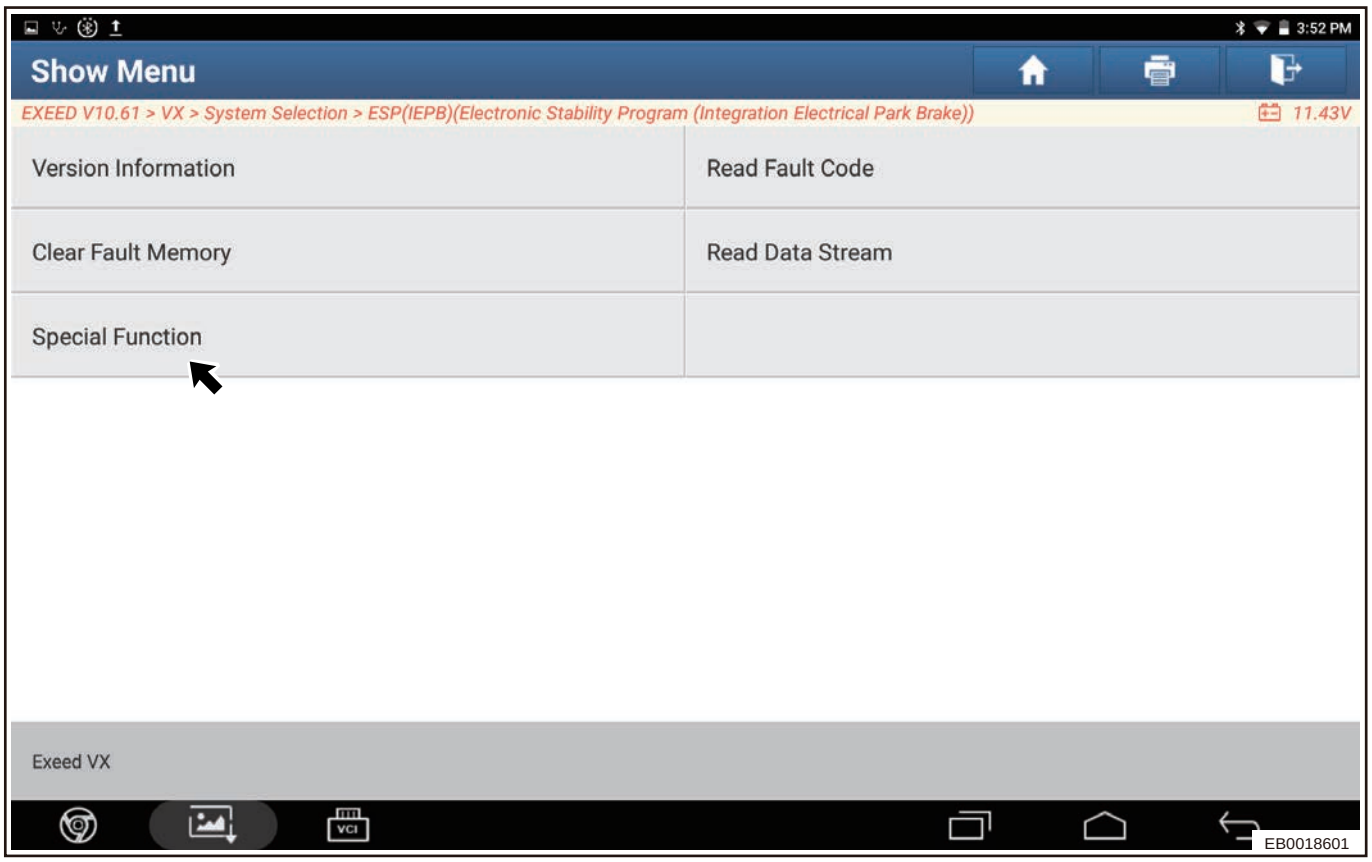
1) Turn ENGINE START switch to ON.

2) Connect the diagnostic tester.

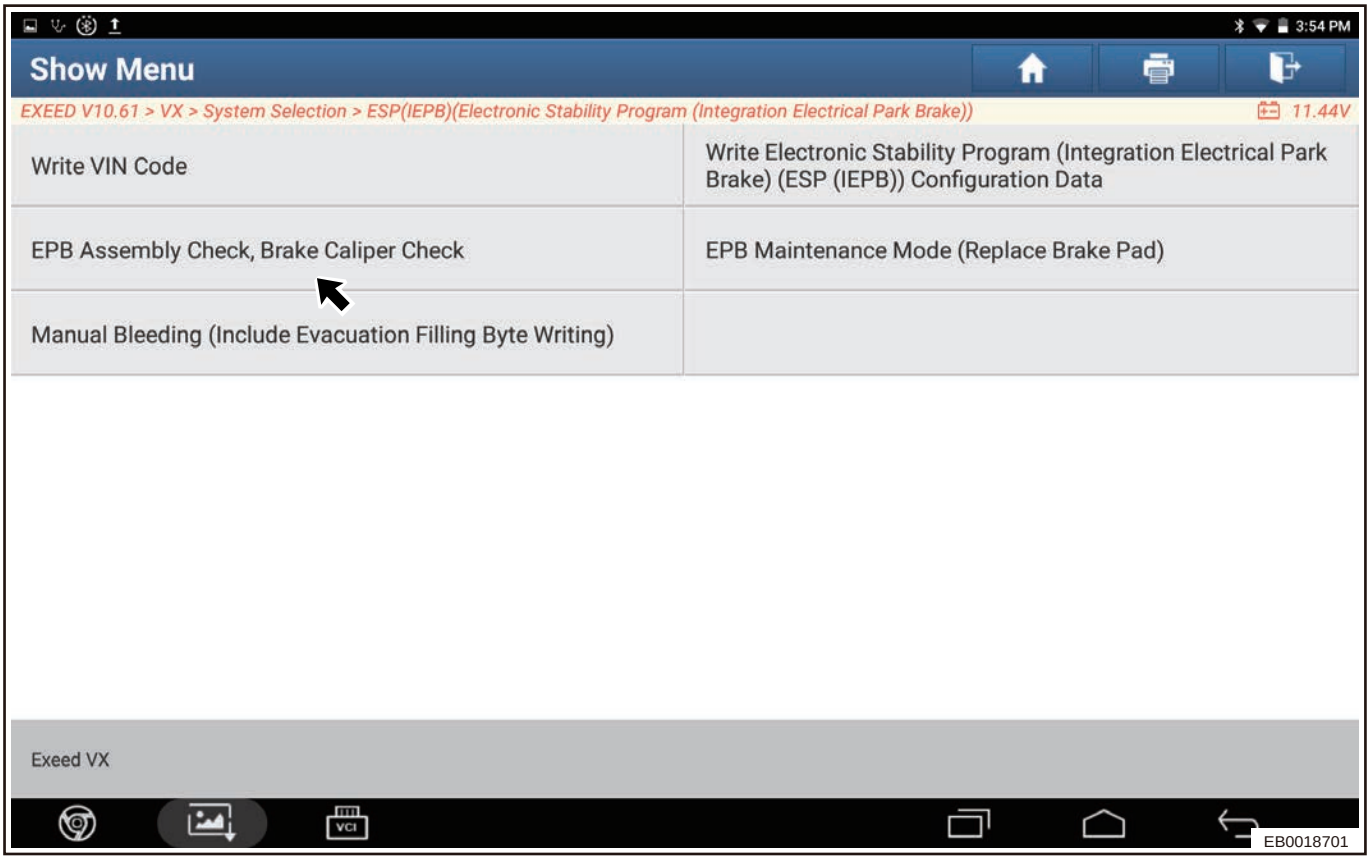
3) Click diagnostic tester to enter "ESP (iEPB) (Electronic Stability Control Module (Integrated Electronic Parking Brake))".



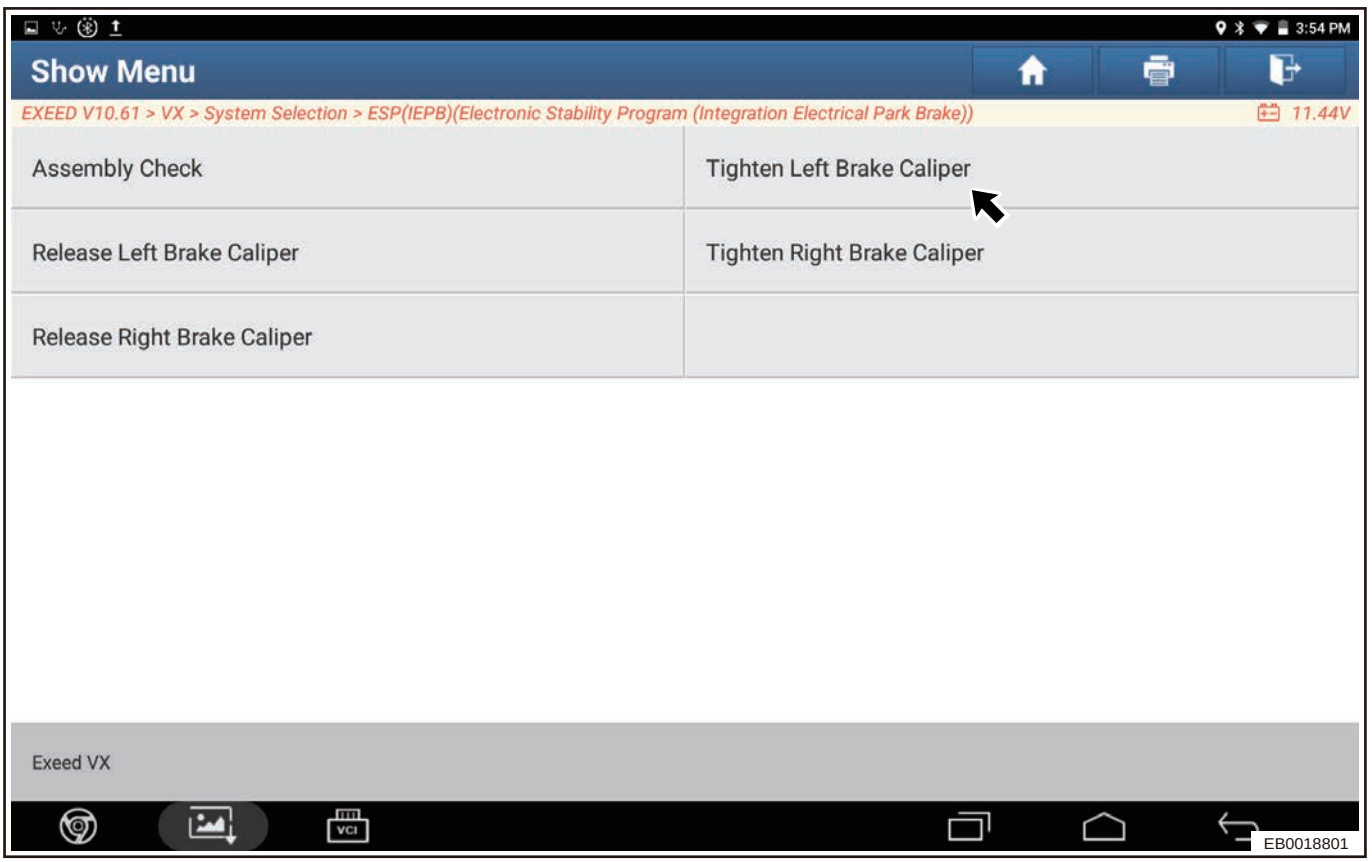
4) Click “Special Function”.



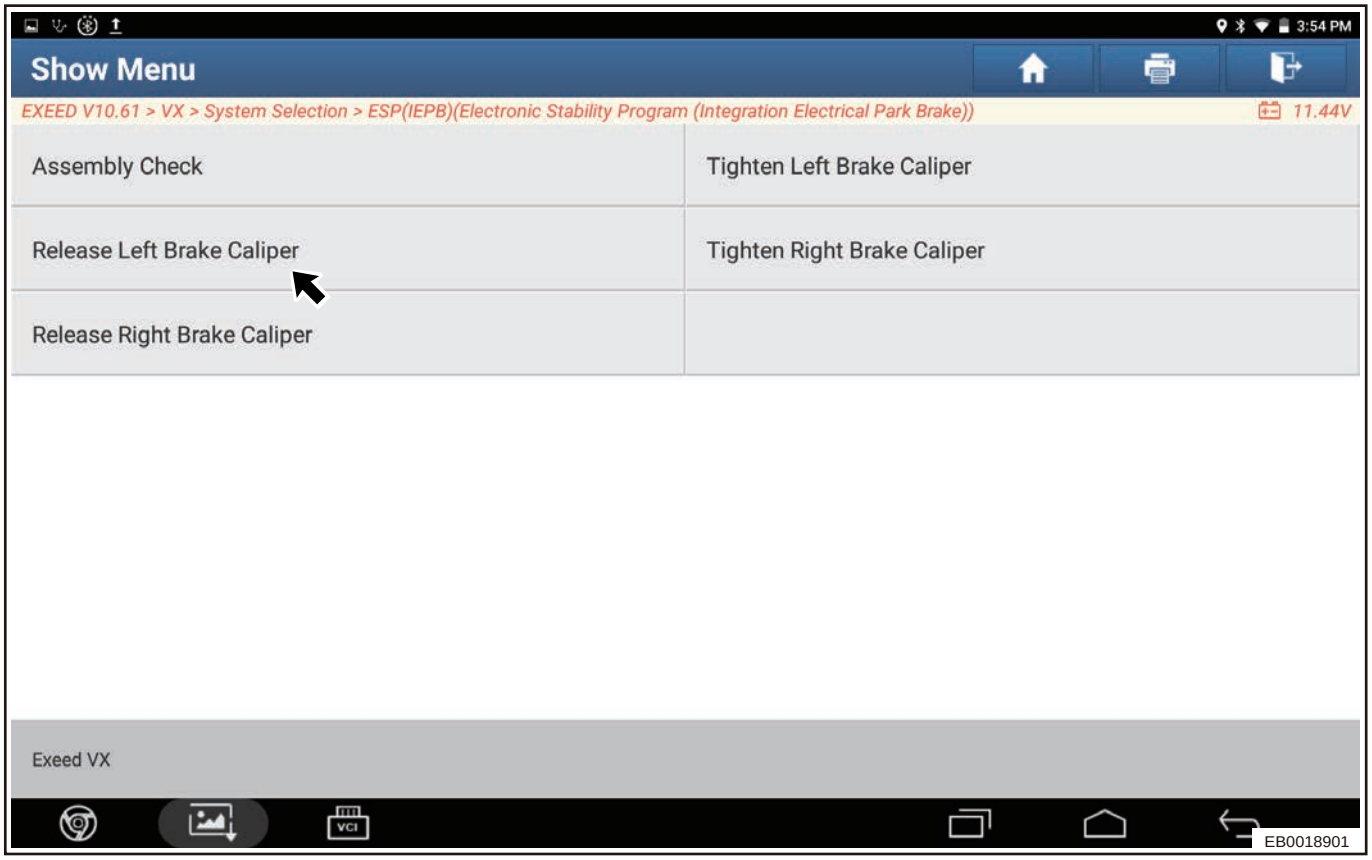
5) Click “EPB Assembly Inspection, Brake Caliper Inspection”.



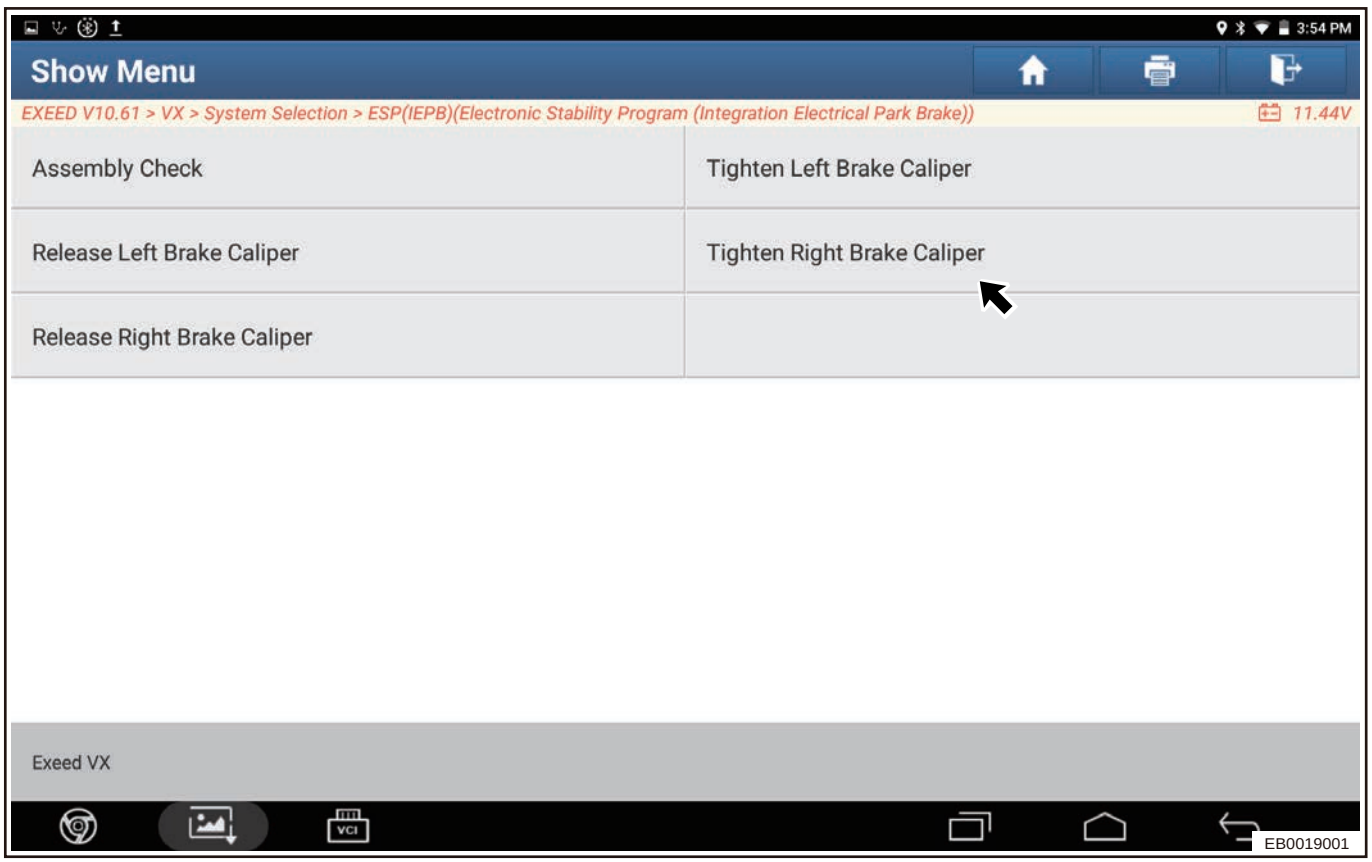
6) Click “Left Caliper Clamp”.



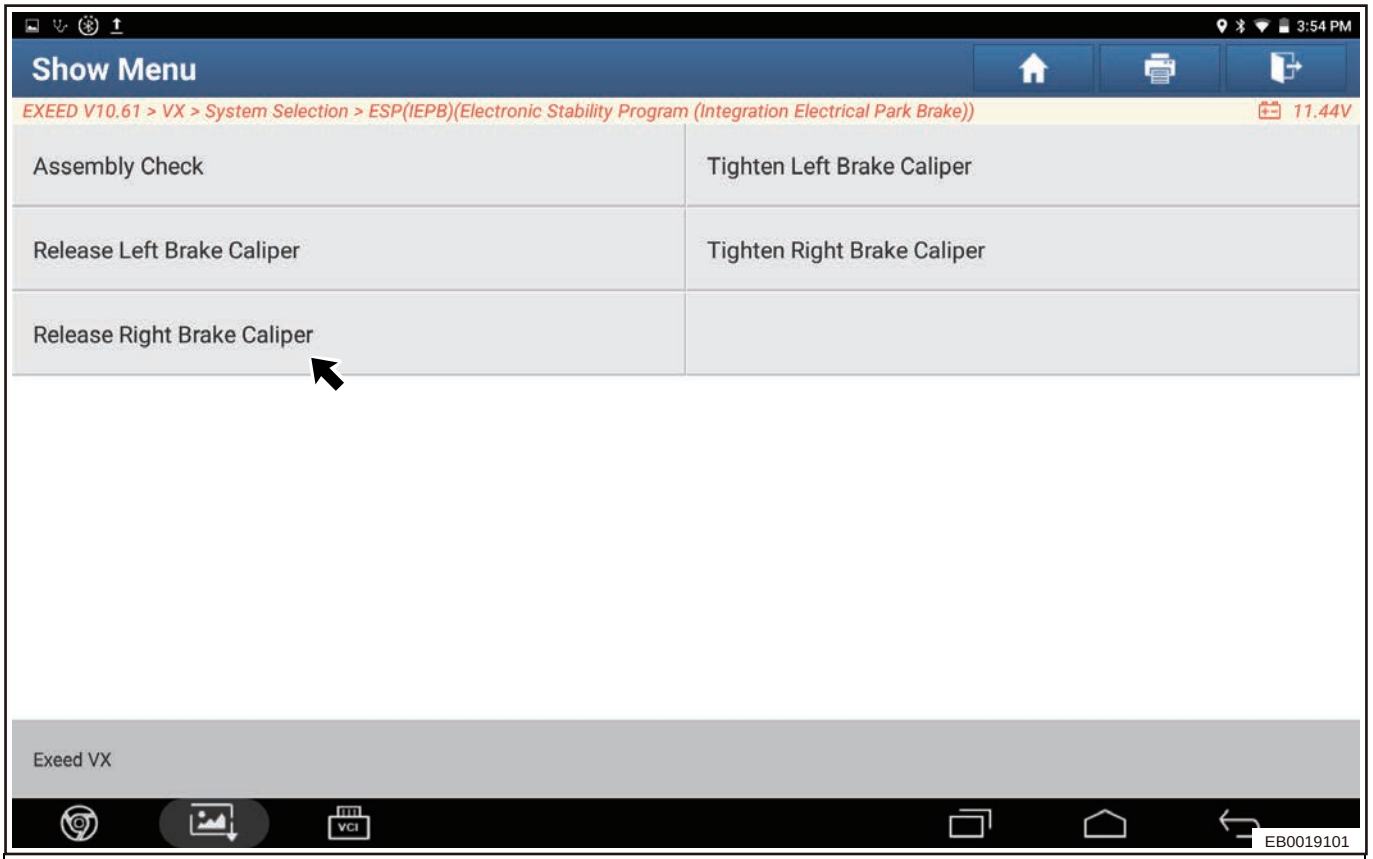
7) Click “Left Caliper Clamp Release”.



8) Click “Right Caliper Clamp”.



9) Click “Right Caliper Release”.



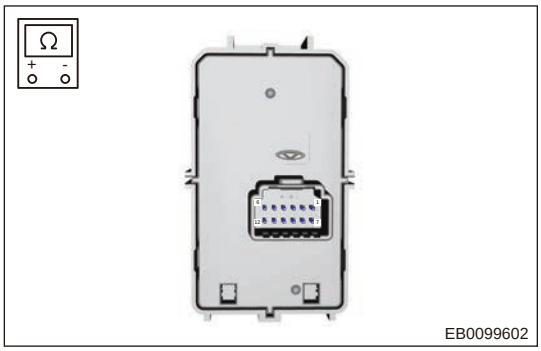
⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing rear brake linings.**
- **When replacing brake lining, check whether piston dust boot and guide pin dust boot is broken, and whether the spring plate is deformed or damaged, replace it when necessary.**
- **After completing replacing new brake lining, make sure to perform “Exit Parking Brake Maintenance Mode” with diagnostic tester.**
- **After installing rear brake linings, two manual parking and release are carried out to make the brake lining fully in contact with the brake disc.**
- **All actions of the EPB action test should be in line with the actual operation, otherwise the EPB system should be overhauled.**

5.5 EPB Switch

■ Inspection

(1) According to circuit diagram, internal resistance of EPB switch is measured using digital multimeter ohm gear. If it does not match with measured value of following table, replace the EPB switch.



Multimeter Connection	Manual Parking Switch State	Specified Condition
Terminal 1 - Terminal 2	No action	⩽ 1 Ω
Terminal 3 - Terminal 4	No action	⩽ 1 Ω
Terminal 1 - Terminal 3 - Terminal 4	Parking brake pulled up	⩽ 1 Ω
Terminal 3 - Terminal 2 - Terminal 1	Parking brake released	⩽ 1 Ω

Multimeter Connection	Automatic Parking Switch State	Specified Condition
Terminal 6 - Terminal 8	Not pressed	∞
Terminal 6 - Terminal 8	Pressed	⩽ 1 Ω

Multimeter Connection	Manual Parking Switch State	Specified Condition
Terminal 12 - Terminal 5	Manual parking switch indicator	2.2 kΩ
Terminal 12 - Terminal 9	Automatic parking switch indicator	2.2 kΩ

7.5 ELECTRONIC STABILITY CONTROL SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

- In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.
- When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to cut off vehicle power supply.
- ESP is a safety related component. Therefore, in addition to general safety and precautionary measures, the following diagnostic precautions must also be observed when performing maintenance and diagnosis on it:

  (1) ESP system must be repaired by professional technicians who have trained and mastered maintenance skills and only use original parts for replacement.

  (2) Before diagnosing ESP system, if basic brake system is malfunctioning, troubleshoot it first, such as:
  1)Brake system noise.
  2)Hard brake pedal.
  3)During normal braking, brake pedal or vehicle vibrates.
  4)Vehicle brake pulls.
  5)Parking brake system malfunction.

  (3) ESP assembly (refers to ESP electronic control unit and hydraulic regulator assembly, excluding some accessory device such as brake line, sensor, etc.) can only be replaced as a whole, and cannot be disassembled or partially replaced/exchanged. The company does not provide separate spare parts, and ESP assembly being disassembled is not covered under warranty. The company cannot accept any liability for adverse effect caused by disassembling or partially replacing/exchanging ESP hydraulic regulator.

  (4) Both the followings indicate that a malfunction is detected in ESP system:
  1)After ignition switch is turned to ON and system performs self-check, the warning light remains on.
  2)The warning light remains on during driving.

  At this time, driver can perform regular brake, but the applied brake force should be reduced as much as possible to prevent wheels from being locked. After the warning light comes on, drive carefully and go to the service station for inspection and repair immediately to prevent more faults, which may lead to traffic accidents.

  (5) Pay attention to the followings when connecting ESP and sensor wire harness:
  1)Before unplugging ESP wire harness and sensor wire harness, the ignition switch must be turned off.
  2)Ensure that connector is dry and clean, and avoid any foreign matter entering.
  3)ESP wire harness connector must be installed in place in horizontal and vertical directions, to avoid damage to the connector.

  (6) When connecting ESP brake line, it must be connected properly. ESP ECU cannot be used to determine if brake line is connected properly. Incorrect connection may cause serious accidents. When connecting brake line, be sure to follow the markings on ESP assembly:
  1)MC1: Brake line 1 connected to brake master cylinder;
  2)MC2: Brake line 2 connected to brake master cylinder;
  3)FL: Brake line connected to brake wheel cylinder of front left wheel;
  4)FR: Brake line connected to brake wheel cylinder of front right wheel;
  5)RL: Brake line connected to brake wheel cylinder of rear left wheel;
  6)RR: Brake line connected to brake wheel cylinder of rear right wheel.

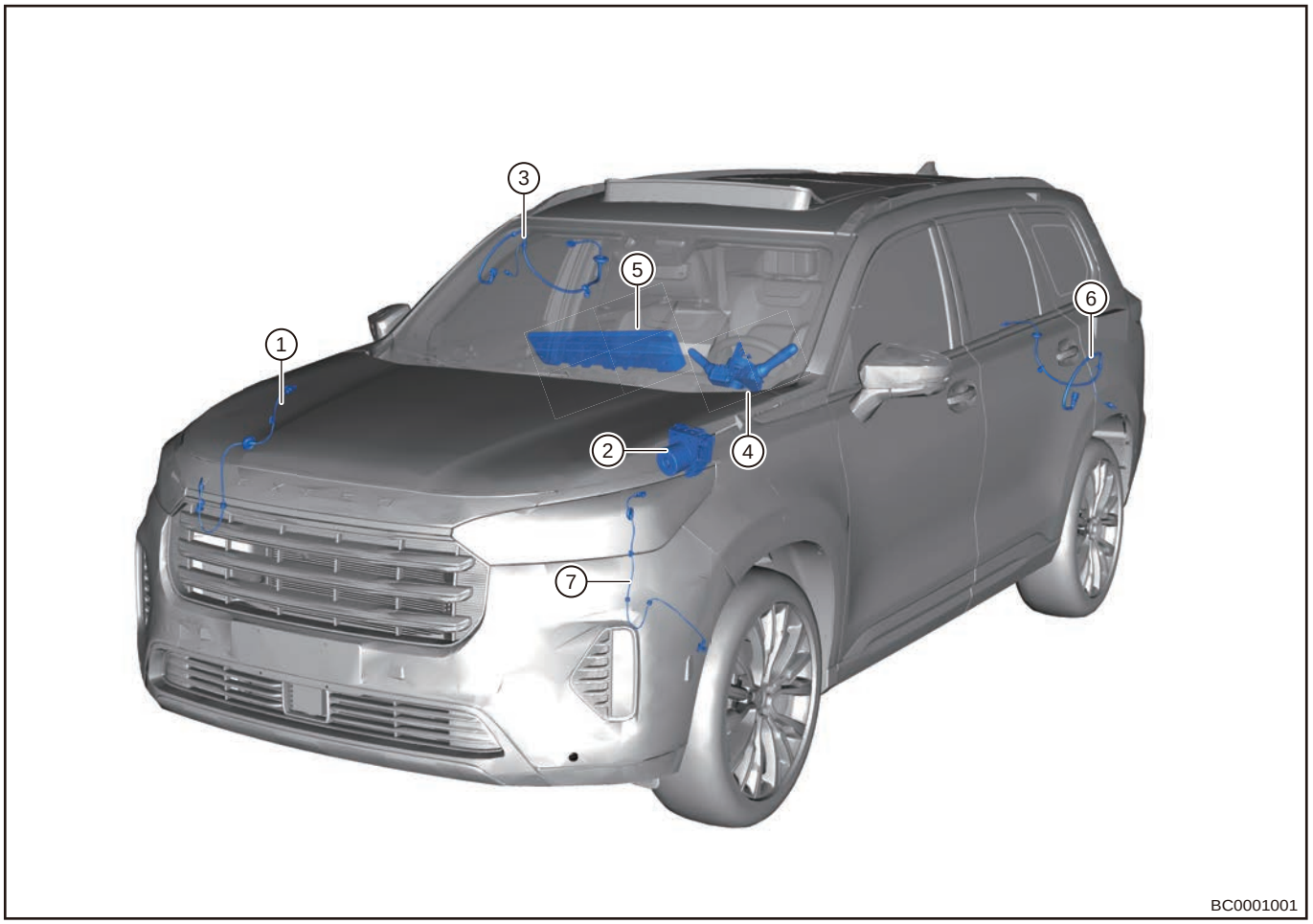
  (7) ESP generates noise in following situations:
  1)After engine is started, short “buzz” sound may be heard when vehicle is accelerated to more than 40km/h. This is a normal sound from ESP self-check.
  2)Sound may be heard when ESP is operating properly, and it is mainly reflected in the following aspects:
  a. Operating sound from motor, solenoid valve and return pump in ESP hydraulic unit.

b. Sound caused by brake pedal rebound.

c. Bumping sound between suspension and vehicle body caused by sudden braking.

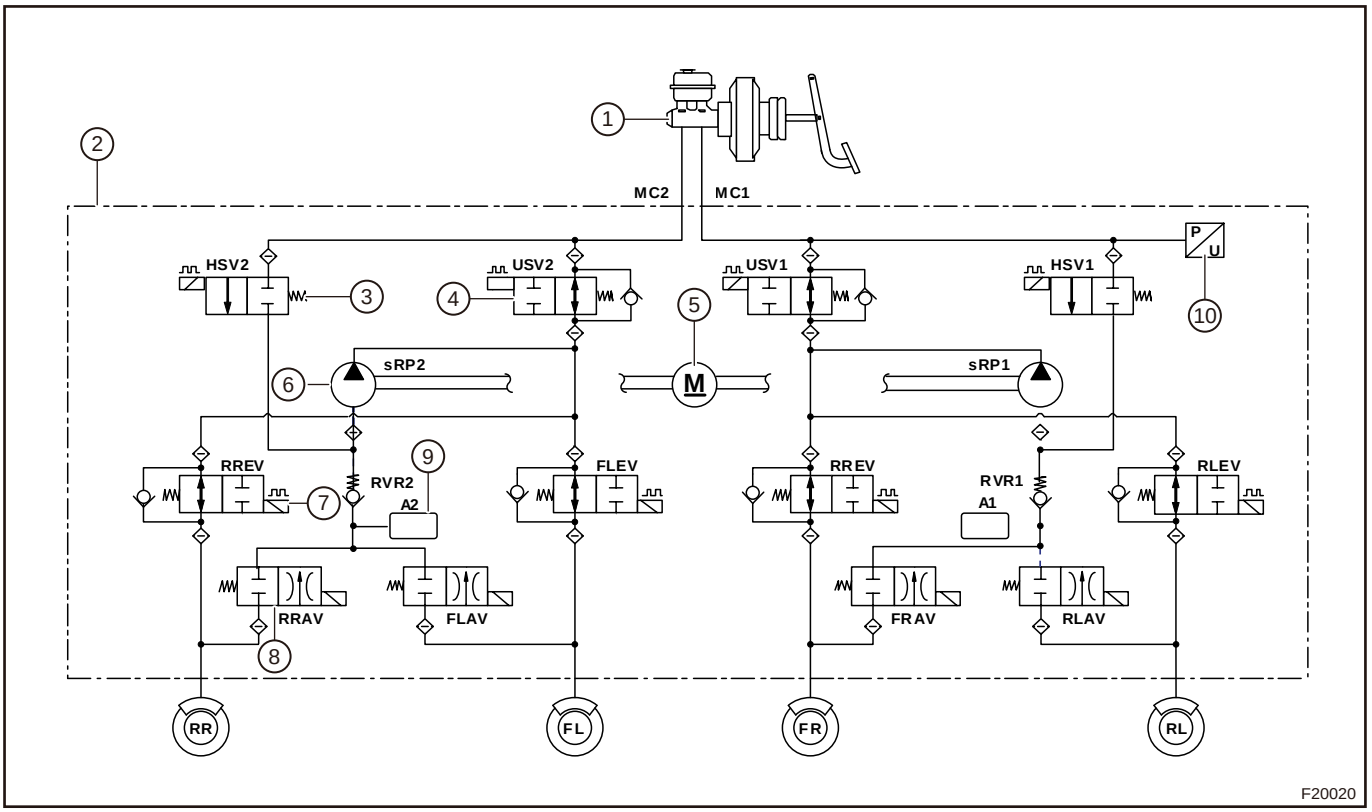
2 System Overview

2.1 System Components Diagram



1	Front Right Wheel Speed Sensor	2	ESP Control Module Assembly
3	Rear Right Wheel Speed Sensor	4	Combination Switch Steering Angle Sensor
5	Instrument Cluster	6	Rear Left Wheel Speed Sensor
7	Front Left Wheel Speed Sensor		

2.2 System Schematic Diagram



1	Brake Master Cylinder Assembly	6	Return Pump (sRP)
2	ESP Control Module Assembly	7	Input Valve (EV)
3	High Pressure Valve (HSV)	8	Output Valve (AV)
4	Circuit Control Valve (USV)	9	Low Pressure Accumulator
5	Return Pump Motor	10	Pressure Sensor

Pressure regulation is achieved by ESP control module assembly mainly through four input valves (EV) (-normal open valve), four output valves (AV) (normal close valve), two high pressure valves (HSV), two circuit control valves (USV), return pump motor, return pump (sRP), pressure sensor and low pressure accumulator, etc.

■ Conventional brake operating condition

When driver does not apply enough pressure to brake pedal to lock wheels, oil pressure generated by brake master cylinder enters brake caliper assembly of each wheel through input valve (EV), producing regular braking effect. If driver reduces pressure to brake pedal, brake fluid of each wheel returns to brake master cylinder assembly, and brake pressure decreases.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Input Valve (EV)	OFF	Normally open
Output Valve (AV)	OFF	Normally closed

■ ESP operating condition (relief)

When driver applies pressure to brake pedal excessively, friction coefficient between wheels and road will decrease, and wheels will be decelerated earlier than vehicle. When wheel locking is about to occur, oil passage of input valve (EV) is cut off, and oil passage of output valve (AV) is opened to reduce wheel brake caliper assembly pressure. Brake fluid of wheel brake caliper assembly is temporarily stored in low pressure accumulator through output valve (AV).

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Input Valve (EV)	ON	Normally closed
Output Valve (AV)	ON	Normally open

■ **ESP operating condition (maintaining)**

When appropriate pressure is applied to wheel brake caliper assembly by relieving or boosting, pressure will be maintained. Oil passage of input valve (EV) and output valve (AV) will be cut off to maintain pressure of wheel brake caliper assembly unchanged.

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Input Valve (EV)	ON	Normally closed
Output Valve (AV)	OFF	Normally closed

■ **ESP operating condition (boost)**

When ESP operating condition (relief) is performed, friction coefficient between wheels and road increases, it needs to increase each wheel pressure. Oil passage of input valve (EV) is opened, oil passage of output valve (AV) is cut off, brake fluid stored in low pressure accumulator becomes oil source for next boost, and enters wheel brake caliper assembly through return pump (sRP) and input valve (EV).

Solenoid Valve	Powered Condition	Solenoid Valve Condition
Input Valve (EV)	OFF	Normally open
Output Valve (AV)	OFF	Normally closed

2.3 System Function Description

■ **Electronic Stability Program System (ESP)**

ESP is an active safety control system. It uses system sensor to monitor vehicle driving condition. In case of oversteering or understeering, it adopts power system and brake system intervention to help prevent tendency deviating from an ideal path, so that, it provides better driving safety.

■ **Anti-lock Brake System (ABS)**

ABS can prevent wheel from being locked in the event of sudden braking or braking on slippery road. When ABS detects that one or more wheels are going to lock, ESP control module will apply or release hydraulic pressure quickly.

■ **Traction Control System (TCS)**

When Traction Control System (TCS) detects that driven wheel speed is lower than drive wheel speed (a kind of wheel slip symptom) using system sensor, it sends a signal to adjust ignition timing, reduce throttle opening, downshift or brake wheels so that wheel no longer slips.

■ **Hill Descent Control System (HDC)**

When driving down steep inclines after Hill Descent Control System (HDC) is turned on, the vehicle with automatic transmission can control the speed within a range of 10 to 35 km/h; If initial speed is lower than the minimum speed, vehicle will be controlled at the minimum speed by default; Current controlling speed can be increased or decreased within the given speed range by depressing accelerator pedal or brake pedal.
With ENGINE START STOP switch in ON mode, press HDC switch to turn on hill descent control function. If vehicle speed is more than 35 km/h, hill descent control system is in standby status, and white indicator in instrument cluster comes on; If vehicle speed is no more than 35 km/h, system is activated,and green indicator in instrument cluster comes on.
With hill descent control system ON, press HDC switch to turn off hill descent control system, and green indicator/white indicator in instrument cluster goes off.
When vehicle speed is more than 60 km/h, hill descent control system turns off.

2.4 Component Operation Description

■ **ESP control module assembly**

During driving, combination switch assembly (steering angle sensor) monitors driver's turning direction and angle, wheel speed sensor monitors vehicle speed, pressure sensor monitors brake force, while lateral acceleration sensor and yaw rate sensor monitor vehicle's yaw and tilt speed. According to these information, ESP control module judges difference between normal and safety driving and driver's operation intention after

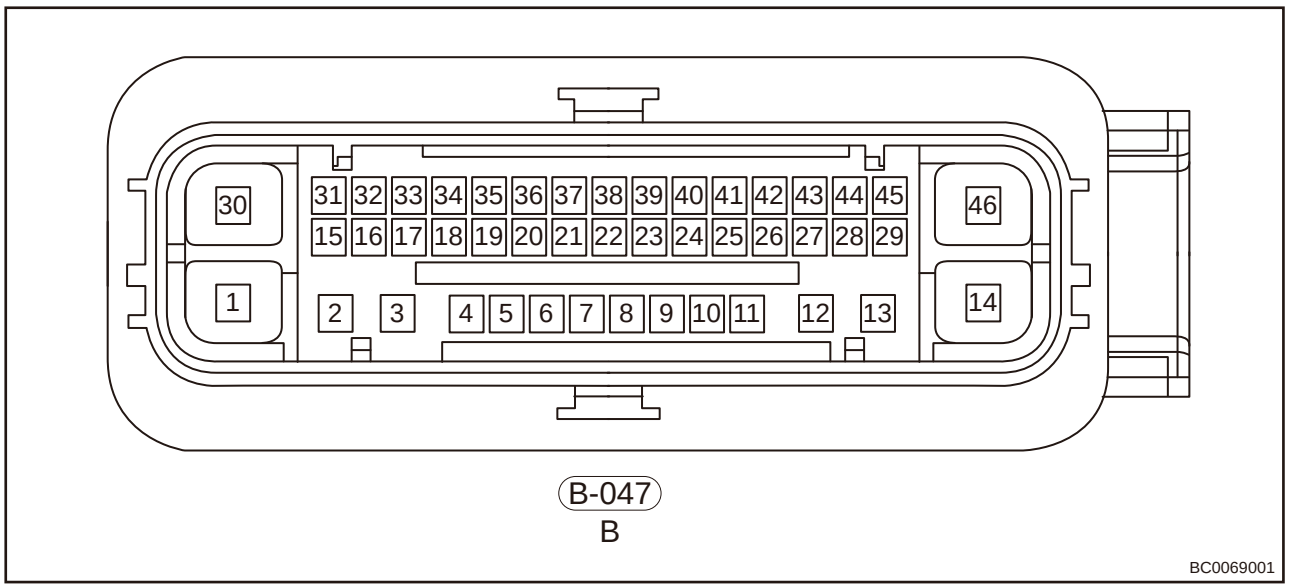
calculation, adjusts engine speed and wheel brake force. If actual movement track deviates from expected movement track, ESP control module automatically controls and applies brake to a wheel, thus correcting understeer and oversteer of vehicle, to avoid vehicle slipping, understeer, oversteer and locking, ensuring vehicle driving safety.

■ Wheel speed sensor

Wheel speed sensor is mainly used to test wheel speed. It has become an indispensable speed information reflecting equipment for modern vehicle. Vehicle’s ESP, ABS and automatic transmission control system all need speed information.

3 System Circuit Diagram

3.1 Module Terminal Definition

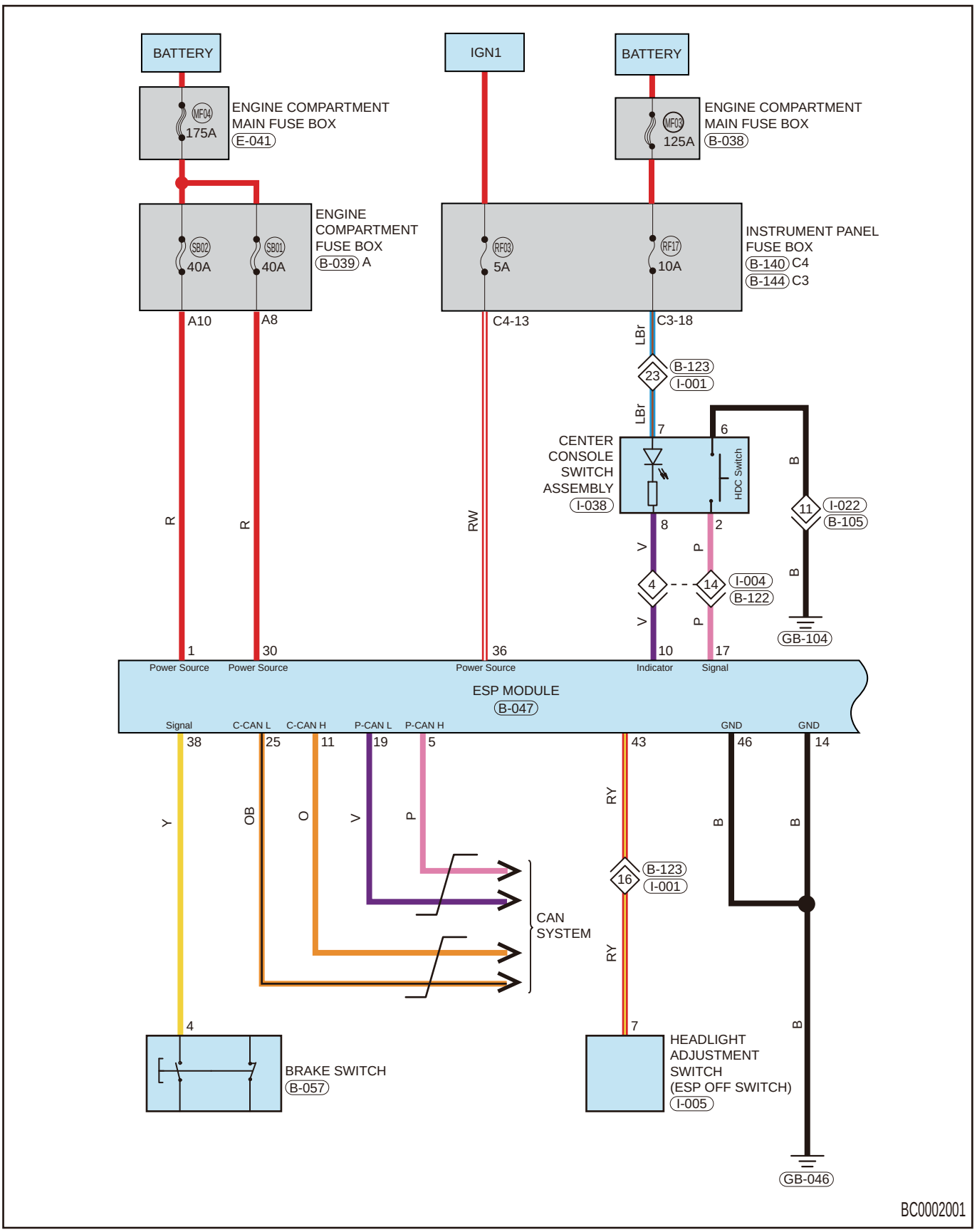


Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	KL30 Power Supply	24	Front Left Wheel Speed Sensor Power Supply
2	Right EPB Motor Power Supply	25	CAN 2 Low
3	Right EPB Motor Ground	26	Front Right Wheel Speed Sensor Signal
4	Reserved	27	Reserved
5	CAN High	28	Reserved
6	Reserved	29	Reserved
7	Front Left Wheel Speed Sensor Signal	30	KL30 Power Supply
8	AUTO HOLD Indicator	31	EPB Switch Pin 1
9	Reserved	32	EPB Switch Pin 4
10	HDC Switch Indicator	33	Reserved
11	CAN2 High	34	Reserved
12	Left EPB Motor Ground	35	Reserved
13	Left EPB Motor Power Supply	36	ING1 Power Supply
14	Ground	37	Rear Right Wheel Speed Sensor Signal

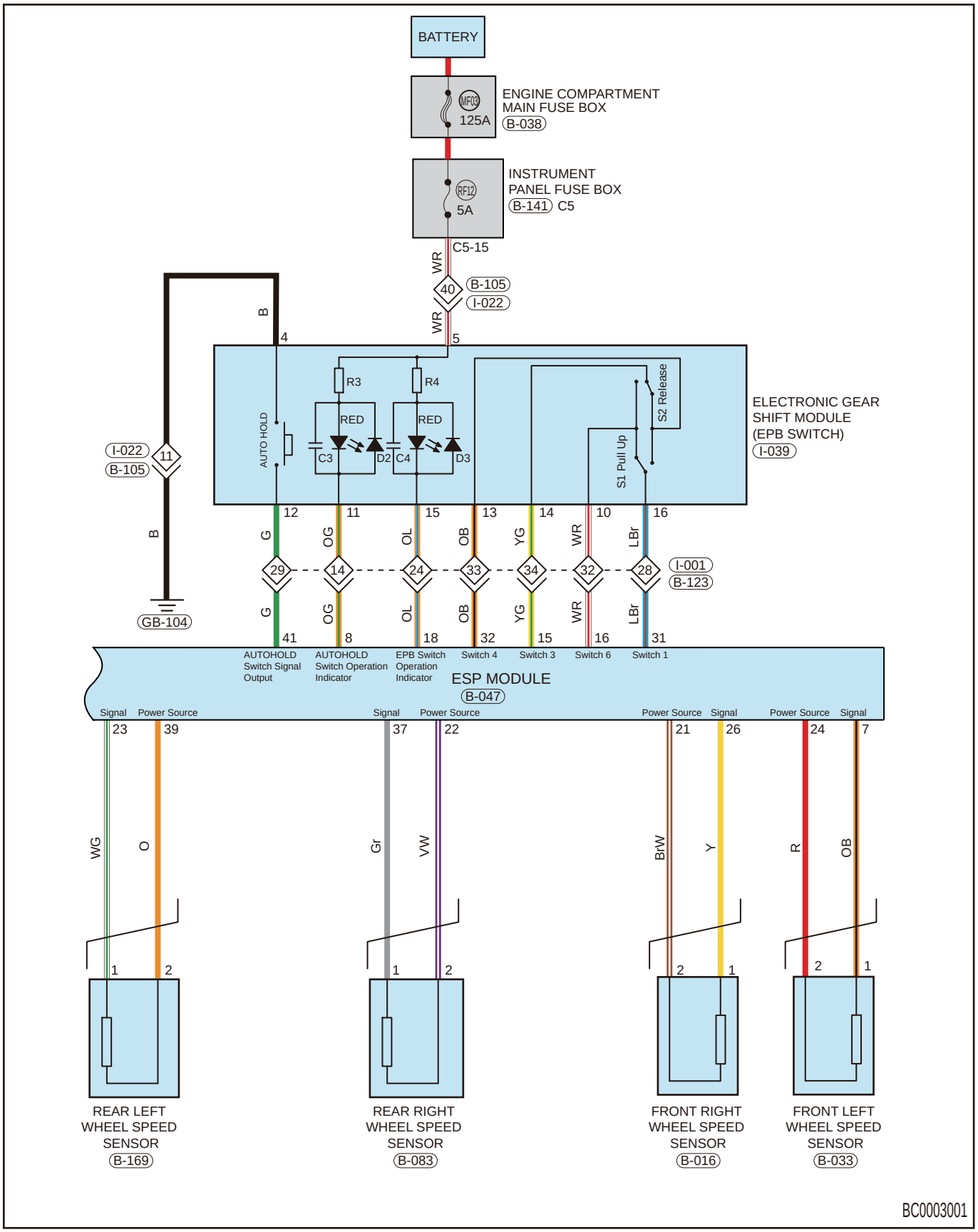
Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
15	EPB Switch Pin 3	38	Brake Switch Signal
16	EPB Switch Pin 2	39	Rear Left Wheel Speed Sensor Power Supply
17	HDC Function Switch	40	Reserved
18	EPB Switch Indicator	41	AUTO HOLD Switch Signal
19	CAN Low	42	Reserved
20	Reserved	43	ESP OFF
21	Front Right Wheel Speed Sensor Power Supply	44	Reserved
22	Rear Right Wheel Speed Sensor Power Supply	45	Reserved
23	Rear Left Wheel Speed Sensor Signal	46	Ground

3.2 Circuit Diagram

■ Electronic stability control system 1



■ Electronic stability control system 2



4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

HINT:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Brake control system:

Symptom	Possible Cause
ABS/ESP malfunction light comes on	Fuse
	Wire harness fault
	ESP control module assembly
ABS/ESP operation is abnormal	Wire harness fault
	Wheel speed sensor assembly
	ESP controller assembly
	Improper installation for hub bearing
	Brake line (blocked or leaked)
CAN network is faulty	Fuse
	Wire harness fault
	CGW controller assembly
	ESP controller assembly

4.2 Primary Inspection

Before performing diagnosis on ESP (iEPB) system, first check the easily accessible components that may cause ESP (iEPB) system fault. Visual inspection and appearance inspection procedures can quickly determine the fault, so that no further diagnosis is required.

1)Make sure that only the recommended size of tire and hub are installed on the vehicle. The pattern style and depth of coaxial tires must be the same.
2)Check ESP (iEPB) hydraulic regulator, brake line and connections for leakage.
3)Check the fuse of ESP (iEPB) system to make sure that the fuse is not blown and the type is correct. ESP (iEPB) system has two fuses: Pump motor fuse (40 A) and solenoid valve fuse (40 A).
4)Check battery voltage and check if battery post is corroded or loose. The normal operating voltage range of ESP (iEPB) system is 9 V to 16 V.
5)Check if grounding point of ESP (iEPB) ground wire is loose and if grounding position is changed.
6)ESP (iEPB) grounding wire must have good airtightness to prevent water and moisture from penetrating into the connector of ESP (iEPB) ECU through the holes in wire harness under the action of capillary (-siphon) effect, which may cause function failure. Measures: Apply sealant to the exposed end of wire harness and use heat shrinkable tube sleeve.
7)Perform visual inspection and appearance inspection to the following electrical components.

a. If wire harness and connector of ESP (iEPB) system related components are properly connected, pinched or cut.

b. If wire harness is routed too close to high voltage or large current devices, such as high voltage electrical components, alternator/starter, and after-sales added stereo amplifiers, etc.

⚠ Caution
• **High voltage or large current devices may cause induced noise in the circuit, interfering with the normal operation of circuit.**

c. ESP (iEPB) components are sensitive to electromagnetic interference (EMI). If a intermittent malfunction is suspected, check if after-sales added anti-theft device, light or mobile phone is installed correctly.

8)ESP (iEPB) is an active safety system. Its main function makes optimal use of ground adhesion and maintains the maneuverability and driving stability of vehicle. However, ESP (iEPB) cannot prevent vehicle slippage absolutely when it exceeds physical limits or driving on slippery road at high speed.
9)If excessive noise is heard from ESP (iEPB), it may be caused by the following reasons:

a. Connection between ESP (iEPB) assembly and ESP (iEPB) bracket becomes loose.

b. Connection between ESP (iEPB) bracket and vehicle body becomes loose.

c. Plastic gasket on ESP (iEPB) bracket is missing or damaged.

d. Brake line is deformed, impacted, or interfered.

e. Clip of brake line bracket is damaged.

4.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

In electronic system, there may be instantaneous poor contact problem in electrical circuit and a point that inputs and outputs signals, resulting in intermittent problem. Sometimes, the problem will disappear by itself, so it is not easy to find the source that problem occurs. When an intermittent problem occurs, simulate the problem in the following way to check if problem occurs again.

No.	Possible Cause	Simulating Malfunction	Note
1	When vibration may be the main cause	• Gently shake ESP ECU connector up and down, left and right • Gently shake ESP wire harness up and down, left and right • Gently shake sensor up and down, left and right • Gently shake other moving parts (such as wheel bearing)	If wire harness is twisted or broken due to tight pulling, new parts must be replaced. When vehicle is moving, short open/ short circuit may occur in wheel speed sensor wire harness as the suspension system moves up and down. Therefore, a actual vehicle driving test must be carried out when checking sensor wire harness.
2	When excessive electrical load may be the main cause	Turn on all electrical switches, including headlights and wipers, so as to make the power supply of vehicle work under high load.	/

HINT:
If problem does not occur again at this time, perform diagnosis and repair only when the next time the problem occurs. Generally, intermittent problem will gradually evolve into reproducible problem, which will not disappear by itself.

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 Diagnosis Procedure

HINT:
Use following procedures to troubleshoot the system.

1	**Vehicle brought to workshop**

NEXT

2	**Customer problem analysis**

NEXT

3	**Read DTCs**

No DTC → **Go to step 6**

DTC occurs

4	**Record DTCs and then clear them**

NEXT

5	Confirm and duplicate malfunction: Accelerate vehicle to 40 km/h, simulate malfunction conditions and read DTCs again

No DTC → Go to step 8

DTC occurs → Go to step 7

6	Problem repair (no DTC), then go to step 9

NEXT

7	Troubleshoot according to Diagnostic Trouble Code (DTC) chart, then go to step 9

NEXT

8	Troubleshoot according to Diagnostic Trouble Code (DTC) chart, then go to step 9

NEXT

9	Confirm malfunction has been repaired, and perform repair completion inspection

NEXT

10	Prevent malfunction from recurring

NEXT

11	Conduct test and confirm malfunction has been repaired

NEXT → End

■ **Problem repair (no DTC)**

If there is a problem in brake system, but no DTC is stored in ESP, this problem is called a problem without DTC. A problem without DTC is caused by basic brake system malfunction. For example:

- Brake fluid leakage (it may result in weak braking, brake pedal over-travel or even ineffective braking).
- Using inferior brake fluid (it can result in corrosion of brake line and ESP hydraulic regulating module internal elements, or even ineffective braking).
- Air in brake line (it may result in weak braking or even ineffective braking).
- Brake line blockage (it may result in hard braking, braking deviation or even ineffective braking).
- Excessive wear of brake disc (it may result in weak braking, brake pedal over-travel).
- Brake booster malfunction (it may result in weak or hard braking, brake pedal over-travel or even ineffective braking).
- Incorrect brake line connection (it may result in ABS/ESP performance decreasing, drift, long braking distance etc. For the correct installation method, please refer to the marks near oil hole on ESP hydraulic regulating module: MC1 represents No. 1 master cylinder oil pipe; MC2 represents No. 2 master cylinder

oil pipe; FL represents front left wheel cylinder oil pipe; FR represents front right wheel cylinder oil pipe; RL represents rear left wheel cylinder oil pipe; RR represents rear right wheel cylinder oil pipe).

⚠ Caution

- **No power supply to ESP or abnormally interrupted power supply will cause brake warning light, ABS warning light and ESP multi-functional warning light remaining on without storing any DTC.**

Hint:
Troubleshooting recommendation: Check corresponding components according to problem symptom, and troubleshoot by following the vehicle repair manual.

4.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0001-04	Valve Fault-USV1 (-Pilot Valve 1)	1. Current through valve coil is more than 4 - 6.5 A. 2. Measured valve resistance is out of range. 3. Leaked current through the valve is more than 0.1 A. 4. Valve is overheated. 5. General problem occurs in valve driver/hardware.	1. Valve is overheated. 2. General problem occurs in valve driver/hardware.	Wait for 120 seconds, and perform the following operations: a. Turn the ignition switch to ON and then to OFF; b. Clear DTC service. C. Perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds. If DTC still exists, please replace ABS/ESP (-iEPB) hardware.
C0002-04	Valve Fault-USV2 (-Pilot Valve 2)			
C0003-04	Valve Fault-HSV1 (-High Pressure Valve 1)	1. Current through valve coil is more than 5 - 8 A. 2. Measured valve resistance is out of range. 3. Leaked current through the valve is more than 0.1 A. 4. Valve is overheated. 5. General problem occurs in valve driver/hardware.		
C0004-04	Valve Fault-HSV2 (-High Pressure Valve 2)			
C0010-04	Valve Fault-Front Left Inlet Valve	1. Current through valve coil is more than 4 - 6.5 A. 2. Measured valve resistance is out of range. 3. Leaked current through the valve is more than 0.1 A. 4. Valve is overheated. 5. General problem occurs in valve driver/hardware.		
C0011-04	Front Valve-Front Left Outlet Valve			
C0014-04	Valve Fault-Front Right Inlet Valve			
C0015-04	Valve Fault-Front Right Outlet Valve			
C0018-04	Valve Fault-Rear Left Inlet Valve			
C0019-04	Front Valve-Rear Left Outlet Valve			
C001C-04	Valve Fault-Rear Right Inlet Valve			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C001D-04	Valve Fault-Rear Right Outlet Valve			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C002001	Return Pump Power Supply Motor Relay Fault	1. Power supply voltage of motor relay connector is lower than the specified threshold; 2. Fuse of motor relay power supply circuit is damaged.	1. Intermittent fault; 2. Internal module fault.	1. Check power supply circuit of return pump motor. 2. Perform the following operations: a. Turn the ignition switch to ON; b. Clear DTCs; c. Perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds.
C002004	Return Pump Fault	1. Motor relay fault is detected; 2. Open or short occurs in the complete UMGen measurement path; 3. Open, short or defective component exists in the follow current path; 4. Motor relay overload is detected; 5. Motor is disconnected.	Pump motor hardware fault	1. Turn the ignition switch to ON and then to OFF; 2. Clear DTC. 3. Perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds. If DTC still exists, please replace ABS/ESP (iEPB) hardware.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0031-00	Wheel-speed Sensor, Front Left-General Fault	• If sensor power supply circuit voltage or ECU power supply circuit voltage when ECU starts is lower than the specified threshold (8.3V), the problem will be set • Sensor is connected incorrectly or installed in the wrong direction • The problem occurs when the sensor is shorted to another sensor	• Wheel speed sensor failure • Sensor is connected incorrectly or installed in the wrong direction • The sensor is shorted to another sensor	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C0031-09	Front Left Wheel Speed Sensor Component Fault	1. If incorrect type of sensor is installed according to the sensor protocol, the problem will be set. 2. Lack of stop pulse.	• Wheel speed sensor fault • Sensor is connected incorrectly or installed in the wrong direction	1. Check for incorrect clearance between rotating wheel and sensor. 2. Check if incorrect type of wheel speed sensor is installed. 3. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C0031-11	Front Left Wheel Speed Sensor Power Supply Circuit Short to Ground	Short to GND or open in sensor circuit (sensor or power supply circuit)	Circuit fault	1. Check sensor circuit or power supply circuit; 2. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C0031-12	Front Left Wheel Speed Sensor Signal Circuit Short to Power Supply	Short to UBATT in signal/power supply circuit		
C0031-13	Front Left Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open	1. Signal circuit is shorted to GND or circuit is open.		
C0031-29	Front Left Wheel Speed Sensor Signal Failure (Out of Range, Lost, Interfered or Discontinuous)	1. Unreasonable high frequency is received. 2. It is suspected that the wheel speed sensor is faulty. 3. Use the normal filtration time to monitor the interference and	1. Wheel speed sensor is faulty. 2. Interference and signal interference occurs. 3. Circuit is faulty. 4. It is not fixed firmly. 5. Fall off from bracket. 6. Teeth is worn or	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		signal interference of one or two wheels, and monitor three or more wheels in a short filtration time. 4. Circuit is open. 5. Short to UZ in circuit. 6. Short to GND in circuit. 7. Connector is in poor contact. 8. It is not fixed firmly. 9. Fall off from bracket. 10. Teeth is worn or missing. 11. Input amplifier in ECU is faulty.	missing. 7. Input amplifier in ECU is faulty.	DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C0031-37	Front Left Wheel Speed Sensor Signal Out of Range	1. If the maximum wheel speed is reached. 2. If wheel speed is higher than the specified threshold, the problem will be set. 3. If incorrect type of sensor is installed. 4. WSS signal is subject to electrical or mechanical interference. 5. WSS sensor is defective.		1. Check and eliminate any electrical or mechanical interference to the sensor. 2. Make sure to use the correct type of sensor. 3. Check if wheel speed sensor is installed at the correct position. 4. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds.
C003208	Front Left Wheel Speed Sensor: Wrong Direction	1. At least one wheel speed sensor is installed in the wrong direction. 2. At least one incorrect wheel speed sensor is installed. 3. At least one wheel speed sensor is connected incorrectly.	1. Wheel speed sensor is installed incorrectly. 2. Wheel speed sensor is not correct.	1. Make sure to use the correct type of WSS. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON, clear DTC, perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0034-00	Wheel-speed Sensor, Front Right-General Fault	• If sensor power supply circuit voltage or ECU power supply circuit voltage when ECU starts is lower than the specified threshold (8.3V), the problem will be set • Sensor is connected incorrectly or installed in the wrong direction • The problem occurs when the sensor is shorted to another sensor	• Wheel speed sensor failure • Sensor is connected incorrectly or installed in the wrong direction • The sensor is shorted to another sensor	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C0034-09	Front Right Wheel Speed Sensor Component Fault	1. If incorrect type of sensor is installed according to the sensor protocol, the problem will be set. 2. Lack of stop pulse.	• Wheel speed sensor fault • Sensor is connected incorrectly or installed in the wrong direction	1. Check for incorrect clearance between rotating wheel and sensor. 2. Check if incorrect type of wheel speed sensor is installed. 3. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C0034-11	Front Right Wheel Speed Sensor Power Supply Circuit Short to Ground	Short to GND or open in sensor circuit (sensor or power supply circuit)	Circuit fault	1. Check sensor circuit or power supply circuit; 2. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C0034-12	Front Right Wheel Speed Sensor Signal Circuit Short to Power Supply	Short to UBATT in signal/power supply circuit		
C0034-13	Front Right Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open	Signal circuit is shorted to GND or circuit is open		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0034-29	Front Right Wheel Speed Sensor: Signal Failure (Out of Range, Lost, Interfered or Discontinuous)	1. Unreasonable high frequency is received. 2. It is suspected that the wheel speed sensor is faulty. 3. Use the normal filtration time to monitor the interference and signal interference of one or two wheels, and monitor three or more wheels in a short filtration time. 4. Circuit is open. 5. Short to UZ in circuit. 6. Short to GND in circuit. 7. Connector is in poor contact. 8. It is not fixed firmly. 9. Fall off from bracket. 10. Teeth is worn or missing. 11. Input amplifier in ECU is faulty.	1. Wheel speed sensor is faulty. 2. Interference and signal interference occurs. 3. Circuit is faulty. 4. It is not fixed firmly. 5. Fall off from bracket. 6. Teeth is worn or missing. 7. Input amplifier in ECU is faulty.	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C0034-37	Front Right Wheel Speed Sensor Signal Out of Range	1. If the maximum wheel speed is reached. 2. If wheel speed is higher than the specified threshold, the problem will be set. 3. If incorrect type of sensor is installed. 4. WSS signal is subject to electrical or mechanical interference. 5. WSS sensor is defective.		1. Check and eliminate any electrical or mechanical interference to the sensor. 2. Make sure to use the correct type of sensor. 3. Check if wheel speed sensor is installed at the correct position. 4. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds.
C003508	Front Right Wheel Speed Sensor: Wrong Direction	1. At least one wheel speed sensor is installed in the wrong direction. 2. At least one incorrect wheel speed sensor is installed. 3. At least one wheel speed sensor is connected incorrectly.	1. Wheel speed sensor is installed incorrectly. 2. Wheel speed sensor is not correct.	1. Make sure to use the correct type of WSS. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON, clear DTCs, perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0037-00	Wheel-speed Sensor, Rear Left-General Fault	• If sensor power supply circuit voltage or ECU power supply circuit voltage when ECU starts is lower than the specified threshold (8.3V), the problem will be set • Sensor is connected incorrectly or installed in the wrong direction • The problem occurs when the sensor is shorted to another sensor	• Wheel speed sensor failure • Sensor is connected incorrectly or installed in the wrong direction • The sensor is shorted to another sensor	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C0037-09	Rear Left Wheel Speed Sensor Component Fault	• If incorrect type of sensor is installed according to the sensor protocol, the problem will be set • Lack of stop pulse	• Wheel speed sensor fault • Sensor is connected incorrectly or installed in the wrong direction	1. Check for incorrect clearance between rotating wheel and sensor. 2. Check if incorrect type of wheel speed sensor is installed. 3. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C0037-11	Rear Left Wheel Speed Sensor Power Supply Circuit Short to Ground	Short to GND or open in sensor circuit (sensor or power supply circuit)	Circuit fault	1. Check sensor circuit or power supply circuit; 2. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C0037-12	Rear Left Wheel Speed Sensor Signal Circuit Short to Power Supply	Short to UBATT in signal/power supply circuit		
C0037-13	Rear Left Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open	Signal circuit is shorted to GND or circuit is open		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0037-29	Rear Left Wheel Speed Sensor: Signal Failure (Out of Range, Lost, Interfered or Discontinuous)	1. Unreasonable high frequency is received. 2. It is suspected that the wheel speed sensor is faulty. 3. Use the normal filtration time to monitor the interference and signal interference of one or two wheels, and monitor three or more wheels in a short filtration time. 4. Circuit is open. 5. Short to UZ in circuit. 6. Short to GND in circuit. 7. Connector is in poor contact. 8. It is not fixed firmly. 9. Fall off from bracket. 10. Teeth is worn or missing. 11. Input amplifier in ECU is faulty.	1. Wheel speed sensor is faulty. 2. Interference and signal interference occurs. 3. Circuit is faulty. 4. It is not fixed firmly. 5. Fall off from bracket. 6. Teeth is worn or missing. 7. Input amplifier in ECU is faulty.	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C0037-37	Rear Left Wheel Speed Sensor Wheel Speed Signal Out of Range	1. If the maximum wheel speed is reached. 2. If wheel speed is higher than the specified threshold, the problem will be set. 3. If incorrect type of sensor is installed. 4. WSS signal is subject to electrical or mechanical interference. 5. WSS sensor is defective.		1. Check and eliminate any electrical or mechanical interference to the sensor. 2. Make sure to use the correct type of sensor. 3. Check if wheel speed sensor is installed at the correct position. 4. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds.
C003808	Rear Left Wheel Speed Sensor: Wrong Direction	1. At least one wheel speed sensor is installed in the wrong direction. 2. At least one incorrect wheel speed sensor is installed. 3. At least one wheel speed sensor is connected incorrectly.	1. Wheel speed sensor is installed incorrectly. 2. Wheel speed sensor is not correct.	1. Make sure to use the correct type of WSS. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON, clear DTCs, perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C003A-00	Wheel-speed Sensor, Rear Right-General Fault	• If sensor power supply circuit voltage or ECU power supply circuit voltage when ECU starts is lower than the specified threshold, the problem will be set to less than 8.3 V • Sensor is connected incorrectly or installed in the wrong direction • The problem occurs when the sensor is shorted to another sensor	• Wheel speed sensor failure • Sensor is connected incorrectly or installed in the wrong direction • The sensor is shorted to another sensor	1. Make sure to use the correct type of sensor. 2. Check if wheel speed sensor is installed at the correct position. 3. Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/problem is not resolved, please replace wheel speed sensor.
C003A-09	Rear Right Wheel Speed Sensor Component Fault	• If incorrect type of sensor is installed according to the sensor protocol, the problem will be set • Lack of stop pulse	• Wheel speed sensor fault • Sensor is connected incorrectly or installed in the wrong direction	1. Check for incorrect clearance between rotating wheel and sensor. 2. Check if incorrect type of wheel speed sensor is installed. 3. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C003A-11	Rear Right Wheel Speed Sensor Power Supply Circuit Short to Ground	Short to GND or open in sensor circuit (sensor or power supply circuit)	Circuit fault	1. Check sensor circuit or power supply circuit; 2. If DTC still exists/ problem is not resolved, please replace wheel speed sensor.
C003A-12	Rear Right Wheel Speed Sensor Signal Circuit Short to Power Supply	Short to UBATT in signal/power supply circuit		
C003A-13	Rear Right Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open	Signal circuit is shorted to GND or circuit is open		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C003A-29	Rear Right Wheel Speed Sensor: Signal Failure (Out of Range, Lost, Interfered or Discontinuous)	1. Unreasonable high frequency is received. 2. It is suspected that the wheel speed sensor is faulty. 3. Use the normal filtration time to monitor the interference and signal interference of one or two wheels, and monitor three or more wheels in a short filtration time. 4. Circuit is open. 5. Short to UZ in circuit. 6. Short to GND in circuit. 7. Connector is in poor contact. 8. It is not fixed firmly. 9. Fall off from bracket. 10. Teeth is worn or missing. 11. Input amplifier in ECU is faulty.	• Wheel speed sensor is faulty. • Interference and signal interference occurs. • Circuit is faulty. • It is not fixed firmly. • Fall off from bracket. • Teeth is worn or missing. • Input amplifier in ECU is faulty.	• Make sure to use the correct type of sensor • Check if wheel speed sensor is installed at the correct position • Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds, if DTC still exists/ problem is not resolved, please replace wheel speed sensor
C003A-37	Rear Right Wheel Speed Sensor Wheel Speed Signal Out of Range	1. If the maximum wheel speed is reached. 2. If wheel speed is higher than the specified threshold, the problem will be set. 3. If incorrect type of sensor is installed. 4. WSS signal is subject to electrical or mechanical interference. 5. WSS sensor is defective.		• Check and eliminate any electrical or mechanical interference to the sensor • Make sure to use the correct type of sensor • Check if wheel speed sensor is installed at the correct position • Turn the ignition switch to ON and then to OFF, clear DTC, wait for 10 seconds, and then drive at 50 kph for 30 seconds

C003B08	Rear Right Wheel Speed Sensor: Wrong Direction	1. At least one wheel speed sensor is installed in the wrong direction. 2. At least one incorrect wheel speed sensor is installed. 3. At least one wheel speed sensor is connected incorrectly.	• Wheel speed sensor is installed incorrectly • Wheel speed sensor is not correct	• Make sure to use the correct type of WSS • Check if wheel speed sensor is installed at the correct position • Turn the ignition switch to ON, clear DTCs, perform ECU reset service and wait for 10 seconds, then drive vehicle at 50 kph for 30 seconds

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C004064	Brake Switch Malfunction: Unreliable	1. There is a mechanical defect in BLS. 2. BLS is adjusted incorrectly. 3. BLS is installed incorrectly.	Brake switch is faulty.	Replace BLS switch properly. Perform the following operations: 1. Turn the ignition switch to ON and then to OFF. 2. Clear DTC. 3. Perform ECU reset service.
C004401	Pressure Sensor Fault (Circuit)	1. Open or short to ground in pressure signal circuit or open in sensor power supply; 2. Short to sensor ground or open in pressure signal circuit.	Sensor circuit fault	1. Check for ground to sensor signal circuit. 2. Otherwise, sensor signal circuit is disconnected/ open.
C004428	Pressure Sensor Fault (Signal)	1. Pressure sensor of brake master cylinder has mechanical or electrical defects. 2. Contact resistance in pressure sensor circuit. 3. Open in test pulse signal circuit.	• Intermittent fault • Internal module fault	1. Drive vehicle for a period of time and apply brake for more than 5 seconds during this period. 2. Replace the ABS/ ESP (iEPB) hardware.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0051-29	Steering Wheel Position Sensor Signal Invalid	Steering wheel angle sensor signal invalid (ESP only)	• Angle sensor is not calibrated • Angle sensor circuit is short or open • Angle sensor is damaged	• Calibrate the angle sensor. • Check for short or open in angle sensor circuit. • Replace the angle sensor.
C0051-54	Steering Angle Sensor Calibration Failure	Steering wheel angle sensor uncalibrated (ESP only)	Angle sensor is not calibrated	Recalibrate the angle sensor.
C0051-64	Steering Angle Sensor Fault (Signal)	1. Yaw rate is more than 10 (deg/s * m/s). 2. After the effective long-term compensation, if offset exceeds the limit, problem will be set immediately. 3. SAS scope is monitored. 4. SAS slope is monitored. 5. Perform comparison between SAS authenticity and yaw rate. 6. When vehicle speed is higher than 20 m/s, compare the measured yaw rate with the model yaw rate calculated based on steering angle. 7. Compare the measured yaw rate calculated based on steering angle with the yaw rate calculated based on wheel speed sensors of two axles. It is determined as a fault.	1. Yaw rate sensor is installed incorrectly. 2. Yaw rate sensor is faulty. 3. Yaw rate sensor is not calibrated.	1. Check the installation of SAS sensor. 2. Check if steering mechanism is installed incorrectly. 3. Check if SAS sensor is faulty. 4. Ensure that steering angle sensor calibration is successfully completed and drive vehicle smoothly at a speed of 60 kph for 30 seconds in left and right curves. After troubleshooting, clear DTCs immediately.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0061-29	Lateral Acceleration Sensor: Invalid Value	1. If the absolute value of lateral acceleration is greater than 20 m/s2. 2. The lateral acceleration sensor signal and yaw rate signal or SAS signal are unreasonable.	1. Inertial sensor is not installed correctly or not aligned. 2. Inertial sensor is not calibrated.	1. Check if inertial sensor is installed incorrectly or not aligned. 2. Check the inertial sensor calibration.
C0061-64	Lateral Acceleration Sensor: Signal Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C0062-29	Longitudinal Acceleration Sensor: Invalid Value	1. Compare longitudinal acceleration with acceleration value calculated based on the vehicle speed, and sensor value exceeds the limit of 20 m/s2. 2. Uncertainty fault occurs in longitudinal acceleration sensor.		
C0062-64	Longitudinal Acceleration Sensor: Signal Error			
C0063-29	Yaw Rate Sensor: Invalid Value	1. If Yrs deviation exceeds 5.25 deg/s. 2. When vehicle is stationary, the absolute value of yaw rate sensor signal exceeds 30 deg/s. 3. The absolute value of yaw rate sensor (YRS) signal is more than 180 94.75 deg/s. 4. Unreasonable inputs of yaw rate and other sensors (WSS, SAS, Ay) are measured. 5. Initial value for YawRate (- detection time is 100 ms). 6. Redundant error of lateral acceleration sensor is detected (- minimum detection time is 20 ms).		
C0063-64	Yaw Rate Sensor: Signal Error			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C008904	Switch Fault (ESC OFF Switch or AVH Switch Long Pressed)	The pressing time for AVH/PATA button exceeds the specified time	• Switch is pressed and held for a long time • Switch is stuck	Make sure button is not pressed for a long time

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C006B00	ABS/ESP Unreasonable Control (Control Time Too Long, Etc.)	ABS/ESP unreasonable control time exceeds the specified time	• Number of teeth is wrong • Sensor failure • Vehicle is in an abnormal condition, such as the incorrect operation of brake components, suspension or sensor	• Check if WSS sensor operates normally. • Check if inertial sensor and steering sensor operate normally.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C2200-16	ECU Voltage Supply Too Low	The power supply voltage of ECU is lower than 9.6 V for 1 second	• Power supply fault • Circuit fault	• Check fuse • Check battery voltage • Check charging system • Check wire harness or connector • Inspect ESP control module assembly
C2200-17	ECU Voltage Supply Too High	The power supply of ECU is higher than 16.5 V for 1 second		
C2201-04	ECU Fault (General Software Problem)	Incorrect software configuration occurs	Internal fault in ECU system	Replace ECU SW
C220249	CAN Hardware Fault	Hardware is damaged or switched	Hardware fault	Replace ECU module
C220304	Valve Relay Fault	1. If a short to ground in ASIC is set, a fault will be set. 2. The electrical resistivity of valve path supply line is higher than the specified threshold. 3. The valve relay cannot be closed. 4. The valve relay cannot be opened.	• Intermittent fault • Hardware fault	Perform the following operations: a. Turn the ignition switch to ON; b. Clear DTC; c. Perform ECU reset service and wait for 10 seconds. If DTC still exists, please replace ABS/ESP (-iEPB) hardware.
C220400	General Valve Fault (Overheat Protection, Signal Invalid, Hardware Fault)	1. If the leaked current is higher than the specified threshold, a fault will be set. 2. If the valve relay cannot be closed by the redundant safety switch, a fault will be set. 3. If the internal	• System overheat protection • Signal invalid • Hardware fault	1. Wait for 120 seconds to 300 seconds to cool valve and pump motor. Check if DTC has been restored. 2. Perform the following operations: a. Turn the ignition switch to ON; b.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		current source of driver ASIC used for valve coil resistance measurement is not equal to the required source current, a fault will be set.		Clear DTC (SID14h). c. Perform ECU reset service (SID 11h) and wait for 10 seconds. 3. If DTC still exists, please replace ABS/ESP (-iEPB) hardware.
C220800	Wheel Speed Sensor General Fault (Interchanged Sensor Installation, Multiple Sensor Error)	1. At least one wheel speed sensor is installed in the wrong direction. 2. At least one incorrect wheel speed sensor is installed. 3. At least one wheel speed sensor is connected incorrectly.	• Position installation error • Circuit fault	1. Check if current wheel speed sensor configuration is correct. 2. Check if WSS power supply circuit is undervoltage.
C2209-00	ECU Fault (-Hardware, Microcontroller Error)	1. uC fault is reported by an incorrect signal module. 2. CPU is abnormal and normal program flow stops. 3. Microcontroller RAM is faulty. 4. Internal system stack or timing error occurs. 5. SPI fault, EEPROM error and ECU ADC conversion fault occur. 6. Lack of charge pump buffer capacitor or charge pump performance. 7 Open or short occurs in the complete UMGen measurement path. 8.Open, short or defective component exists in the follow current path. 9. Motor relay or gate driver is defective/ overloaded. 10. Fuse is damaged or power supply wire is missing. 11. ASIC internal fault occurs in the load dump detection logic part.	• Intermittent fault • ECU hardware fault	Turn the ignition switch to OFF and then to ON, wait for 5 to 20 seconds, then perform the following operations: 1. Turn the ignition switch to ON and then to OFF; 2. Clear DTC. 3. Perform ECU reset service and wait for 10 seconds, if DTC still exists, please replace ABS/ESP (-iEPB) hardware.

■ **TCS control channel changeover valve fault**

Description

DTC	DTC Definition
C0001-04	Valve Fault-USV1 (Pilot Valve 1)
C0002-04	Valve Fault-USV2 (Pilot Valve 2)
C0003-04	Valve Fault-HSV1 (High Pressure Valve 1)
C0004-04	Valve Fault-HSV2 (High Pressure Valve 2)
C0010-04	Valve Fault-Front Left Inlet Valve
C0011-04	Front Valve-Front Left Outlet Valve
C0014-04	Valve Fault-Front Right Inlet Valve
C0015-04	Valve Fault-Front Right Outlet Valve
C0018-04	Valve Fault-Rear Left Inlet Valve
C0019-04	Front Valve-Rear Left Outlet Valve
C001C-04	Valve Fault-Rear Right Inlet Valve
C001D-04	Valve Fault-Rear Right Outlet Valve

1	**Check intermittent fault**

(a) Wait for 120 seconds, turn the ignition switch to ON and then to OFF.
(b) Clear DTC again.

OK → **Drive vehicle at 50 kph for 30 seconds, if DTC still exists, please replace ABS/ESP (iEPB) hardware**

NG

2	**Check fuse**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove fuse SB01 (40A) and SB02 (40A) from engine compartment fuse box.
(d) Check if fuse is blown.

NG → **Check and repair or replace corresponding fuse**

OK

3	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect the ESP module assembly connector B-047.

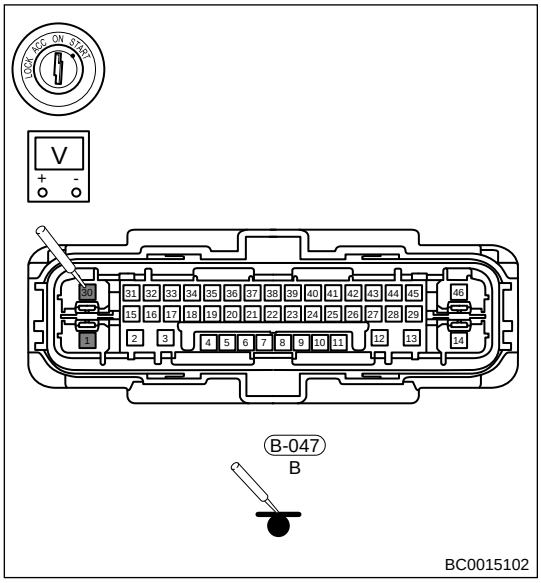
(d) Check if related wire harnesses are worn, pinched or broken.

(e) Check if related connector terminals are loose, broken, bent or corrosive.

(f) Using a digital multimeter, measure if voltage between ESP module assembly connector B-047 (1, 30) and body ground is normal according to table below.

Standard Voltage

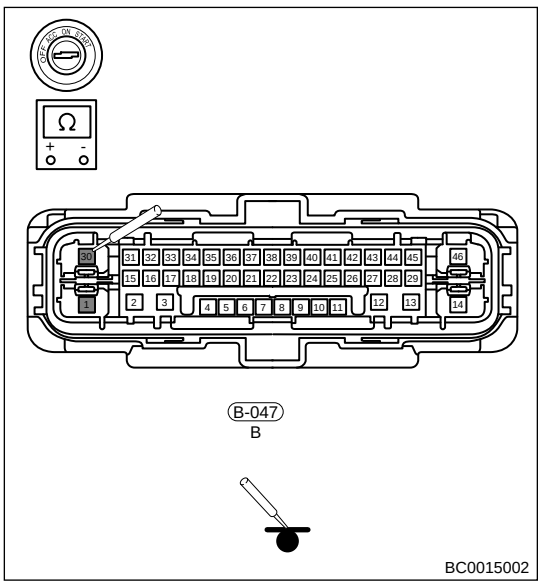
Multimeter Connection	Condition	Specified Condition
B-047 (1, 30) - Body ground	Always	⩾ 12 V



(g) Using a digital multimeter, check for normal continuity between ESP module assembly connector B-047 (1, 30) and body ground according to table below.

Normal Resistance

Multimeter Connection	Condition	Specified Condition
B-047 (1) - Body ground	Always	∞
B-047 (30) - Body ground	Always	∞



NG → **Check and repair wire harness or connector**

OK

4	Check control module ESP (iEPB)

(a) After replacement, it is necessary to perform configuration.

OK → **System is normal and there is no fault**

NG → **Check and repair or replace controller ESP (-iEPB) assembly**

■ **Return pump fault**

Description

DTC	DTC Definition
C002004	Return Pump Fault
C002001	Return Pump Power Supply Motor Relay Fault

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check for DTCs

(a) Leave vehicle for 5 minutes to make it cool down, clear and read ESP (iEPB) control module assembly DTC again with diagnostic tester.
(b) Refer to "DTC confirmation procedure".
(c) Check if the same DTC are still output.

NG → **Problem indicated by DTC is intermittent (- system overheat protection)**

OK ↓

2	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove MF04 (175A) from main fuse box.
(d) Check if fuse is blown.

NG → **Replace fuse MF04**

OK ↓

3	Check wire harness and connector

Use circuit diagram as a guide to perform following procedures:
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP(iEPB) control module connector B-047.
(d) Check wire harness between terminal A10 of main fuse box connector B-039 and terminal 1 of ESP (iEPB) control module assembly.
(e) Check if wire harnesses are worn, pierced, pinched or partially broken.
(f) Check for broken, bent, protruded or corroded terminals.
(g) Using a multimeter, check for continuity in wiring harness between main fuse box A10 and ESP (iEPB) controller.

NG → **Repair or replace body wire harness and connector**

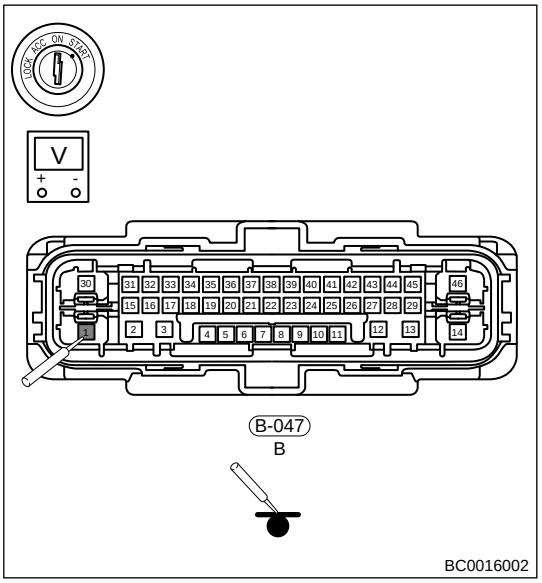
OK ↓

4	Check power supply circuit of ESP (iEPB) control module

(a) Connect the negative battery cable.
(b) Turn ENGINE START STOP switch to OFF.
(c) Disconnect the ESP (iEPB) control module connector B-047.
(d) Turn ENGINE START STOP switch to ON.

(e) Using a digital multimeter, measure voltage between terminal 1 of ESP (iEPB) control module assembly and body ground to check if power supply circuit of system is normal according to table below.

Multimeter Connection	Conditi-on	Specified Condition
B-047 (1) - Body ground (digital multimeter)	Always	Not less than 12 V
B-047 (1) - Body ground (test light 21 W)	Always	On



NG → **Repair or replace body wire harness and connector**

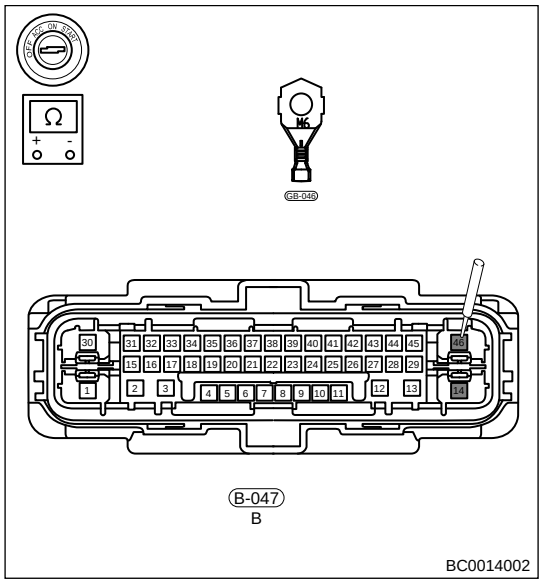
OK →

5	Check ground circuit of ESP (iEPB) control module

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module connector B-047.

(d) Using a digital multimeter, check for continuity between terminals 14, 46 of ESP (iEPB) control module assembly and body ground to check if ground circuit of system is normal.

Multimeter Connection	Conditi-on	Specified Condition
B-047 (14) - Body ground	Always	⩽ 1 Ω
B-047 (46) - Body ground	Always	⩽ 1 Ω



NG → **Repair or replace body wire harness and connector**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.

(d) Check if the same DTCs are still output.

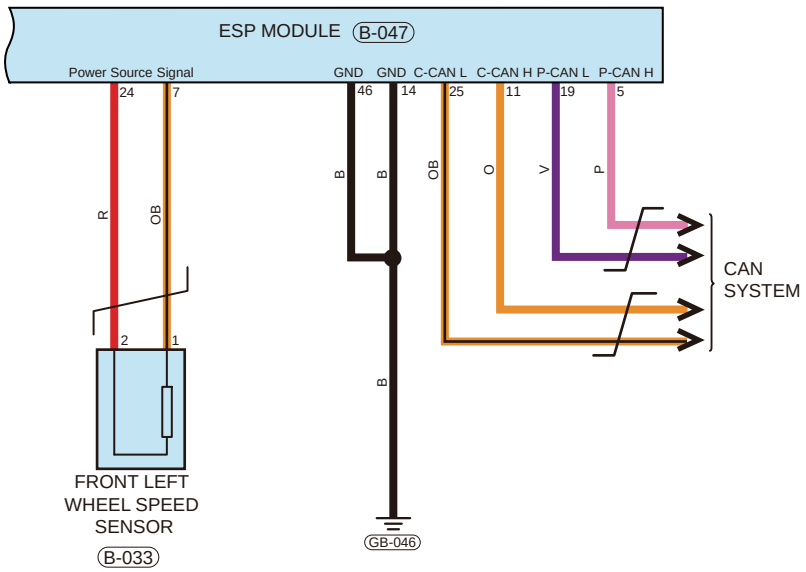
OK	System operates normally
NG	Replace ESP (iEPB) control module assembly

■ **Front left wheel speed sensor fault**

Description

DTC	DTC Definition
C0031-00	Wheel-speed Sensor, Front Left-General Fault
C0031-09	Front Left Wheel Speed Sensor Component Fault
C0031-11	Front Left Wheel Speed Sensor Power Supply Circuit Short to Ground
C0031-12	Front Left Wheel Speed Sensor Signal Circuit Short to Power Supply
C0031-13	Front Left Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open
C0031-29	Front Left Wheel Speed Sensor Signal Failure (Out of Range, Lost, Interfered or Discontinuous)
C0031-37	Front Left Wheel Speed Sensor Signal Out of Range
C0032-08	Front Left Wheel Speed Sensor: Wrong Direction

Circuit diagram



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⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check front left wheel speed sensor wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the front left wheel speed sensor connector B-033.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.

NG → **Repair or replace front left wheel speed sensor wire harness and connector**

OK

2	Check installation of front left wheel speed sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check front left wheel speed sensor mounting bolt for looseness.
(d) Check if mounting clearance between front left wheel speed sensor and front left hub bearing is too large or too small.
(e) Check installation position of front left wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace front left wheel speed sensor**

OK ↓

3	Check front left wheel speed sensor

(a) Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
(b) Drive vehicle straight ahead, and read datastream of front left wheel speed sensor with diagnostic tester.
(c) Check if data change of front left wheel speed sensor matches that of other wheel speed sensors, and if it is correct.

NG → **Replace front left wheel speed sensor**

OK ↓

4	Check front left hub bearing

(a) Check front left hub bearing for excessive clearance.
(b) Check front left hub bearing magnetic strip for foreign matter, defect or damage.

NG → **Replace front left hub bearing**

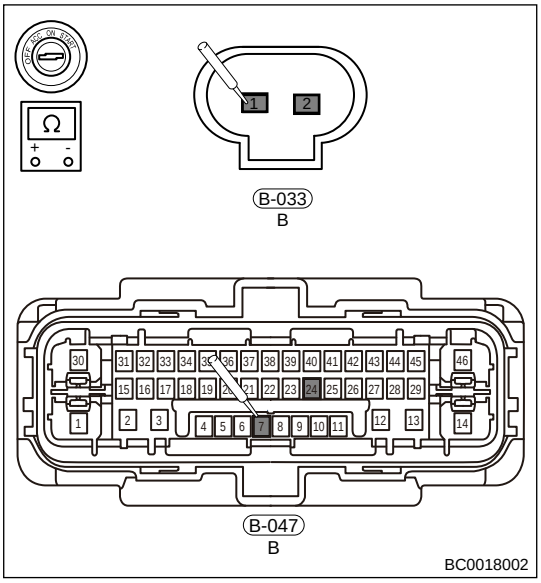
OK ↓

5	Check wire harness and connector (front left wheel speed sensor - ESP (iEPB) control module)

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module connector B-047.
(d) Disconnect the front left wheel speed sensor connector B-033.

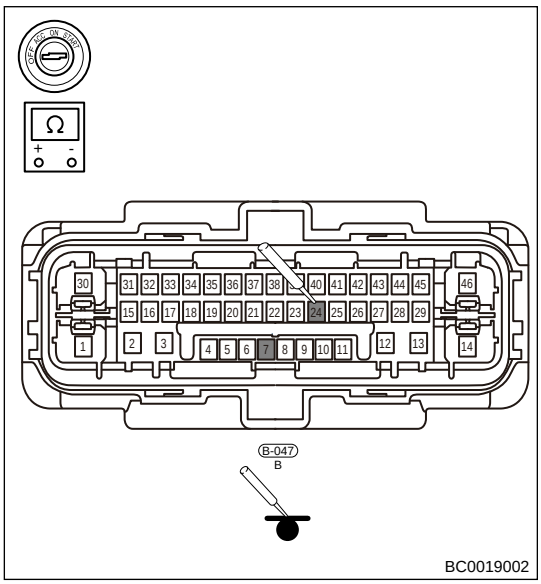
(e) Using a digital multimeter, check for continuity between terminals of connector B-047 and connector B-033 to check if there is an open in the wire harness and connector according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (7) - B-033 (1)	Always	⩽ 1 Ω
B-047 (24) - B-033 (2)	Always	⩽ 1 Ω
B-047 (7) - B-033 (2)	Always	∞
B-047 (24) - B-033 (1)	Always	∞



(f) Using a digital multimeter, check for continuity between connector B-047 and body ground to check if front left wheel speed sensor is short to ground.

Multimeter Connection	Condition	Specified Condition
B-047 (7) - Body ground	Always	∞
B-047 (24) - Body ground	Always	∞

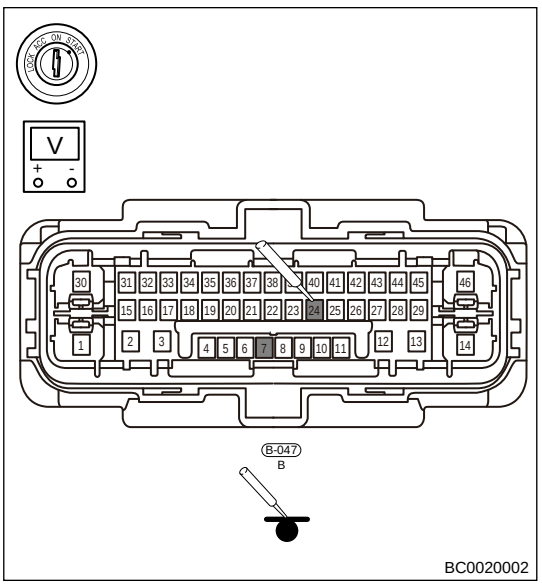


(g) Connect the negative battery terminal cable.

(h) Turn ENGINE START STOP switch to ON.

(i) Using voltage band of digital multimeter, measure voltage between connector B-047 and body ground to check if front left wheel speed sensor is short to power supply according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (7) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-047 (24) - Body ground	ENGINE START STOP switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between front left wheel speed sensor and ESP (iEPB) control module assembly**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.

(d) Check if the same DTCs are still output.

OK → **System operates normally**

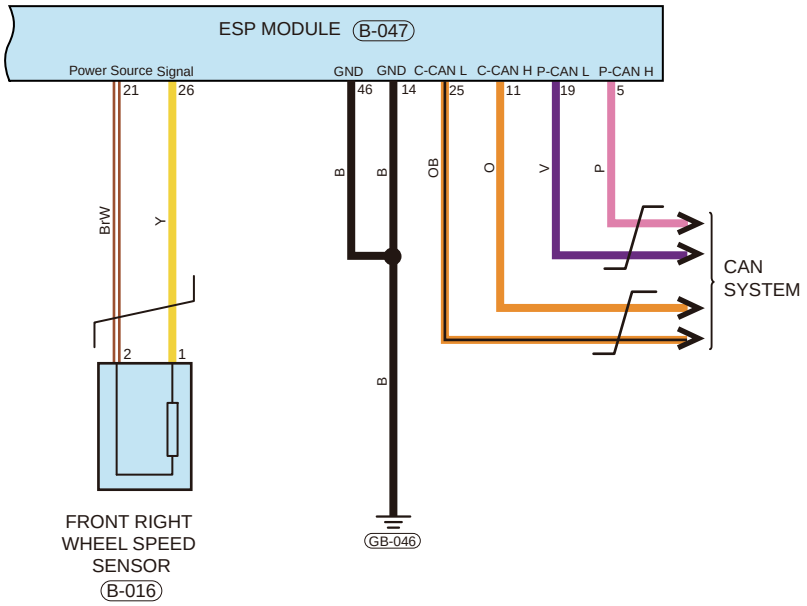
NG → **Replace ESP (iEPB) control module assembly**

■ **Front right wheel speed sensor fault**

Description

DTC	DTC Definition
C0034-00	Wheel-speed Sensor, Front Right-General Fault
C0034-09	Front Right Wheel Speed Sensor Component Fault
C0034-11	Front Right Wheel Speed Sensor Power Supply Circuit Short to Ground
C0034-12	Front Right Wheel Speed Sensor Signal Circuit Short to Power Supply
C0034-13	Front Right Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open
C0034-29	Front Right Wheel Speed Sensor Signal Failure (Out of Range, Lost, Interfered or Discontinuous)
C0034-37	Front Right Wheel Speed Sensor Signal Out of Range
C0035-08	Front Right Wheel Speed Sensor: Wrong Direction

Circuit diagram



BC0006001

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check front right wheel speed sensor wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the front right wheel speed sensor connector B-016.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.

NG → **Repair or replace front right wheel speed sensor wire harness and connector**

OK

2	Check installation of front right wheel speed sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check front right wheel speed sensor mounting bolt for looseness.
(d) Check if mounting clearance between front right wheel speed sensor and front right hub bearing is too large or too small.
(e) Check installation position of front right wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace front right wheel speed sensor**

OK

3	Check front right wheel speed sensor

(a) Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
(b) Drive vehicle straight ahead, and read datastream of front right wheel speed sensor with diagnostic tester.
(c) Check if data change of front right wheel speed sensor matches that of other wheel speed sensors, and if it is correct.

NG → **Replace front right wheel speed sensor**

OK

4	Check front right hub bearing

(a) Check front right hub bearing for excessive clearance.
(b) Check front right hub bearing magnetic strip for foreign matter, defect or damage.

NG → **Replace front right hub bearing**

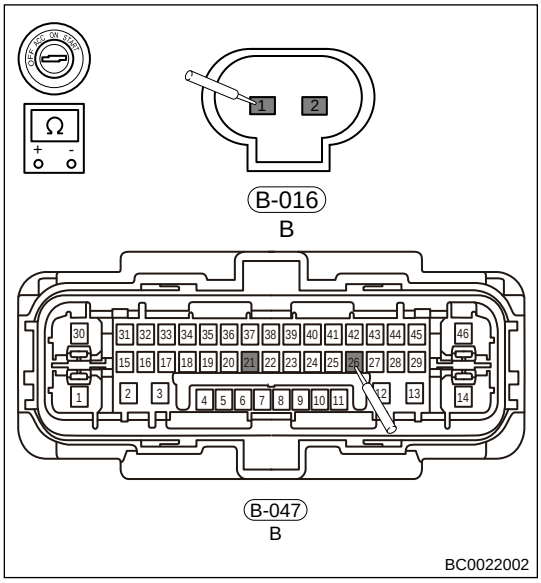
OK

5	Check wire harness and connector (Front right wheel speed sensor - ESP (iEPB) control module)

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module connector B-047.
(d) Disconnect the front right wheel speed sensor connector B-016.

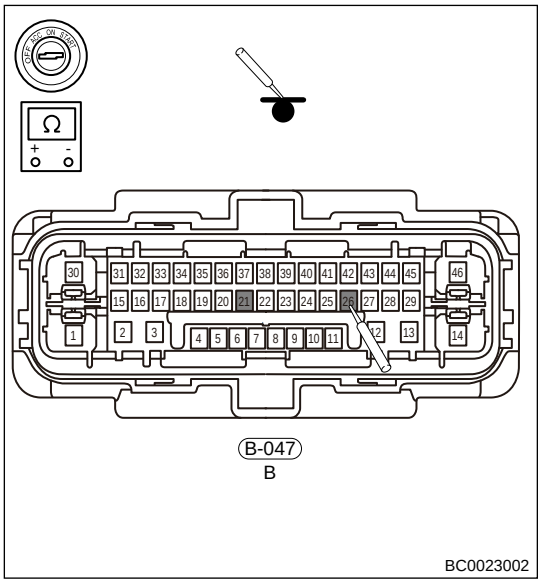
(e) Using a digital multimeter, check for continuity between terminals of connector B-047 and connector B-016 to check if there is an open in the wire harness and connector according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (26) - B-016 (1)	Always	⩽ 1 Ω
B-047 (21) - B-016 (2)	Always	⩽ 1 Ω
B-047 (21) - B-016 (2)	Always	∞
B-047 (26) - B-016 (1)	Always	∞



(f) Using a digital multimeter, check for continuity between connector B-047 and body ground to check if front right wheel speed sensor is short to ground.

Multimeter Connection	Condition	Specified Condition
B-047 (21) - Body ground	Always	∞
B-047 (26) - Body ground	Always	∞

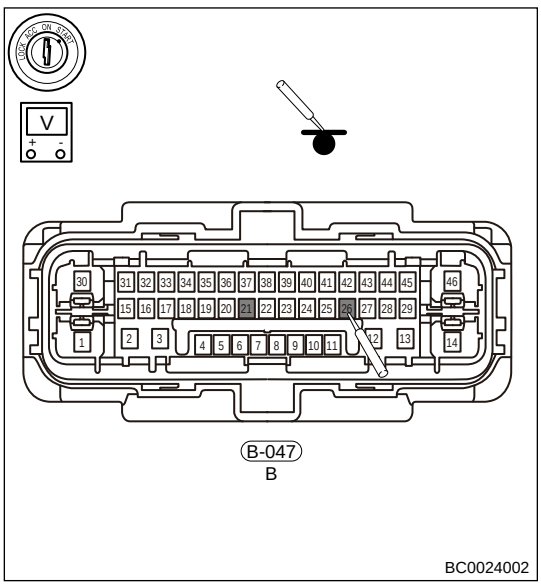


(g) Connect the negative battery terminal cable.

(h) Turn ENGINE START STOP switch to ON.

(i) Using a digital multimeter, measure voltage between connector B-047 and body ground to check if front right wheel speed sensor is short to power supply according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (21) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-047 (26) - Body ground	ENGINE START STOP switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between front right wheel speed sensor and ESP (iEPB) control module assembly**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.

(d) Check if the same DTCs are still output.

OK → **System operates normally**

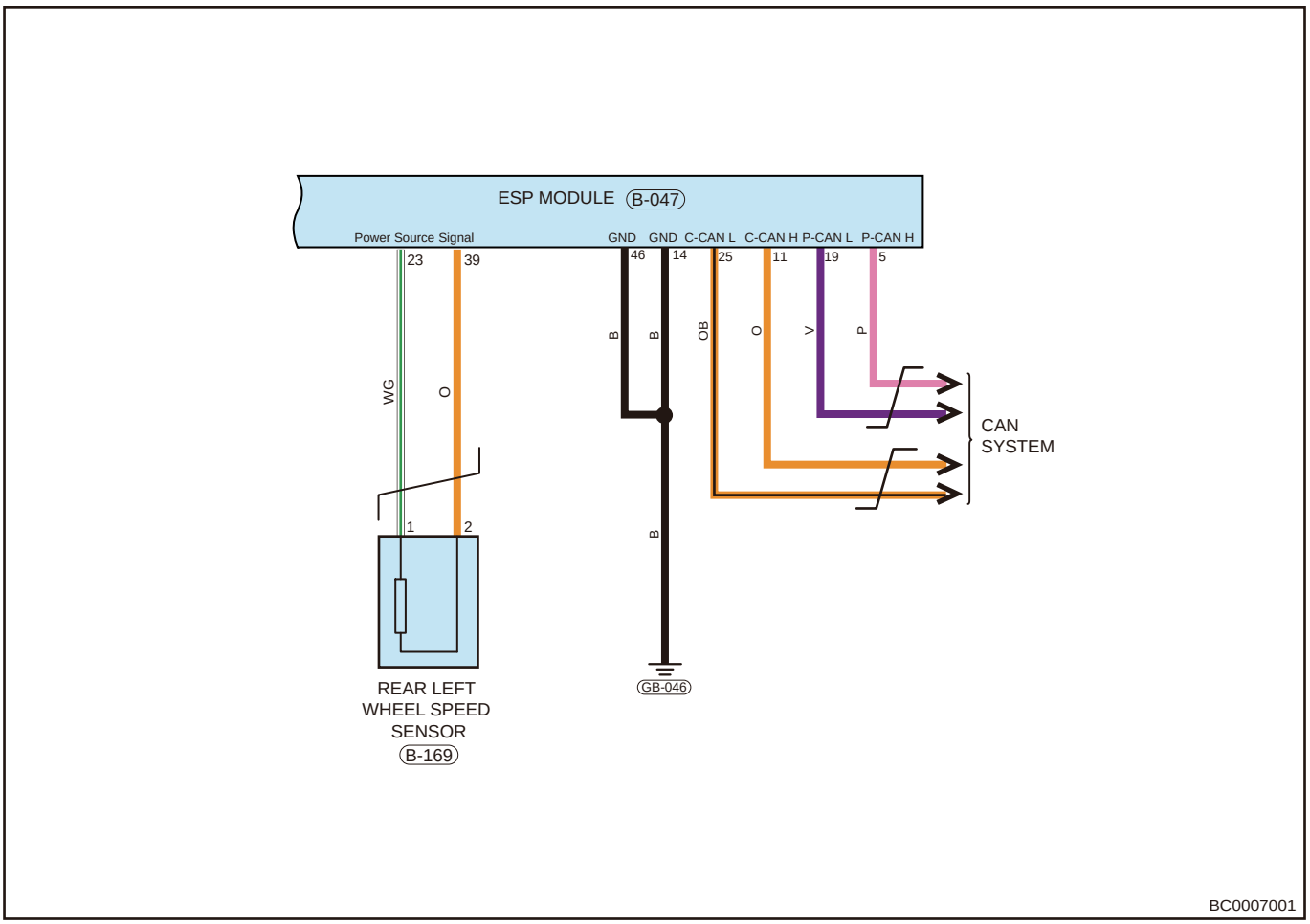
NG → **Replace ESP (iEPB) control module assembly**

■ Rear left wheel speed sensor fault

Description

DTC	DTC Definition
C0037-00	Wheel-speed Sensor, Rear Left-General Fault
C0037-09	Rear Left Wheel Speed Sensor Component Fault
C0037-11	Rear Left Wheel Speed Sensor Power Supply Circuit Short to Ground
C0037-12	Rear Left Wheel Speed Sensor Signal Circuit Short to Power Supply
C0037-13	Rear Left Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open
C0037-29	Rear Left Wheel Speed Sensor Signal Failure (Out of Range, Lost, Interfered or Discontinuous)
C0037-37	Rear Left Wheel Speed Sensor Signal Out of Range
C0038-08	Rear Left Wheel Speed Sensor: Wrong Direction

Circuit diagram



⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check rear left wheel speed sensor wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the rear left wheel speed sensor connector B-169.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.

NG → **Repair or replace rear left wheel speed sensor wire harness and connector**

OK

2	Check installation of rear left wheel speed sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check rear left wheel speed sensor mounting bolt for looseness.
(d) Check if mounting clearance between rear left wheel speed sensor and rear left steering knuckle is too large or too small.
(e) Check installation position of rear left wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace rear left wheel speed sensor**

OK ↓

3	Check rear left wheel speed sensor

(a) Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
(b) Drive vehicle straight ahead, and read datastream of rear left wheel speed sensor with diagnostic tester.
(c) Check if data change of rear left wheel speed sensor matches that of other wheel speed sensors, and if it is correct.

NG → **Replace rear left wheel speed sensor**

OK ↓

4	Check rear left hub bearing

(a) Check rear left hub bearing for excessive clearance.
(b) Check rear left hub bearing magnetic strip for foreign matter, defect or damage.

NG → **Replace rear left hub bearing assembly**

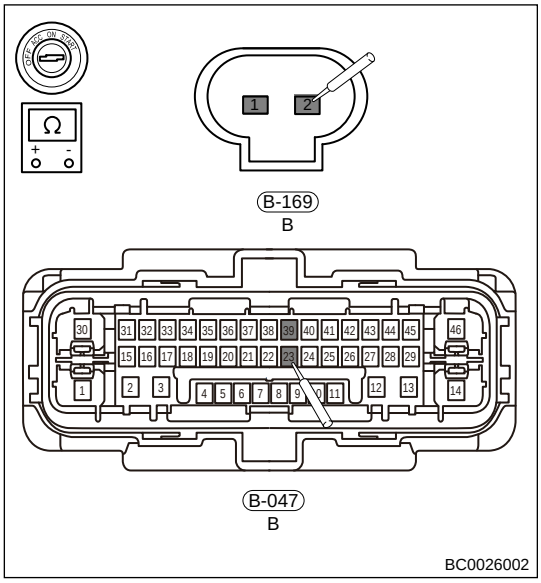
OK ↓

5	Check wire harness and connector (rear left wheel speed sensor - ESP (iEPB) control module)

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module connector B-047.
(d) Disconnect the rear left wheel speed sensor connector B-169.

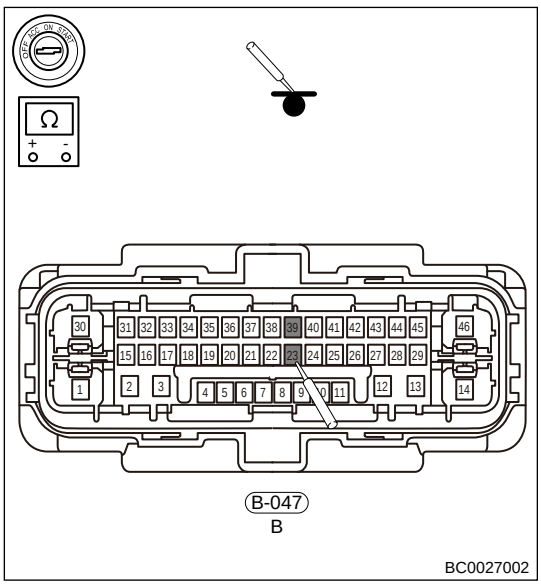
(e) Using a digital multimeter, check for continuity between terminals of connector B-047 and connector B-169 to check if there is an open in the wire harness and connector according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (23) - B-169 (1)	Always	⩽ 1 Ω
B-047 (39) - B-169 (2)	Always	⩽ 1 Ω
B-047 (39) - B-169 (2)	Always	∞
B-047 (23) - B-169 (1)	Always	∞



(f) Using a digital multimeter, check for continuity between connector B-047 and body ground to check if rear left wheel speed sensor is short to ground.

Multimeter Connection	Condition	Specified Condition
B-047 (23) - Body ground	Always	∞
B-047 (39) - Body ground	Always	∞

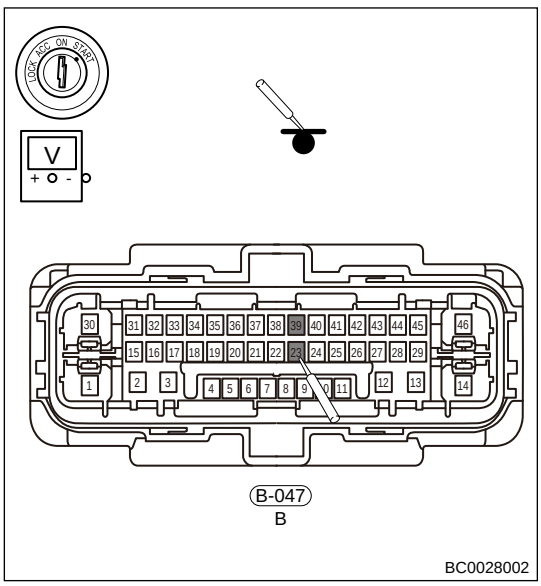


(g) Connect the negative battery terminal cable.

(h) Turn ENGINE START STOP switch to ON.

(i) Using a digital multimeter, measure voltage between connector B-047 and body ground to check if rear left wheel speed sensor is short to power supply according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (23) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-047 (39) - Body ground	ENGINE START STOP switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between rear left wheel speed sensor and ESP (iEPB) control module assembly**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.

(d) Check if the same DTCs are still output.

OK → **System operates normally**

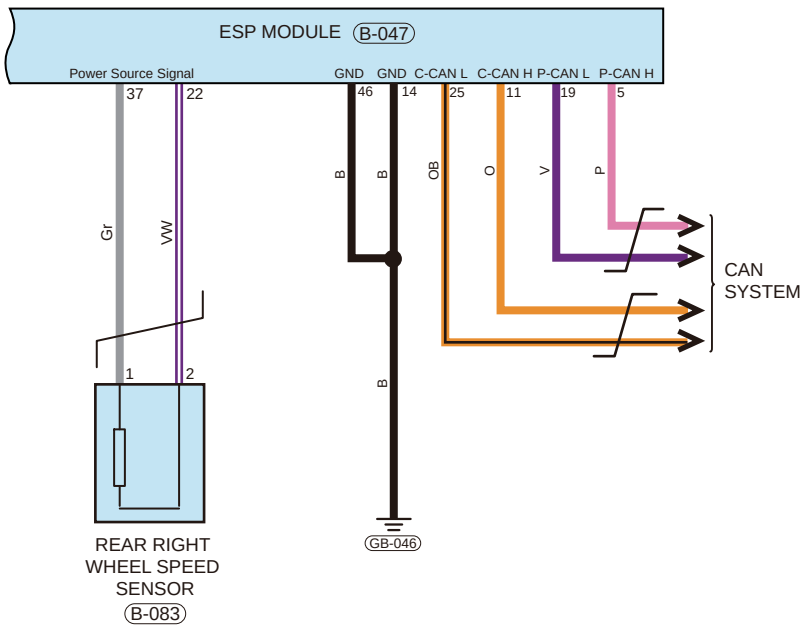
NG → **Replace ESP (iEPB) control module assembly**

■ **Rear right wheel speed sensor fault**

Description

DTC	DTC Definition
C003A-00	Wheel-speed Sensor, Rear Right-General Fault
C003A-09	Rear Right Wheel Speed Sensor Component Fault
C003A-11	Rear Right Wheel Speed Sensor Power Supply Circuit Short to Ground
C003A-12	Rear Right Wheel Speed Sensor Signal Circuit Short to Power Supply
C003A-13	Rear Right Wheel Speed Sensor: Signal Circuit Short to Ground or Open; Power Supply Circuit Open
C003A-29	Rear Right Wheel Speed Sensor Signal Failure (Out of Range, Lost, Interfered or Discontinuous)
C003A-37	Rear Right Wheel Speed Sensor Signal Out of Range
C003B-08	Rear Right Wheel Speed Sensor: Wrong Direction

Circuit diagram



⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check rear right wheel speed sensor wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the rear right wheel speed sensor connector B-083.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.

NG → **Repair or replace rear right wheel speed sensor wire harness and connector**

OK

2	Check installation of rear right wheel speed sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check rear right wheel speed sensor mounting bolt for looseness.
(d) Check if mounting clearance between rear right wheel speed sensor and rear right steering knuckle is too large or too small.
(e) Check installation position of rear right wheel speed sensor for dirt.

NG → **Tighten mounting bolt properly, clean or replace rear right wheel speed sensor**

OK

3	Check rear right wheel speed sensor

(a) Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
(b) Drive vehicle straight ahead, and read datastream of rear right wheel speed sensor with diagnostic tester.
(c) Check if data change of rear right wheel speed sensor matches that of other wheel speed sensors, and if it is correct.

NG → **Replace rear right wheel speed sensor**

OK

4	Check rear right hub bearing

(a) Check rear right hub bearing for excessive clearance.
(b) Check rear right hub bearing magnetic strip for foreign matter, defect or damage.

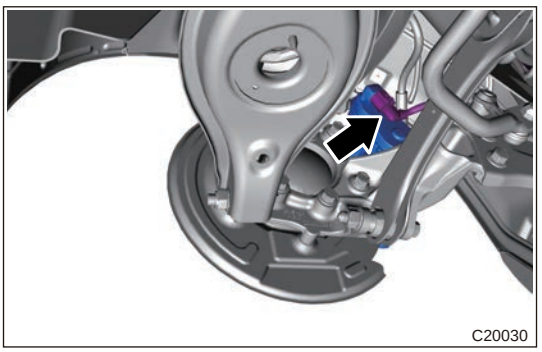
NG → **Replace rear right hub bearing assembly**

OK

5	Check wire harness and connector (rear right wheel speed sensor - ESP (iEPB) control module)

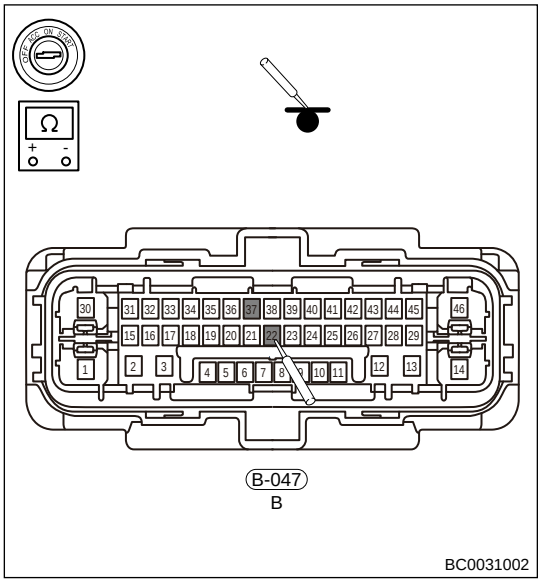
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module connector B-047.
(d) Disconnect the rear right wheel speed sensor connector B-083.
(e) Using a digital multimeter, check for continuity between terminals of connector B-047 and connector B-083 to check if there is an open in the wire harness and connector according to table below.

Multimeter Connection	Conditi-on	Specified Condition
B-047 (37) - B-083 (1)	Always	⩽ 1 Ω
B-047 (22) - B-083 (2)	Always	⩽ 1 Ω
B-047 (22) - B-083 (2)	Always	∞
B-047 (37) - B-083 (1)	Always	∞


C20030

(f) Using a digital multimeter, check for continuity between connector B-047 and body ground to check if rear right wheel speed sensor is short to ground.

Multimeter Connection	Condition	Specified Condition
B-047 (37) - Body ground	Always	∞
B-047 (22) - Body ground	Always	∞

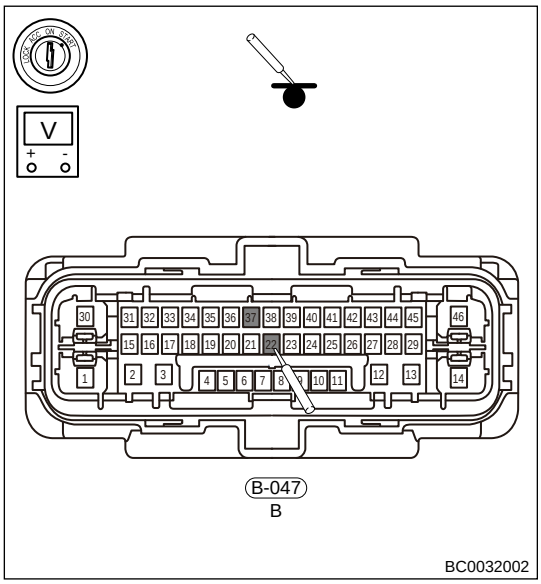


(g) Connect the negative battery terminal cable.

(h) Turn ENGINE START STOP switch to ON.

(i) Using a digital multimeter, measure voltage between connector B-047 and body ground to check if rear right wheel speed sensor is short to power supply according to table below.

Multimeter Connection	Condition	Specified Condition
B-047 (22) - Body ground	ENGINE START STOP switch ON	Approx. 0 V
B-047 (37) - Body ground	ENGINE START STOP switch ON	Approx. 0 V



NG → **Repair or replace wire harness and connector between front right wheel speed sensor and ESP (iEPB) control module assembly**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.

(d) Check if the same DTCs are still output.

OK → **System operates normally**

NG → **Replace ESP (iEPB) control module assembly**

■ **Brake switch fault**

Description

DTC	DTC Definition
C004064	Brake Switch Malfunction: Unreliable

Circuit diagram

1	**Perform basic inspection on brake switch**

(a) Make sure to use the correct brake switch.
(b) Check if brake switch is installed at the correct position.
(c) Check if there is an incorrect clearance between brake switches.
(d) Check and eliminate any electrical or mechanical interference to the brake switch.

OK → **After driving for a period of time and clearing DTC, perform test again. If DTC still exists, please replace brake switch**

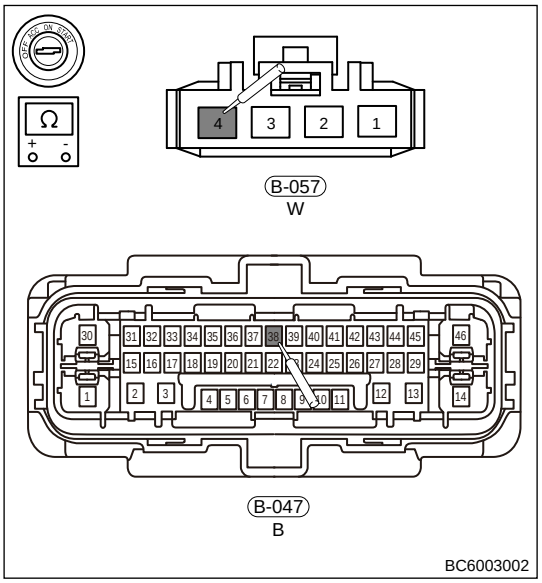
NG

2	**Check related wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) module assembly connector B-047.
(d) Disconnect the brake switch connector B-057.
(e) Check if related wire harnesses are worn, pinched or broken.
(f) Check if related connector terminals are loose, broken, bent or corrosive.
(g) Using a digital multimeter, check for normal continuity between ESP (iEPB) module assembly connector B-047 (38) and brake switch connector B-057 (4) according to table below.

OK

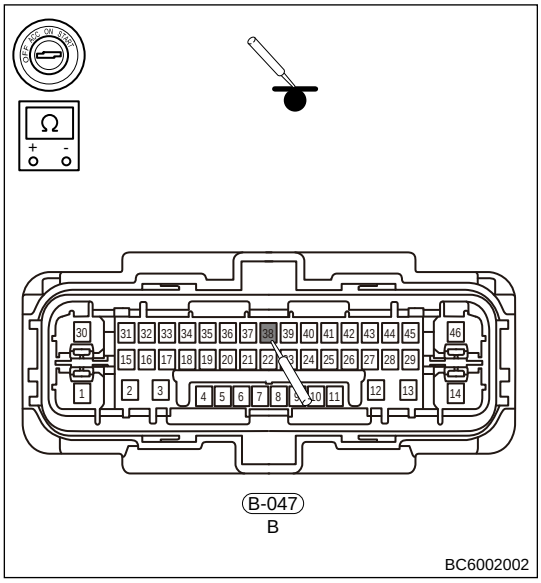
Multimeter Connection	Specified Condition
B-047 (38) - B-057 (4)	⩽ 1 Ω



(h) Using a digital multimeter, check for normal continuity between ESP (iEPB) module assembly connector B-047 (38) and body ground according to table below.

OK

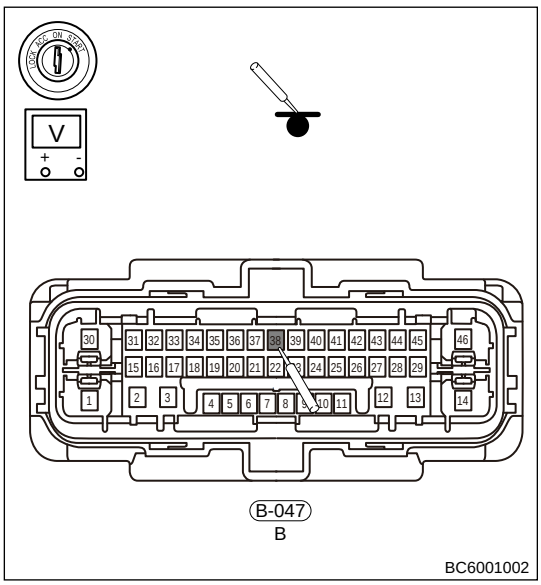
Multimeter Connection	Specified Condition
B-047 (38) - Body ground	∞



(i) Connect the negative battery cable.
(j) Turn ENGINE START STOP switch to ON.
(k) Turn ENGINE START STOP switch to ON.

OK

Multimeter Connection	Specified Condition
B-047 (38) - Body ground	0 V



NG → **Repair/replace related wire harness and connector**

OK

3	Check ESP (iEPB) control module

OK → **System operates normally**

NG → **Replace ESP (iEPB) control module assembly**

■ **Pressure sensor fault**

Description

DTC	DTC Definition
C004428	Pressure Sensor Fault (Signal)
C004401	Pressure Sensor Fault (Circuit)

1	Check intermittent fault

(a) After clearing DTC, drive vehicle for a period of time and apply brake for more than 5 seconds during this period.

OK → **After driving for a period of time and clearing DTC, perform test again. If DTC still exists, please replace ESP (iEPB) module**

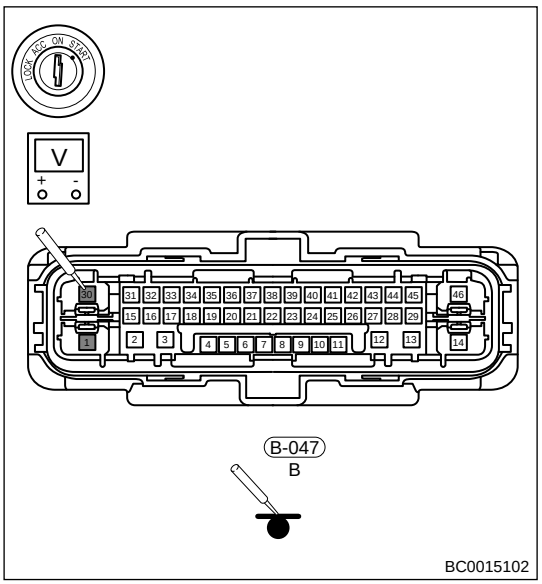
NG

2	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) module assembly connector B-047.
(d) Check if related connector terminals are loose, broken, bent or corroded.
(e) Using a digital multimeter, measure if voltage between ESP (iEPB) module assembly connector B-047 (1, 30) and body ground is normal according to table below.

OK

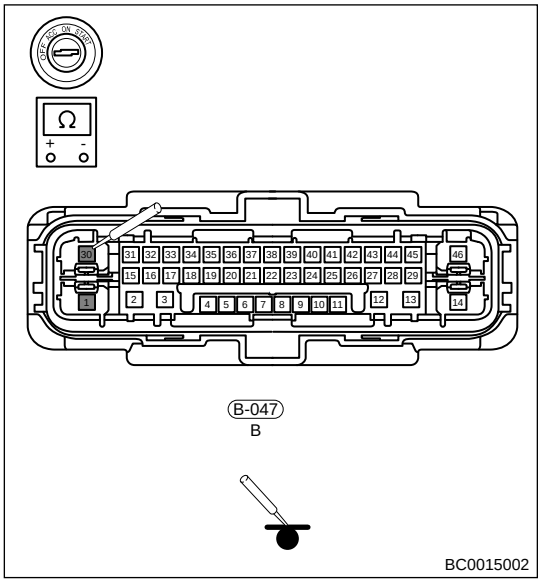
Multimeter Connection	Specified Condition
B-047 (1, 30) - Body ground	⩾ 12 V



(f) Using a digital multimeter, check for continuity between ESP (iEPB) module assembly connector B-047 (1, 30) and body ground according to table below.

OK

Multimeter Connection	Specified Condition
B-047 (1) - Body ground	∞
B-047 (30) - Body ground	∞



NG → **Repair/replace related wire harness and connector**

OK

3	**Check ESP (iEPB) control module**

OK → **System operates normally**

NG → **Replace ESP (iEPB) control module assembly**

■ Steering angle sensor failure

Description

DTC	DTC Definition
C0051-29	Steering Wheel SAS Offset Error, Noisy Signal
C0051-64	Steering Angle Sensor Fault (Signal)
C0051-54	Steering Angle Sensor Calibration Failure

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	**Check steering angle sensor calibration**

(a) Turn ENGINE START STOP switch to ON.
(b) Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
(c) Calibrate the steering angle sensor according to instruction of diagnostic tester.
(d) Use diagnostic tester to clear DTCs.
(e) Start the engine.
(f) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.
(g) Check if the same DTCs are still output.

NG → **Steering angle sensor is not calibrated**

OK ↓

2	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check if fuse RF16 5A in instrument panel fuse and relay box B-141 is blown.

NG → **Replace fuse RF16**

OK ↓

3	Check wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the steering angle sensor connector I-006.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.

NG → **Repair or replace instrument panel wire harness and connector**

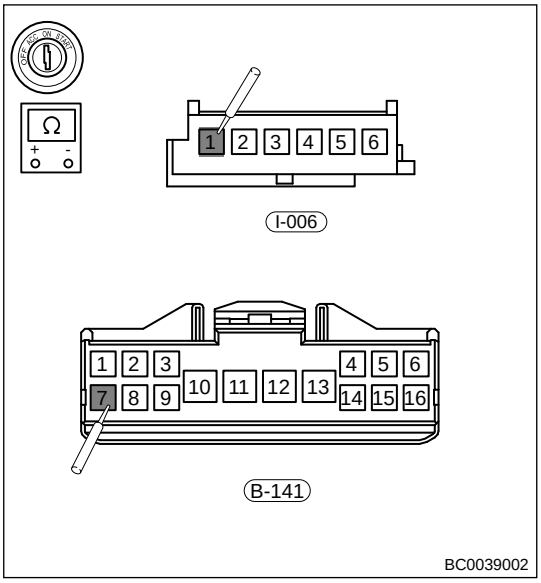
OK ↓

4	Check steering angle sensor power supply and instrument panel fuse and relay box B-141

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the instrument panel fuse box connector B-141.
(c) Check if terminal of instrument panel fuse box connector is deformed, bent or loose.

(d) Using a multimeter, check for continuity between wire harness terminal B-141 (7) of instrument fuse box and terminal I-006 (1) of steering angle sensor.

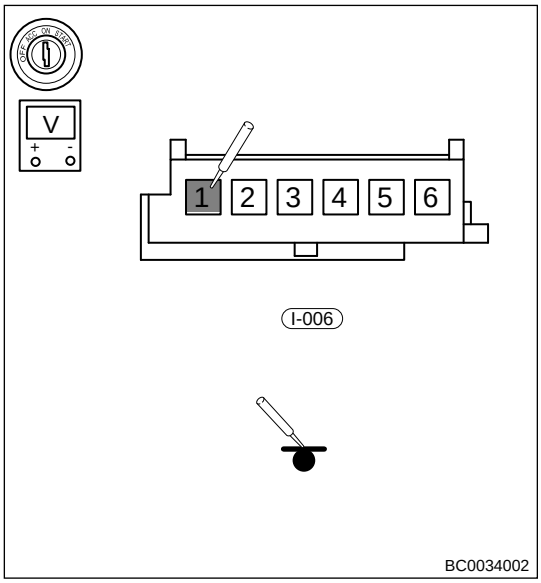
Multimeter Connection	Condition	Specified Condition
I-006 (1) - B-141 (7)	Always	⩽ 1 Ω



(e) Turn ENGINE START STOP switch to ON.

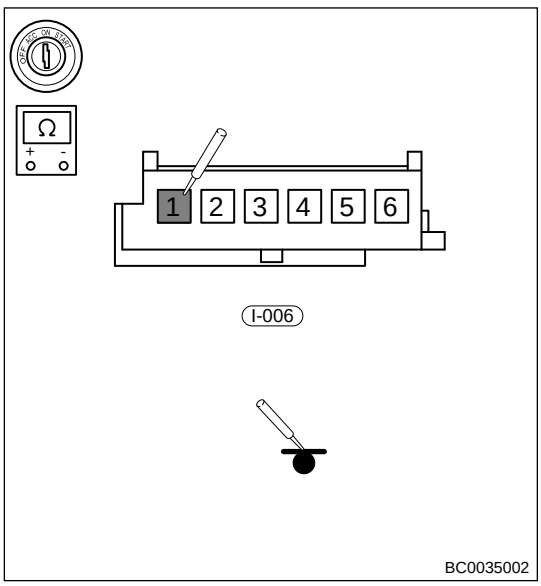
(f) Using a multimeter, measure if connector terminal I-006 (1) of steering angle sensor has 12 V power supply voltage.

Multimeter Connection	Condition	Specified Condition
I-006 (1) - Body ground (digital multimeter)	ENGINE START STOP switch ON	Not less than 12 V
I-006 (1) - Body ground (test lamp 21 W)	ENGINE START STOP switch ON	On



(g) Using a multimeter, check continuity between connector I-006 (1) of steering angle sensor and ground to check if it is short to ground.

Multimeter Connection	Condition	Specified Condition
I-006 (1) - Body ground	Always	∞



NG → **Repair or replace instrument panel wire harness or replace instrument panel fuse box**

OK ↓

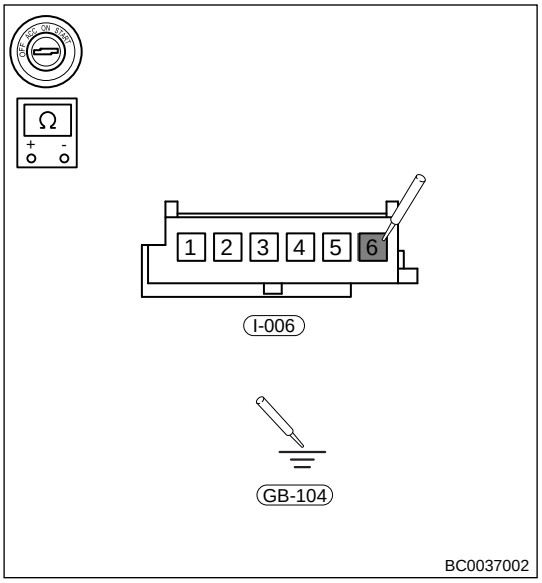
5	Check ground wire harness and CAN wire of steering angle sensor

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the steering angle sensor connector I-006.

(c) Using a multimeter, check continuity between connector I-006 (6) of steering angle sensor and ground point GB-104.

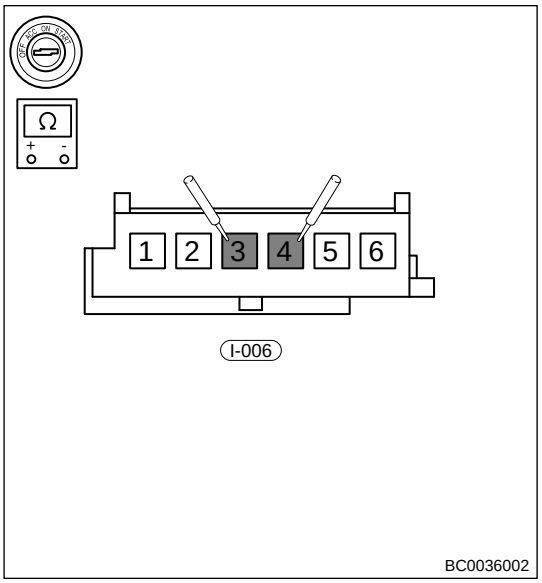
Multimeter Connection	Condition	Specified Condition
I-006 (6) - GB-104	Always	⩽ 1 Ω



(d) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

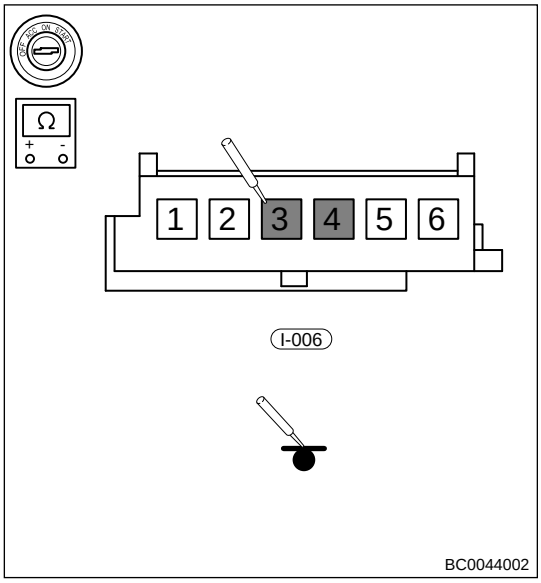
(e) Using a digital multimeter check if connection between steering angle sensor and CAN communication line is normal according to table below (measure terminal resistance from CAN node).

Multimeter Connection	Condition	Specified Condition
I-006 (3) - I-006 (4)	Always	≈ 60 Ω



(f) Using a digital multimeter, check if CAN circuit connected to steering angle sensor is short to body ground.

Multimeter Connection	Conditi-on	Specified Condition
I-006 (3) - Body ground	Always	∞
I-006 (4) - Body ground	Always	∞

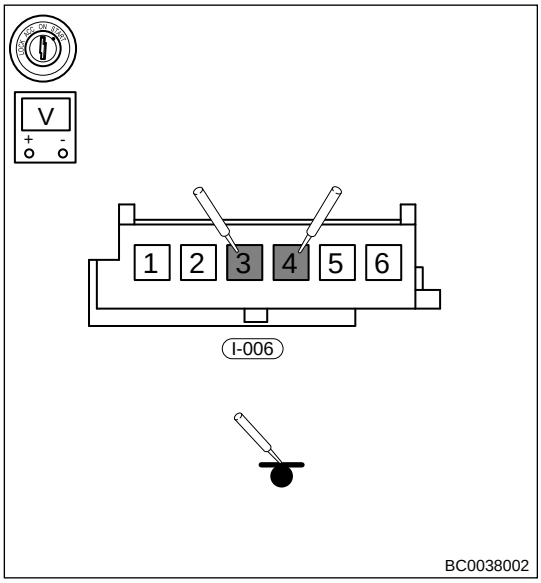


(g) Connect the negative battery terminal cable.

(h) Turn ENGINE START STOP switch to ON.

(i) Using digital multimeter, check if voltage between steering angle sensor I-006 (3) (4) and body ground is normal.

Multimeter Connection	Conditi-on	Specified Condition
I-006 (3) - Body ground	Always	1.5 - 2.5 V
I-006 (4) - Body ground	Always	2.5 - 3.5 V



OK	**System operates normally**
NG	**Repair or replace ground wire harness or replace CAN network wire harness**

■ Acceleration & yaw rate sensor fault

Description

DTC	DTC Definition
C0061-29	Lateral Acceleration Sensor: Invalid Value
C0061-64	Lateral Acceleration Sensor: Signal Error
C0062-29	Longitudinal Acceleration Sensor: Invalid Value
C0062-64	Longitudinal Acceleration Sensor: Signal Error
C0063-29	Yaw Rate Sensor: Invalid Value
C0063-64	Yaw Rate Sensor: Signal Error

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check sensor calibration

(a) Turn ENGINE START STOP switch to ON.
(b) Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
(c) Calibrate the steering angle sensor according to instruction of diagnostic tester.
(d) Use diagnostic tester to clear DTCs.
(e) Start the engine.
(f) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.
(g) Check if the same DTCs are still output.

NG → **Lateral acceleration/yaw rate sensor is not calibrated**

OK

2	Check installation position of yaw rate sensor

⚠ Caution

- **Yaw rate sensor is integrated in the Airbag Control Module (ACM).**

(a) Check ACM control module fixing bolt for looseness.
(b) Check pin connector of ACM controller for bending or looseness or wire harness for damage.
(c) Adjust installation position of yaw rate sensor (always keep sensor level on vehicle body).

NG → **Replace ACM module assembly**

OK

3	Reconfirm DTCs

(a) After replacing ACM module, calibrate yaw rate sensor with a diagnostic tester.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.
(e) Check if the same DTCs are still output.

OK → **System operates normally**

NG → **Replace ESP (iEPB) control module**

■ Switch fault

Description

DTC	DTC Definition
C008904	Switch Fault (ESC OFF Switch or AVH Switch Long Pressed)

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check ESP (iEPB) switch

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check if ESP (iEPB) switch is stuck or pushed in by other objects.

NG → **Replace ESP (iEPB) switch**

OK →

2	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove RF17 (10A) from instrument panel fuse box.
(d) Check if fuse is blown.

NG → **Replace fuse**

OK →

3	Check wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check if wire harnesses are worn, pierced, pinched or partially broken.
(d) Check for broken, bent, protruded or corroded terminals.
(e) Check if related connector pins are in good condition.

NG → **Repair or replace body/instrument panel wire harness and connector**

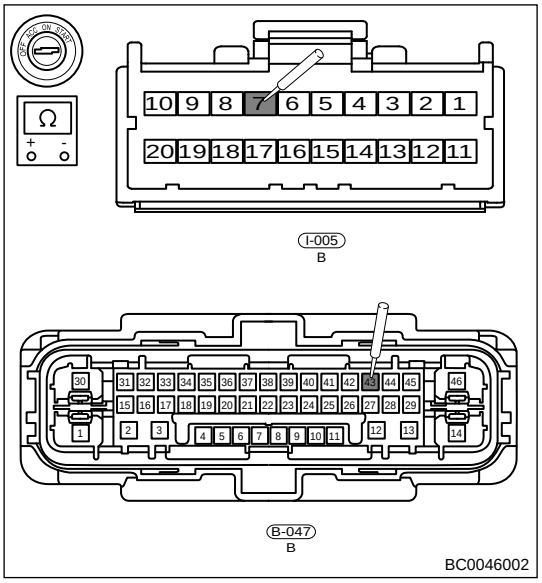
OK →

4	Check wire harness and connector (ESP (iEPB) switch - ESP (iEPB) control module)

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module assembly connector B-047.
(d) Disconnect the ESP (iEPB) switch connector I-005.

(e) Using a digital multimeter, check for continuity between terminals of connector B-047 and connector I-005 to check if there is an open circuit in wire harness.

Multimeter Connection	Condition	Specified Condition
B-047 (43) - I-005 (7)	Always	⩽ 1 Ω



NG → **Repair or replace body/instrument panel wire harness**

OK →

5	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.
(d) Check if the same DTCs are still output.

OK → **System operates normally**

NG → **Replace ESP (iEPB) control module**

■ ABS/ESP unreasonable control fault

Description

DTC	DTC Definition
C006B-00	ABS/ESP Unreasonable Control (Control Time Too Long, Etc.)

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect all wheel speed sensor and angle sensor connectors.
(d) Check if related connector terminals are loose, broken, bent or corroded.

NG → **Repair/replace related wire harness and connector**

OK

2	Check installation of wheel speed sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check wheel speed sensor fixing bolt for looseness.
(d) Check for excessive clearance between installation position of wheel speed sensor and front steering knuckle.
(e) Check installation position of rear right wheel speed sensor for dirt.

NG → **Tighten fixing bolt properly, clean or replace wheel speed sensor**

OK

3	Check hub gear ring and drive shaft upper gear ring

(a) Check hub gear ring and drive shaft upper gear ring for foreign matter, missing teeth or damage.

NG → **Replace hub bearing assembly or outer ball cage assembly**

OK

4	Check wheel speed sensor

(a) Drive vehicle straight ahead, and read datastream of wheel speed sensor with diagnostic tester.
(b) Check if data change of wheel speed sensor matches that of other wheel speed sensors.

NG → **Replace corresponding wheel speed sensor assembly**

OK

5	Check installation of angle sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check if angle sensor connector is connected securely.
(d) Check if angle sensor is installed in place.
(e) Check if angle sensor connector position is dirty.

NG → **Clean or replace Steering Column Module (SCM)**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Drive vehicle at 40 km/h or above, read "ABS/ESP (Anti-lock Brake System/Electronic Stability Program)" system DTC again with diagnostic tester.
(d) Check if the same DTCs are still output.

OK	System operates normally
NG	Replace ESP (iEPB) module assembly

■ ECU power supply and hardware fault

Description

DTC	DTC Definition
C2200-16	ECU Voltage Supply Too Low
C2201-04	ECU Fault (General Software Problem)
C2202-49	CAN Hardware Fault
C2200-17	ECU Voltage Supply Too High

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	**Check fuse**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check fuse MF04 175A in main fuse and relay box E-041 and fuses SB01 40A and SB02 40A in engine compartment fuse box B-039.
(d) Check if fuse is blown.

NG	Replace fuse

OK

2	**Check battery voltage**

(a) Using a digital multimeter, measure voltage between positive battery terminal and negative battery terminal.
(b) Battery voltage should be higher than 12 V.

NG	Replace battery

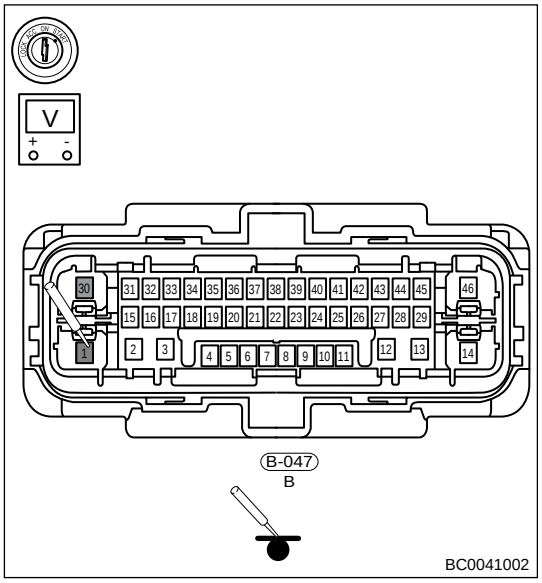
OK

3	**Check wire harness and connector (ESP (iEPB) control module assembly - power supply)**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the ESP (iEPB) control module assembly connector B-047.
(d) Connect the negative battery terminal cable.
(e) Turn ENGINE START STOP switch to ON.

(f) Using a digital multimeter, measure voltage between ESP (iEPB) control module assembly connector B-047 and body ground to check if power supply circuit is normal.

Multimeter Connection	Condition	Specified Condition
B-047 (1) - Body ground (digital multimeter)	ENGINE START STOP switch ON	Not less than 12 V
B-047 (1) - Body ground (test light 21 W)	ENGINE START STOP switch ON	On
B-047(30) - Body ground (digital multimeter)	ENGINE START STOP switch ON	Not less than 12 V
B-047 (30) - Body ground (test light 21 W)	ENGINE START STOP switch ON	On



NG → **Repair or replace related wire harness and connector**

OK

4	Check wire harness and connector (ESP (iEPB) control module assembly - body ground)

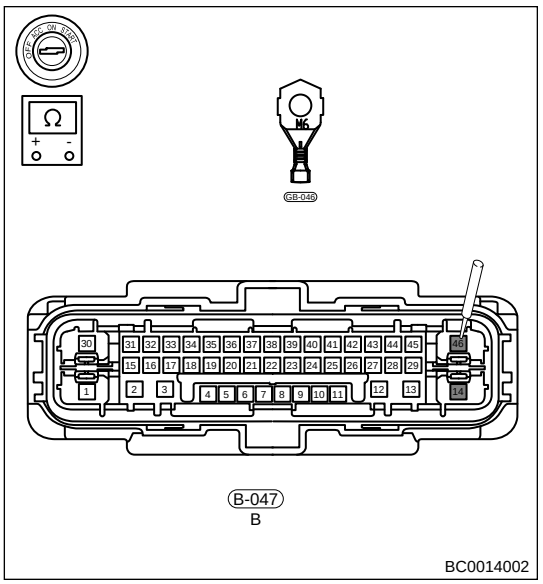
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect the ESP (iEPB) control module assembly connector B-047.

(d) Using a digital multimeter, measure continuity between ESP (-iEPB) module connector B-047 (46, 14) and body ground GB-046 to check if ground circuit is normal.

Multimeter Connection	Condition	Specified Condition
B-047 (46) - GB-046	Always	⩽ 1 Ω
B-047 (14) - GB-046	Always	⩽ 1 Ω



NG → **Repair or replace ESP (iEPB) control module assembly wire harness and connector**

OK

5	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Drive vehicle at 40 km/h or above, and read ESP (iEPB) control module assembly DTC again with diagnostic tester.
(d) Check if the same DTCs are still output.

OK → **System operates normally**

NG → **Replace ESP (iEPB) control module**

■ **Internal motor fault**

Description

DTC	DTC Definition
C220304	Valve Relay Fault
C220400	General Valve Fault (Overheat Protection, Signal Invalid, Hardware Fault)
C220800	Wheel Speed Sensor General Fault (Interchanged Sensor Installation, Multiple Sensor Error)
C2009-00	ECU Fault (Hardware, Microcontroller Error)

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

1	Perform basic fault inspection

(a) Perform hardware appearance inspection.

NG → **Eliminate hardware appearance interference**

OK

2	Check module for intermittent fault

(a) Clear DTC, drive vehicle for a period of time, and test again.

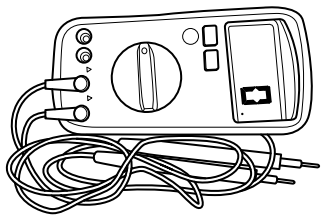
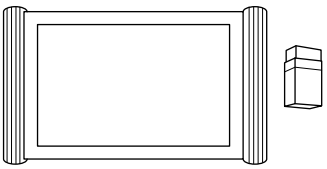
NG → **Replace module**

OK

3	Refer to inspection method for intermittent fault

5 ON-VEHICLE SERVICE

5.1 Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001

5.2 ESP (iEPB)/ESP Control Module Assembly

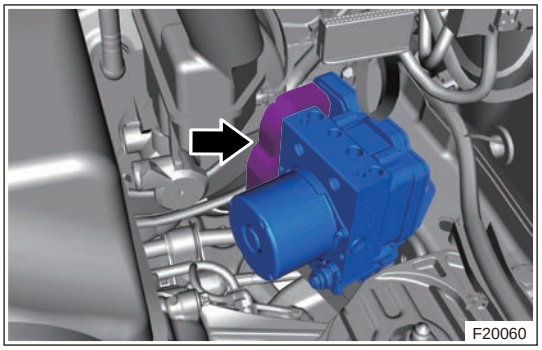
■ **Removal**

Warning/Caution/Hint
• **When repairing ESP (iEPB)/ESP system, first release the pressure of high pressure brake fluid in accumulator, to prevent high pressure brake fluid from spraying out and causing personal injury.** • **Operation step: First turn ENGINE START STOP switch off, then depress and release brake pedal repeatedly, until brake pedal becomes hard.** • **In addition, never turn ENGINE START STOP switch to ON before ESP (iEPB)/ESP system is installed completely to prevent hydraulic pump from energizing and running.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the air filter assembly.
(4) Remove the battery.
(5) Remove the battery tray assembly.
(6) Remove the brake pipe assembly.

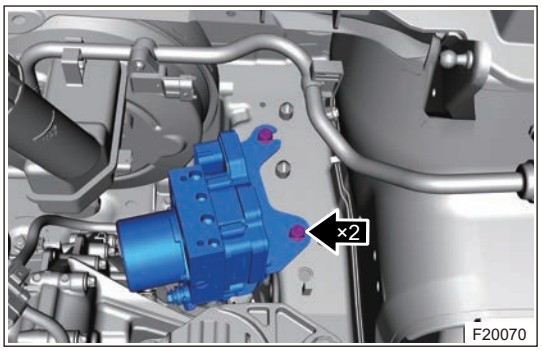
⚠ Warning
• **When removing brake line, prevent foreign matter from entering ESP (iEPB)/ESP control module assembly threaded holes.** • **After disconnecting brake line, sealing measure should be taken to prevent foreign matter form entering.**

(7) Disconnect the ESP control module assembly connector.

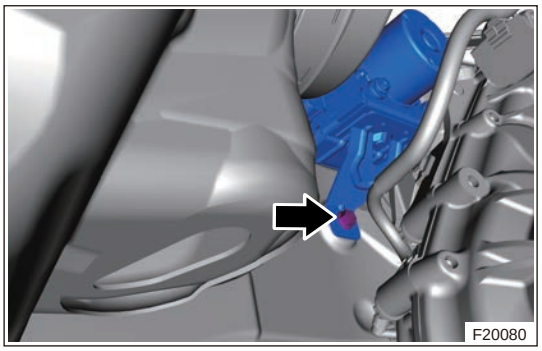


(8) Brake pedal is fully depressed and secured by pedal bracket to prevent brake fluid from coming out after brake pipeline is removed from brake master cylinder.

(9) Remove 2 fixing bolts between ESP control module assembly and upper body of front left side rail.



(10) Remove 1 fixing bolt between ESP control module assembly and side of front left side rail body.



(11) Remove the ESP control module assembly.

■ Installation

(1) Install the ESP control module assembly.

(2) Install 3 fixing bolts between ESP control module assembly and side rail body.

Tightening torque: 23 ± 3.5 N•m

(3) Install 6 coupling bolts to brake pipe.

Tightening torque: 16 ± 2 N•m

(4) Connect the ESP control module assembly connector.

(5) Install the battery tray assembly.

(6) Install the battery.

(7) Install the air filter assembly.

(8) Fill brake fluid and drain air.

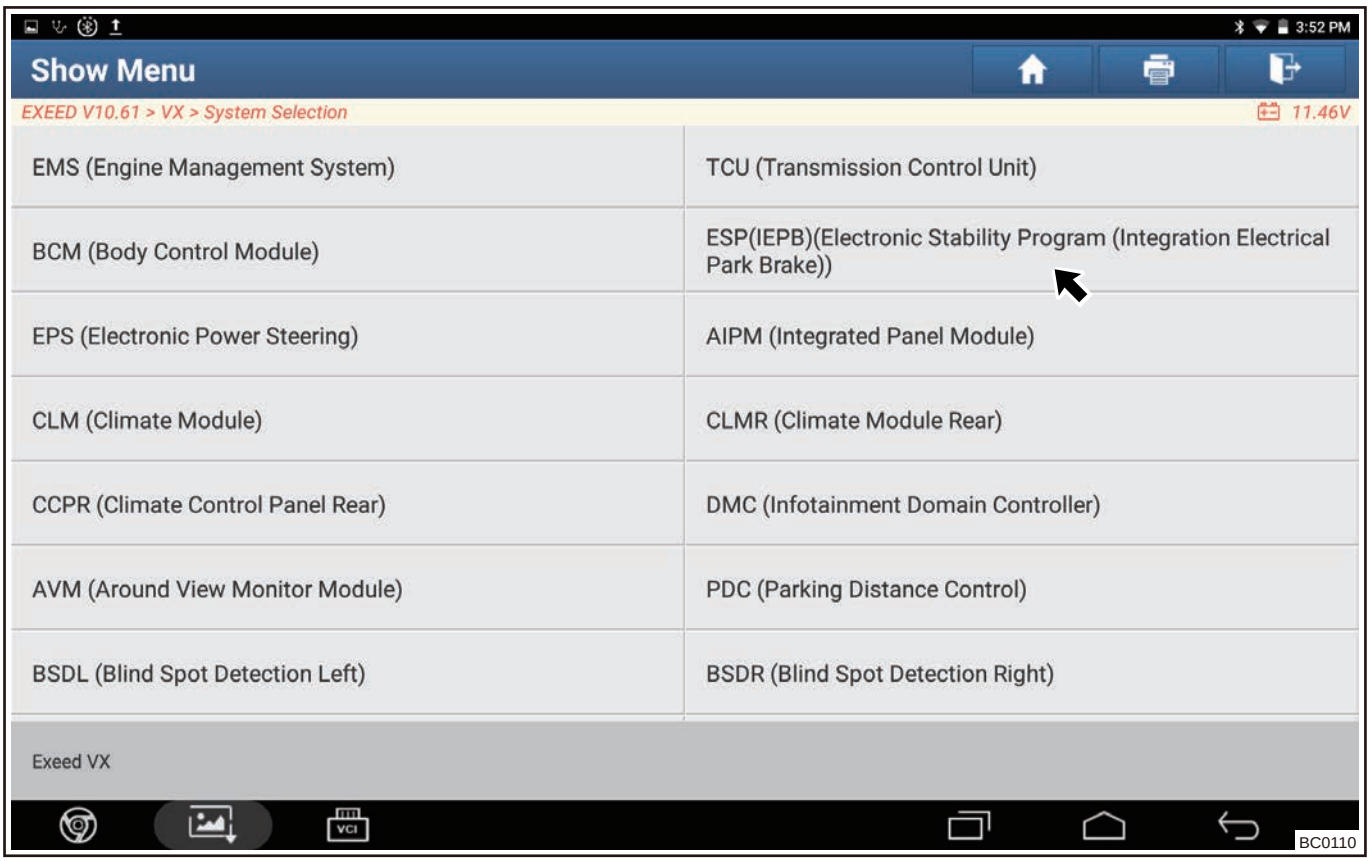
⚠ Caution

- **When installing fixing bolts and screws, be sure to tighten them to specified torque.**
- **Perform ESP (iEPB)/ESP bleeding procedures for brake system after completing installation.**
- **Using diagnostic tester, enter brake control system, record and clear trouble code, then drive vehicle to perform a road test, confirming that ESP (iEPB)/ESP system operates normally and brake pedal feel is good.**

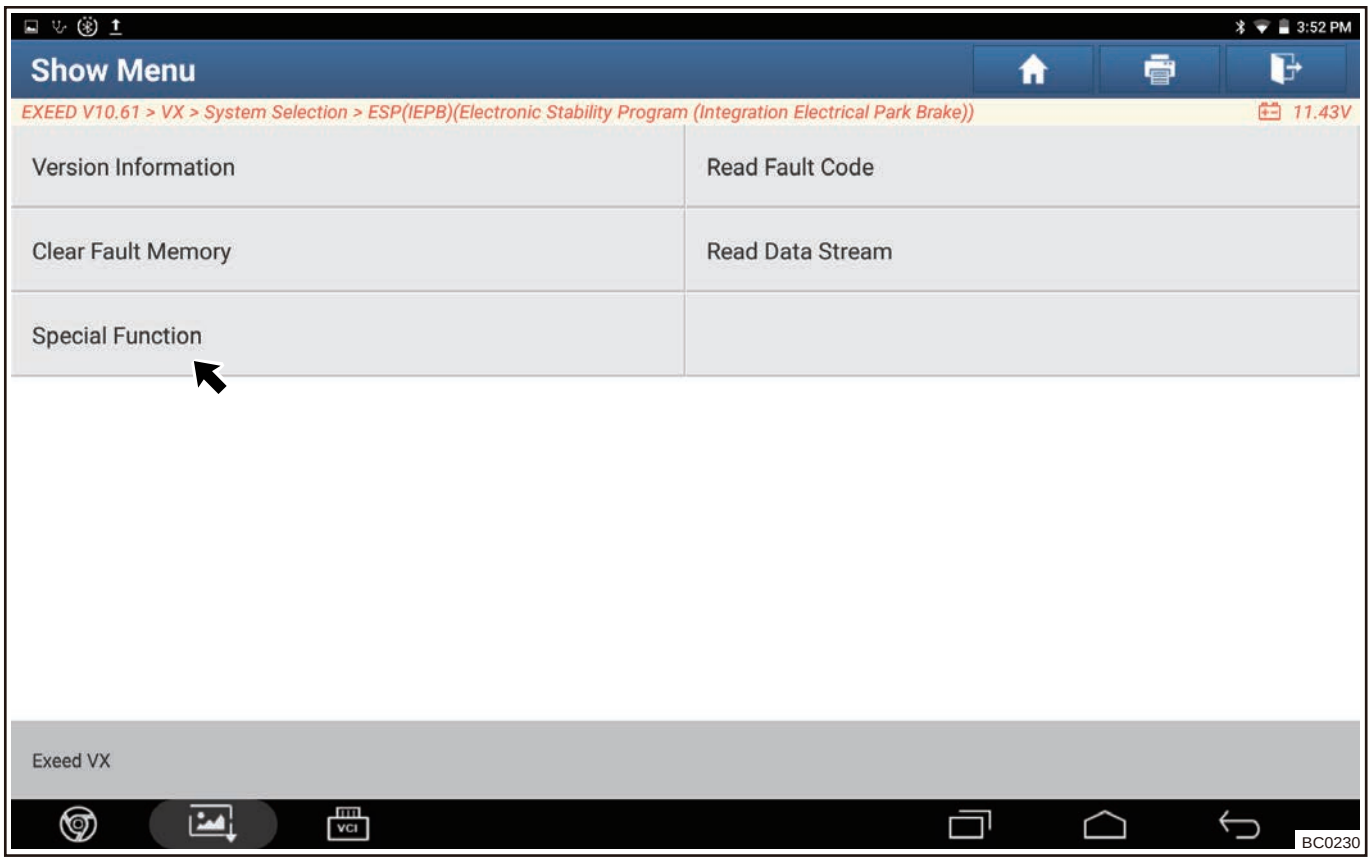
■ Matching learning

Write configuration code with diagnostic tester after ESP module is installed:

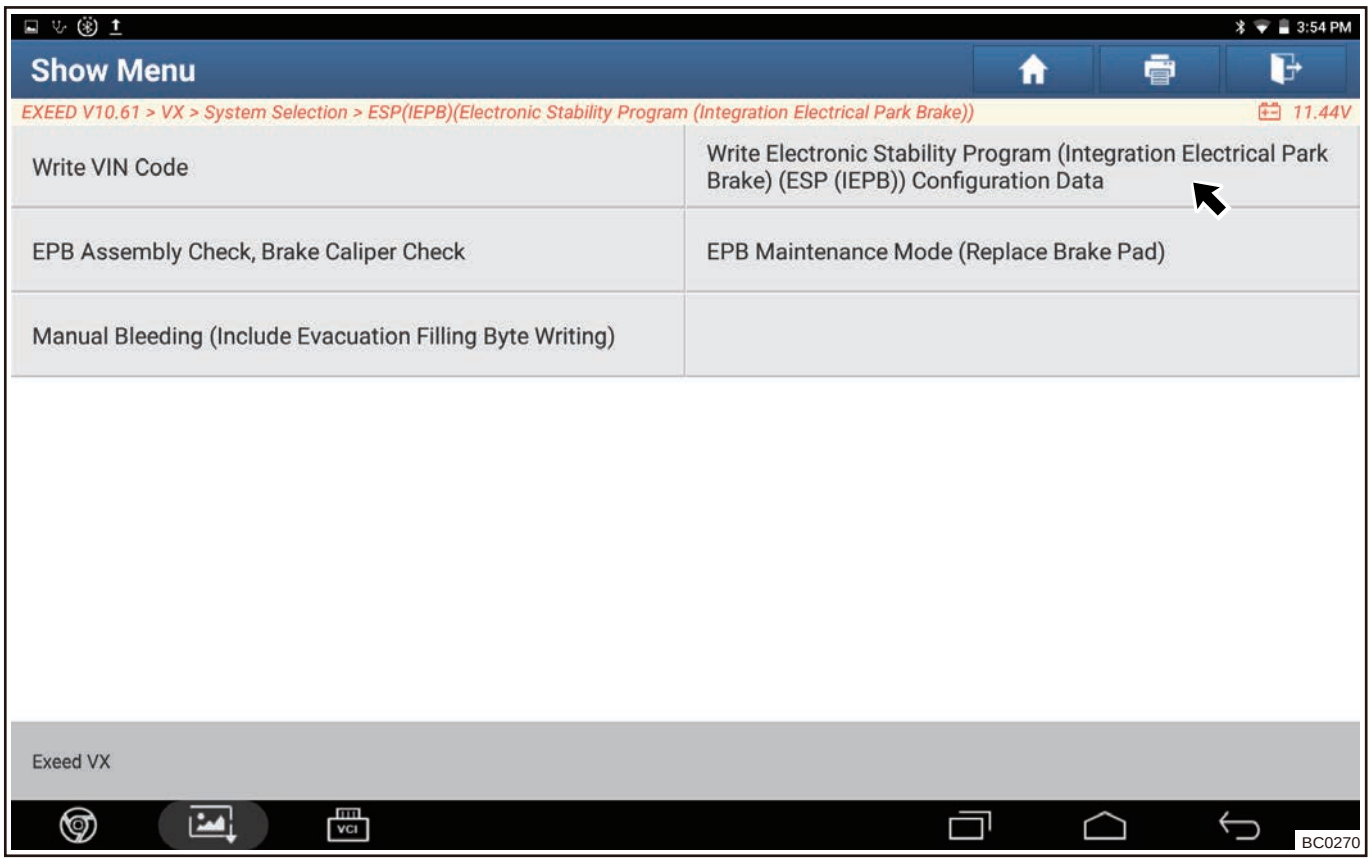
(1) Click “ESP (IEPB) (Electronic Stability Program (Integration Electrical Park Brake))”.



(2) Click “Special Function”.



(3) Click “Write Electronic Stability Program (Integration Electrical Park Brake) (ESP (IEPB)) Configuration Data”.



5.3 Brake System Bleeding

⚠ Warning

- **When bleeding brake system, wear safety glasses. If brake fluid gets on your eyes or skin, wash off with water completely.**
- **Brake fluid has a corrosive on body paint surface. Do not drop brake fluid on body paint surface.**

⚠ Caution

- **Brake fluid should meet the specified type. DO NOT mix brake fluid with other types of brake fluid.**
- **Brake fluid has strong water absorbability, be sure to place it in the original sealed container.**
- **To prevent dust and other foreign matter from entering reservoir, wipe it off before removing reservoir cap.**

■ Description

Bleeding must be performed after brake system components are replaced by the customer (such as replacement of brake fluid, brake pipeline, hydraulic unit) or when brake pedal is weak.
Manual bleeding may be performed on hydraulic unit, one of three bleeding procedures can be selected during maintenance:

- Bleeding can be performed with filling unit (Bleeding pressure is 2 bar);
- Bleeding can be performed with manual pedal;
- Bleeding can be performed with manual pedal and filling unit.

■ Bleeding with bleeding/filling unit (bleeding pressure is 2 bar)

(1) Connect bleeding/filling unit to fluid reservoir, confirm that brake fluid is enough to turn on the switch and set pressure to 2 bar.

(2) Disengage bleeder screw from wheel cylinder until bubbles are drained. Bleeding order is rear left/front left/front right/rear right.

(3) Check the pedal travel.

(4) If it is not successful, repeat the bleeding in order.

(5) After bleeding is finished, check brake fluid level and ensure the level is between maximum value and maximum value.

■ Bleeding with manual pedal

⚠ Caution

- **During the whole bleeding, fluid level in fluid reservoir cannot be lower than minimum mark.**
- **If it is necessary to repeat part or whole bleeding procedure, be sure to wait for 5 minutes to cool solenoid valve down, otherwise solenoid valve may be damaged due to overheat.**

(1) Fill fluid reservoir with brake fluid (up to the bottleneck of filter).

(2) Repeat the following bleeding procedures for each wheel cylinder. Bleeding order is rear left/front left/ front right/rear right.

(3) Disengage the bleeder screw.

(4) Depress brake pedal repeatedly.

(5) When brake pedal is depressed for the last time, depress and hold it and engage bleeder screw.

(6) Release the brake pedal.

(7) Check the brake pedal travel.

(8) If it is not successful, repeat the above bleeding steps in order.

(9) After bleeding is finished, check that the brake fluid level is between maximum mark and maximum mark.

■ **Bleeding with manual pedal and 2 bar bleeding**

⚠ Caution

- **During the whole bleeding, fluid level in fluid reservoir cannot be lower than minimum mark.**
- **If it is necessary to repeat part or whole bleeding procedure, be sure to wait for 5 minutes to cool solenoid valve down, otherwise solenoid valve may be damaged due to overheat.**

(1) Connect bleeding/filling unit to fluid reservoir, confirm that brake fluid is enough to turn on the switch and set pressure to 2 bar.

(2) Disengage bleeder screw from wheel cylinder until bubbles are drained. Bleeding order is rear left/front left/front right/rear right.

(3) Depress pedal repeatedly.

(4) Check the brake pedal travel.

(5) If it is not successful, repeat the bleeding in order.

(6) Check that the brake fluid level is between maximum value and maximum value.

5.4 Front Wheel Speed Sensor

■ **Removal**

⚠ Warning

- **Keep wheel speed sensor away from oil or other foreign matter. Otherwise speed signal generated by wheel speed sensor may be inaccurate, and system may even fail to operate normally.**

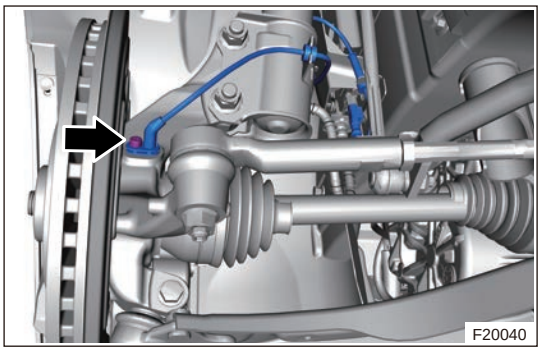
Hint:
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

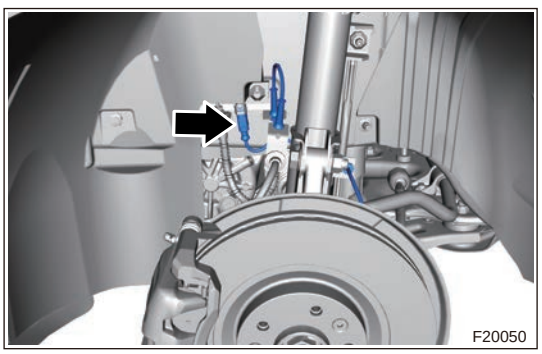
(2) Disconnect the negative battery cable.

(3) Remove the front left wheel.

(4) Remove 1 fixing bolt from front left wheel speed sensor assembly.


F20040

(5) Disconnect the front left wheel speed sensor assembly connector.


F20050

(6) Remove the front left wheel speed sensor assembly.

■ **Inspection**

(1) Check the front wheel speed sensor.

1) Check front wheel speed sensor surface for breakage, dents or notch.
2) Check front wheel speed sensor connector or wire harness for scratches, breakage or damage.
3) If any of above conditions occurs, replace front wheel speed sensor with a new one.
4) Check wheel speed sensor for proper installation.

■ **Installation**

(1) Install front left wheel speed sensor and tighten fixing bolt between front left wheel speed sensor and front left steering knuckle assembly.

Tightening torque: 8 ± 1.2 N·m

(2) Install attachment parts of front left wheel speed sensor wire harness.
(3) Connect the front left wheel speed sensor wire harness connector.
(4) Install the front left wheel.
(5) Connect the negative battery cable.

5.5 Rear Wheel Speed Sensor

■ **Removal**

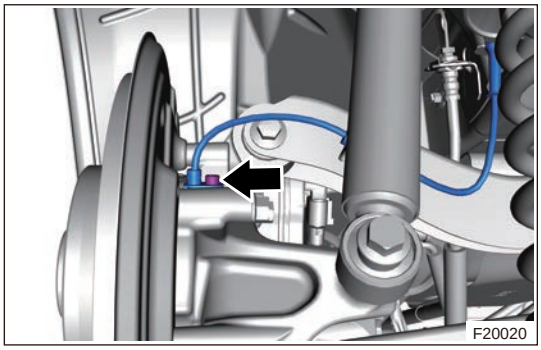
⚠ Warning

- **Keep wheel speed sensor away from oil or other foreign matter. Otherwise speed signal generated by wheel speed sensor may be inaccurate, and system may even fail to operate normally.**

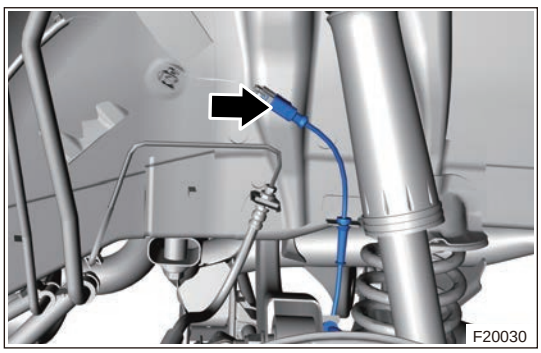
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear left wheel.
(4) Remove the rear left wheel house protector assembly.
(5) Remove 1 fixing bolt from rear left wheel speed sensor assembly.



(6) Disconnect the rear left wheel speed sensor assembly connector.



(7) Remove the rear left wheel speed sensor assembly.

■ **Inspection**

(1) Check the rear left wheel speed sensor.

1) Check rear wheel speed sensor surface for breakage, dents or notch.
2) Check rear wheel speed sensor connector or wire harness for scratches, breakage or damage.
3) If any of above conditions occurs, replace rear wheel speed sensor with a new one.
4) Check wheel speed sensor for proper installation.

■ **Installation**

(1) Install rear left wheel speed sensor and tighten fixing bolt.

Tightening torque: 8 ± 1.2 N·m

(2) Install attachment parts between fixing bracket and rear wheel speed sensor.
(3) Connect the rear left wheel speed sensor connector.
(4) Install the rear left wheel house protector assembly.
(5) Install the rear left wheel.
(6) Connect the negative battery cable.

⚠ Caution

- **When installing coupling bolts, be sure to tighten them to specified torque.**

STEERING SYSTEM

8.1 ELECTRONIC POWER STEERING CONTROL SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Calibration requirements: Keep vehicle stationary and steering wheel centered to ensure that the left and right errors are within 10°.

(2) Battery voltage is higher than 10 V and lower than 16 V.

(3) When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

(4) It is necessary to perform steering angle calibration after replacing electronic power steering column assembly, steering gear, four-wheel alignment etc.

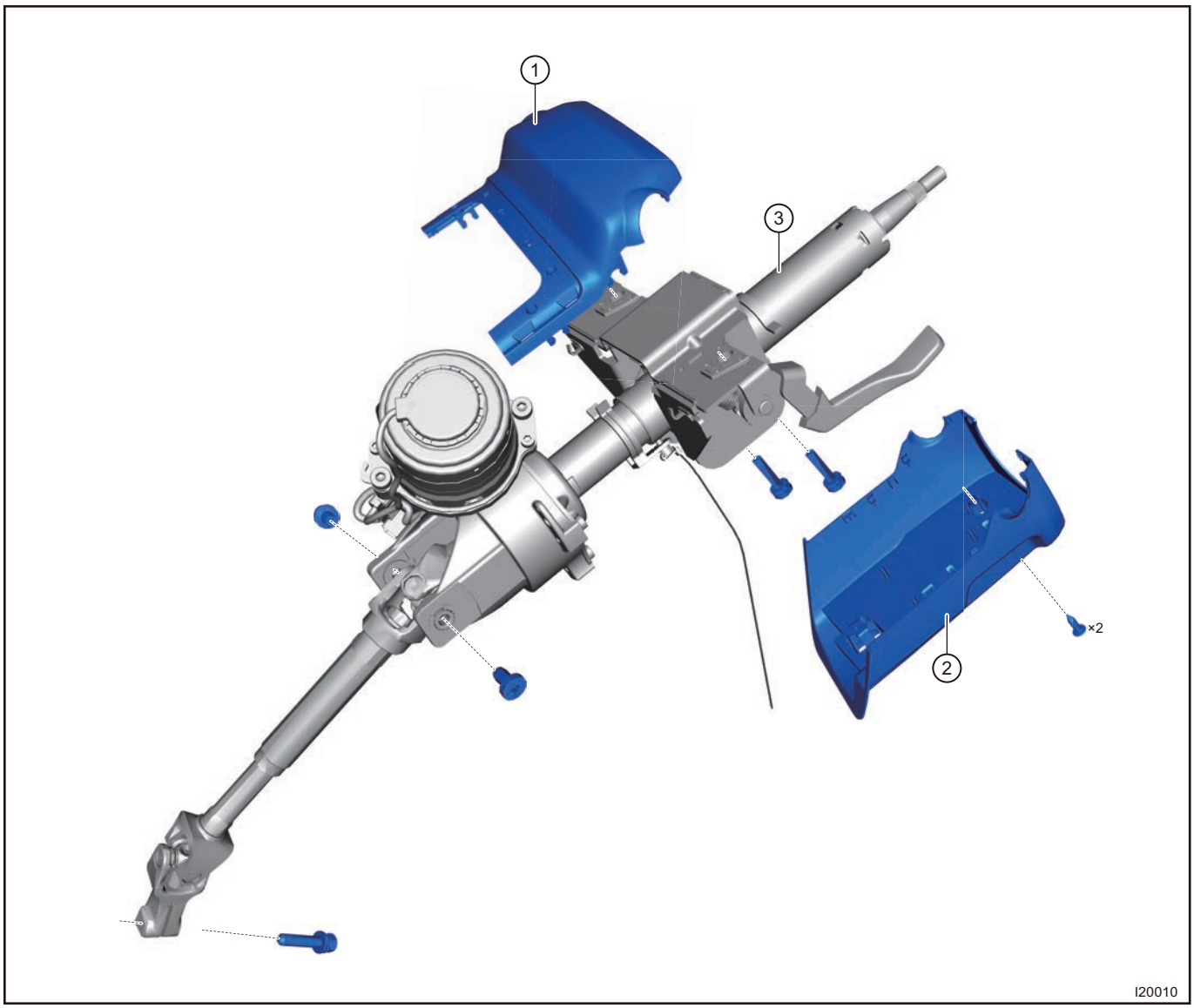
(5) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Description

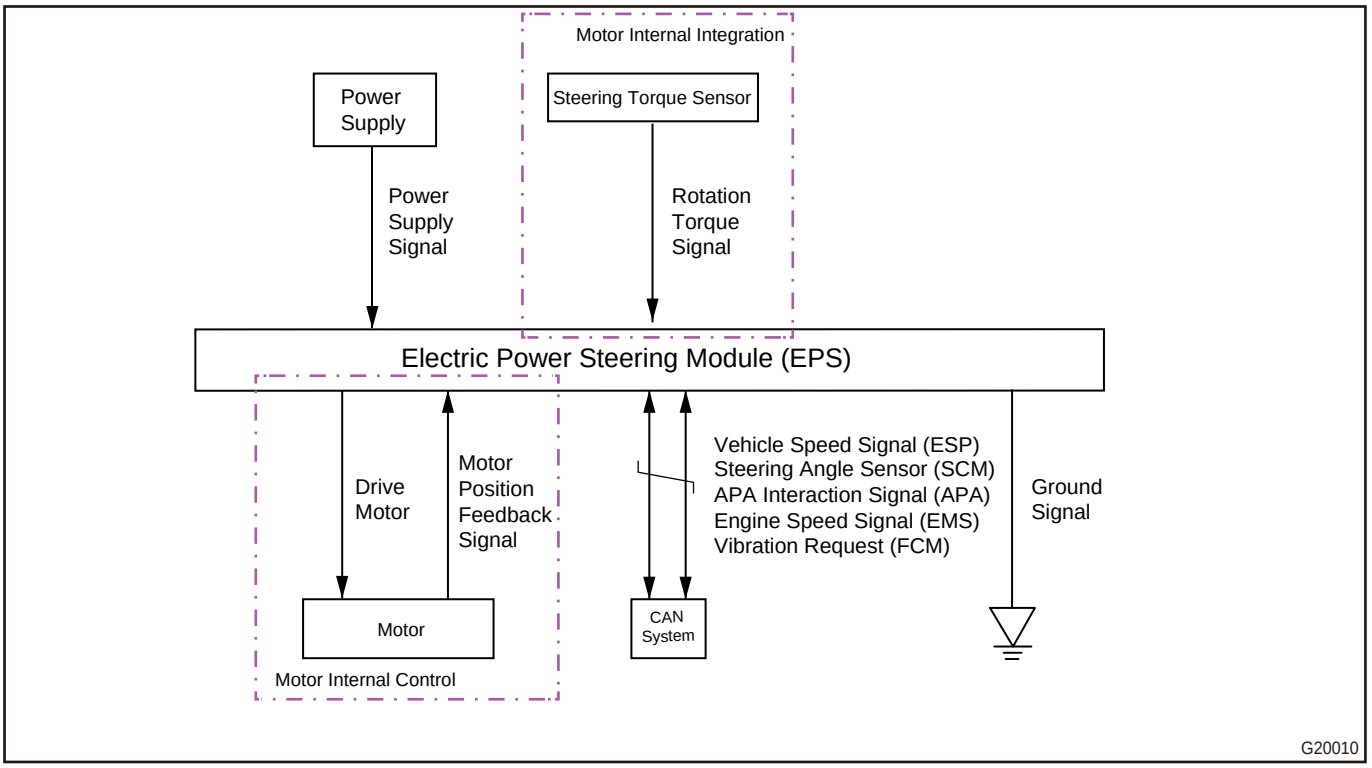
The steering column is the component of the steering system that connects the steering wheel and the steering gear. Through the steering column, the driver transfers torque to the steering gear, which drives the steering gear to achieve steering.

2.2 System Components Diagram



1	Combination Switch Upper Cover	3	Electric Steering Column with Intermediate Shaft Assembly
2	Combination Switch Lower Cover		

2.3 System Schematic Diagram



Electric power steering module is integrated into steering column.

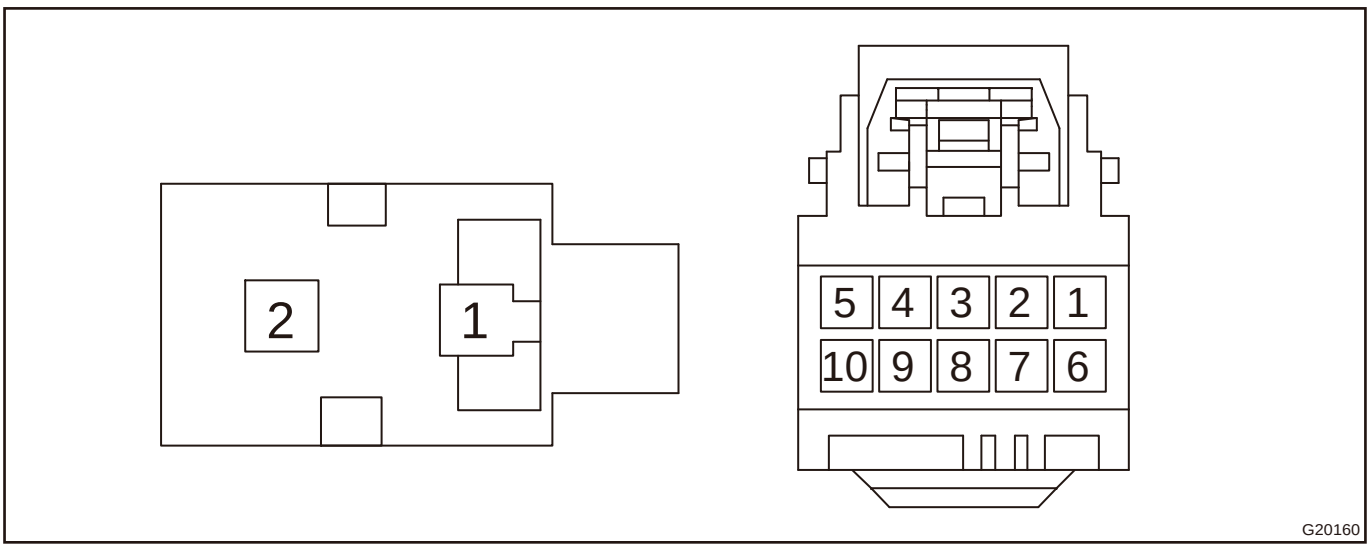
2.4 Component Operation Description

■ Steering Angle Sensor

The steering angle sensor of vehicle is used to detect rotation angle and direction of steering wheel. Turning steering wheel to left and right will be detected by steering angle sensor, so as to make electronic control unit of vehicle send correct steering command. Rotation angle of steering wheel provides basis for steering extent of vehicle, so that the vehicle drives according to driver’ s steering intention.

3 System Circuit Diagram

3.1 Module Terminal Diagram



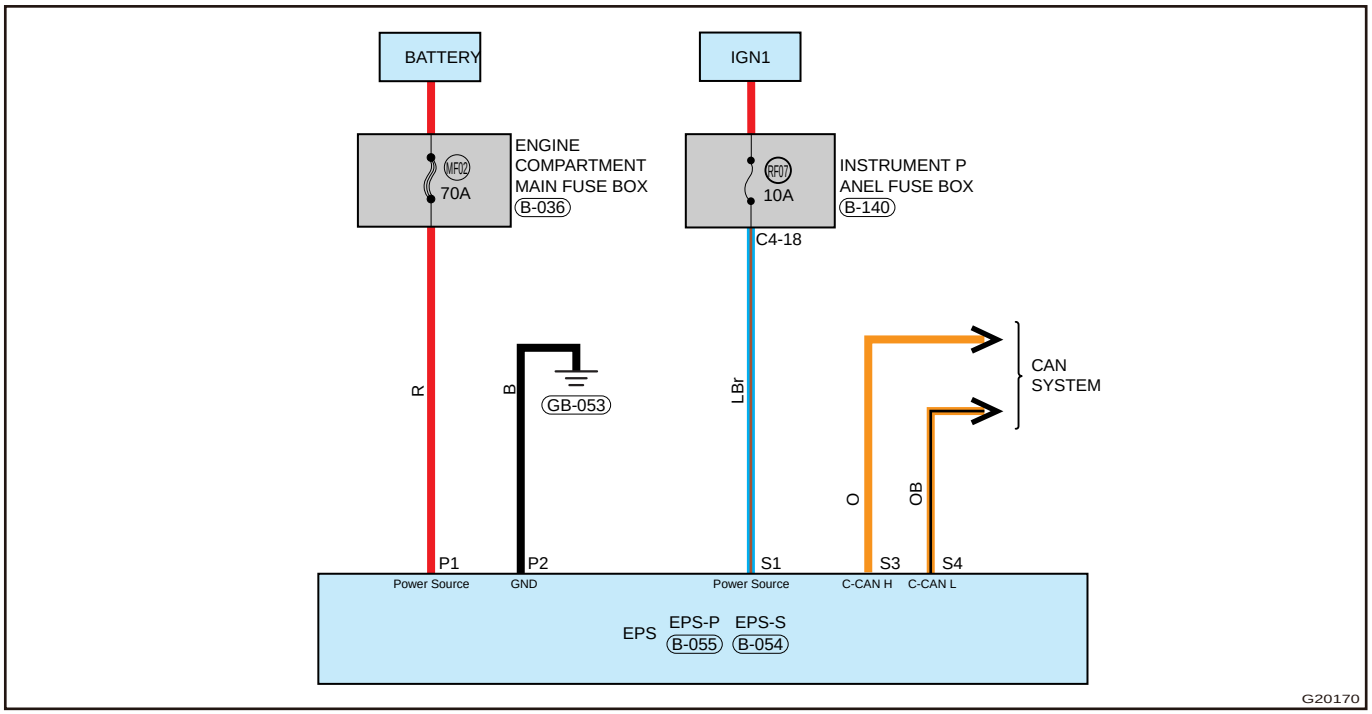
Vehicle power supply: Controller power supply connector (connector A)

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
P1	Body ground	KL30	Power supply “ON”	12V
P2	Body ground	POWER GND	Power supply “ON”	0 V

Vehicle power supply: Controller power supply connector (connector B)

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
S1	Body ground	KL15	Power supply “ON”	12V
S2	Body ground	CAN-H	Power supply “ON”	-
S3	Body ground	C CAN-H	Power supply “ON”	2.78V
S4	Body ground	C CAN-L	Power supply “ON”	2.28V
S5	Body ground	CAN-L	Power supply “ON”	-

3.2 Circuit Diagram



4 Diagnostic Information and Steps

4.1 Diagnostic Help

(1) Connect diagnostic tester (the latest software) to diagnostic connector, and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of brake control system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all wire harness connectors and ground parts related to DTC.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

4.2 Intermittent Troubleshooting

If malfunction is intermittent, perform the followings:

(1) Check if connector is loose.
(2) Check if wire harness is worn, pierced, pinched or partially broken.
(3) Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
(4) If possible, try to duplicate the conditions under which DTC was set.
(5) Look for data that has changed or DTC to reset during wiggle test.
(6) Look for broken, bent, protruded or corroded terminals.
(7) Inspect the mounting areas of brake control system, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
(8) Check and clean all wire harness connectors and ground parts related to DTC.
(9) Refer to any Technical Bulletin that may apply to this malfunction.

4.3 Ground Inspection

Ground points are very important to normal work of circuit, and they are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.4 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures:

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic connector, and make it communicate with vehicle electronic module through data network.
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in EPB system.
- Turn the ENGINE START STOP switch to OFF and wait for several seconds.
- Turn the ENGINE START STOP switch to ON, select “Read DTC”.
- If DTC is not detected, malfunction indicated by DTC is intermittent.

4.5 System Diagnosis Procedure

Hint:

- Use following procedures to troubleshoot the electronic parking control system (EPB).

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

(a) Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V.

NG → **Replace battery**

OK

3	**Customer problem analysis**

NEXT

4	**Read DTCs**

No DTC → **Repair according to Problem Symptoms Table**

DTC occurs

5	**Read DTCs (current DTC and history DTC)**

No DTC → **Troubleshoot according to Intermittent DTC Fault Flow**

DTC occurs

6	**Repair according to Diagnostic Trouble Code (DTC) Chart**

NEXT

7	**Adjust, repair or replace**

NEXT

8	**Conduct test and confirm malfunction has been repaired**

NEXT → END

4.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause
C120500	External Function Fault - Invalid LKA Torque	Lane keeping assist torque is high	• Intermittent fault • EPS module failure
C200100	EPS Internal Software Error - Dataflash Operation Error	• Nv Ram reading failure • Nv Ram writing failure	EPS module failure
C200200	EPS Internal Software Error - Dataflash Verify Error	• Incorrect NvRam configuration or initialization • Software label error in NvRam • Incorrect data exists in NvShare	
C200300	EPS Internal Hardware Error - ECU Hardware Error	• SPI communication timeout • Watchdog enabled/ disabled failure • ASIC start failure • ADC operation failure • Error in RAM • Built-in software test failed • Different outputs for incorrect pin • Registration read back failure • SGA error in single-chip microcomputer • Improper reset	
C200400	EPS Internal Software Error - ECU Reset	Improper reset of ECU	
C200500	EPS Internal Software Error - ECU Software Monitor Error	• OS monitoring routine for OS error detection • Design problem or timing problem (load when running) or unauthorized interrupt latch • Comparison failure in level 1 of comparator • Comparison failure in level 2 of comparator • • Rotor position angle error; • Software default branch failure • Error handling process monitoring failure	

DTC	DTC Definition	Detection Condition	Possible Cause
		• CodeFlash implausibility • Problem in error event reaction component • Different applied torque and calculated torque.	
C200600	EPS Internal Hardware Error - Flash Code Verify Error	Code flash corrupted	
C200700	EPS Steering Column Error - High Friction	Steering friction too high	Steering column stuck
C200800	EPS Internal Hardware Error - Index Sensor Error	Index sensor failure	EPS module failure
C200900	EPS Internal Hardware Error - Output Stage Error	• SPI communication failure due to flag inconsistency or error frame response • Output stage failure • Output stage drive failure • Measured output stage PWM error	EPS module failure
C200A00	EPS Internal Hardware Error - Phase Current Error	• Motor phase current out of range • Motor phase current offset out of range	
C200B00	EPS Internal Hardware Error - RPS Error	• RPS radius error • DRPS sensor plausibility	
C200C00	EPS Internal Hardware Error - Steering Oscillation Error	Reduction of assistance is within 0 - 40% due to steering oscillation. Note:100 % = Full assistance	Mechanical components loose
C200D00	EPS Internal Software Error - Steering Angle Implausible Error	Different iLWS and steering wheel speed angle	• Configuration error • EPS failure
C200E00	EPS Internal Software Error - Steering Angle Not Initialized Error	iLWS not initialized	• Steering angle not calibrated • Low software version • EPS failure
C200F00	EPS Internal Software Error - Steering Angle Not Calibrated Error	iLWS not calibrated	
C201100	EPS Internal Hardware Error - Steer Ang Sens Self Test Error	Internal steering angle sensor self test failure	EPS module failure
C201200	Voltage Out of Range - Power Supply Voltage Abnormal at Start	Battery voltage less than 8.3 or more than 18 V at start	• Battery fault • Wire harness or connector fault • ECU intermittent fault • EPS failure
C201300	Voltage Out of Range - Power Supply Voltage too High Warn	When battery voltage is higher than 16 V for at least 1.5 s	

DTC	DTC Definition	Detection Condition	Possible Cause
C201400	Voltage Out of Range - Reduction Due to High Power Supply Voltage	Battery voltage is within 16 - 18 V and assistance reduces to 0 - 40%	
C201500	Voltage Out of Range - Power Supply Voltage too High OFF	When battery voltage is higher than 18 V for at least 20 ms	
C201600	Voltage Out of Range - Power Supply Voltage too Low Warn	When battery voltage is lower than 10 V for at least 9 s	
C201700	Voltage Out of Range - Reduction Due to Low Power Supply Voltage	When battery voltage is within 6.5 - 10 V and reduction of assistance is within 0 - 60%. Note:100 % = Full assistance	
C201800	Voltage Out of Range - Power Supply Voltage too High OFF	When battery voltage is lower than 6.5 V for at least 20 ms	
C201900	Temperature Error - Over Temperature Reduction	• When PCB temperature is higher than 85°C and the reduction of assistance is within 0 - 40% • When FET temperature is higher than 100 ˚C and the reduce of assistance is within 0 - 60% • Motor temperature is higher than 150°C, and the reduction of assistance is within 0 - 40%; Note:100 % = Full assistance	• System overheating • ECU intermittent fault • EPS failure
C201A00	Temperature Error - Temperature Out of Range	• PCB temperature is out of range • Temperature difference between NTC1 and NTC2 is within -24 to 27 ˚C for at least 2 s	
C201B00	EPS Internal Hardware Error - Torque Sensor Error	• Torque sensor passage is not available, power supply of sensor is undervoltage and torque difference between A and B is too large • SENT driver protocol is faulty	• Torque sensor failure • EPS failure
C201C00	EPS Internal Software Error - Flash Memory Changed via XCP	When it does not flash properly via XCP, this will be detected if the CRC fails while part of flashing is adjusted.	• Intermittent fault • Low software version • EPS failure

DTC	DTC Definition	Detection Condition	Possible Cause
C201D00	EPS Internal Software Error - ECU Software Info Error	• OEM task running fails • Floating point overflows/ underflows; Software is corrupted	
C201E46	EPS Internal Software Error - Vehicle Configuration Not Programmed	Vehicle configuration data is not programmed	Configuration writing is not performed or configuration is lost

■ **DTC Diagnosis Procedure**

DTC	C120500	External Function Fault - Invalid LKA Torque

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Reduce lane keeping assist torque to less than 3 Nm and reset ECU

(a) Turn ENGINE START STOP switch to OFF.
(b) Reduce lane keeping assist torque to less than 3 Nm.
(c) Reset the ECU.

OK → **Conduct test and confirm malfunction has been repaired**

NG → **Replace EPS controller assembly**

DTC	C201200	Voltage Out of Range - Power Supply Voltage Abnormal at Start
DTC	C201300	Voltage Out of Range - Power Supply Voltage too High Warn
DTC	C201400	Voltage Out of Range - Reduction Due to High Power Supply Voltage
DTC	C201500	Voltage Out of Range - Power Supply Voltage too High OFF
DTC	C201600	Voltage Out of Range - Power Supply Voltage too Low Warn
DTC	C201700	Voltage Out of Range - Reduction Due to Low Power Supply Voltage
DTC	C201800	Voltage Out of Range - Power Supply Voltage too High OFF

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Check battery voltage

(a) Check if battery voltage is normal.
(b) Check battery voltage with voltage band of multimeter.

OK

Standard voltage: Not less than 12 V.

NG → **Check and repair battery**

OK

2	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Remove fuses MF02 (70 A) and RF07 (10 A) from engine compartment fuse and relay box.
(d) Check if fuse is blown.

NG → **Replace fuse**

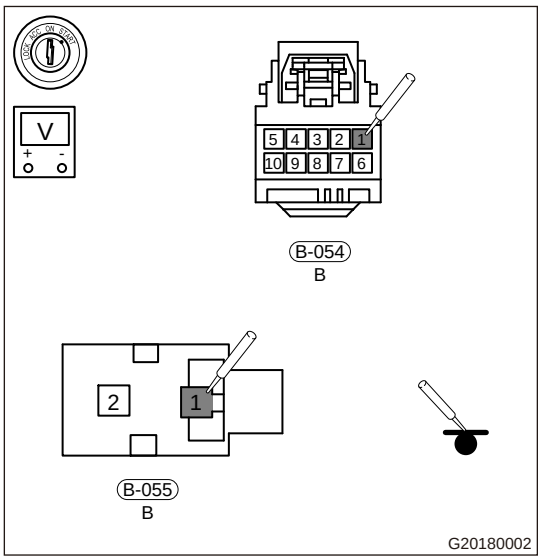
OK

3	Check power supply voltage

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect electronic power steering module connectors B-055 and B-054.
(c) Turn ENGINE START STOP switch to ON.
(d) Check voltage between B-055 (1) and body ground with voltage band of multimeter, and check if 21 W test light comes on.
Check voltage between B-054 (1) and body ground with voltage band of multimeter, and check if 21 W test light comes on.

Standard Voltage

Multimeter Connection	Detection Condition	Specified Condition
B-055 (1) - Body ground	ENGINE START STOP switch “ON”	Not less than 12 V
B-054 (1) - Body ground	ENGINE START STOP switch “ON”	Not less than 12 V
B-054 (1) - Body ground	ENGINE START STOP switch “ON”	On
B-055 (1) - Body ground	ENGINE START STOP switch “ON”	On



NG → **Repair or replace power supply wire harness**

OK

4	Check ground

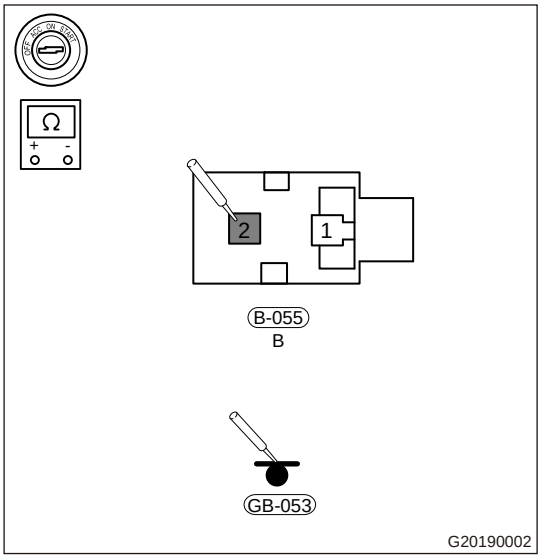
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the electronic power steering module connector B-055.

(c) Check for continuity between B-055 (2) and body ground GB-053 with ohm band of multimeter.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-055 (2) - Body ground GB-053	Always	⩽ 1 Ω



NG → **Repair or replace ground point**

OK

5	**Check wire harness and connector**

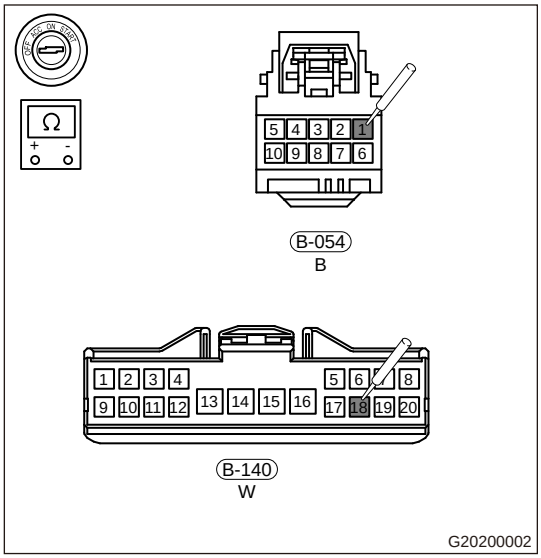
(a) Turn ENGINE START STOP switch to OFF.

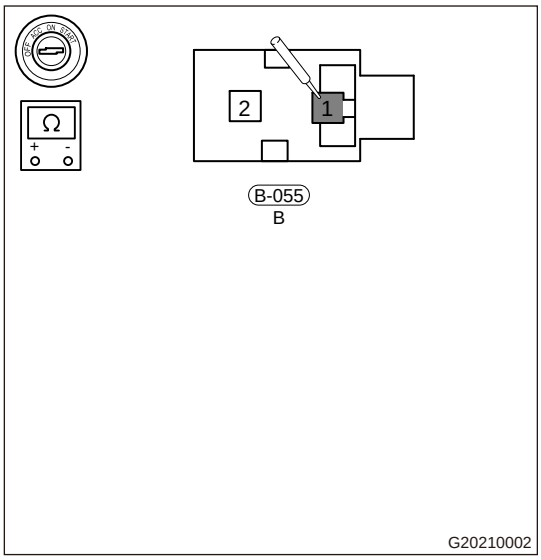
(b) Disconnect electronic power steering module connectors B-054 and B-055.

(c) Using ohm band of multimeter, check for continuity between B-054(1) and C4-18 of instrument panel fuse and relay box B-140, B-055 (1) and engine compartment fuse and relay box B-036.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-054(1)- B-140 (C4-18)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
B-055 (1) - B-036	ENGINE START STOP switch “OFF”	⩽ 1 Ω

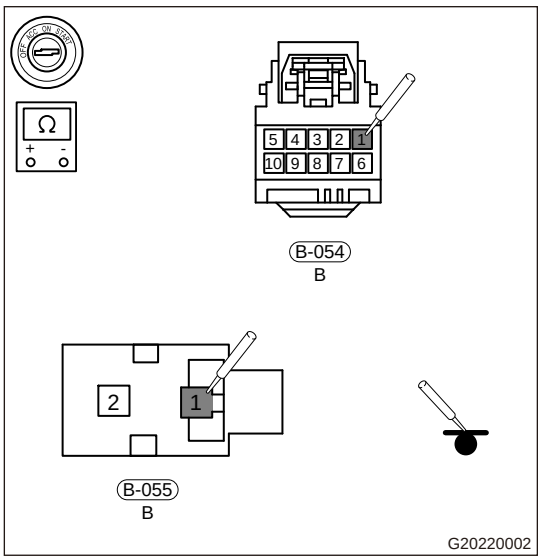




(d) Check for continuity between B-055 (1) and body ground, B-054 (1) and body ground with ohm band of multimeter.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-055 (1) - Body ground	ENGINE START STOP switch “OFF”	∞
B-054 (1) - Body ground	ENGINE START STOP switch “OFF”	∞



NG → **Repair or replace control circuit wire harness and connector**

OK

6	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm malfunction has been repaired
NG	Replace EPS controller assembly

DTC	C200300	EPS Internal Hardware Error - ECU Hardware Error

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Check if MF02 70A fuse of engine compartment main fuse box B-036 is blown.
(c) Check if RF07 10A fuse in instrument panel fuse box B-140 is blown.

NG	Replace fuse

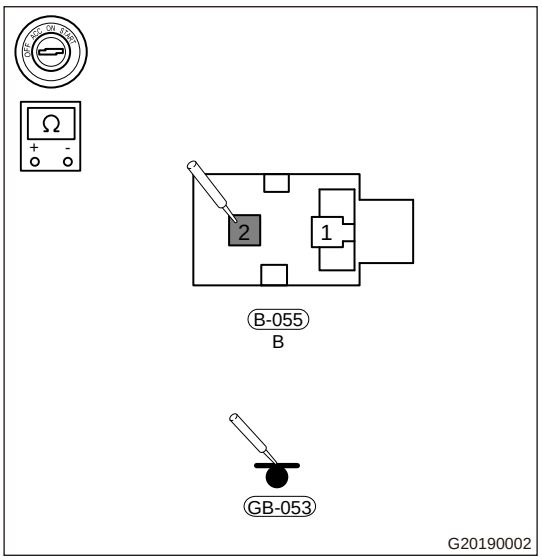
OK

2	Inspect EPS power supply and ground circuit

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the electronic power steering module connector B-055.
(c) Using a multimeter, check for continuity between terminal 2 of EPS connector B-055 and ground point GB-053.

Standard Resistance

Multimeter Connection	Detection Condition	Specified Condition
B-055 (2) - Ground point GB-053	ENGINE START STOP switch "OFF"	⩽ 1 Ω

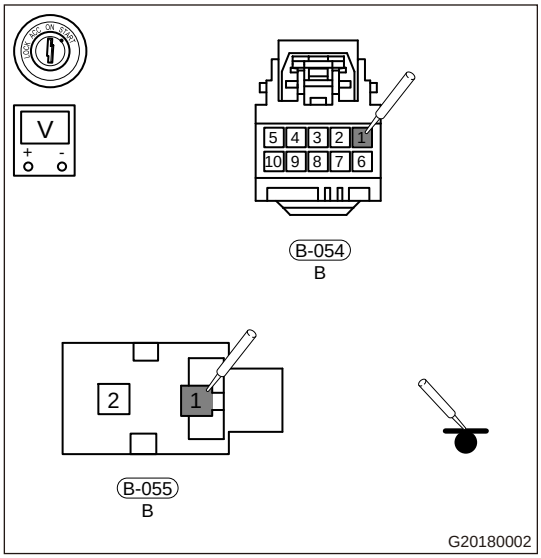


(d) Turn ENGINE START STOP switch to ON.

(e) Measure voltage between B-055 (1) and body ground, B-054 (1) and body ground with voltage band of multimeter.

Standard Voltage

Multimeter Connection	Detection Condition	Specified Condition
B-055 (1) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
B-054 (1) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V



NG → **Repair or replace power supply wire harness**

OK

3	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm malfunction has been repaired**

NG → **Replace EPS controller assembly**

DTC	C200100	EPS Internal Software Error - Dataflash Operation Error
DTC	C200200	EPS Internal Hardware Error - ECU Hardware Error
DTC	C200300	EPS Internal Software Error - Dataflash Verify Error
DTC	C200500	EPS Internal Software Error - ECU Software Monitor Error
DTC	C200600	EPS Internal Hardware Error - Flash Code Verify Error
DTC	C200800	EPS Internal Hardware Error - Index Sensor Error
DTC	C200900	EPS Internal Hardware Error - Output Stage Error
DTC	C200A00	EPS Internal Hardware Error - Phase Current Error
DTC	C200B00	EPS Internal Hardware Error - RPS Error
DTC	C200C00	EPS Internal Hardware Error - Steering Oscillation Error
DTC	C200D00	EPS Internal Software Error - Steering Angle Implausible Error
DTC	C200E00	EPS Internal Software Error - Steering Angle Not Initialized Error

DTC	C200F00	EPS Internal Software Error - Steering Angle Not Calibrated Error
DTC	C201100	EPS Internal Hardware Error - Steer Ang Sens Self Test Error

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Check battery voltage

(a) Connect negative battery terminal cable, and turn ENGINE START STOP switch to ON to make engine run normally.

(b) Check battery voltage with voltage band of multimeter.

OK

Standard voltage: Not less than 12 V

NG → **Check and repair battery**

OK →

2	Check ground

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect negative battery cable, and check EPS ground point.

OK

Ground point is well.

NG → **Repair or replace ground wire circuit or ground point**

OK →

3	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.

(b) Start the engine.

(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm malfunction has been repaired**

NG → **Replace EPS controller assembly**

DTC	C200700	EPS Steering Column Error - High Friction

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Check tire pressure

(a) Check tire for wear.
(b) Use tire pressure gauge to check tire pressure, and standard pressure value is required.

NG	**Check and repair or replace tire**

OK

2	**Check mechanical steering gear and chassis system**

(a) Check if mechanical steering gear runs smoothly or is stuck.
(b) Check if chassis area is damaged.

NG	**Replace steering gear or chassis components**

OK

3	**Check EPS motor and universal joint**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check if mechanical universal joint is damaged.
(c) Check if electric steering column motor is damaged.

NG	**Replace electric steering column or universal joint**

OK

4	**Reconfirm DTCs**

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

OK	**Conduct test and confirm malfunction has been repaired**
NG	**Replace EPS controller assembly**

DTC	C201E46	EPS Internal Software Error - Vehicle Configuration Not Programmed

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	**Check configuration code of EPS controller**

(a) Turn ENGINE START STOP switch to ON.
(b) Use diagnostic tester (the latest software) to read configuration code in EPS system.
(c) Check if configuration code is written and correct.

NG	**Rewrite correct configuration code**

OK

2	Check EPS motor calibration

(a) Keep battery voltage sufficient.
(b) Park vehicle on a level ground and keep it straight ahead.
(c) Connect diagnostic tester, and recalibrate EPS motor according to prompted requirements.

NG → **Recalibrate it several times if necessary**

OK

3	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

OK → **Conduct test and confirm malfunction has been repaired**

NG → **Replace EPS controller assembly**

DTC	C201900	Temperature Error - Over Temperature Reduction
DTC	C201A00	Temperature Error - Temperature Out of Range

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Decrease ambient temperature, and avoid strong steering movement

(a) Turn ENGINE START STOP switch to OFF.
(b) Park vehicle on a level ground and cool it for a while.

NG → **Read DTCs again**

OK

2	Check if EPS is assembled correctly and tire pressure is sufficient

(a) Check steering column for mechanical friction or interference.
(b) Check steering gear for mechanical friction or interference or damage.
(c) Check if tire pressure is sufficient.

NG → **Readjust assembly**

OK

3	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm malfunction has been repaired
NG	Replace EPS controller assembly

DTC	C201B00	EPS Internal Hardware Error - Torque Sensor Error
DTC	C201C00	EPS Internal Software Error - Flash Memory Changed via XCP
DTC	C201D00	EPS Internal Software Error - ECU Software Info Error

⚠ Caution

- **When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.**

1	Recheck torque sensor connection and reset ECU

(a) Turn ENGINE START STOP switch to OFF.
(b) Recheck the torque sensor connection.
(c) Reset the ECU.

NG	Replace torque sensor

OK

2	Refresh software

(a) Refresh the software.

NG	Refresh software

OK

3	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

OK	Conduct test and confirm malfunction has been repaired
NG	Replace EPS controller assembly

DTC	U000188	High Speed CAN Communication Bus
DTC	U010087	CAN Communication Error - Lost Communication with EMS
DTC	U010187	CAN Communication Error - Lost Communication with TCU
DTC	U012287	CAN Communication Error - Lost Communication with ESC

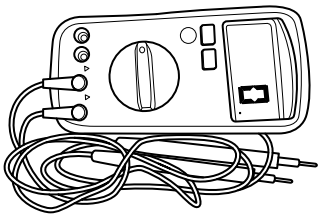
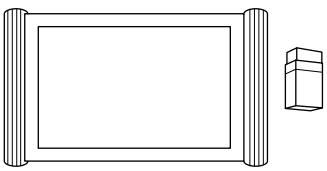
DTC	U015587	CAN Communication Error - Lost Communication with IPC
DTC	U015987	CAN Communication Error - Lost Communication with PDC_APA
DTC	U023987	CAN Communication Error - Lost Communication with FCM
DTC	U024887	CAN Communication Error - Lost Communication with PEPS
DTC	U040181	CAN Communication Error - Invalid DLC Received from EMS
DTC	U040281	CAN Communication Error - Invalid DLC Received from TCU
DTC	U041681	CAN Communication Error - Invalid DLC Received from ESC
DTC	U042381	CAN Communication Error - Invalid DLC Received from IPC
DTC	U042681	CAN Communication Error - Invalid DLC Received from PEPS
DTC	U053A81	CAN Communication Error - Invalid DLC Received from FCM
DTC	U200281	CAN Communication Error - Invalid DLC Received from PDC_APA

Refer to CAN network malfunction diagnosis.

5 On-vehicle Service

5.1 Tools

■ General Tools

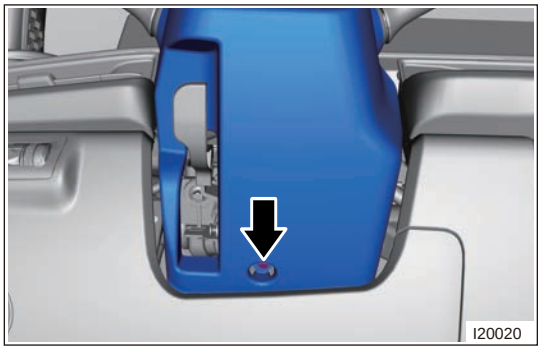
Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001

5.2 Replacement of Combination Switch Cover Assembly

■ Removal

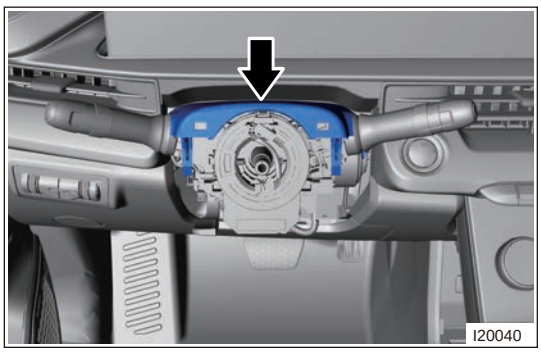
(1) Set the steering wheel to straight-ahead position.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the driver airbag assembly.
(5) Remove the steering wheel assembly.

(6) Remove the combination switch lower cover fixing screw. (arrow).



(7) Disengage connecting clips between upper cover and lower cover, and separate upper cover and lower cover, then remove lower cover.

(8) Disengage combination switch upper cover from DVD trim panel, and remove upper cover.



⚠ Caution

- **Operate carefully to prevent damage to components during removal.**

Hint:

- Check combination switch upper and lower covers for damage or deformation. Replace upper and lower covers if necessary.
- Check if upper and lower cover clips are normal. Replace upper and lower covers if necessary.

■ Installation

(1) Loosen steering wheel adjusting handle, and adjust steering column assembly to uppermost position, then tighten adjusting handle to uppermost position.

(2) Insert steering column lower cover from right side of combination switch at an angle, and then install adjusting handle into cover hole.

(3) After adjusting lower cover, install upper cover and fix upper and lower cover clips in place.

(4) Install fixing screw to combination switch lower cover.

⚠ Caution

- **Tighten fixing screw in place.**
- **Operate carefully to prevent damage to components during installation.**

(5) Install the steering wheel assembly.

(6) Install the driver airbag assembly.

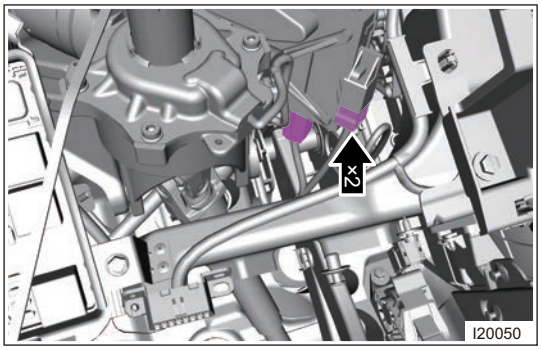
(7) Install the negative battery cable.

(8) Press ENGINE START STOP switch and perform running test.

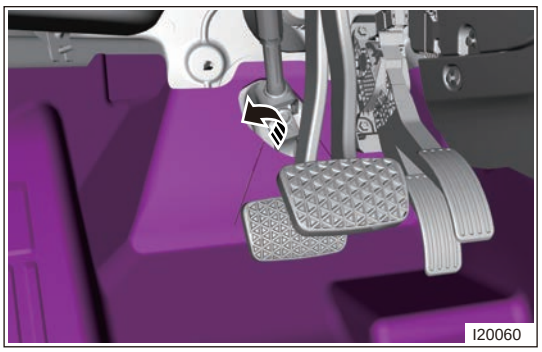
5.3 Replacement of Steering Column with Intermediate Shaft Assembly

■ Removal

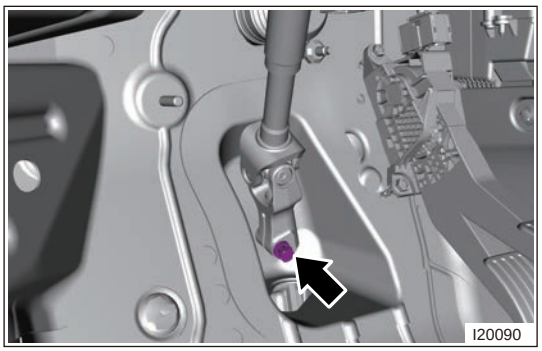
(1) Set the steering wheel to straight-ahead position.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the driver airbag assembly.
(5) Remove the steering wheel assembly.
(6) Remove the combination switch cover.
(7) Remove the spiral cable.
(8) Remove the light combination switch assembly.
(9) Disconnect 2 connectors (arrow) from EPS controller.



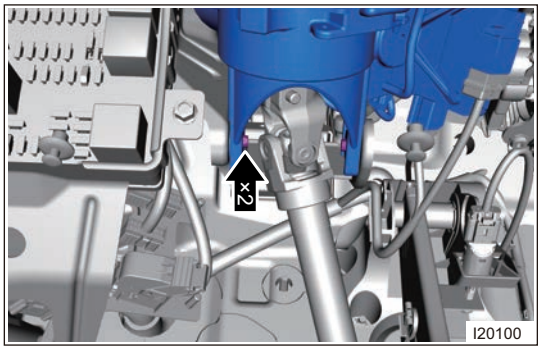
(10) Turn over carpet under driver seat in the direction of arrow.



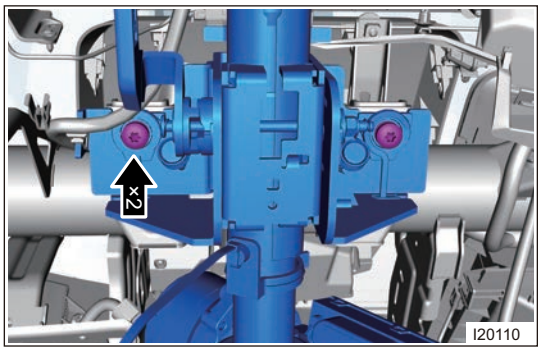
(11) Remove the coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.



(12) Remove 2 fixing bolts (arrow) from steering column lower bracket.



(13) Remove 2 fixing bolts (arrow) from steering column upper bracket.



(14) Remove the steering column with intermediate shaft assembly.

⚠ Caution

- **Check steering column assembly for wear, crack or deformation. As welding or correction is not allowed, replace steering column assembly if necessary.**
- **Check steering column bearing for looseness, wear or sticking. Replace steering column assembly if necessary.**

■ Installation

(1) Install the steering column with intermediate shaft assembly.
(2) Install 2 fixing bolts to steering column upper bracket.
Tightening torque: 25 ± 2 N·m

(3) Install 2 fixing bolts to steering column lower bracket.
Tightening torque: 25 ± 2 N·m

(4) Install coupling bolt between steering column with intermediate shaft assembly and steering gear input shaft.
Tightening torque: 40 ± 3 N·m

(5) Place the carpet under driver seat in a suitable position.
(6) Connect 2 connectors to EPS controller.
(7) Install the light combination switch assembly.
(8) Install the spiral cable.
(9) Install the combination switch cover.
(10) Install the steering wheel assembly.
(11) Install the driver airbag assembly.
(12) Install the negative battery cable.
(13) Press ENGINE START STOP switch and perform running test.
(14) Connect EXEED special diagnostic tester, read and clear DTCs.

■ Replacement and Matching Overview

Hint:

- Before performing matching and learning of vehicle module, be sure to carefully read the related precautions and perform the operation strictly according to standard working procedures.

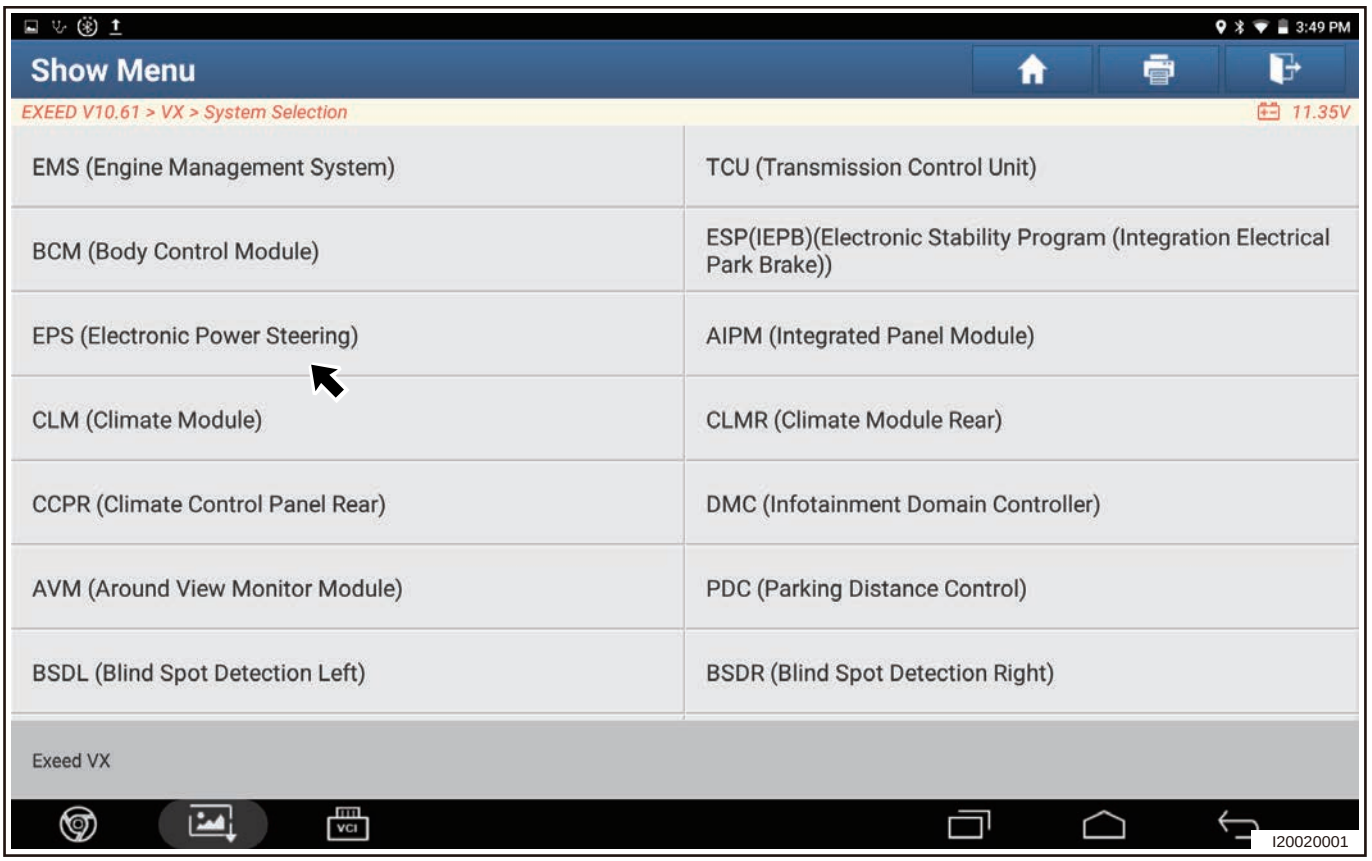
For details of matching and learning of Electronic Power Steering (EPS) system performed under different situations, see table below:

Items	Applicable Situations	Actions Required by Diagnostic Tester	Note
Module replacement	• Module damage • Module failure	Writing VIN code	Relearning steering angle calibration is not necessary when writing VIN code, they are not affected each other.
		Software configuration information writing	
		Steering angle calibration	
Software upgrading	• Low software version • Software error	Controller software refreshing	/
Calibration	• Replacement of steering wheel • Replacement of EPS motor assembly • Steering gear • Four-wheel alignment	Steering angle calibration	When recalibrating steering angle, it is necessary to clear calibrated data
Configuration writing	• Replacement of module • Modification of configuration	Software configuration information writing	If configuration code cannot be read in the original module, try to get it from same configuration model or EXEED after-sales service department

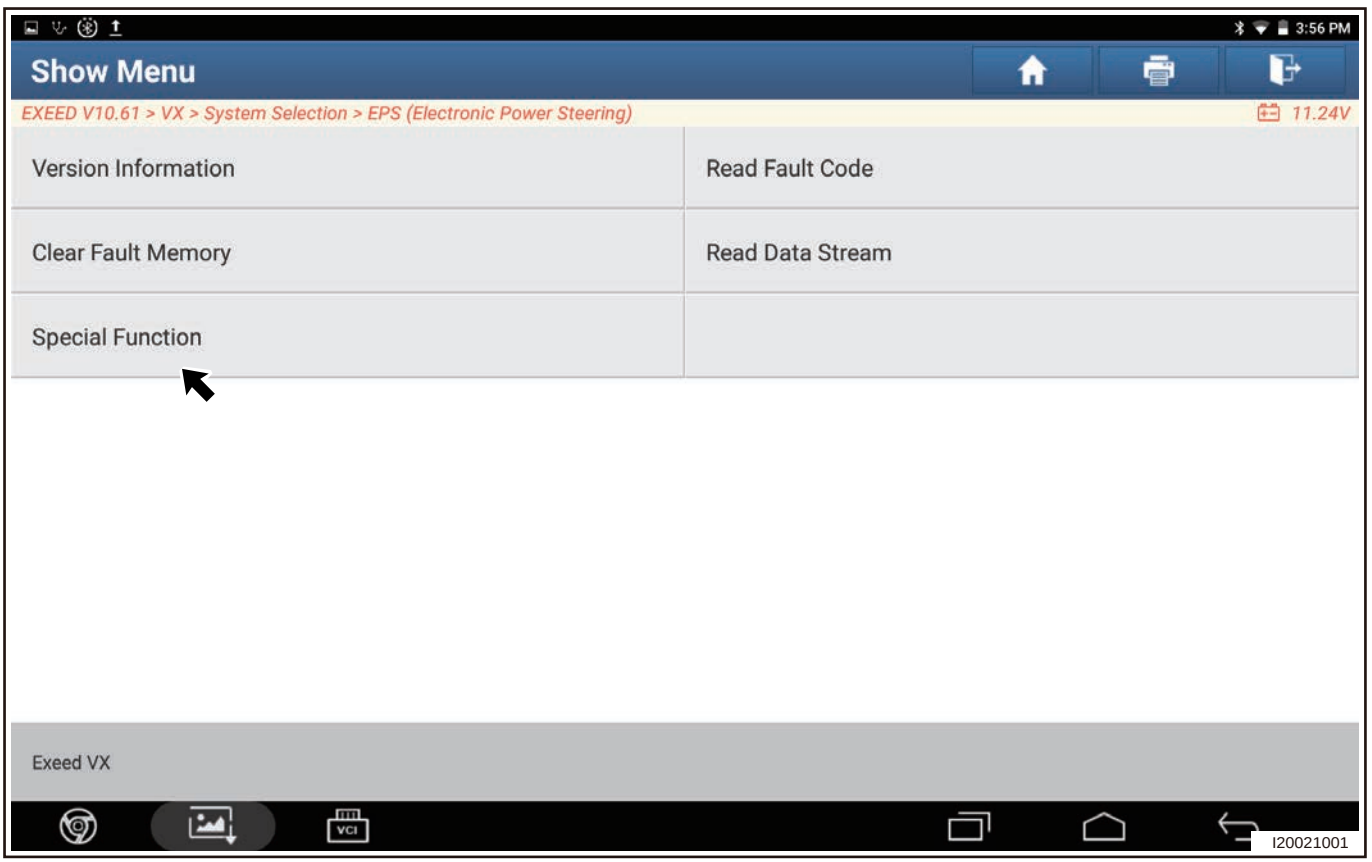
■ Writing VIN Code

(1) Connect diagnostic tester, turn ignition switch ON.

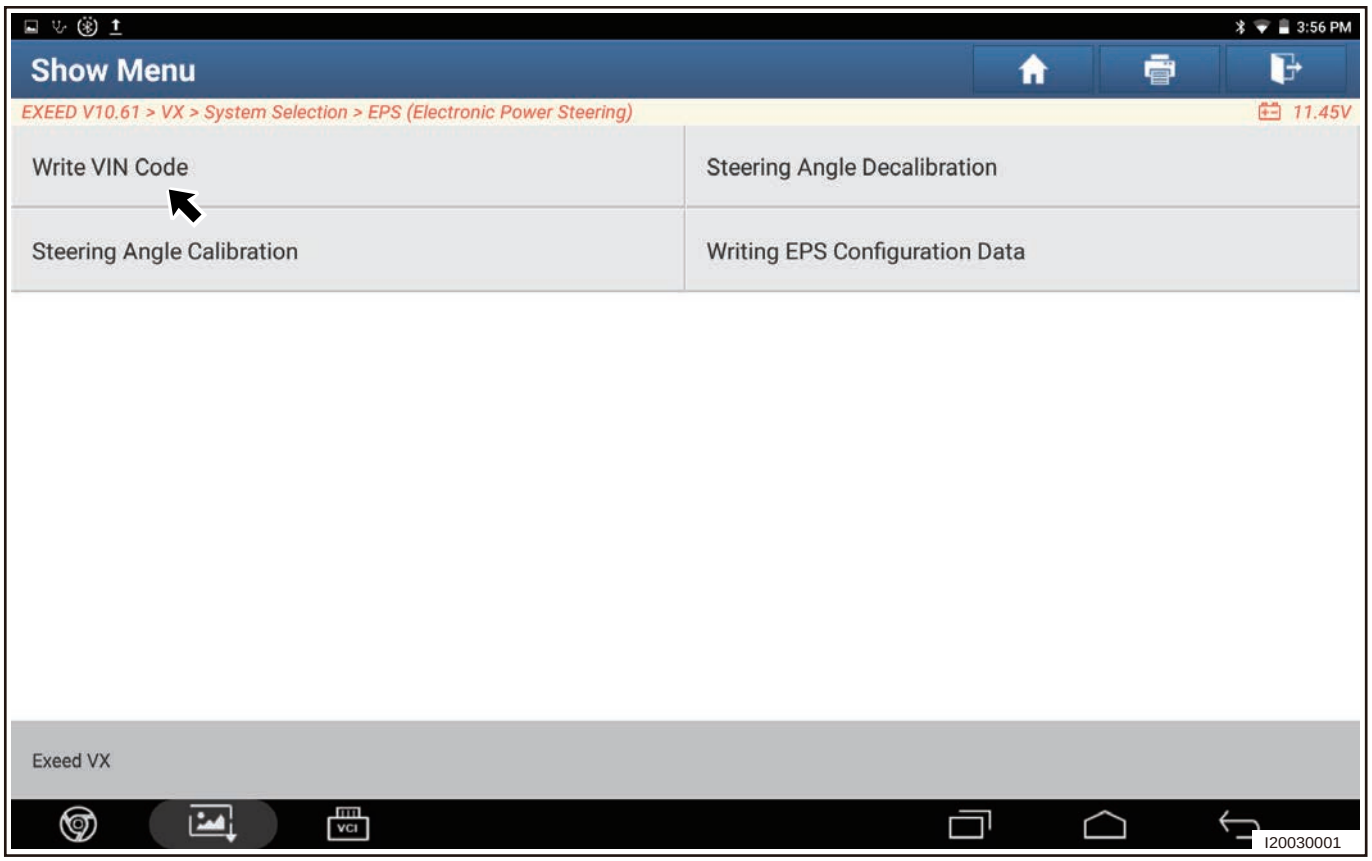
(2) Enter “EPS (Electronic Power Steering System)”.



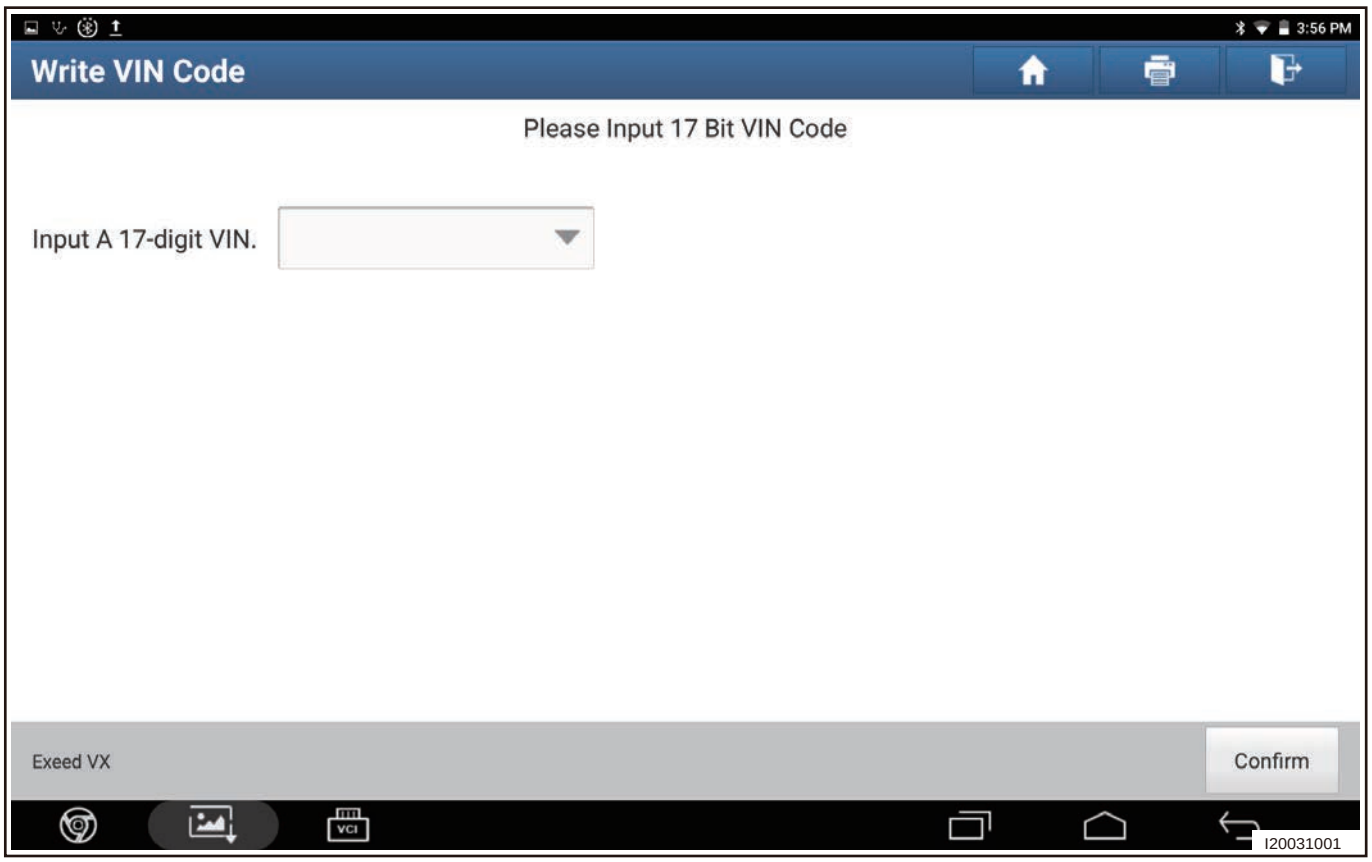
(3) Click “Special Function”.



(4) Enter next screen and click “Writing VIN Code”.



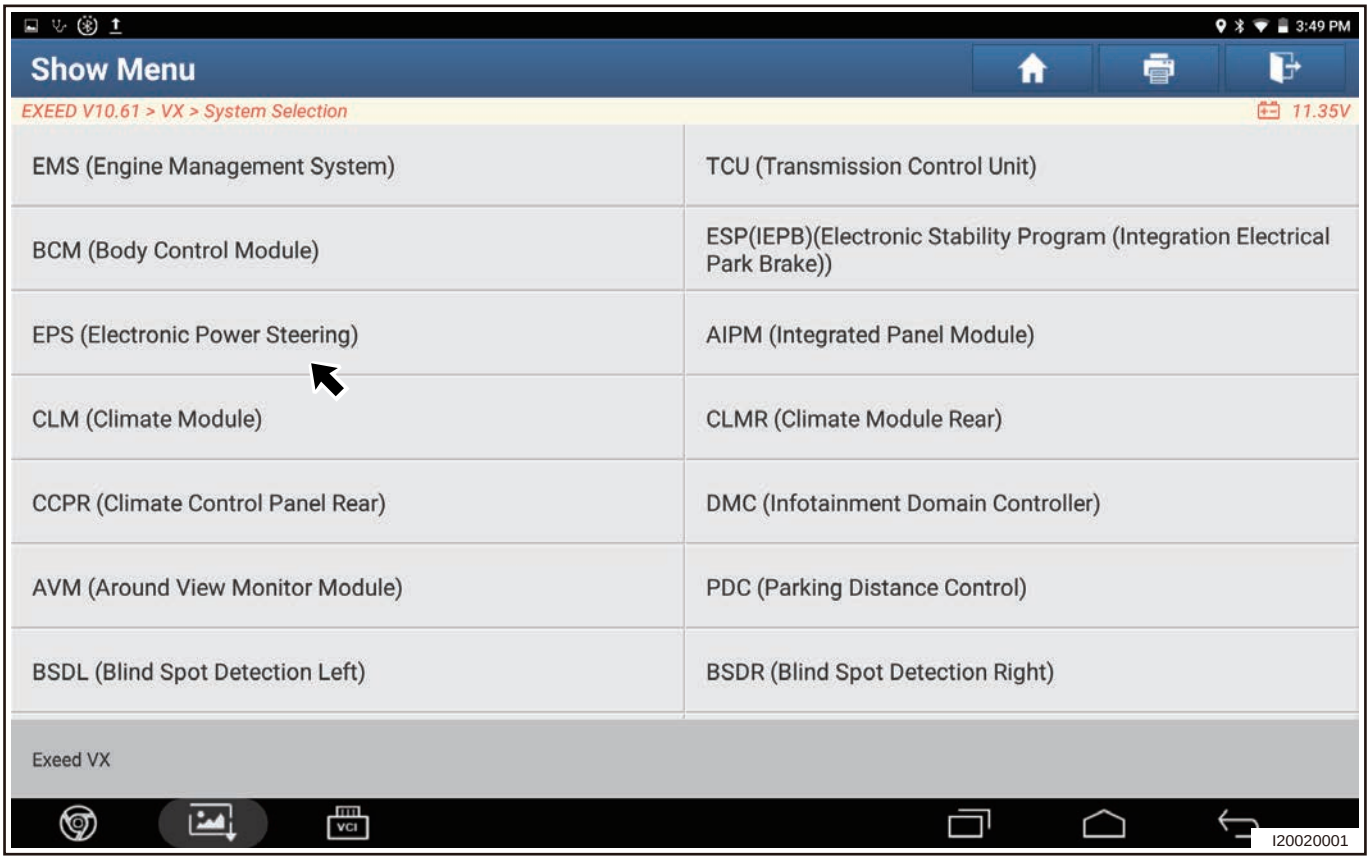
(5) It prompts” “VIN code is detected, please compare with the VIN code on the front windshield or vehicle nameplate”. Click "Yes" after confirming that they are consistent.



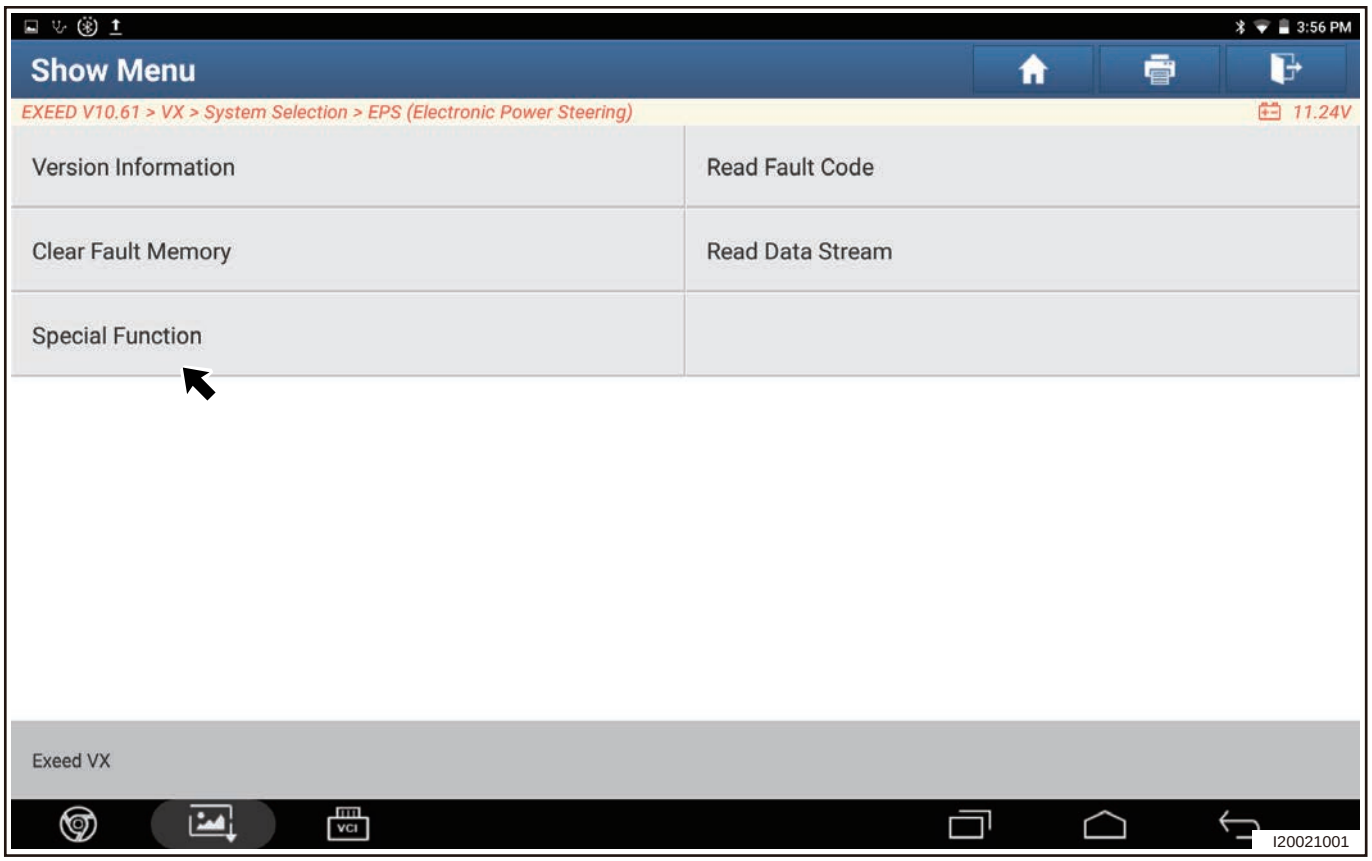
(6) The screen displays “Write VIN Code Successfully” after a short wait.

■ **Configuration Information Writing**

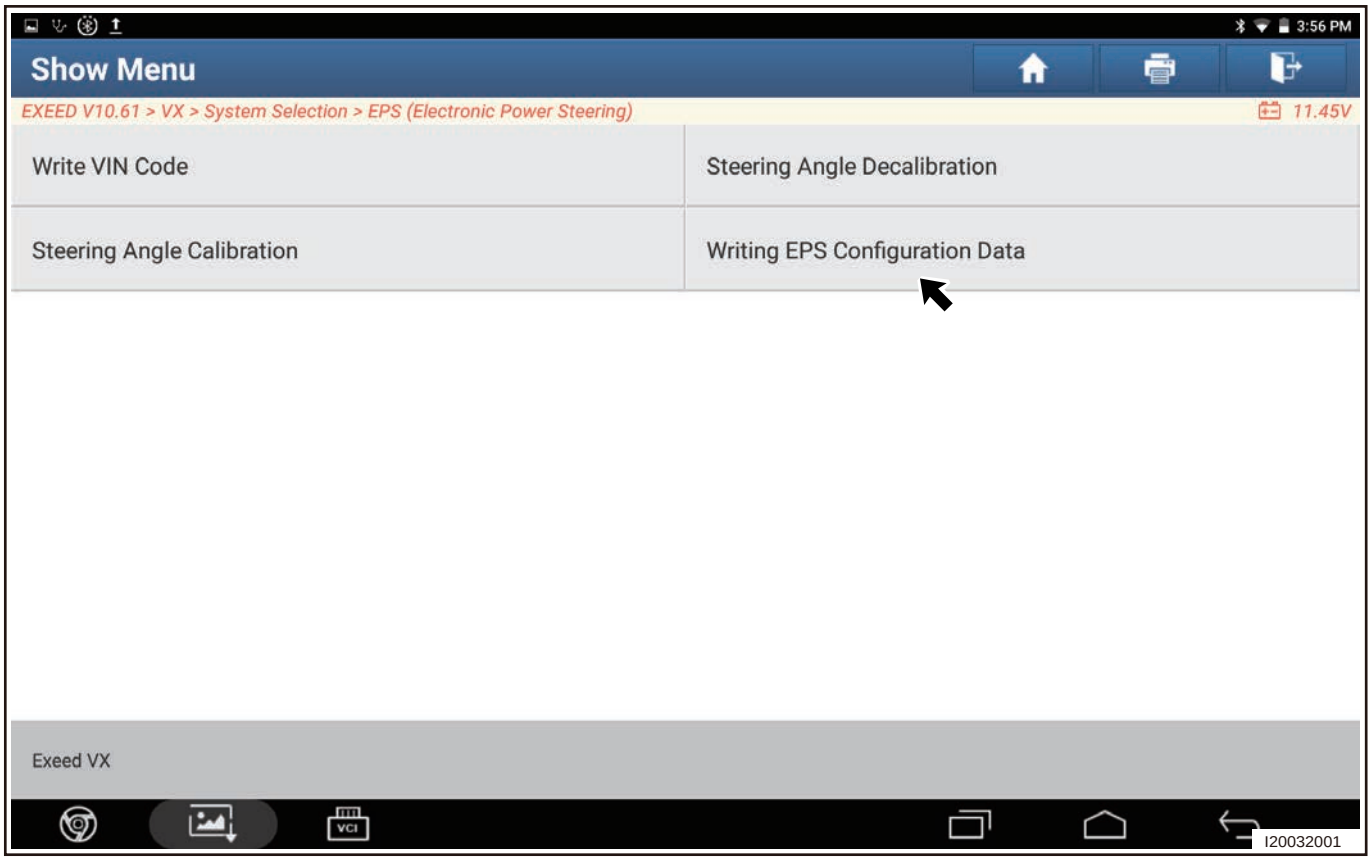
(1) Enter “EPS (Electronic Power Steering System)”.



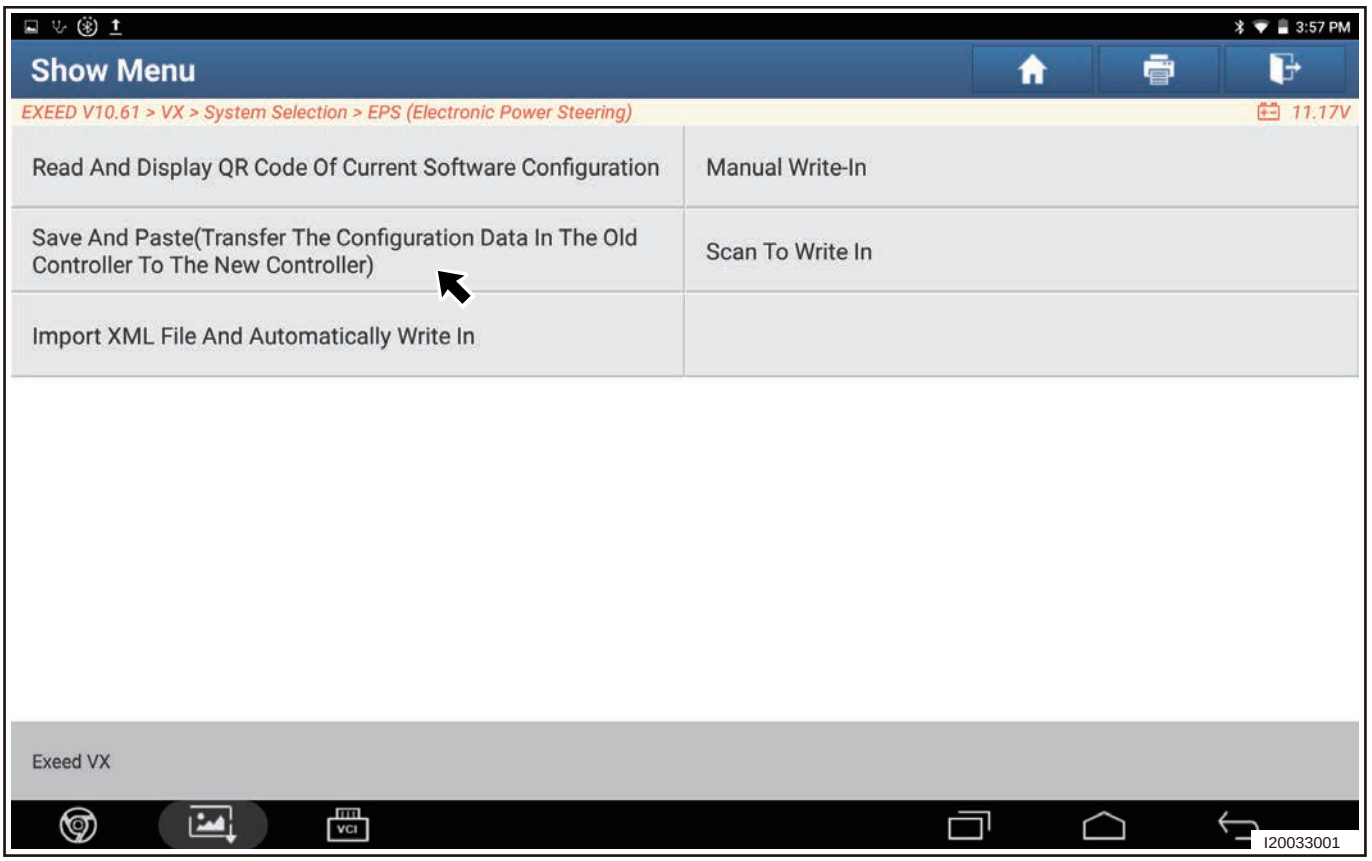
(2) Click “Special Function”.



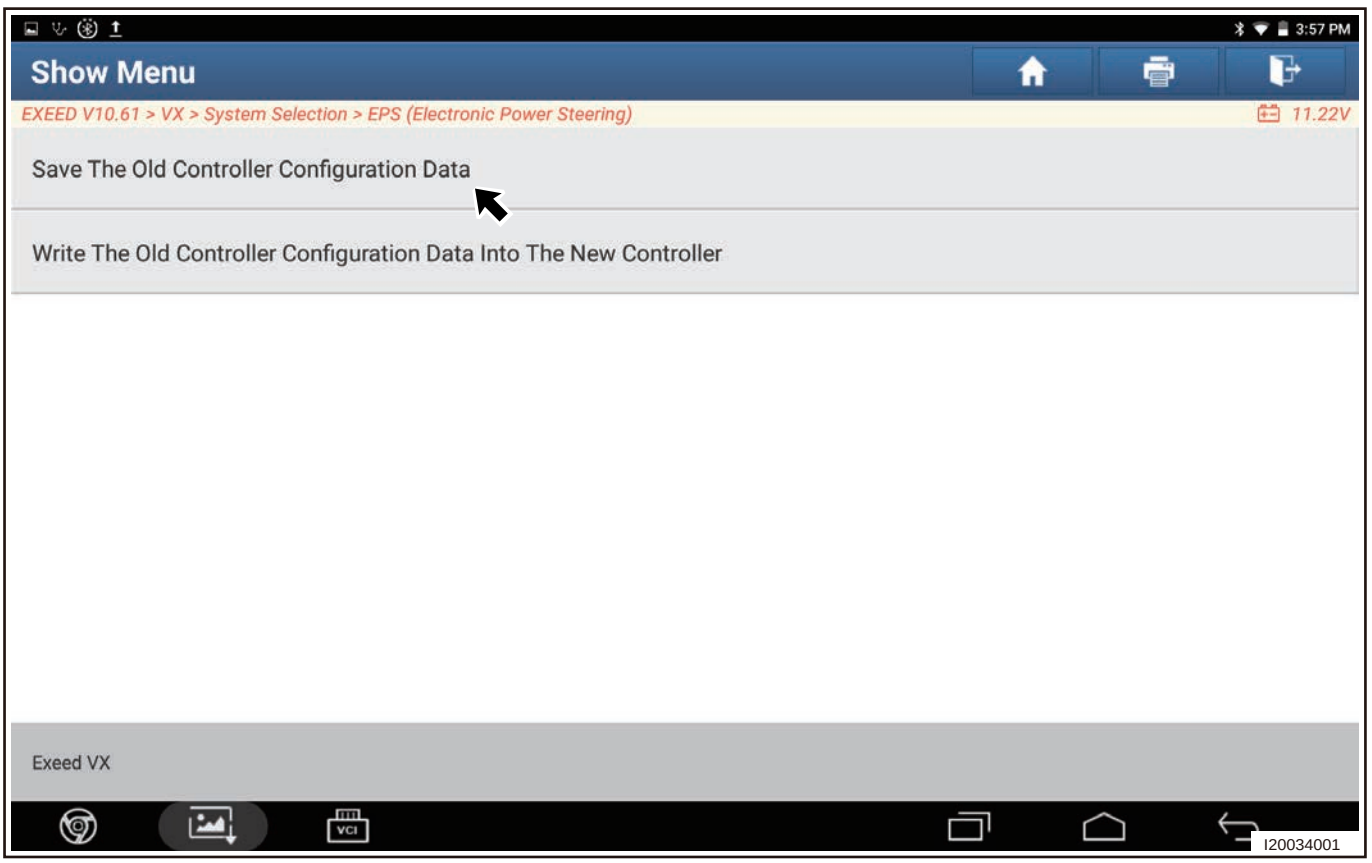
(3) Enter next screen, click “Writing EPS Configuration Data”.



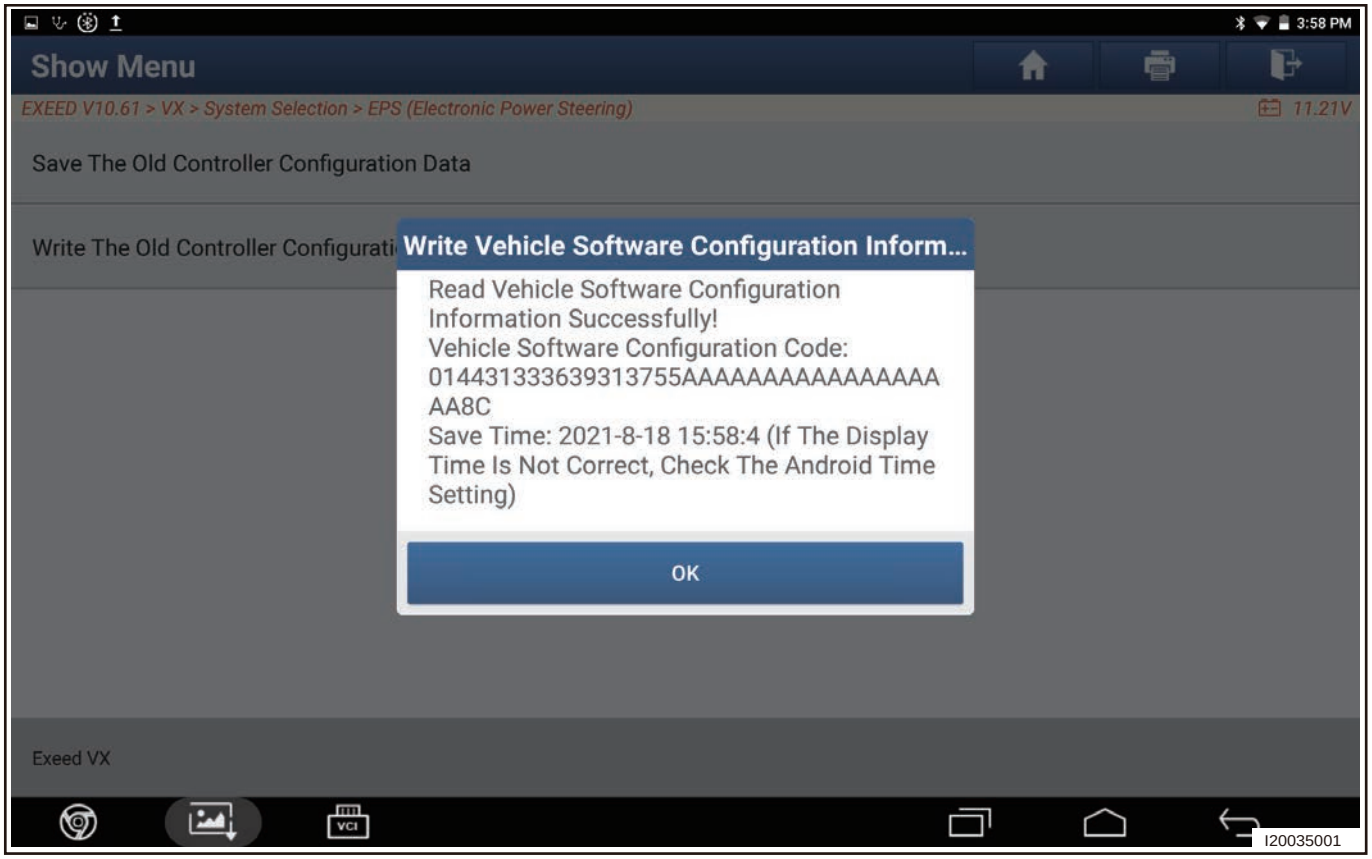
(4) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



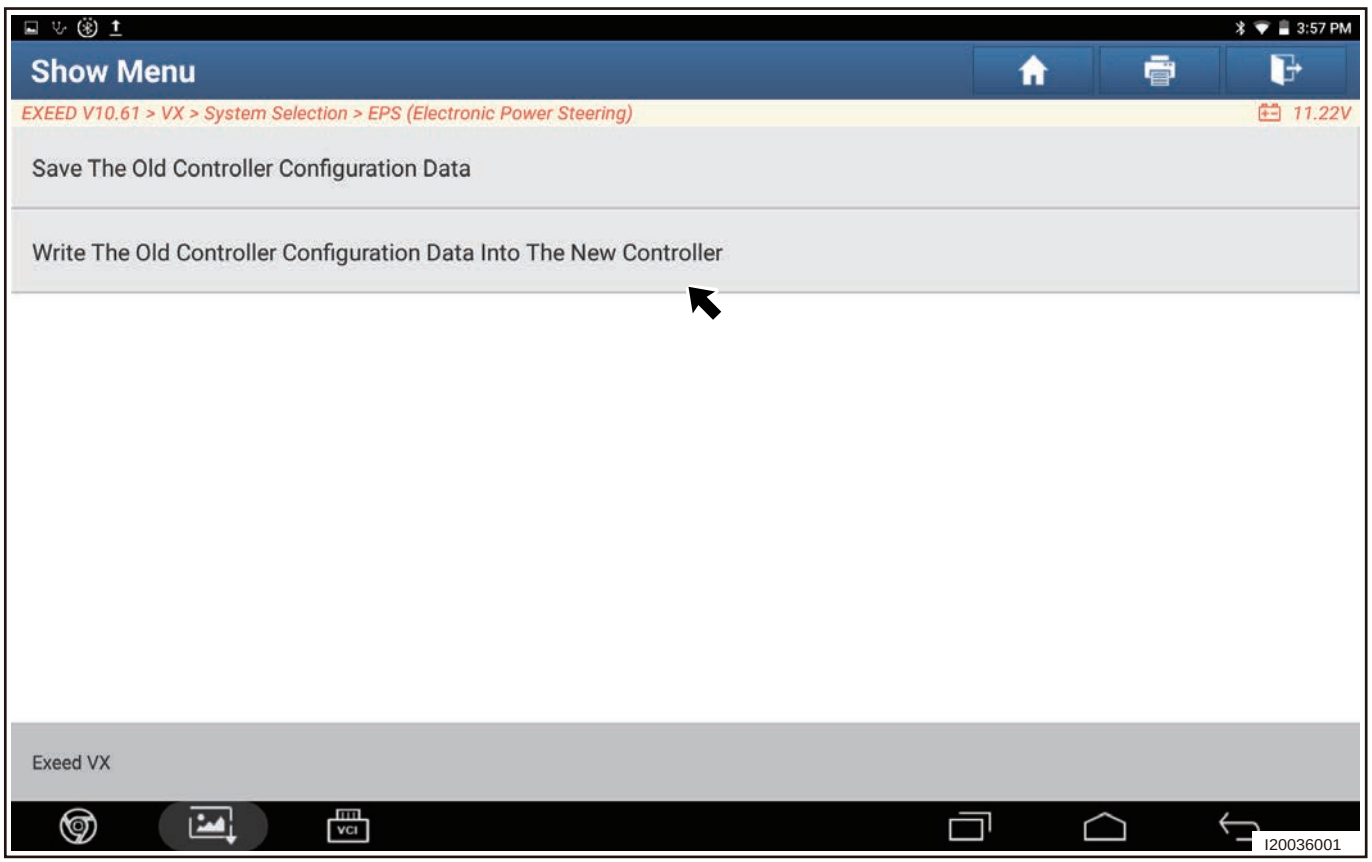
(5) Click “Save The Old Controller Configuration Data”.



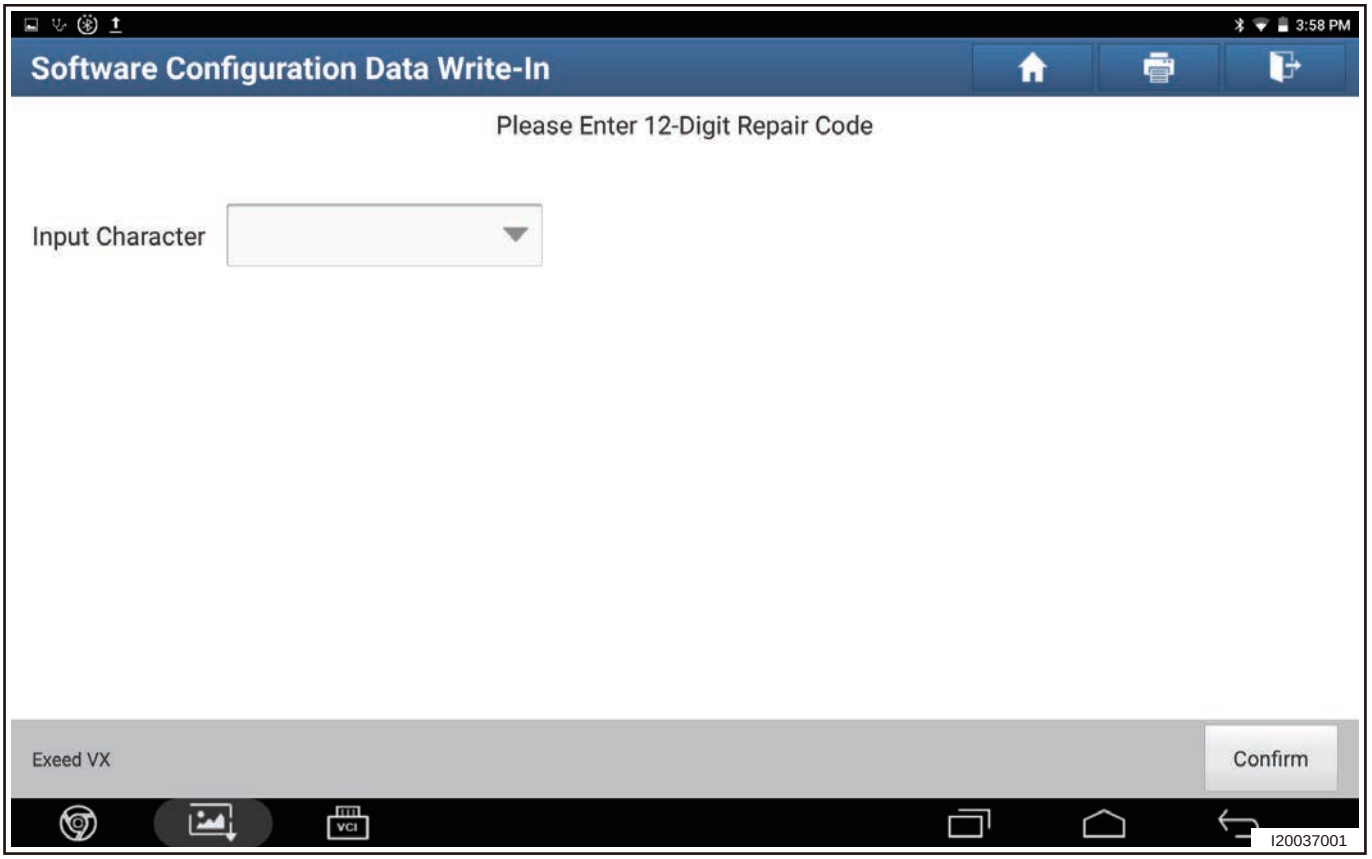
(6) It prompts “Read and save whole vehicle configuration code successfully”, the click “OK” to return to previous screen.



(7) Click “Write The Old Controller Configuration Data Into The New Controller”.



(8) It prompts “Please Enter 12-Digit Repair Code”. Click “Confirm” after entering.



⚠ Caution

- **The first 5 digits of the 12-digit repair shop code are the dealer code (ERP), and the last 7 digits can be entered at will.**

(9) Click “YES” after confirming that repair shop code is correct again

(10) It prompts “Saved Vehicle Configuration Code Last Time”. Click "Yes" after confirming that they are consistent.

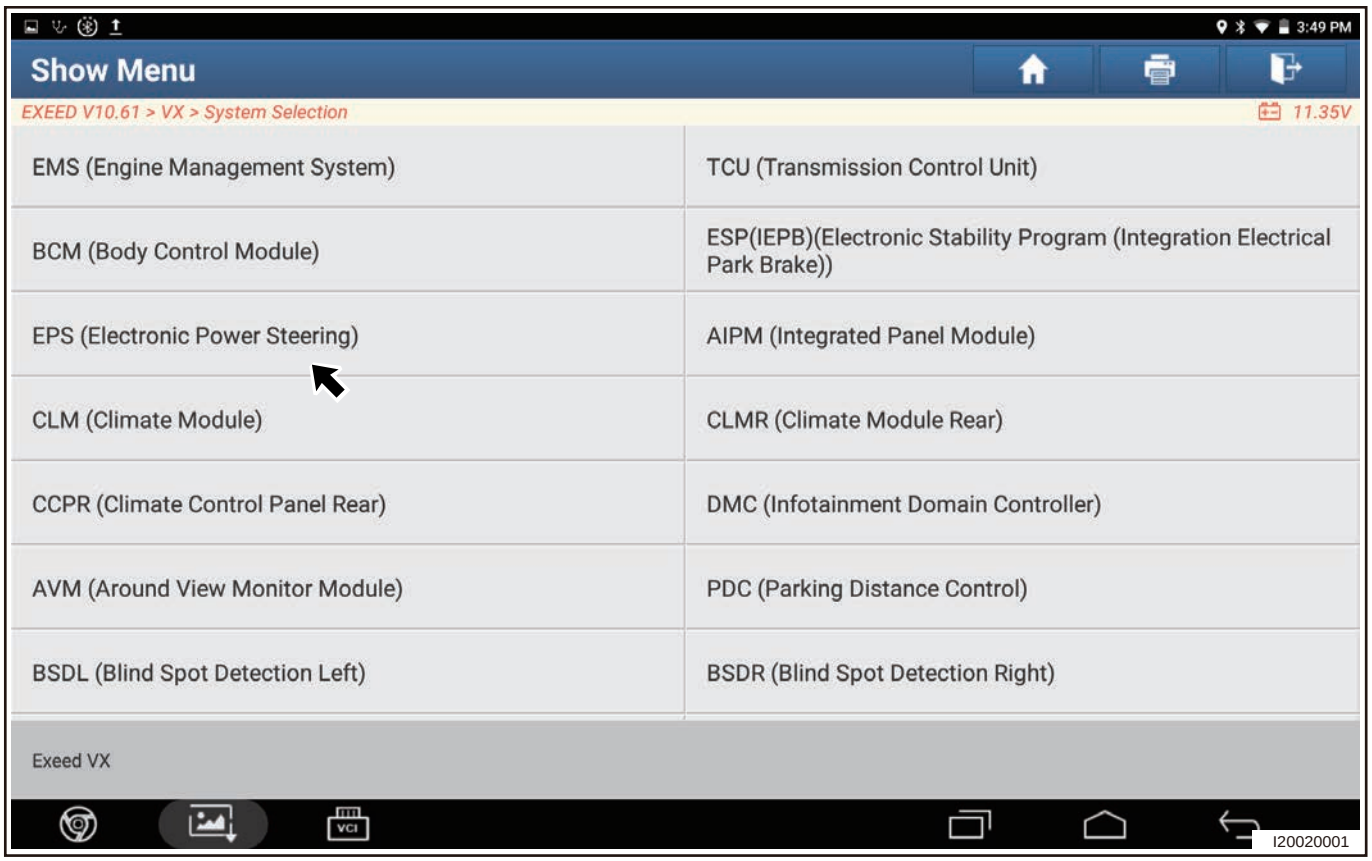
(11) It prompts “Write Configuration Data Successfully”. Click “OK”.

(12) It prompts “Configuration Data Backup Succeeded". Click “OK”.

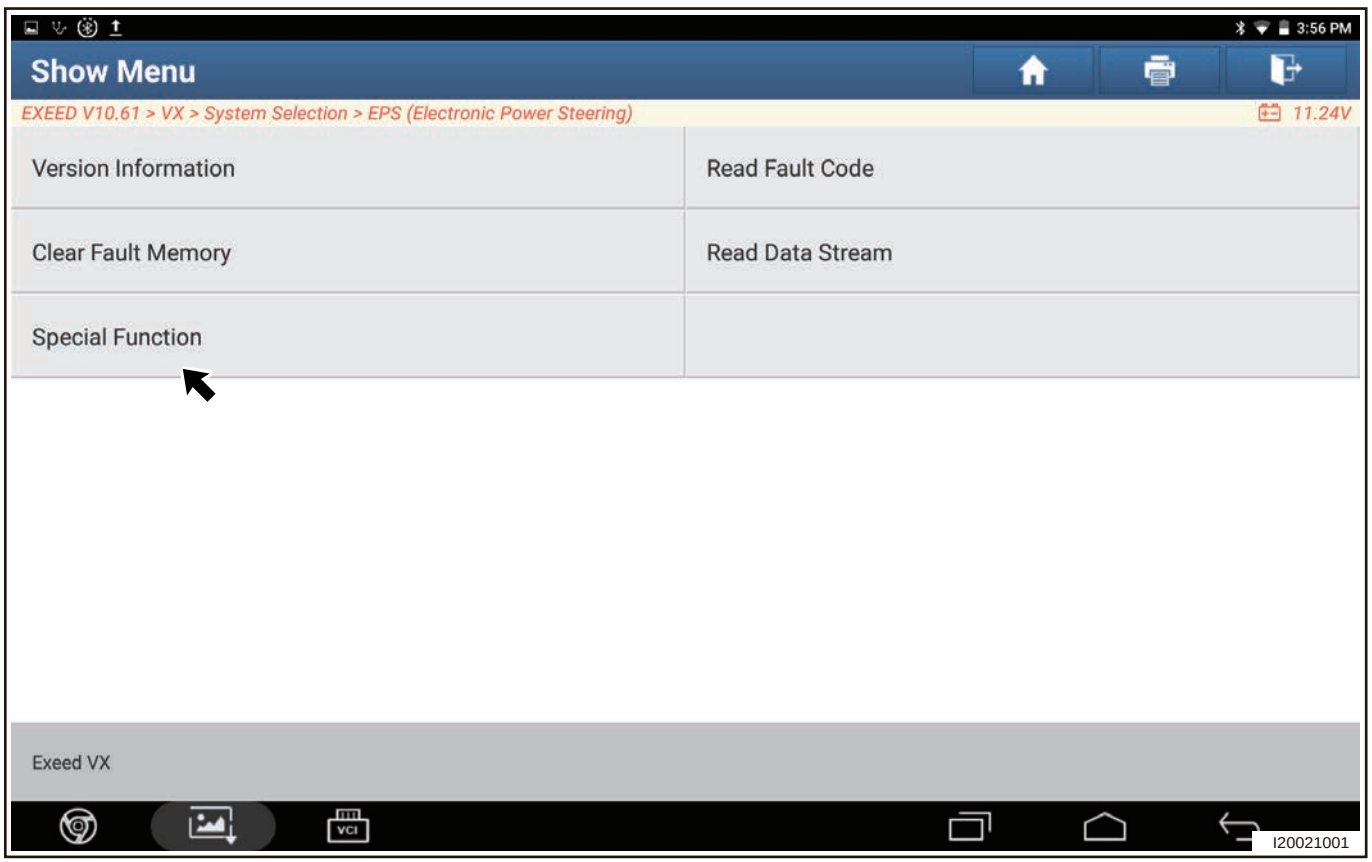
(13) It prompts “Configuration Data Check is Valid”. Click “OK”.

■ Calibration of Steering Angle

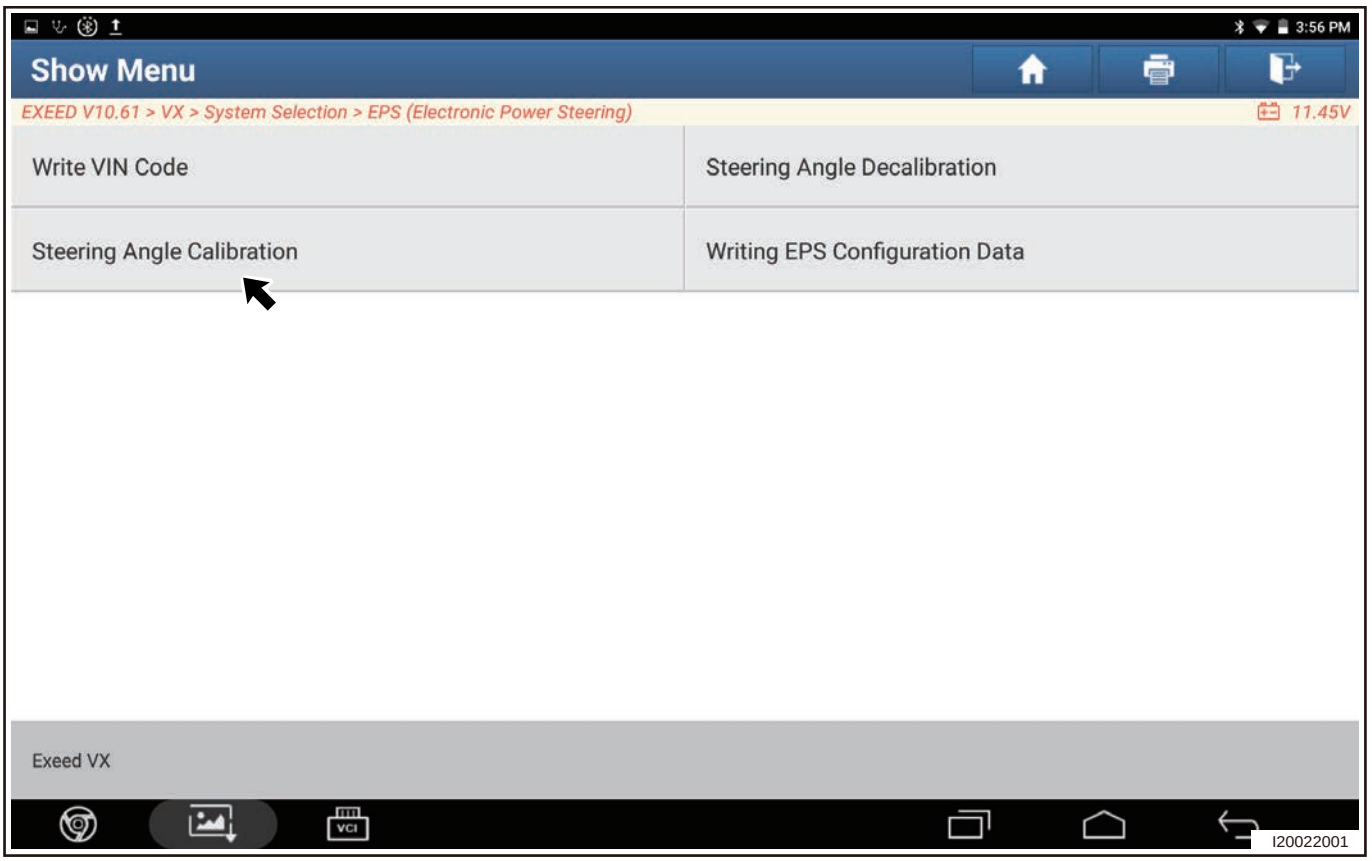
(1) Enter “EPS (Electronic Power Steering System)”.



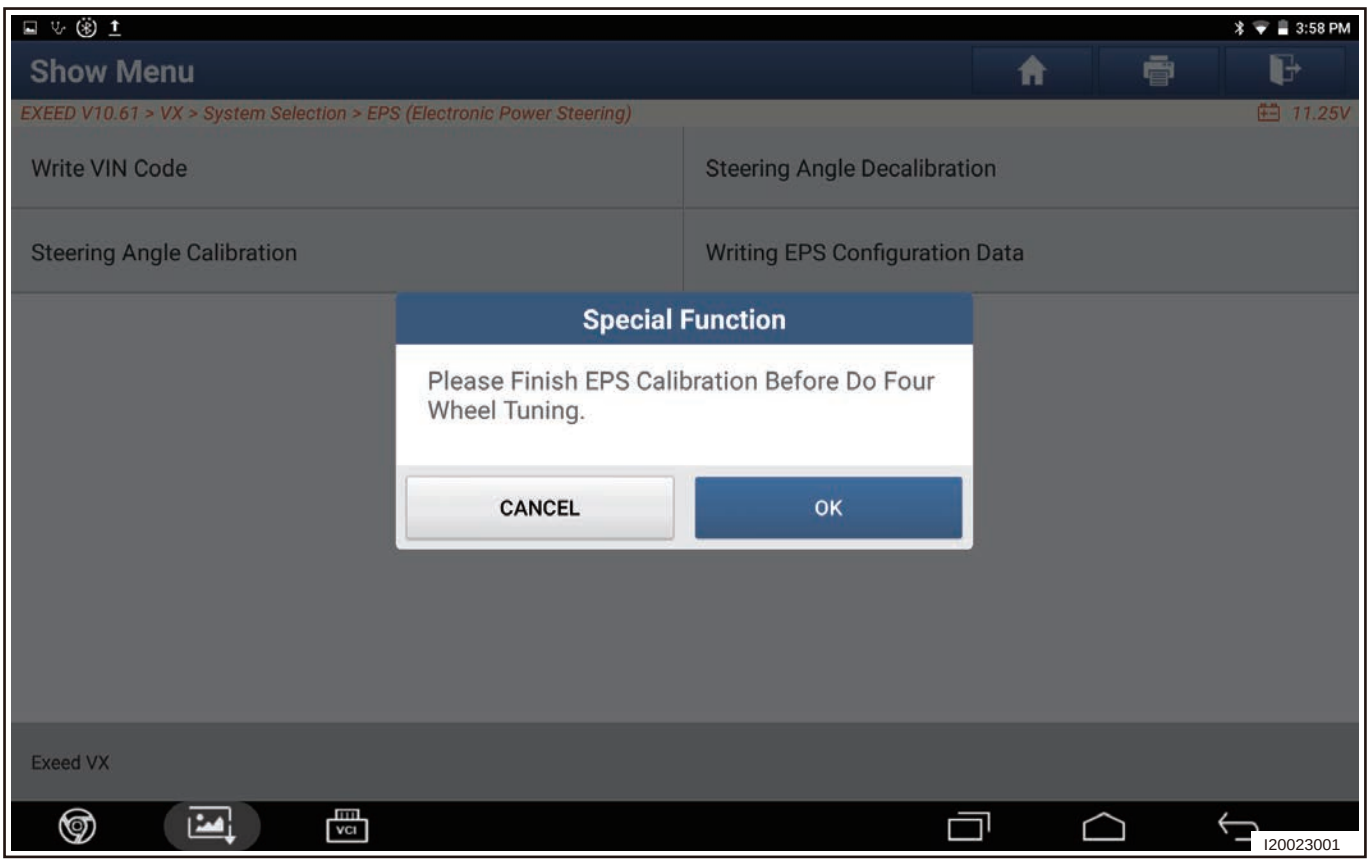
(2) Click “Special Function”.

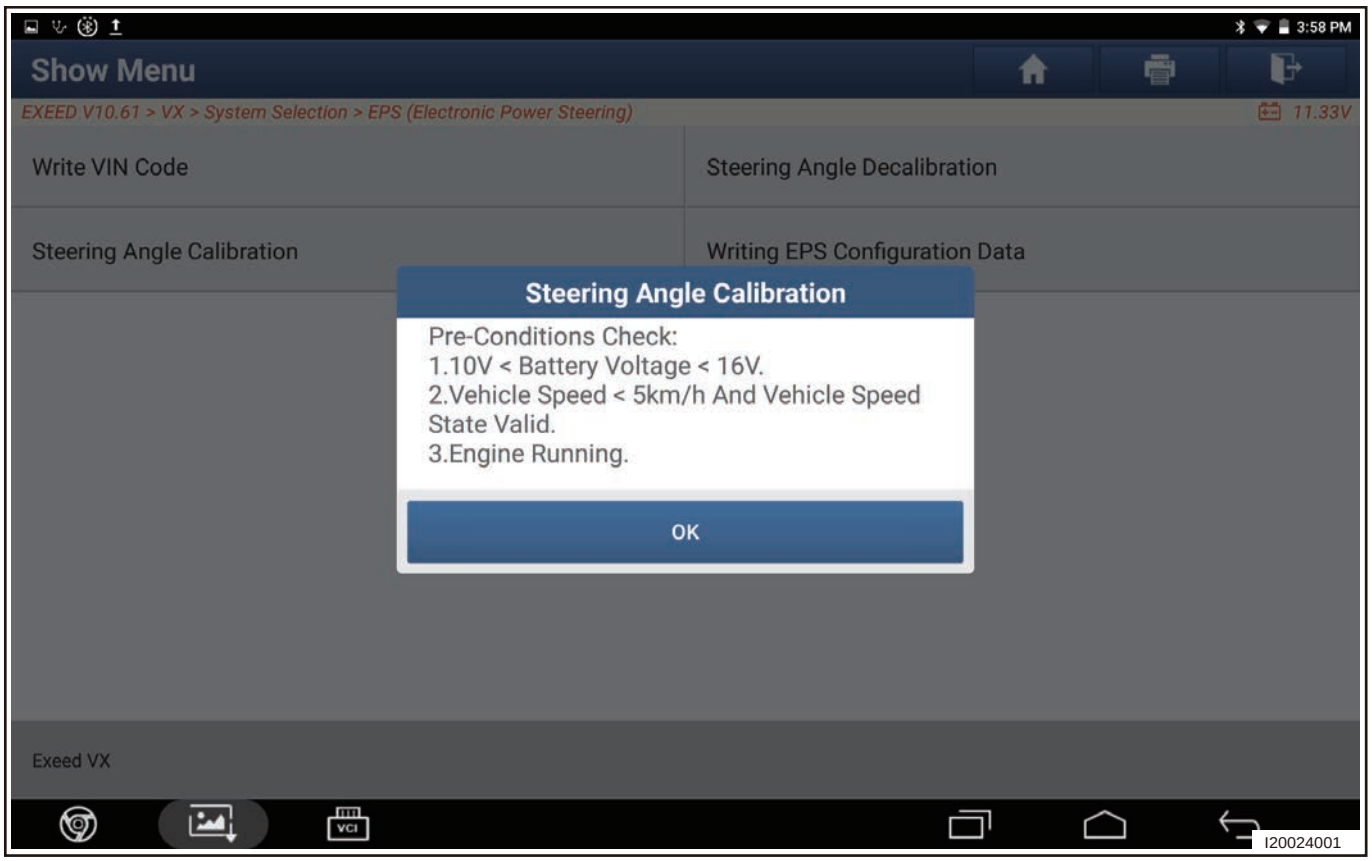


(3) Enter next interface and click “Steering Angle Calibration”.

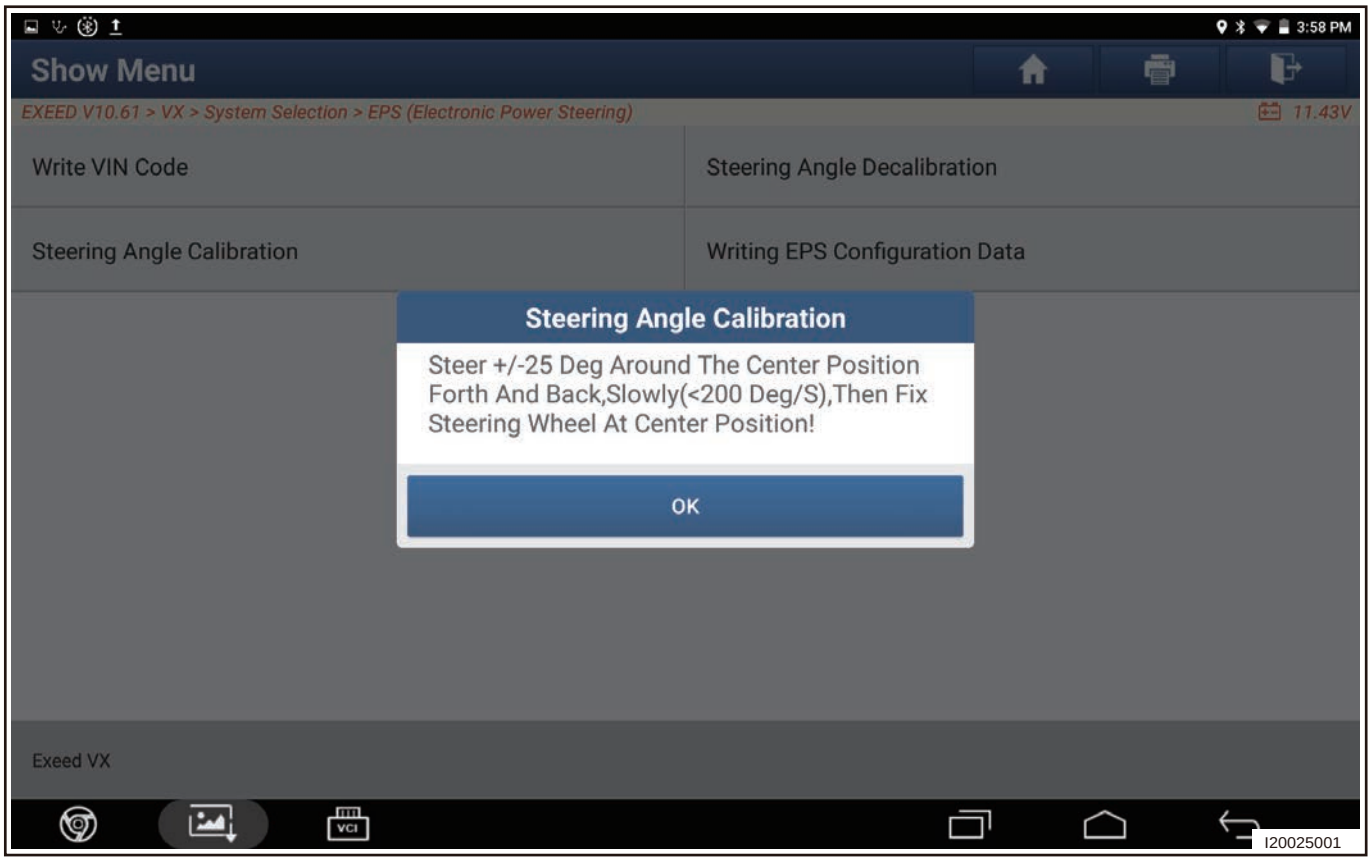


(4) It prompts “Pre-Condition Check” is prompted, then click “OK”.





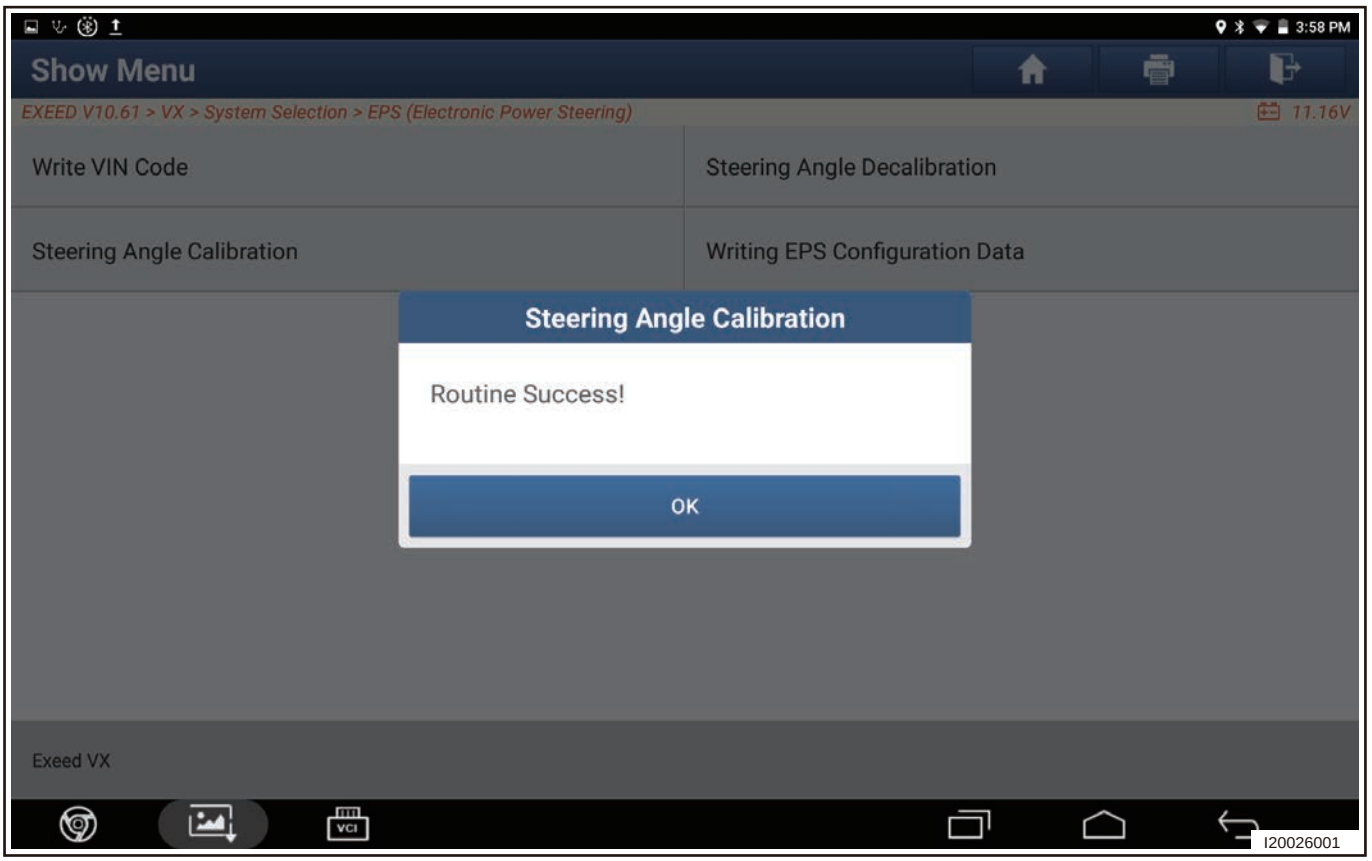
(5) Hint: “System ready to calibrate! Please turn the steering wheel slowly to the left and right about 25 degrees in sequence, then return the steering wheel to original position.” Then click “OK”.



Hint:

- About 25 degrees is full rotation of the steering wheel

(6) Hint: “Calibration is successful!” Then click “OK”.



8.2 STEERING WHEEL

1 Warnings and Precautions

1.1 Warnings

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Be sure to read precautions for SRS airbag before removing steering wheel.

(2) Be sure to read precautions for SRS airbag before removing multi-function switch.

(3) Be sure to read precautions for SRS airbag before removing shift fork.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Wait at least 90 seconds after disconnecting the negative battery cable to prevent airbag and belt pretensioner from being activated.

(2) Vehicle SAM angle sensor provides angle signal to ESP and other related controllers; Motor position sensor in EPS module provides steering angle signal for EPS; Therefore, after replacing electric steering column assembly, steering gear and performing four-wheel alignment, it is necessary to calibrate zero point of SAM steering angle and motor position sensor in EPS module.

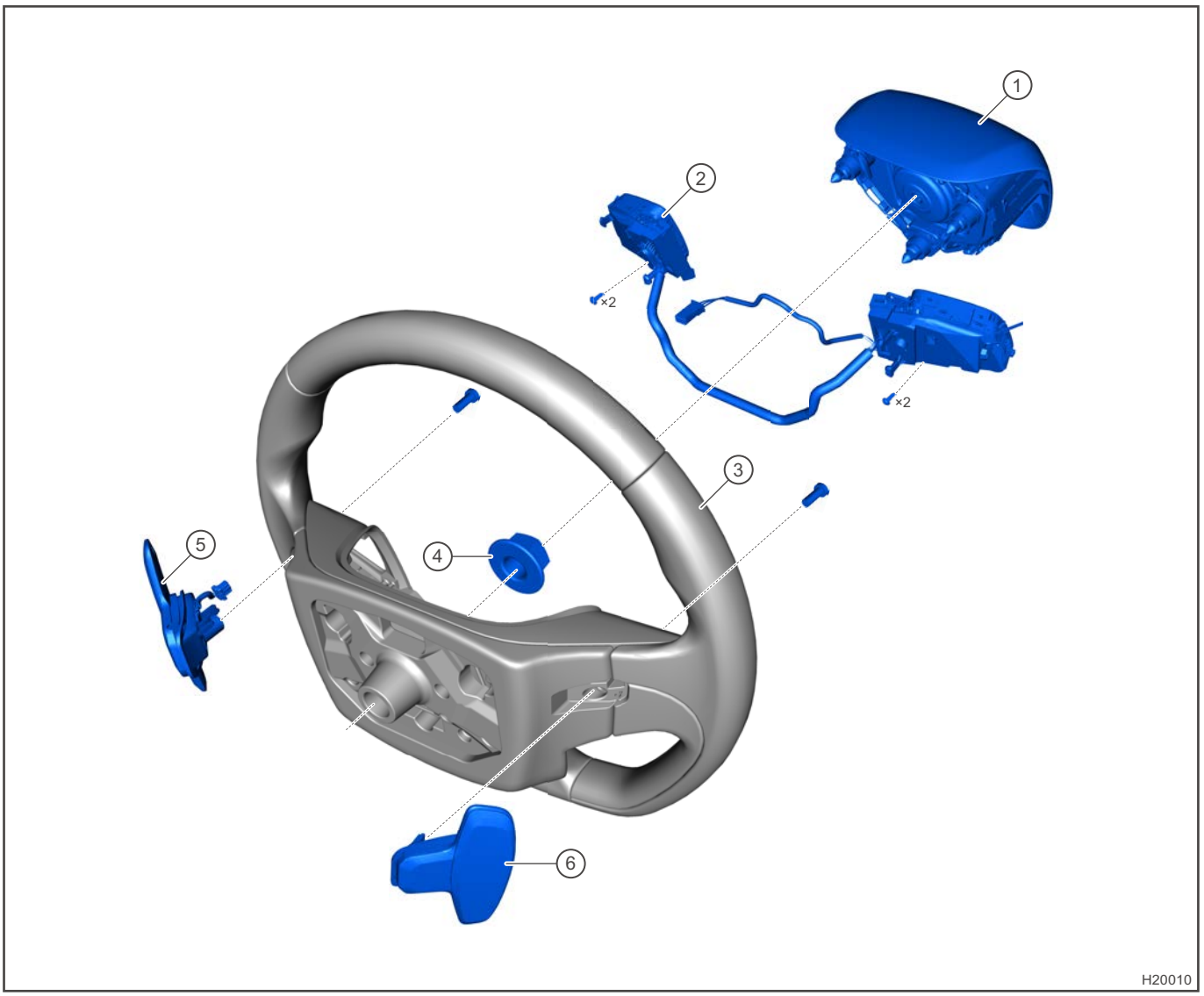
(3) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 System Overview

2.1 System Description

Steering wheel is the device that driver controls the driving direction. Through the steering mechanism, steering wheel controls wheels to left and right to change driving direction or keep vehicle driving straight.

2.2 System Components Diagram

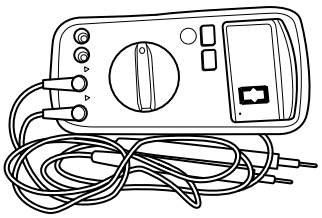


1	Driver Airbag	4	Steering Wheel Locking Nut
2	Steering Wheel Multi-function Switch	5	Right Shift Paddle
3	Steering Wheel Body	6	Left Shift Paddle

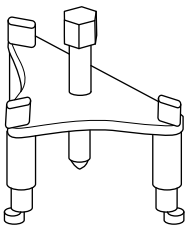
3 ON-VEHICLE SERVICE

3.1 Tools

■ General tool

Tool Name	Tool Drawing
Digital Multimeter	 S00002

■ Special tool

Tool Name	Part No.	Tool Drawing
Steering Wheel Remover	ECH-0008	 S00085

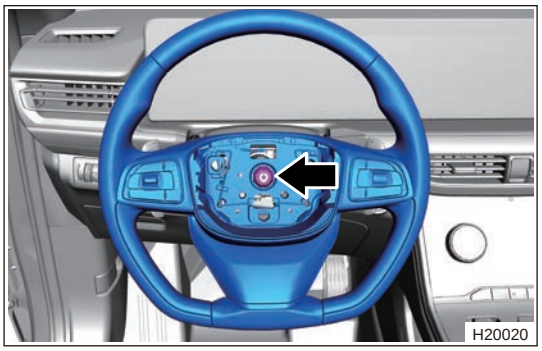
3.2 Replacement of Steering Wheel Body

■ Removal

⚠ Caution

- **After removing steering wheel, install spiral cable stopper pin fixing combination switch.**

(1) Adjust steering wheel to the centered position (visually check tire is straight-ahead).
(2) Turn ENGINE START STOP switch to OFF.
(3) Disconnect the negative battery cable.
(4) Remove the combination switch lower cover.
(5) Remove the driver airbag.
(6) Remove the steering wheel locking nut (arrow).


H20020

(7) Disconnect the steering wheel multi-function switch connector.

(8) Use steering wheel remover to remove steering wheel.

(9) Install spiral cable stopper pin fixing combination switch.

■ Inspection

Steering wheel centering or steering performance are affected by manufacturing error, requirements for four wheels alignment toe-in and steering wheel centering are as following:

(1) Confirm the left and right strokes of steering wheel after it is assembled.

(2) Before performing four-wheel alignment, first rotate steering wheel to left and right to determine rotation angle of one side is not less than 45°, then returns to horizontal position.

(3) Fix the steering wheel horizontally.

(4) Use calibration device to complete center position calibration of steering wheel rotation angle (for calibration methods, refer to EPS steering angle calibration).

(5) When adjusting front wheel toe-in, it is necessary to adjust steering gear left and right tie rods. Loosen locking nut of steering gear tie rod when adjusting, use wrench to rotate inner lever at hexagonal position of outer lever, until toe-in value reaches specified value, then tighten locking nut. If threads exposed outside on left and right levers are greatly not equal (difference between threads exposed outside on left and right levers are more than 3 threads), please recheck if steering wheel is centered. It is necessary to hold the flat and square position of outer lever with wrench while tightening. Tightening torque for nut is 50 ± 5 N·m.

(6) After four-wheel alignment is completed and vehicle drives from four-wheel alignment station, turn the steering wheel left and right to the limit position (make sure steering wheel has hit the limit position) without vehicle moving and return it to the center position, then turn off the vehicle.

■ Installation

Hint:

- The scale marks on steering wheel and steering column can only assist in assembly, and cannot be used on final position, it is necessary to perform toe-in and steering wheel rotation angle adjustment.

(1) Pull out the spiral cable stopper pin.

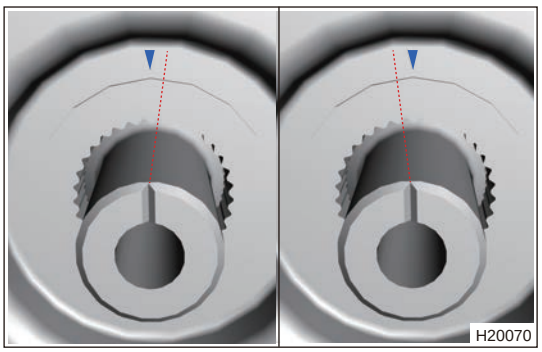
(2) Visually check tire is straight-ahead (adjust steering wheel to the centered position).

(3) Install the steering wheel.

1) Align steering wheel scale mark with column scale mark to assemble steering wheel.

2) Turn steering wheel left and right to the limit position, and check steering wheel rotation angle.

3) Visually check steering wheel rotation angle, and ensure the angle deviation on both sides is no more than 10°. If the deviation is more than 10°, check after adjusting one gear tooth.



(4) Install the steering wheel locking nut.

Torque: 48 ± 4 N·m

(5) Connect the steering wheel multi-function switch connector.

(6) Install the driver airbag.

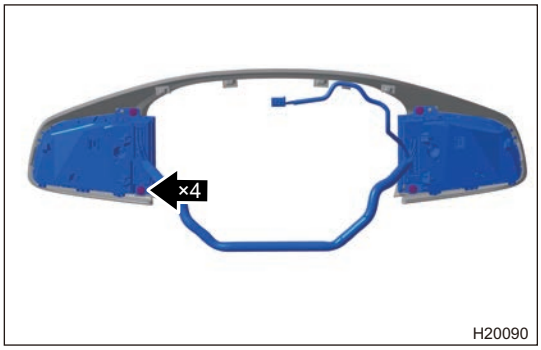
3.3 Replacement of Steering Wheel Multi-function Switch

■ Removal

(1) Remove the driver airbag.

(2) Squeeze mounting board clips and steering wheel multi-function switch to push it out.

(3) Remove 4 fixing screws between steering wheel multi-function switch and mounting board.



(4) Remove the steering wheel multi-function switch.

■ **Installation**

(1) Install the steering wheel multi-function switch.

(2) Install 4 fixing screws between steering wheel multi-function switch and mounting board.

Tightening torque: 5 ± 0.5 N·m

(3) Install steering wheel multi-function switch and mounting board to steering wheel, press steering wheel multi-function switch firmly, and clip steering wheel with clips.

(4) Install the driver airbag.

3.4 Replacement of Shift Paddle

■ **Removal**

(1) Remove the steering wheel multi-function switch.

(2) Remove 2 fixing screws from left/right shift paddle and steering wheel.

(3) Remove left/right shift paddle.

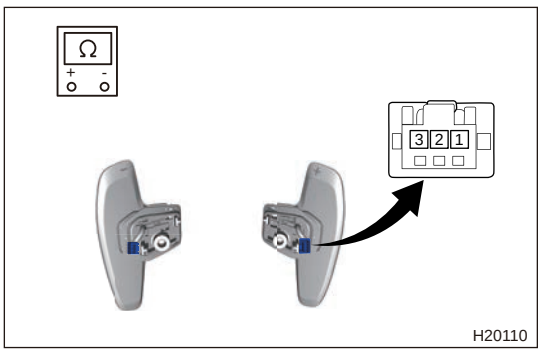
■ **Inspection**

(1) Remove the steering wheel multi-function switch.

(2) Using ohm band of digital multimeter, measure left/right shift paddle terminal.

Standard Resistance

Multimeter Connection	Switch Condition	Specified Condition
Terminal 1 - Terminal 2	Pressed	228 Ω ⩽ R ⩽ 252 Ω
Terminal 1 - Terminal 2	Released	R ⩾ 10 MΩ



If measurement result is not as specified, replace shift paddle.

■ **Installation**

(1) Install the left/right shift paddle.

(2) Install 2 fixing screws between left/right shift paddle and steering wheel.
Torque: 5 ± 0.5 N·m

(3) Install the steering wheel multi-function switch.
(4) Install the steering wheel.

8.3 STEERING COLUMN MODULE (SCM)

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) Wear glove during assembling steering column with intermediate shaft assembly, prevent hands are contacted with steering column, which may cause rust.

(2) DO NOT hold steering column handle position, but steering column position; do not bump, strike steering column when taking, carrying or assembling it, prevent steering column from collapse.

(3) Adjustment handle is in locking state after steering column is assembled, do not transfer to next station, prevent handle is knocked during operation, which may cause person damage or handle breakage.

(4) DO NOT touch interior ornaments when removing steering column with intermediate shaft assembly to avoid scratching interior ornaments.

(5) The zero point calibration of steering angle sensor must be carried out on four-wheel alignment station, otherwise the zero point calibration of steering angle sensor is not accurate, which will bring the risk of ESP alarm.

(6) After installing steering column, perform software configuration and center calibration.

(7) When removing and installing steering column, it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

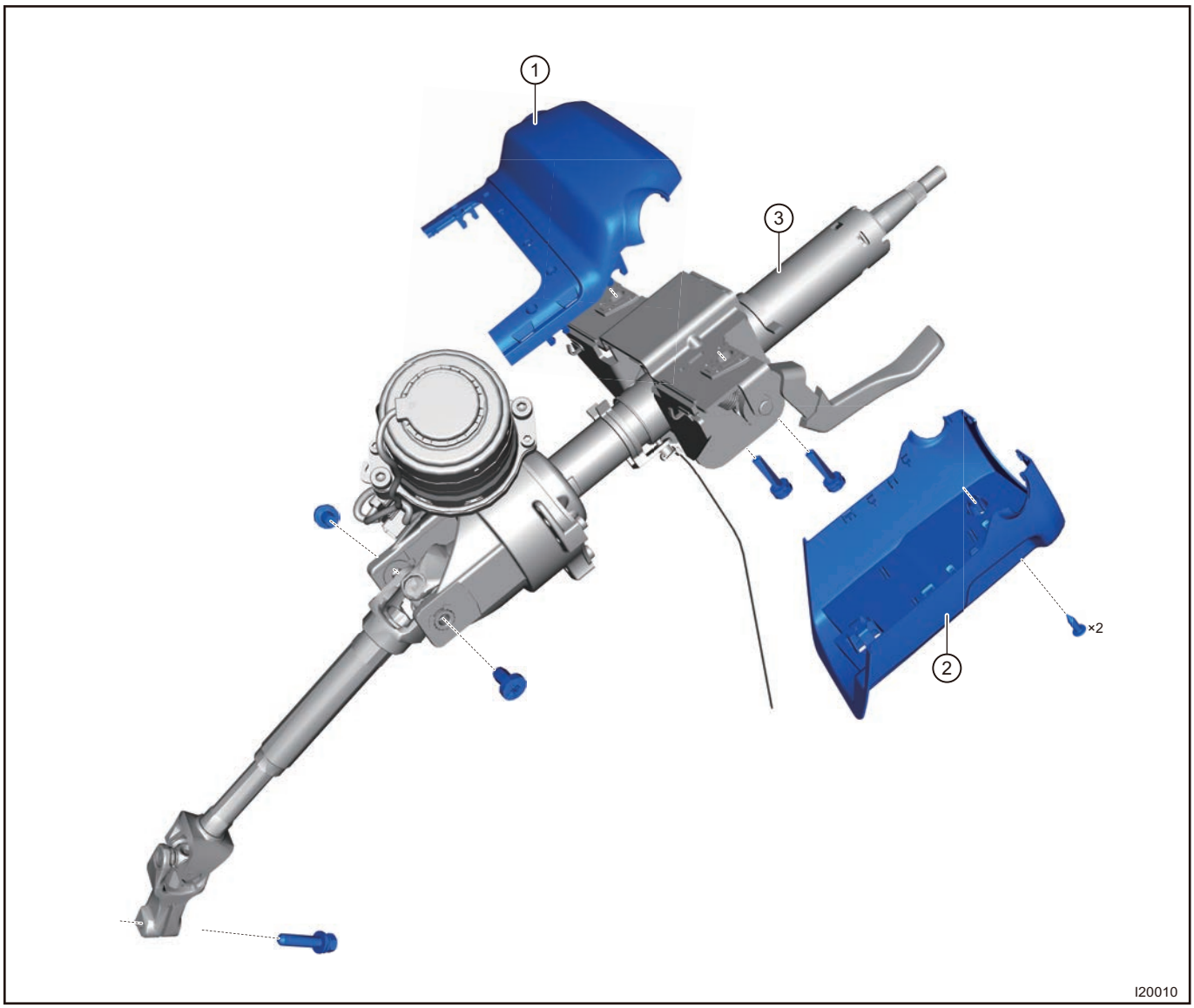
(8) It is necessary to perform steering angle sensor zero point calibration after replacing steering column.

2 System Overview

2.1 System Description

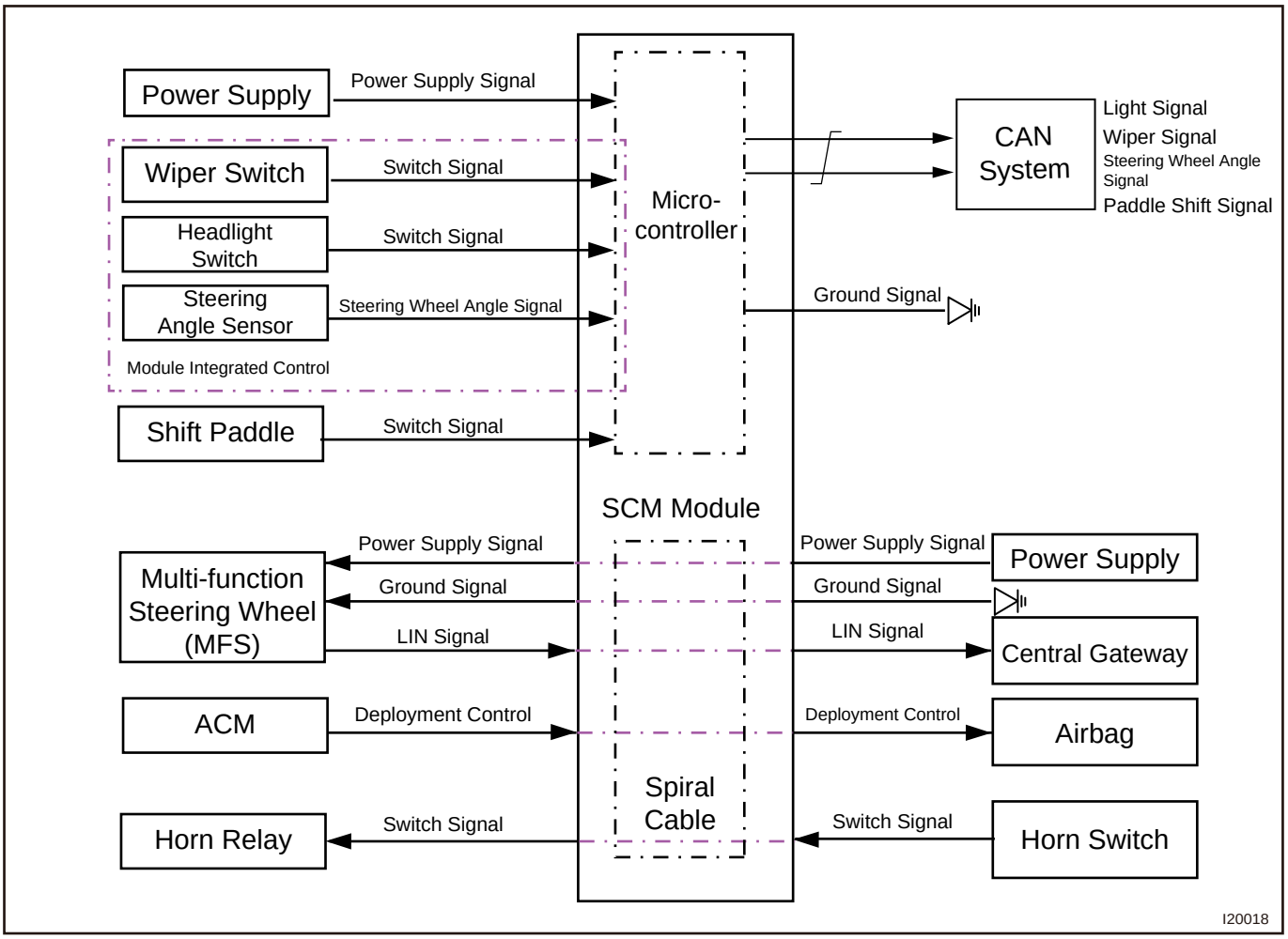
The steering column is the component of the steering system that connects the steering wheel and the steering gear. Through the steering column, the driver transfers torque to the steering gear, which drives the steering gear to achieve steering.

2.2 System Components Diagram



1	Combination Switch Upper Cover	3	Electric Steering Column with Intermediate Shaft Assembly
2	Combination Switch Lower Cover		

2.3 System Schematic Diagram



The steering column module is integrated inside the combination switch.

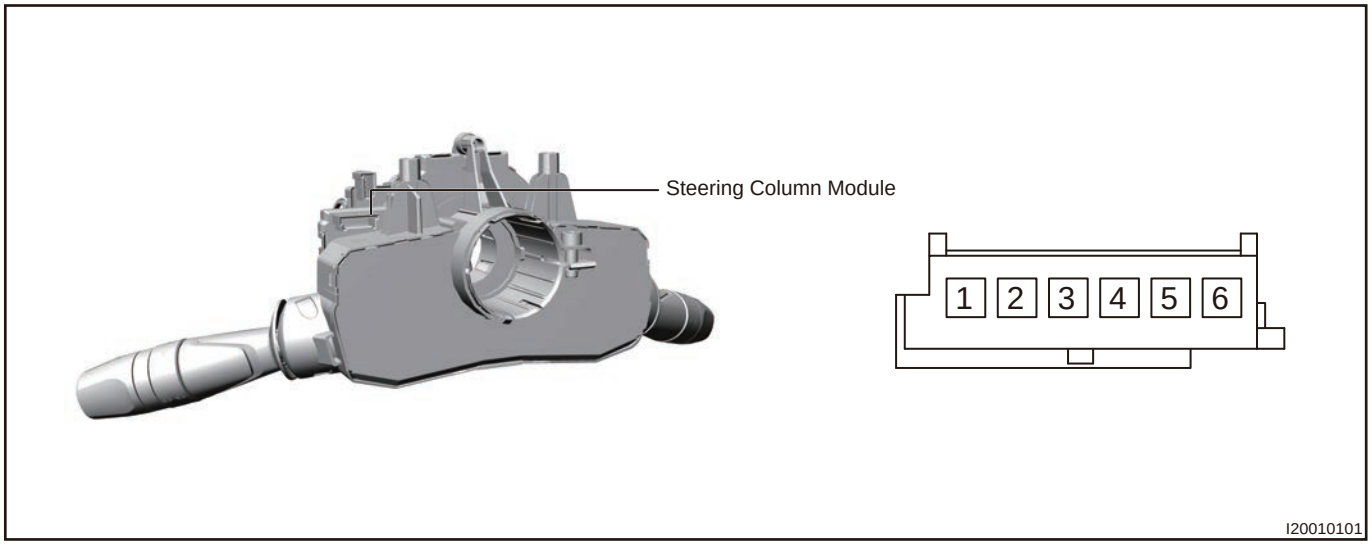
2.4 Component Operation Description

■ Steering angle sensor

The steering angle sensor of vehicle is used to detect rotation angle and direction of steering wheel. Turning steering wheel to left and right will be detected by steering angle sensor, so as to make electronic control unit of vehicle send correct steering command. Rotation angle of steering wheel provides basis for steering extent of vehicle, so that the vehicle drives according to driver’ s steering intention.

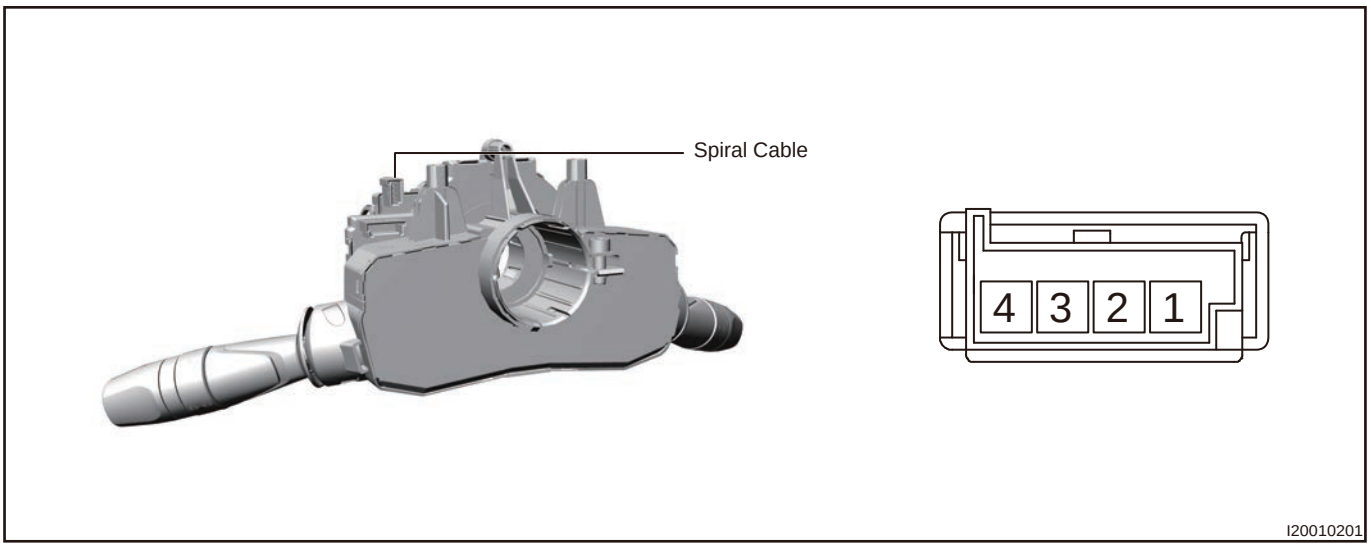
3 System Circuit Diagram

3.1 Module Terminal Definition



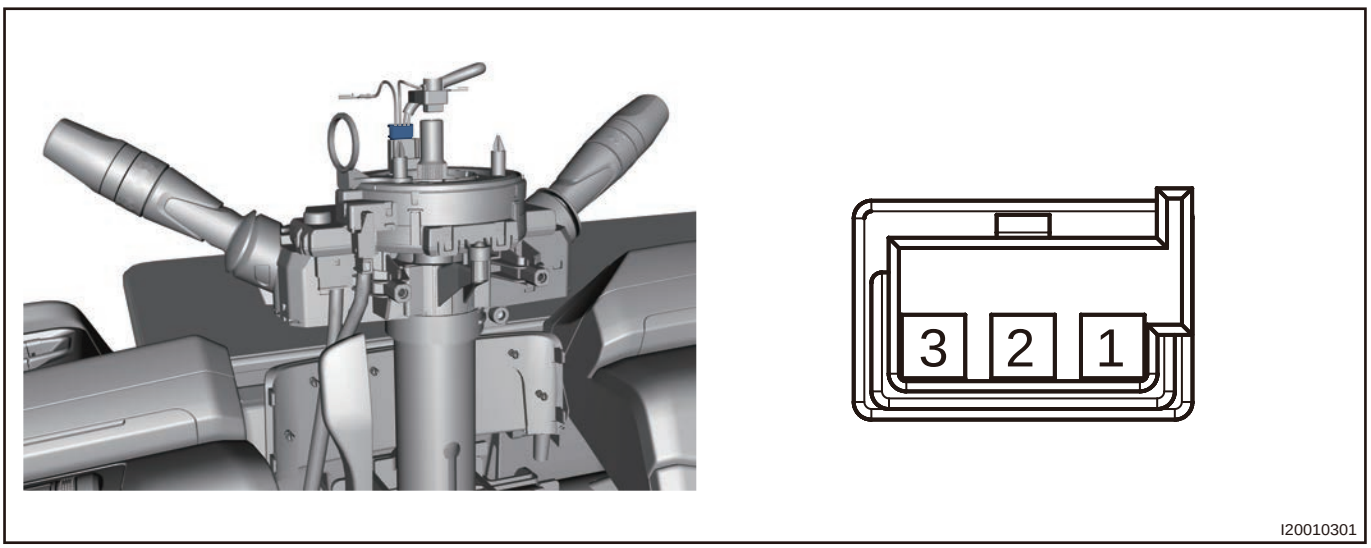
Steering column module lower connector (6 PIN)

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Battery +	Power supply “ON”	12V
2	/	/	/	/
3	Body ground	CAN L	Power supply “ON”	2.3V
4	Body ground	CAN H	Power supply “ON”	2.7V
5	Body ground	Multi-function switch LIN	Power supply “ON”	7.7V
6	Body ground	GND	Power supply “ON”	0V



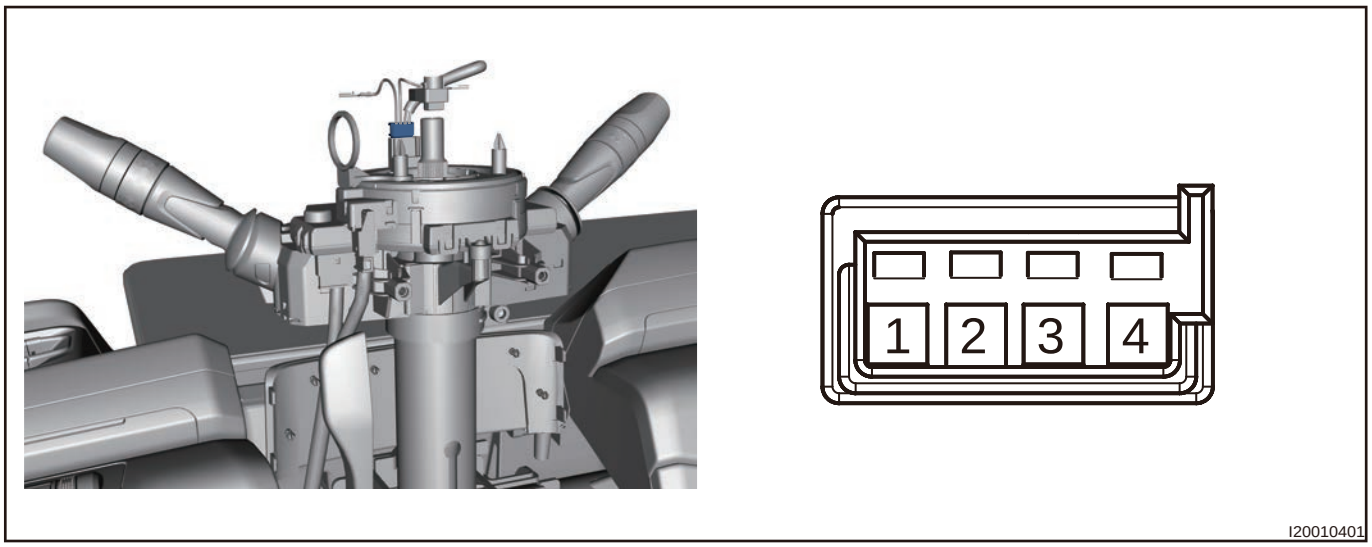
Steering column module lower connector (4 PIN)

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Horn switch ground	Power supply “ON”	0V
2	Body ground	Horn switch	Power supply “ON”	Do not press 12 V, press 0 V
3	/	Airbag -	/	/
4	/	Airbag +	/	/



Steering column module upper connector (3 PIN)

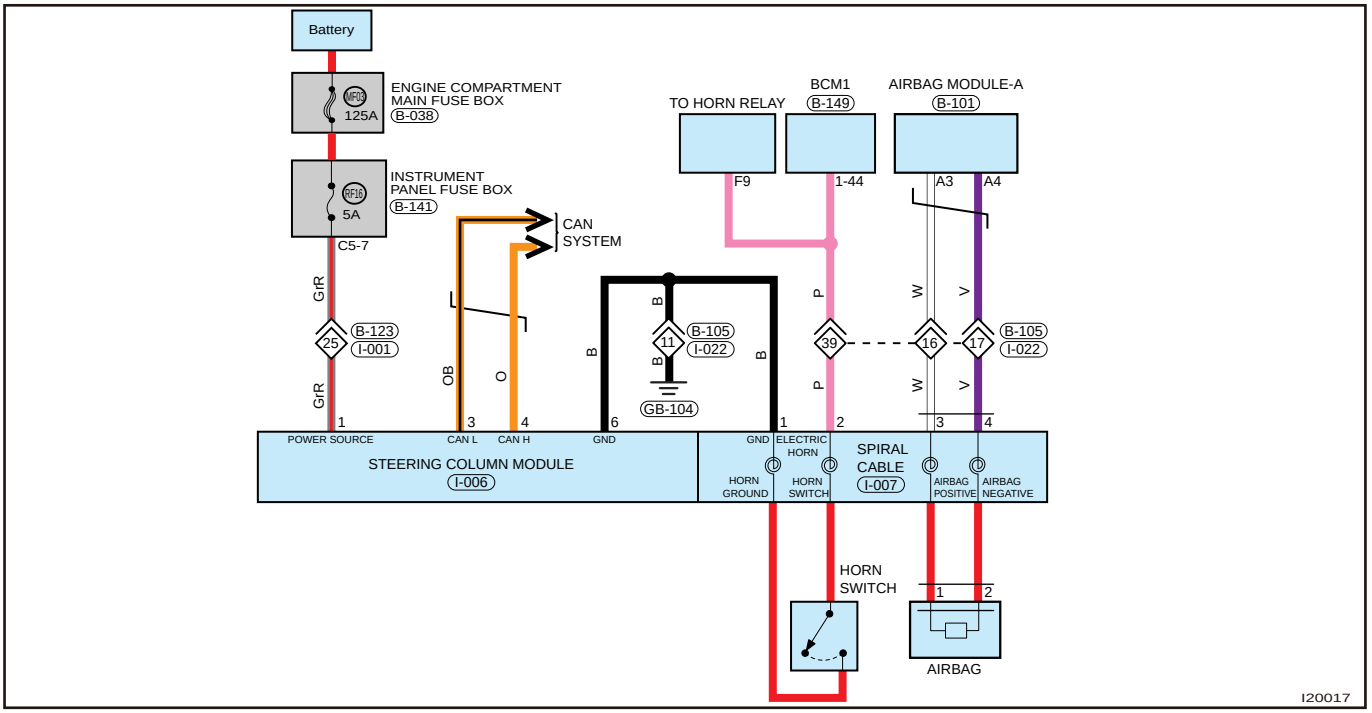
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Power supply	Power supply “ON”	12V
2	Body ground	LIN	Power supply “ON”	7.7V
3	Body ground	GND	Power supply “ON”	0V

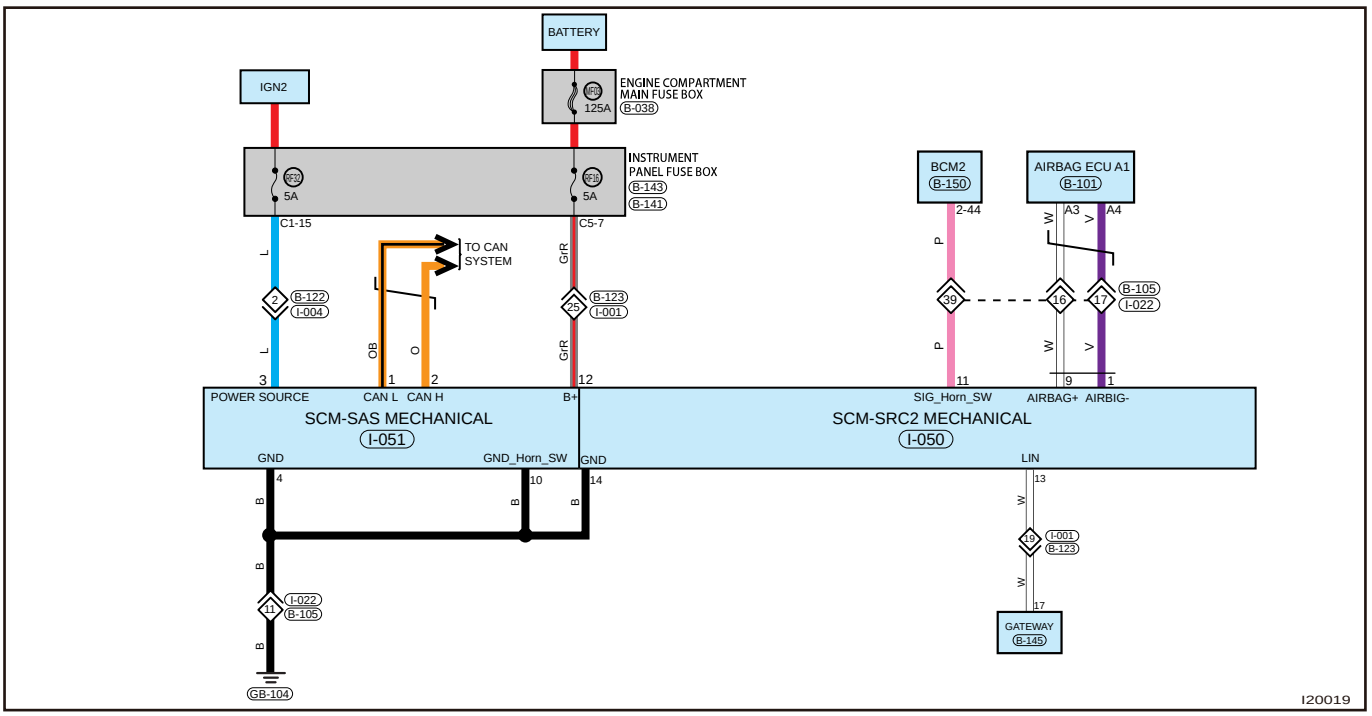


Steering column module upper connector (4 PIN)

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Horn switch ground	Power supply “ON”	0V
2	Body ground	Horn switch	Power supply “ON”	Do not press 12 V, press 0 V
3	/	Airbag -	/	/
4	/	Airbag +	/	/

3.2 Circuit Diagram





4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:

- Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
Steering wheel free play is too large	Suspension or steering parts (loose or worn)
	Front hub bearing (worn or loose)
	Steering gear bracket (loose)
	Gear clearance (improper)
	Steering shaft (worn or loose)
Sideslip	Tire pressure
	Brake lag
	Wheel alignment (wrong)
	Steering column (worn or damaged)
	Steering or suspension parts (loose or worn)
Running deviation	Tire pressure (too high or too low)
	Different tire wear (diameter difference occurs)
	Wheel alignment (wrong)

4.2 Diagnostic Help

(1) Connect diagnostic tester (the latest software) to diagnostic connector, and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of brake control system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all wire harness connectors and ground parts related to DTC.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

4.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures:

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software) to diagnostic connector, and make it communicate with vehicle electronic module through data network.
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in EPB system.
- Turn the ENGINE START STOP switch to OFF and wait for several seconds.
- Turn the ENGINE START STOP switch to ON, select “Read DTC”.
- If DTC is not detected, malfunction indicated by DTC is intermittent.

4.4 Intermittent Troubleshooting

If malfunction is intermittent, perform the followings:

(1) Check if connector is loose.
(2) Check if wire harness is worn, pierced, pinched or partially broken.
(3) Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
(4) If possible, try to duplicate the conditions under which DTC was set.

(5) Look for data that has changed or DTC to reset during wiggle test.

(6) Look for broken, bent, protruded or corroded terminals.

(7) Inspect the mounting areas of brake control system, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.

(8) Check and clean all wire harness connectors and ground parts related to DTC.

(9) Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Ground points are very important to normal work of circuit, and they are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 System Diagnosis Procedure

Hint:

- Use following procedures to troubleshoot Steering Column Module (SCM).

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

(a) Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V.

NG → **Replace battery**

OK

3	**Customer problem analysis**

NEXT

4	**Read DTCs**

No DTC → **Repair according to Problem Symptoms Table**

DTC is output

5	**Read DTCs (current DTC and history DTC)**

No DTC → Troubleshoot according to Intermittent DTC Fault Flow

DTC is output

6	Repair according to Diagnostic Trouble Code (DTC) Chart

NEXT

7	Adjust, repair or replace

NEXT

8	Conduct test and confirm malfunction has been repaired

NEXT → End

4.7 Diagnostic Trouble Code (DTC) Chart

■ **SCM power supply DTC**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12A017	ECU Power Supply Voltage Above Threshold	• Microcontroller is not in calibration state • SCM is awake	• Power supply system voltage too high • Wire harness or connector fault • SCM failure	• Check whether power supply voltage is in effective range (9 - 16 V) • Check wire harness • Clear DTC and test again. If DTC still exists, replace SCM
B12A116	ECU Power Supply Voltage Below Threshold	• Ignition signal state is not in "-start" state • Microcontroller is not in calibration state • SCM is awake	• Power supply system voltage too Low • Wire harness or connector fault • SCM failure	

■ **SCM light part DTC**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12A214	Turn Light Switch Short to GND	• Voltage condition is in valid range (9 - 16 V) • Microcontroller is not in calibration state • SCM is awake	• Wire harness or connector fault • SCM failure	• Check whether power supply voltage is in effective range • Check wire harness • Clear DTC and test again. If DTC still exists, replace SCM
B12A215	Turn Light Switch Short to BAT or Open			
B12A21C	Turn Light Switch Circuit Voltage Invalid			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12A314	HighBeam/ FlashLight Switch Short to GND			
B12A315	HighBeam/ FlashLight Switch Short to BAT or Open			
B12A31C	HighBeam/ FlashLight Switch Circuit Voltage Invalid			
B12A514	Master Light Switch Short to GND			
B12A515	Master Light Switch Short to BAT or Open			
B12A51C	Master Light Switch Circuit Voltage Invalid			

■ **SCM wiper part DTC**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12A614	Front Wiper Switch Short to GND	• Voltage condition is in valid range (9 - 16 V) • Microcontroller is not in calibration state • SCM is awake	• Wire harness or connector fault • SCM failure	• Check whether power supply voltage is in effective range • Check wire harness • Clear DTC and test again. If DTC still exists, replace SCM
B12A615	Front Wiper Switch Short to BAT or Open			
B12A61C	Front Wiper Switch Circuit Voltage Invalid			
B12A714	Front Wiper Interval Switch Short to GND			
B12A715	Front Wiper Interval Switch Short to BAT or Open			
B12A71C	Front Wiper Interval Switch Circuit Voltage Invalid			
B12A814	FrontFog/RearFog Switch Short to GND			
B12A815	FrontFog/RearFog Switch Short to BAT or Open			
B12A81C	FrontFog/RearFog Switch Circuit Voltage Invalid			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12AA14	RearWiper/ RearWasher Switch Short to GND			
B12AA15	RearWiper/ RearWasher Switch Short to BAT or Open			
B12AA1C	RearWiper/ RearWasher Switch Circuit Voltage Invalid			

■ **SCM steering angle part DTC**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12B049	Steering Angle Sensor System Internal Failures	• Voltage condition is in valid range (9 - 16 V) • Microcontroller is not in calibration state • SCM is awake	• Wire harness or connector fault • SCM failure	• Check whether power supply voltage is in effective range • Check wire harness • Clear DTC and test again. If DTC still exists, replace SCM
B12B061	Steering Angle Sensor Algorithm Based Failures			
B12B185	Steering Angle Sensor Overflow			

■ **SCM control part DTC**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12B292	Control Module Program Memory Failure	• Voltage condition is in valid range (9 - 16 V) • Microcontroller is not in calibration state • SCM is awake	• Wire harness or connector fault • SCM failure	• Check whether power supply voltage is in effective range • Check wire harness • Clear DTC and test again. If DTC still exists, replace SCM
B12B3A3	Control Module Data Memory Failure			
B12B4A0	Calibration Parameter Memory Failure			
B12B5B8	SCM Zero Calibration			• Check whether power supply is in effective range • Check wire harness and connector • Clear DTCs, perform zero point calibration

■ DTC diagnosis procedure

DTC	B12A017	ECU Power Supply Voltage Above Threshold
DTC	B12A116	ECU Power Supply Voltage Below Threshold
DTC	B12A214	Turn Light Switch Short to GND
DTC	B12A215	Turn Light Switch Short to BAT or Open
DTC	B12A21C	Turn Light Switch Circuit Voltage Invalid
DTC	B12A314	HighBeam/FlashLight Switch Short to GND
DTC	B12A315	HighBeam/FlashLight Switch Short to BAT or Open
DTC	B12A31C	HighBeam/FlashLight Switch Circuit Voltage Invalid
DTC	B12A514	Master Light Switch Short to GND
DTC	B12A515	Master Light Switch Short to BAT or Open
DTC	B12A51C	Master Light Switch Circuit Voltage Invalid
DTC	B12A614	Front Wiper Switch Short to GND
DTC	B12A615	Front Wiper Switch Short to BAT or Open
DTC	B12A61C	Front Wiper Switch Circuit Voltage Invalid
DTC	B12A714	Front Wiper Interval Switch Short to GND
DTC	B12A715	Front Wiper Interval Switch Short to BAT or Open
DTC	B12A71C	Front Wiper Interval Switch Circuit Voltage Invalid
DTC	B12A814	FrontFog/RearFog Switch Short to GND
DTC	B12A815	FrontFog/RearFog Switch Short to BAT or Open
DTC	B12A81C	FrontFog/RearFog Switch Circuit Voltage Invalid
DTC	B12AA14	RearWiper/RearWasher Switch Short to GND
DTC	B12AA15	RearWiper/RearWasher Switch Short to BAT or Open
DTC	B12AA1C	RearWiper/RearWasher Switch Circuit Voltage Invalid
DTC	B12B049	Steering Angle Sensor System Internal Failures
DTC	B12B061	Steering Angle Sensor Algorithm Based Failures
DTC	B12B185	Steering Angle Sensor Overflow
DTC	B12B292	Control Module Program Memory Failure
DTC	B12B3A3	Control Module Data Memory Failure
DTC	B12B4A0	Calibration Parameter Memory Failure
DTC	B12B5B8	SCM Zero Calibration

⚠ Caution

- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

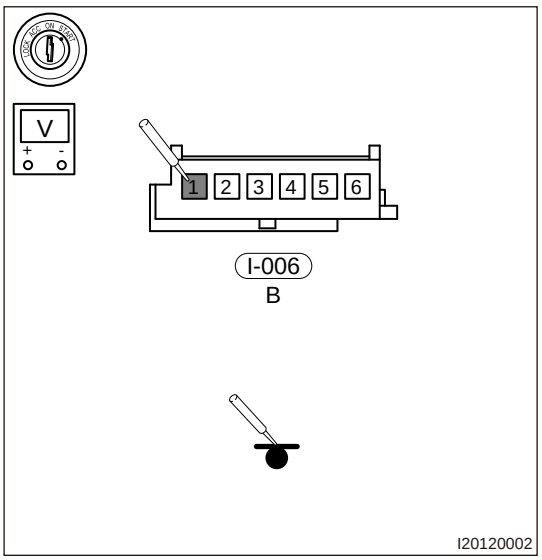
1	Check power supply voltage

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect steering column module connector I-006.
(c) Turn ENGINE START STOP switch to ON.

(d) Using voltage band of digital multimeter, measure voltage between I-006 (1) and body ground.

Standard Voltage

Multimeter Connection	Condition	Specified Condition
I-006 (1) - Body ground	ENGINE START STOP switch "ON"	9-16V



NG → **Repair or replace power supply wire harness**

OK

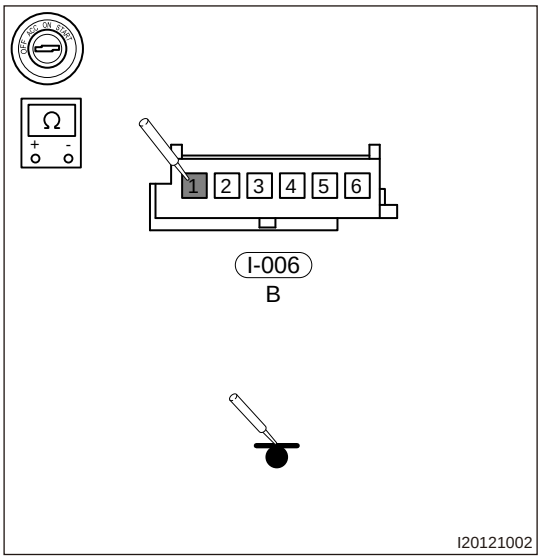
2	Check wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect steering column module connector I-006.

(c) Using ohm band of multimeter, check for continuity between I-006 (1) and ground.

Standard Resistance

Multimeter Connection	Condition	Specified Condition
I-006 (1) - Ground	Always	∞



NG → **Repair or replace faulty wire harness or connector**

OK

3	Reconfirm DTCs

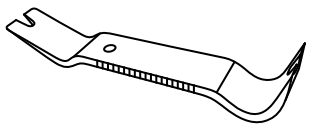
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the SCM module connector.
(c) Check whether SCM module terminal is bent, deformed or out of position.
(d) Use diagnostic tester (the latest software) to reread DTC in SCM system.

OK	System operates normally
NG	Replace SCM module

5 ON-VEHICLE SERVICE

5.1 Tools

■ **General tool**

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

5.2 Steering Column Module

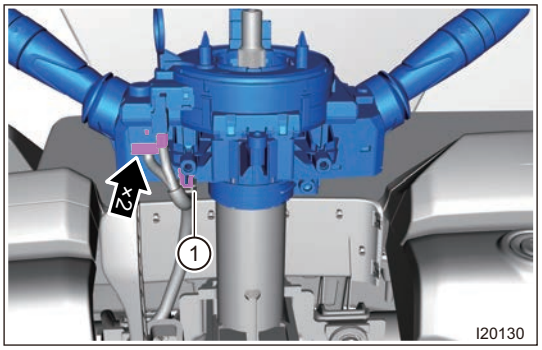
■ **Removal**

⚠ Caution

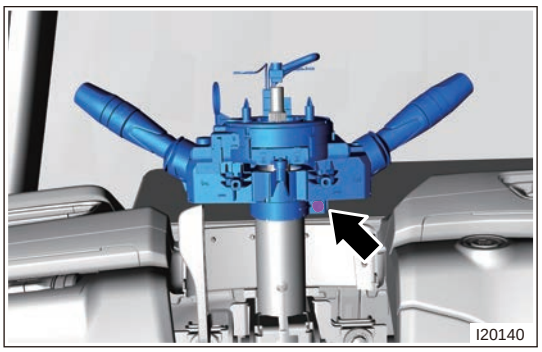
- **Be sure to wear necessary safety equipment to prevent accidents, when removing steering column module.**
- **Appropriate force should be applied when removing steering column module. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched when removing steering column module.**
- **Disconnect the negative battery cable for more than 90 seconds when removing airbag.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the combination switch lower cover assembly.
(4) Remove the combination switch lower cover assembly.
(5) Remove the driver airbag.
(6) Remove the steering wheel assembly.

(7) Disconnect 2 connectors from steering column module, and detach wire harness clip (1).



(8) Remove 1 fixing screw from steering column module.



■ Inspection

Check the appearance of steering column module for cracks and damages and corrosion of pins.

■ Installation

⚠ Caution

- **Always operate carefully to prevent components from being damaged, when installing steering column module.**
- **Install connector in place when installing steering column module.**
- **Check switch for proper operation after installing steering column module.**

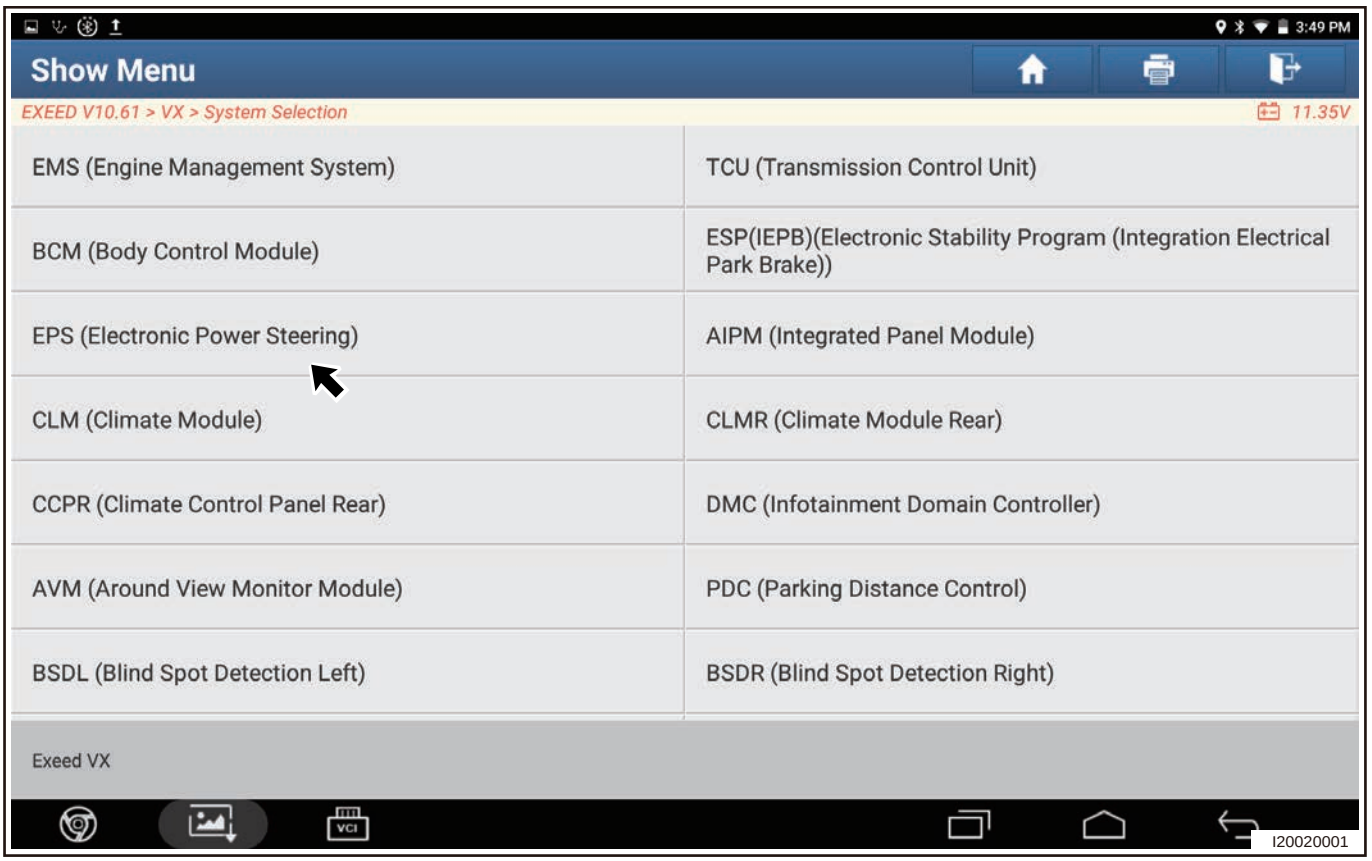
(1) Install 1 fixing screw to steering column module.
(2) Install the steering column module connector.
(3) Install the combination switch lower cover assembly.
(4) Install the steering wheel assembly.
(5) Install the driver airbag.
(6) Connect the negative battery cable.

■ Steering angle calibration

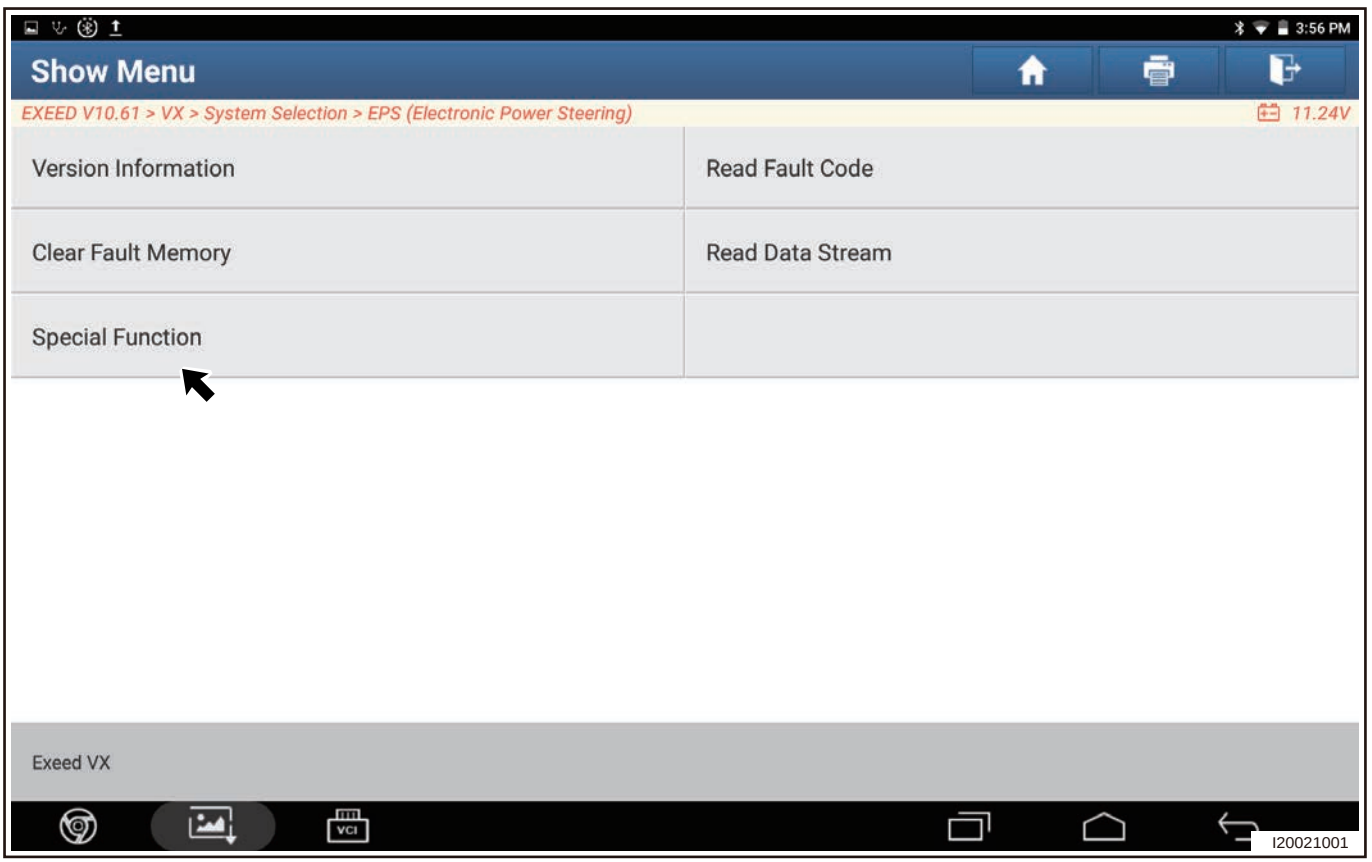
⚠ Caution

- **The zero point calibration of steering angle sensor must be carried out on four-wheel alignment station, otherwise the zero point calibration of steering angle sensor is not accurate, which will bring the risk of ESP alarm.**

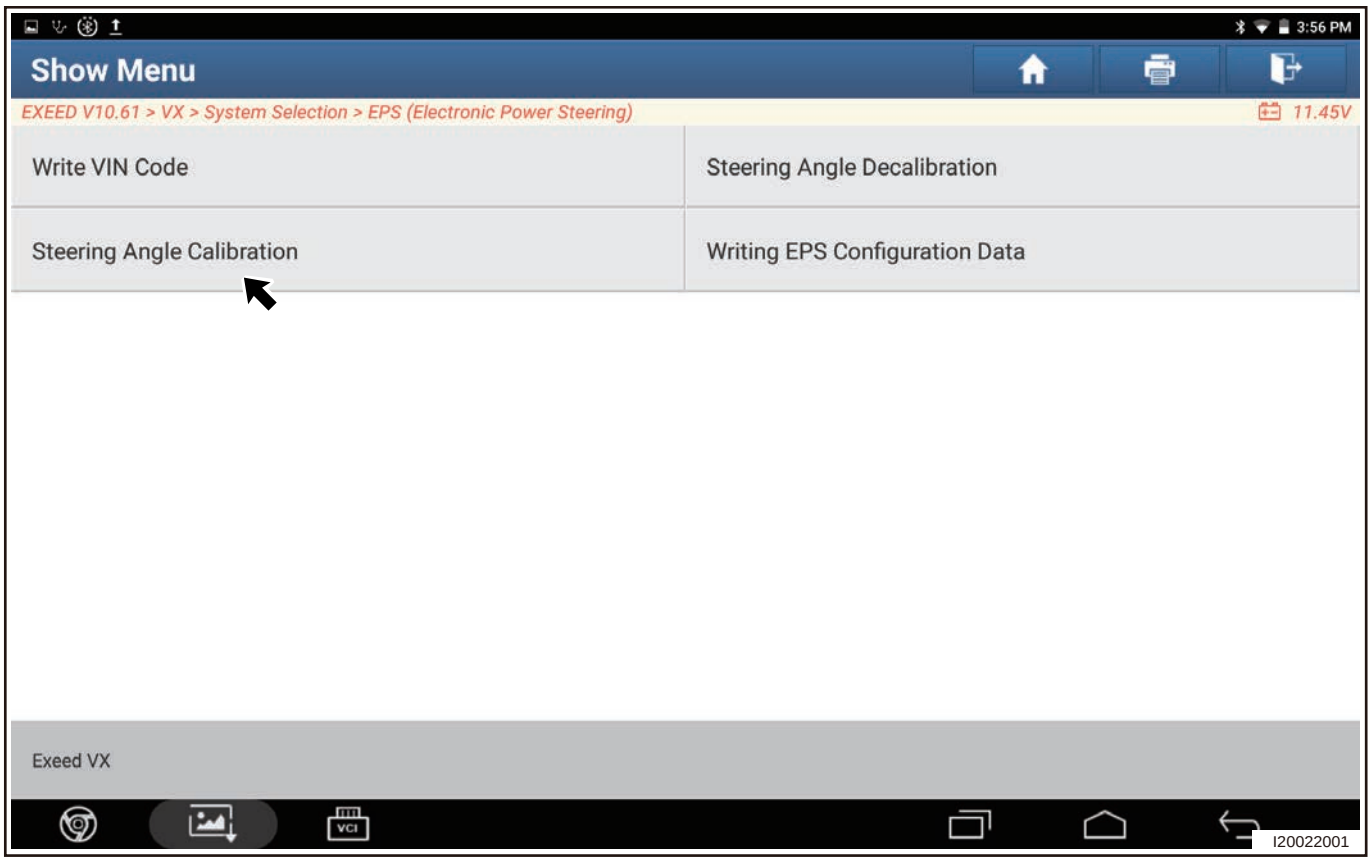
(1) Enter “EPS (Electronic Power Steering)”.



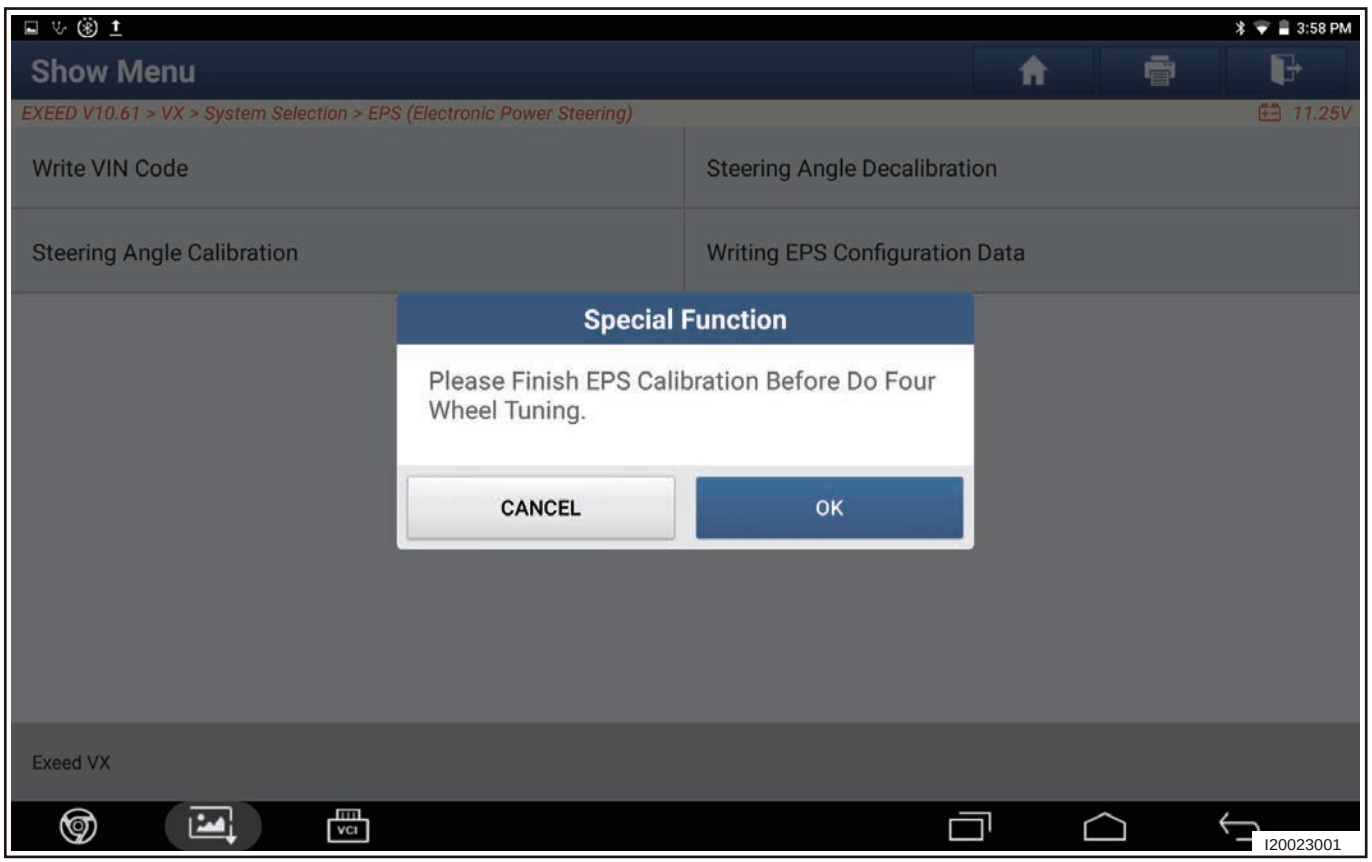
(2) Click “Special Function”.

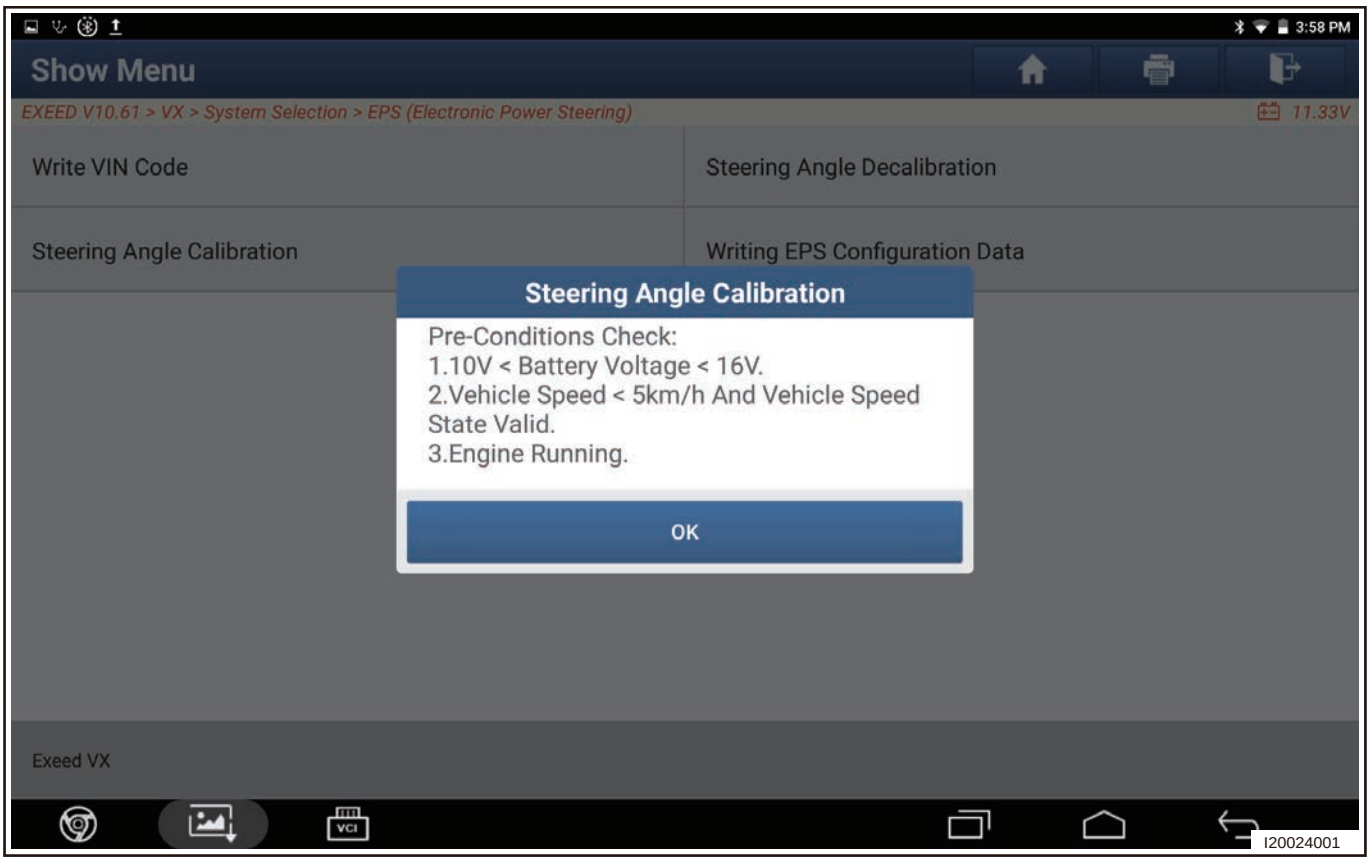


(3) Go to next interface, click “Steering Angle Sensor Calibration”.

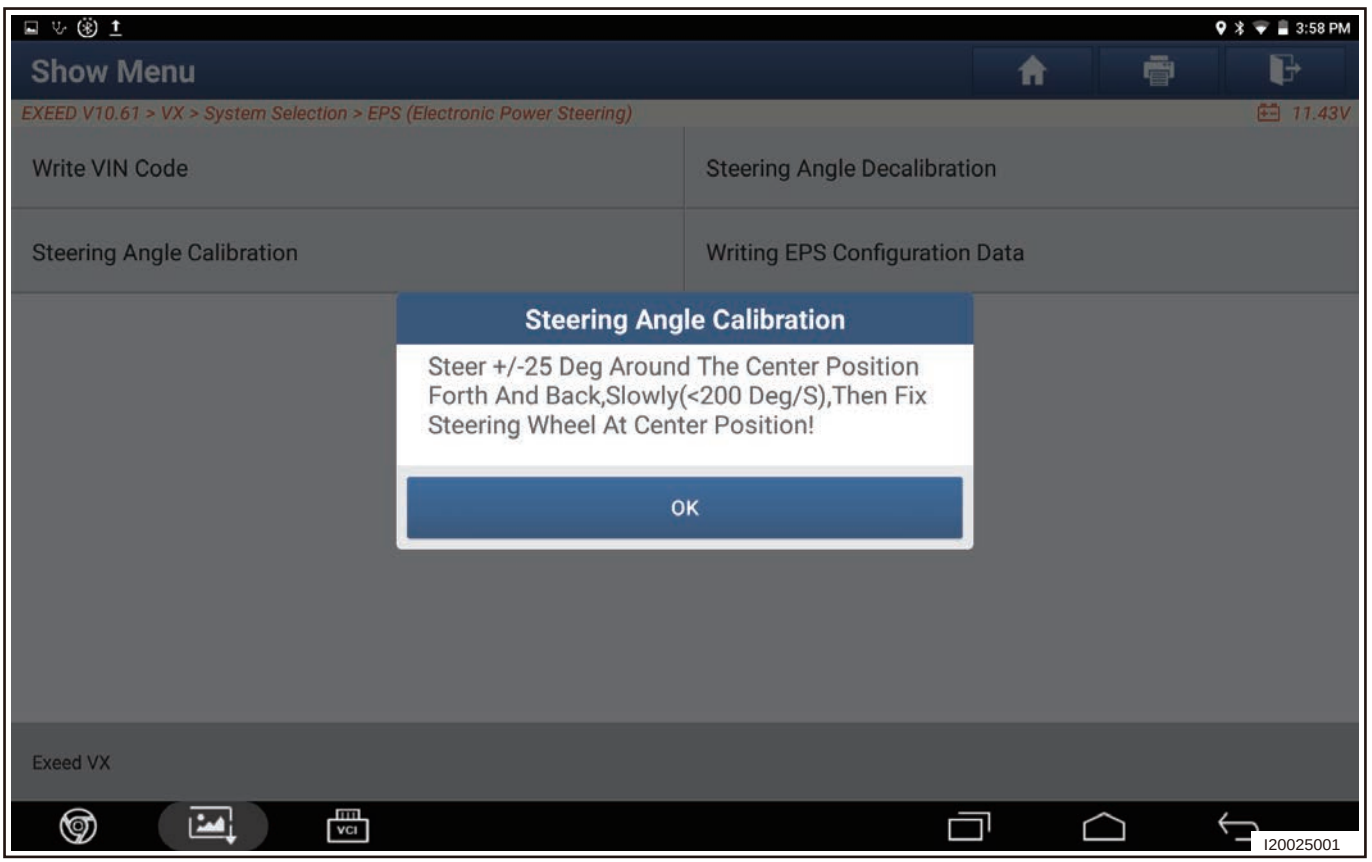


(4) Hint: “Steering Angle Calibration”, then click “OK”.

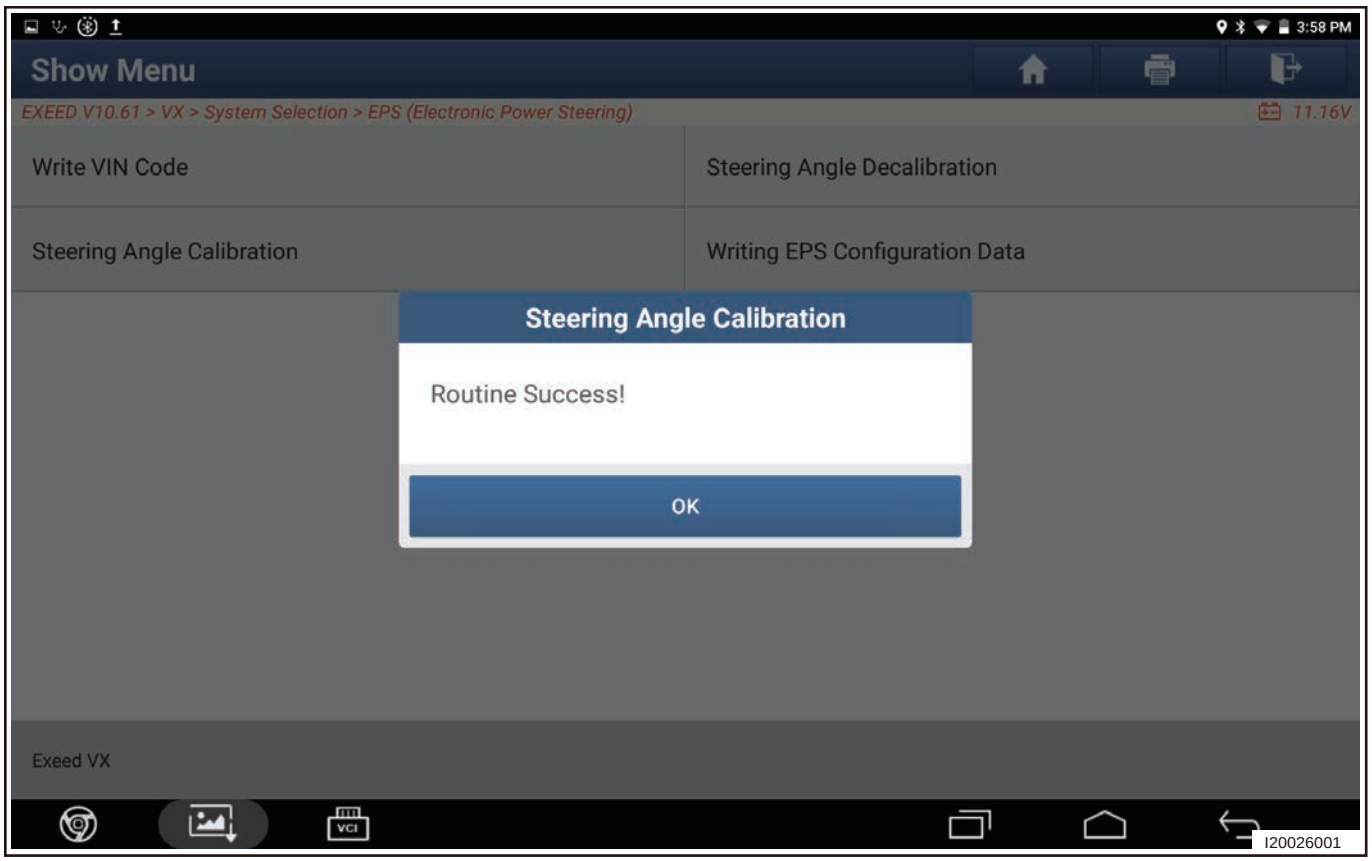




(5) Turn steering wheel according to the hint, then click “OK”.



(6) Hint: “Routine Success!”. Then click “OK”.


3:58 PM
Show Menu
EXEED V10.61 > VX > System Selection > EPS (Electronic Power Steering)
11.16V
Write VIN Code
Steering Angle Decalibration
Steering Angle Calibration
Writing EPS Configuration Data
Steering Angle Calibration
Routine Success!
OK
Exeed VX
VCI
I20026001

8.4 STEERING GEAR

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair:

(1) To replace steering gear, it is necessary to perform four-wheel alignment and center calibration.

(2) After four-wheel alignment, it is necessary to recalibrate center calibration.

(3) When removing and installing steering gear, it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

(4) It is necessary to perform steering angle sensor zero point calibration after replacing steering gear.

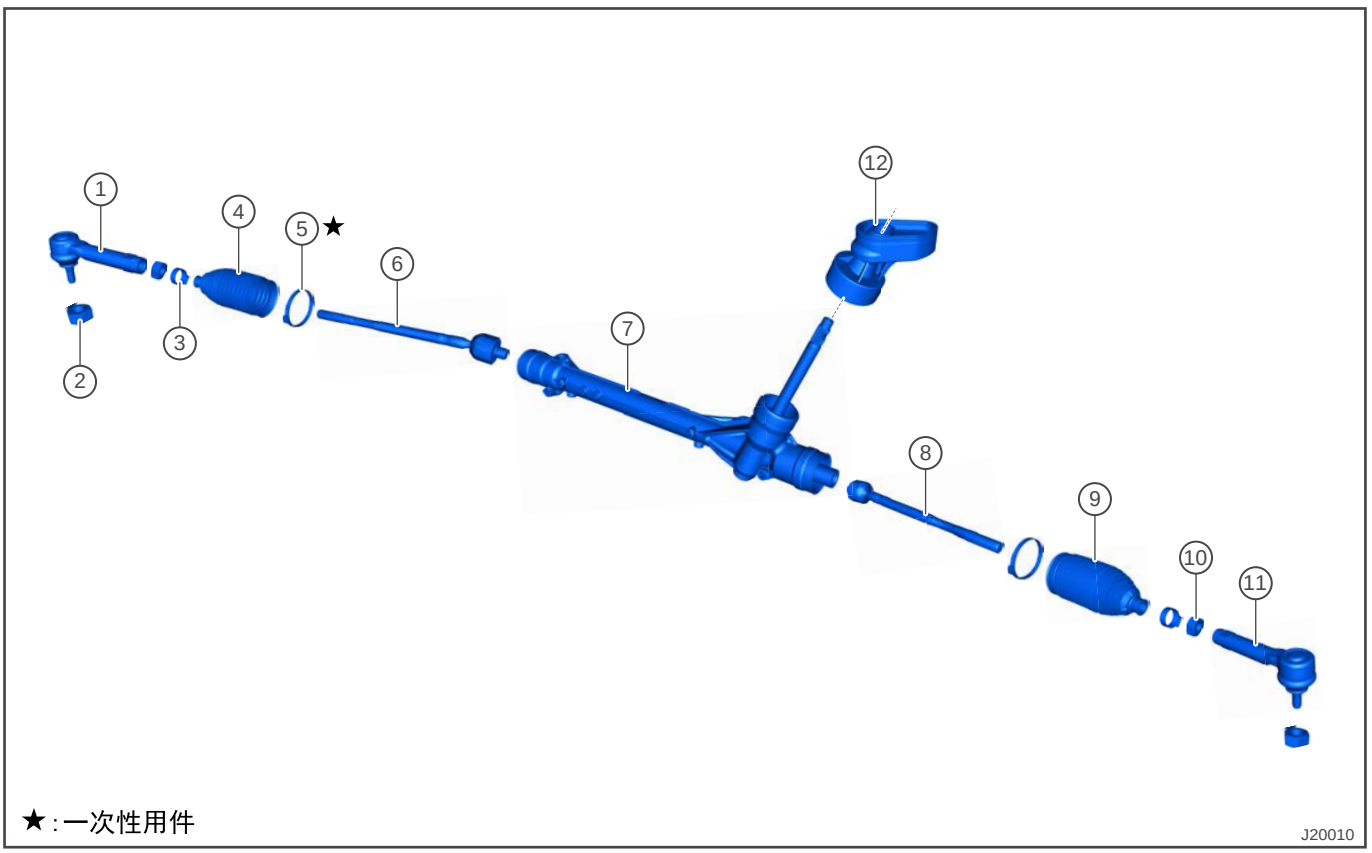
(5) When removing and installing steering system, suspension system, brake, tire, etc., it is necessary to turn off power supply of EPS (vehicle power supply is turned off), so as to avoid reverse impact, resulting in EPS internal protection circuit breakdown.

2 SYSTEM OVERVIEW

2.1 System Description

This vehicle adopts the electronic power steering system, which can reduce the workload when driver operates the steering wheel, thus improving operation convenience and driving safety.

2.2 System Components Diagram



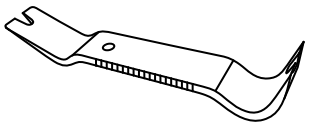
1	Right Steering Tie Rod Ball Pin	7	Steering Gear Body
2	Steering Tie Rod Ball Pin Locking Nut	8	Left Steering Tie Rod Assembly

3	Steel Belt Clamp	9	Left Steering Tie Rod Boot
4	Right Steering Tie Rod Boot	10	Steering Tie Rod Fixing Nut
5	Steel Belt Elastic Clamp	11	Left Steering Tie Rod Ball Pin
6	Right Steering Tie Rod Assembly	2	Boot Assembly

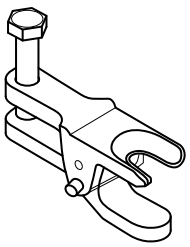
3 ON-VEHICLE SERVICE

3.1 Tools

■ General Tools

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

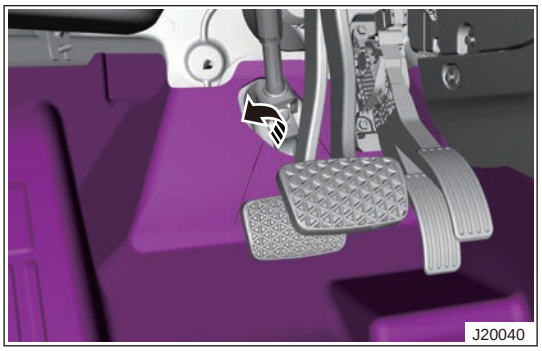
■ Special Tools

Tool Name	Part No.	Tool Drawing
Ball Separator	ECH-0003	 S00019

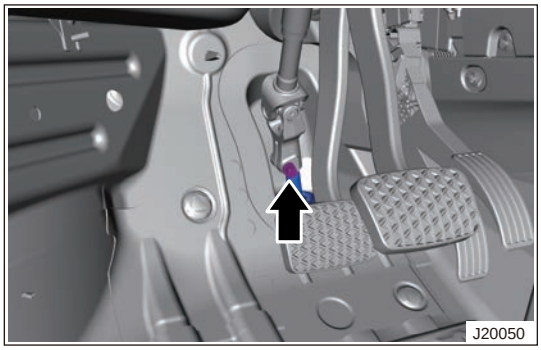
3.2 Replacement of Steering Gear Assembly

■ Removal

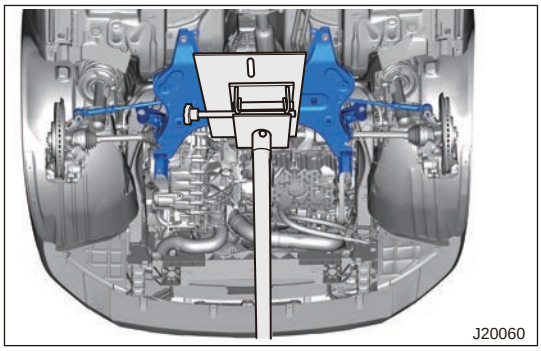
(1) Set the steering wheel to straight-ahead position.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Turn over carpet under driver seat in the direction of arrow.


J20040

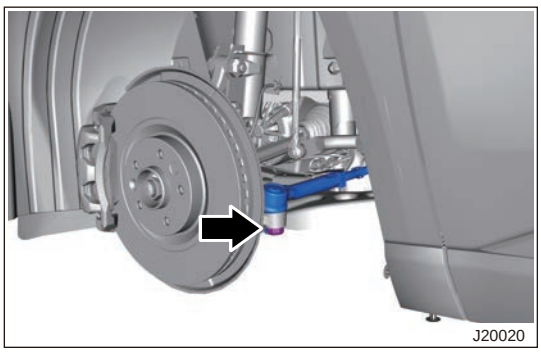
(5) Remove the coupling bolt (arrow) between steering column with intermediate shaft assembly and steering gear input shaft.



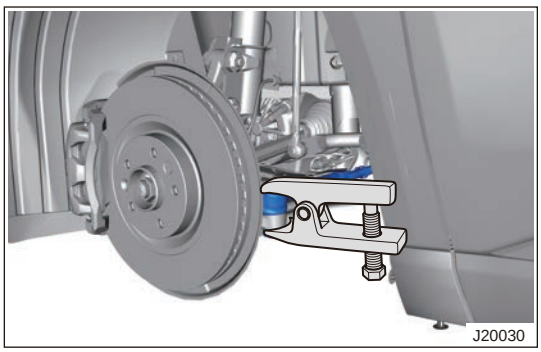
(6) Remove front left and front right wheels.
(7) Remove the engine lower protector assembly.
(8) Remove left and right side rail assembly.
(9) Remove front left and front right control arm assemblies.
(10) Remove the rear mounting cushion assembly.
(11) Using a transmission carrier, support front sub frame welding assembly.



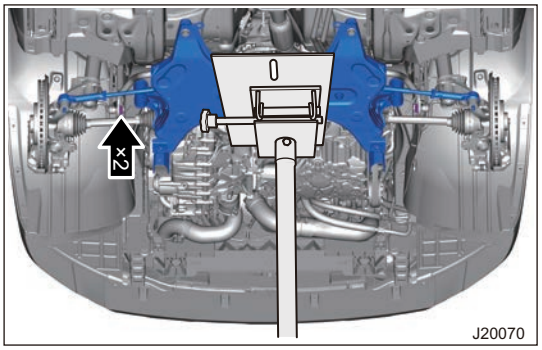
(12) Remove locking nut (arrow) between left steering tie rod ball pin assembly and front left steering knuckle assembly (the right side is same as left side).



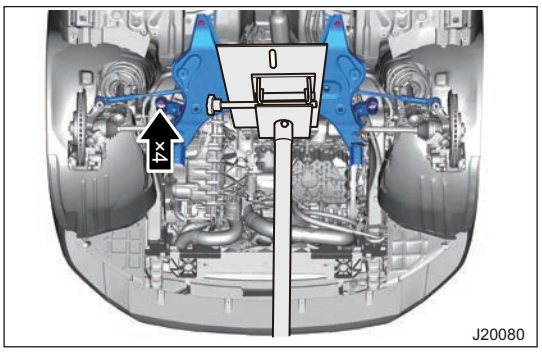
(13) Install ball pin separator, and separate steering tie rod ball pin from steering knuckle assembly.



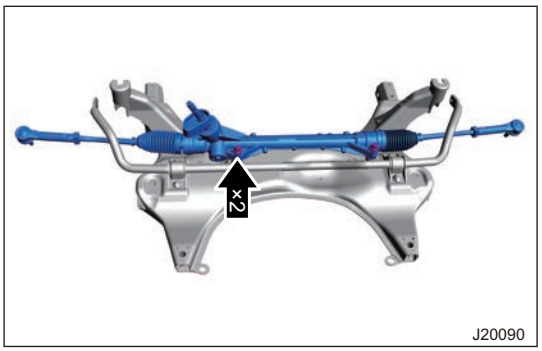
(14) Remove 2 locking nuts (arrow) between front connecting rod and front stabilizer bar.



(15) Remove 4 fixing bolts (arrow) between front sub frame and vehicle body, and lower front sub frame slowly.



(16) Remove 2 fixing bolts (arrow) that fix the steering gear with tie rod assembly from sub frame, and remove steering gear with tie rod assembly.



Hint:

- Check if steering gear dust boot is damaged, clamp is loose. Replace them if necessary to prevent water and micro dust from entering and causing parts failure prematurely.
- Check if steering gear is damaged. Replace the steering gear assembly if necessary.

■ **Installation**

(1) Install steering gear with tie rod assembly to sub frame.

(2) Install 2 fixing bolts that fix the steering gear with tie rod assembly to sub frame.

Torque: 180 ± 18 N·m

(3) Slowly raise sub frame to a proper position and install 2 fixing bolts between sub frame and vehicle body.

Torque: 110 ± 8 N·m

(4) Install 2 fixing bolts between left and right brackets and front sub frame welding assembly.

Torque: 200 ± 18 N·m

(5) Separate transmission carrier from front sub frame welding assembly.

(6) Install 2 hanger blocks to front sub frame assembly.

(7) Install steering tie rod ball pin to steering knuckle assembly.

(8) Install locking nut between left steering tie rod ball pin assembly and front left steering knuckle assembly (the right side is same as left side).

Torque: 60 ± 5 N·m

(9) Install the rear mounting lower body.

(10) Install front left and front right control arm assemblies.

(11) Install left and right side rail welding assemblies.

(12) Install the engine compartment lower protector assembly.

(13) Install front left and front right wheels.

(14) Install coupling bolt between steering column with intermediate shaft assembly and steering gear input shaft.

Torque: 40 ± 3 N·m

(15) Place the carpet under driver seat in a suitable position.

(16) Connect the negative battery cable.

(17) Press ENGINE START STOP switch, perform four-wheel alignment and perform running test.

AIR CONDITIONING SYSTEM

9.1 AIR CONDITIONING SYSTEM

1 Warnings and Precautions

1.1 Precautions

(1) The connector of negative ion generator must be disconnected when cleaning the air conditioning line after sale to avoid fire.

(2) To prevent battery is depleted, turn off A/C system after engine stopping if it is not necessary.

(3) Do not insert or stick anything to each vent, or use the spray around vents; Otherwise, these objects may cause system can not operate normally.

(4) When you find that the air volume or speed at the air outlet is obviously reduced, please check whether the A/C element is dirty or blocked. If so, please clean or replace the air conditioning element in time; It is recommended to check or replace A/C element every 5000 km.

(5) When you find that the refrigeration effect is obviously reduced, check whether the refrigerant in A/C system is sufficient, and check whether there is dirt blockage on the windward side of the condenser. If so, please add refrigerant or clean the dirt on the condenser surface.

(6) When the air quality outside vehicle is poor (during dusty or air pollution), it is recommended to use the inner air circulation mode of air conditioning (when the button character shows blue, the mode is in inner air circulation mode; when the character shows white, the mode is in outer air circulation mode).

(7) When the air conditioning system is not in use for a long time, it is recommended to start air conditioning once every month and operate it for about 5 minutes. The purpose is to ensure the good sealing of main shaft of A/C compressor. At the same time, it can also avoid electrolytic corrosion of compressor internal parts, resulting in poor refrigeration effect of A/C system.

(8) During assembly of line, it is necessary to confirm that O-ring is installed into groove first, if there is wear on O-ring during assembly, it is necessary to replace O-ring.

(9) Before refrigerant filling, nitrogen leakage detection, pressure keeping and vacuum pre-pumping must be performed through nitrogen vacuum pre-pumping equipment.

(10) After the completion of nitrogen leakage detection and pressure keeping process, screw on the A/C pipe filler cap in time to avoid touching the valve core in filler by mis-operation, so that A/C system can be communicated with atmosphere.

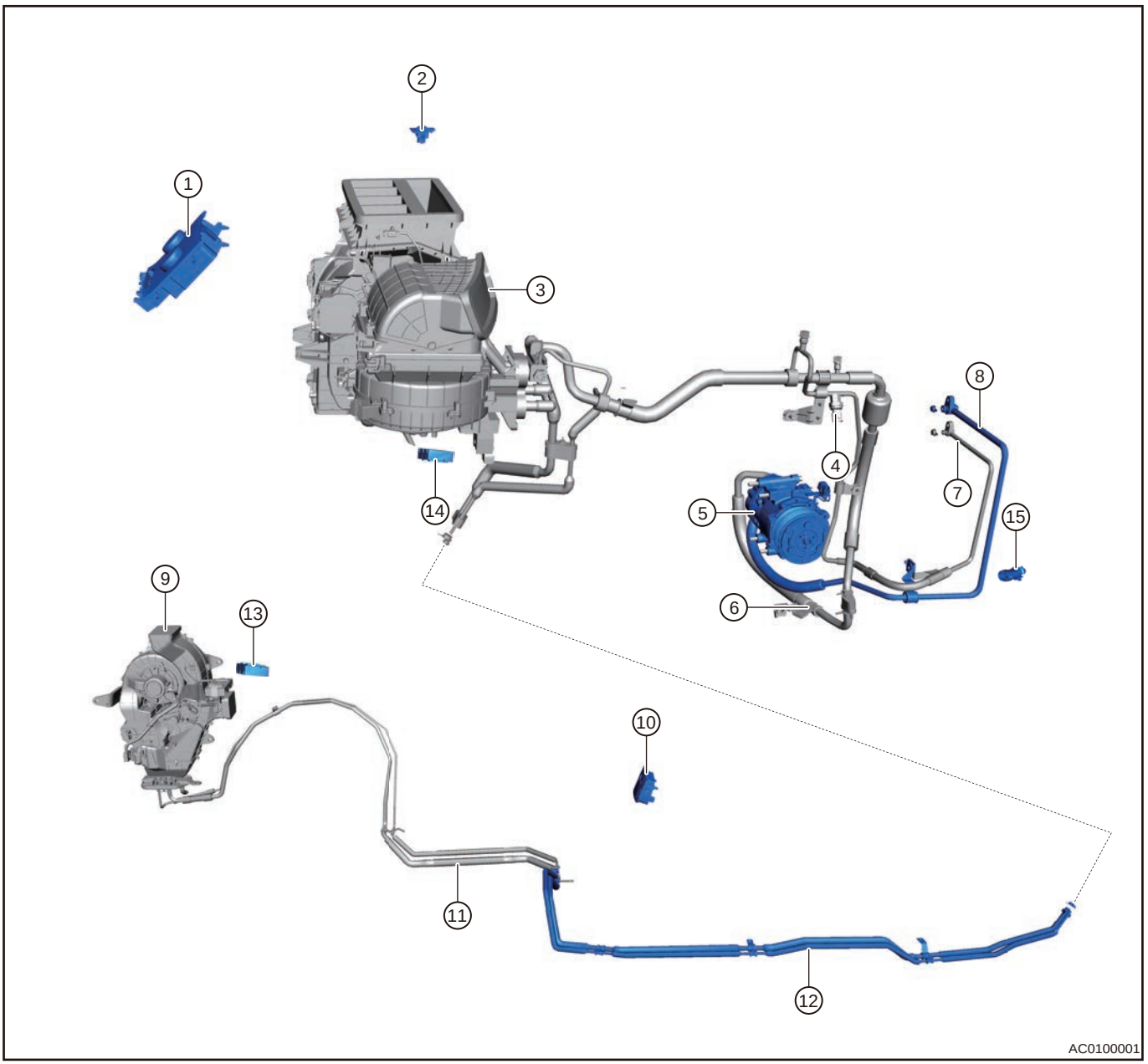
(11) When filling refrigerant, the filling gun should be vertically installed on the filler. Do not shake filling gun left and right to avoid touching the valve core in filler after install it into place.

2 System Overview

2.1 System Description

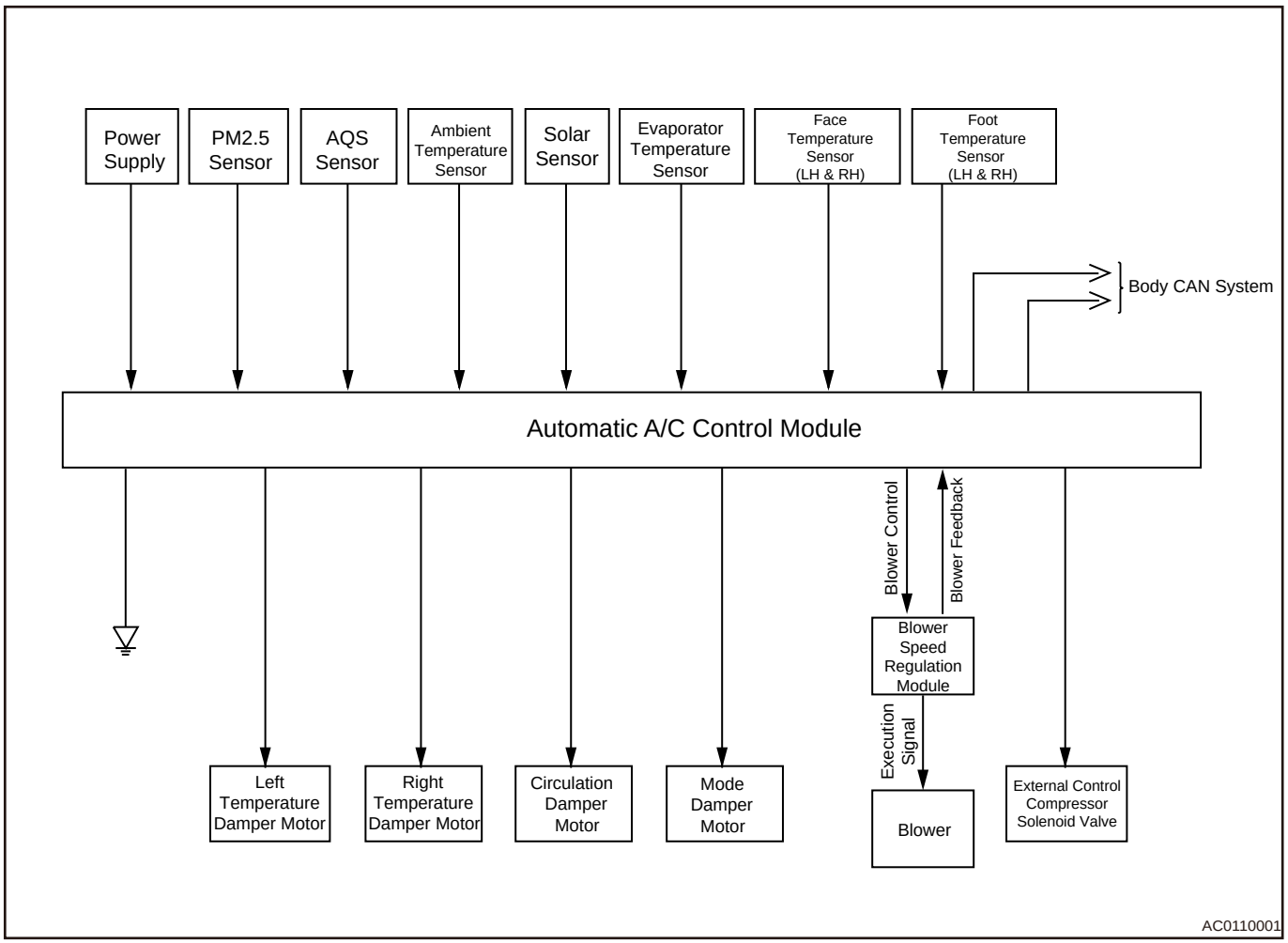
This model adopts an integrated heating and cooling air conditioning, which way with external control variable displacement compressor + expansion valve control method, and uses environment-friendly refrigerant R134a. This system consists of basic components: compressor, condenser, HVAC, lines, AIPM (front A/C control panel), CLM (A/C control module), CLMR (rear A/C control module), CCPR (rear A/C control panel, not equipped with low configuration model) as well as other accessories such as pressure switch, O-ring, etc.

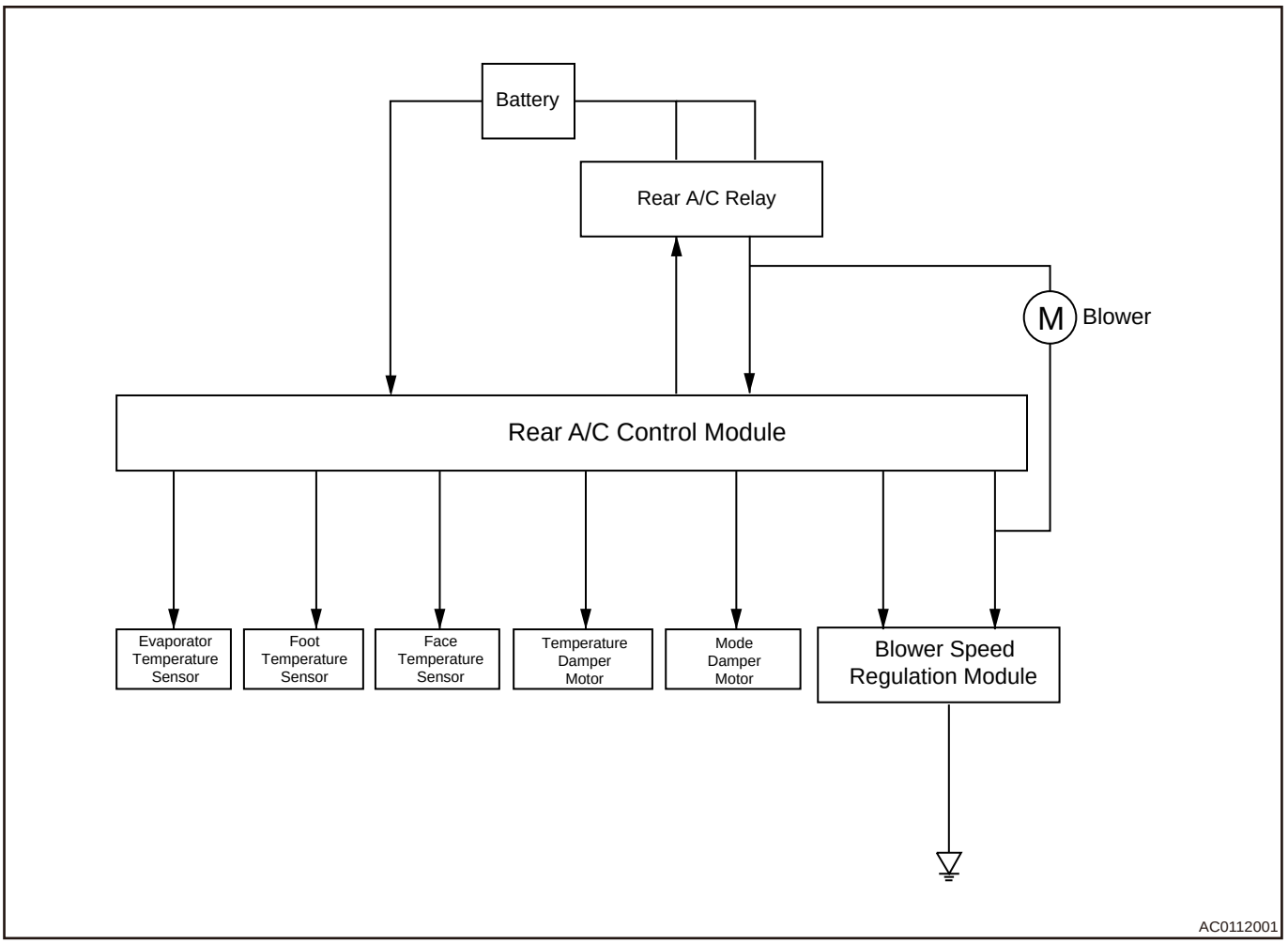
2.2 System Components Diagram



1	Auto A/C Control Panel Assembly	9	Rear HVAC Assembly Single Refrigeration
2	Solar Sensor Assembly	10	Rear A/C Control Panel Assembly
3	Auto Double Zone A/C HVAC Assembly	11	Condenser to Rear Evaporator Line Assembly II
4	A/C Pressure Sensor	12	Condenser to Rear Evaporator Line Assembly I
5	A/C Compressor Assembly	13	CLMR (Rear A/C Control Module)
6	Evaporator to Compressor Line Assembly	14	CLM (A/C Control Module)
7	A/C Coaxial Line Assembly	15	Ambient Temperature Sensor
8	Compressor to Condenser Line Assembly		

2.3 System Schematic Diagram





2.4 Function Description for Combination Button of Front A/C Control Panel

■ Functional definition requirements:

(1) The control panel sends function requests for A/C self-learning, clearing DTCs, and self-diagnosis functions to A/C controller CLM by operating the combination button;

(2) After pressing the combination button, the commands of combination button are transmitted to CLM through CAN network, and CLM completes the related functions;

(3) The combination button is defined as:

1) A/C self-learning function: Press AC button, REC button and rear defrosting button at the same time for more than 5 seconds, AIPM_1REQ_SelfStudy_FrontCLM sends the current status of the combination button. After the front A/C controller receives the self-learning request, the front A/C enters self-learning status.

2) After the self-learning is completed, all the indicated status returns to the status before self-learning.

3) Clearing DTCs function: Press A/C button, REC button and front defrosting button at the same time for more than 5 seconds, AIPM_1 REQ_ClearDTC_FrontCLM sends the current status of the combination button. After front A/C controller CLM receives the request, front A/C control panel enters the function status of clearing history DTC.

4) After clearing DTC for 1s, all indicated status return to normal working status.

5) Self-diagnosis function: Press A/C button, front defrosting button and rear defrosting button at the same time for more than 5 seconds, AIPM_1 REQ_SelfDiag_FrontCLM sends the current status of combination button. After front A/C controller CLM receives the request, the front A/C enters self-diagnostic status; If front A/C has no fault information, the screen of front CCU left and right knobs continues to display "00" for 2 seconds, and "00" will disappear automatically.

6) If there are more than one set of DTCs, it is displayed in turn, switching once per second, and the self-diagnosis mode automatically exits after the display completes.

7) Exit Self-diagnosis: During self-diagnosis, pressing ON/OFF button, bus power off or CCU power off can immediately exit self-diagnosis. Other buttons and knobs operations are invalid and self-diagnosis does not exit. Indicator light status, blower air volume, temperature damper, mode damper, inner and outer circulation and AC return to the normal conditions before diagnosing.

2.5 Functional Definition of Combination Button

■ Self-learning function of step motor

(1) Press AC button, REC button and rear defrosting button at the same time for more than 5 seconds, front A/C step motor enters the self-learning status.

(2) Indicator lights of all front CCU buttons come on.

(3) PM2.5 appears in blue.

(4) After the self-learning is completed, all the indicated status return to the status before self-learning.

■ Clearing history DTC function

(1) Press AC button, REC button and front defrosting button at the same time for more than 5 seconds, front CCU enters function status of clearing history DTC.

(2) Indicator lights of all front CCU buttons come on.

(3) PM2.5 appears in blue.

(4) After clearing DTC for 1s, all indicated status return to normal working status.

■ Self-diagnostic function

(1) Display self-diagnostic.

(2) Press AC button, front defrosting button and rear defrosting button at the same time for more than 5 seconds, front A/C enters the self-diagnostic status.

(3) Indicator lights of all front CCU buttons come on.

(4) PM2.5 appears in blue.

(5) LCD or TFT screen displays the DTC information.

(6) After the self-diagnostic is completed, all the indicated status return to the status before self-diagnostic.

(7) If front A/C has no fault information, the screen of front CCU left and right knobs continues to display "00" for 2 seconds, and "00" will disappear automatically.

(8) If there are more than one set of DTCs, it is displayed in turn, switching once per second, and the self-diagnosis mode automatically exits after the display completes.

(9) Self-diagnostic exits.

(10) During self-diagnosis, pressing ON/OFF button, bus power off or CCU power off can immediately exit self-diagnosis. Other buttons and knobs operations are invalid and self-diagnosis will not exit. Indicator light status, blower air volume, temperature damper, mode damper, inner and outer circulation and AC return to normal conditions before diagnosing.

2.6 Function Description for Combination Button of Rear A/C Control Panel

■ Functional definition requirements

(1) Combination button function includes: Self-learning function of step motor, clearing history DTC function and self-diagnostic function.

■ Trigger of combination button

(1) When rear CCU is working, press 3 buttons at the same time for more than 5 seconds, and rear CCU enters the combination button function. Combination button function includes: Self-learning function of step motor, clearing history DTC function and self-diagnostic function.

2.7 Functional Definition of Combination Button

■ Self-learning function of step motor

(1) Press AC button, AUTO button and mode button at the same time for more than 5 seconds, rear A/C step motor enters the self-learning status.

(2) Indicator lights of all rear CCU buttons come on.

(3) Display all contents on the LCD.

(4) After the self-learning is completed for 1 second, all the indicated status and all displayed contents on LCD return to the status before self-learning.

■ Clearing history DTC function

(1) While pressing AUTO button, press and hold the mode selection button 3 times within 5 seconds, and rear CCU enters clearing history DTC function status.

(2) Indicator lights of all rear CCU buttons come on.

(3) Display all contents on the LCD.

(4) After clearing DTC for 1s, all the indicated status and all contents displayed on the LCD return to normal working status.

■ Self-diagnostic function

(1) Display self-diagnostic.

(2) Press AC button, front defrosting button and rear defrosting button at the same time for more than 5 seconds, front A/C enters the self-diagnostic status.

(3) Indicator lights of all front CCU buttons come on.

(4) PM2.5 appears in blue.

(5) LCD or TFT screen displays the DTC information.

(6) After the self-diagnostic is completed, all the indicated status return to the status before self-diagnostic.

(7) If front A/C has no fault information, the screen of front CCU left and right knobs continues to display "00" for 2 seconds, and "00" disappears automatically.

(8) If there are more than one set of DTCs, it is displayed in turn, switching once per second, and the self-diagnosis mode automatically exits after the display completes.

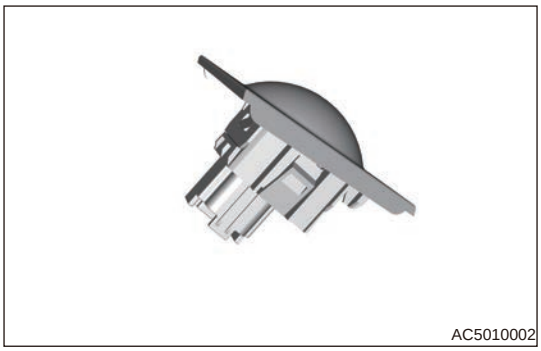
(9) Self-diagnostic exits.

(10) During self-diagnosis, pressing ON/OFF button, bus power off or CCU power off can immediately exit self-diagnosis. Other buttons and knobs operations are invalid and self-diagnosis will not exit. Indicator light status, blower air volume, temperature damper, mode damper, inner and outer circulation and AC return to normal conditions before diagnosing.

2.8 System Components Description

■ Dual-zone solar sensor

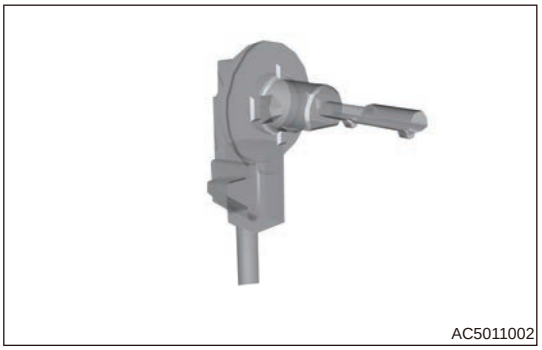
Solar sensor is installed on instrument panel and used to detect light intensity in the area where the vehicle is located and control the automatic mode of air conditioning. The sensor is a photoresistor (including left solar sensor and right solar sensor), which is connected to the sensor power supply via a 4.7K pull-up resistor to calculate the solar intensity.


AC5010002

Item	Description	Note
Operating voltage range	0.07 ~ 2.19 V	
Measurement range	80 ~ 2000 W	
Accuracy	1W	
Fault diagnosis	Short to power supply/open: Collecting voltage is 4.9 V	
Invalid default	0W/m2	

■ Air duct temperature sensor

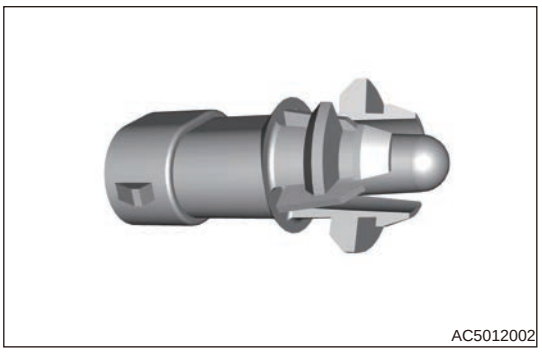
The sensor is NTC resistance (including right face air outlet temperature sensor, left face air outlet temperature sensor, right foot air outlet temperature sensor, left foot air outlet temperature sensor, ambient temperature sensor and evaporator sensor), which is connected to the sensor power supply via the pull-up resistor. Different temperatures will result in different resistance values. Different voltage values are generated by NTC resistor and pull-up resistor at the sensor terminal and input it to MCU to calculate the temperature.


AC5011002

No.	Function	Function Description	Note
1.	Left and right face and foot air outlet temperature collecting (air duct temperature sensor)	Collect the local air duct sensor signal and convert it into a temperature signal via RT meter.	
2.	Air duct temperature signal abnormal handling	22˚C	

■ Outside temperature sensor

Outside temperature sensor is installed at lower left of front impact beam and used to detect the outside temperature and control the automatic mode of air conditioning. The sensor sends signal to automatic A/C module. The resistance of outside temperature sensor changes with the change of ambient temperature. Resistance increases as temperature decreases. Resistance decreases as temperature increases.


AC5012002

No.	Function	Function Description	Note
1.	Outside temperature collecting	Obtain the bus temperature value according to RT table, and obtain the actual outside temperature after updating bus outside temperature value (filtered value of outside temperature).	
2.	Outside temperature signal abnormal handling	1. When PowerMode is OFF, the outside temperature maintains the previous value; 2. When the outside temperature diagnosis status is not valid, the outside temperature maintains the previous value. When the outside temperature diagnosis status is valid, the software outside temperature continues to update normally at a maximum of 2˚C every 5 seconds.	
3.	Read outside temperature value	The ambient temperature signal is the collected value of outside temperature	The maximum outside temperature is 86 ± 1˚C

No.	Function	Function Description	Note
		The ambient temperature signal is the filtered value of outside temperature	
4.	Initial value of outside temperature	When power-on or waking up for the first time, if the power mode is not in OFF and the outside temperature is valid, the software outside temperature is immediately updated according to bus outside temperature resistance value; otherwise, the outside temperature filtered value uses the default value of 22℃, after the power mode is not in OFF and the outside temperature is valid, it will be updated to the current outside temperature filtered value immediately according to the outside temperature resistance value.	
5.	The format of outside temperature diagnostic signal is ambient temperature diagnostic		
6.	Signal sending	When power-on for the first time, the outside temperature will first send the initial value of 1 second (86℃), then send a frame of default value (22℃), and then update to the current sensor temperature; After waking up from sleep, the outside temperature will first send the initial value of 1 second (86°C), then update to the current sensor temperature.	

■ **Evaporator temperature sensor**

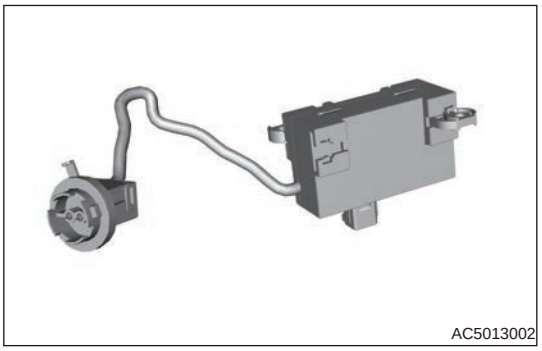
Item	Description	Note
Component property	Thermistor	
Quantity	One	
Operating voltage range	1 ~ 4V	
Measurement range	-20 ~ 75℃	
Nominal resistance	R0℃ = 6.194 KΩ ± 1%	
Accuracy	0.1℃	
Error	± 1℃	
Fault diagnosis	Short to power supply/open: Collecting voltage is 4.9 V Short to ground: Collecting voltage is lower than 0.1V	
Invalid default	-1℃	

No.	Function	Function Description
1.	Evaporator temperature signal collecting	Collect the local evaporator signal and convert it into a temperature signal via RT meter
2.	Invalid default	-2℃

■ Anion generator

Anion generator is installed on air duct on left side of instrument panel. The anion generator boosts the low voltage into positive high voltage and negative high voltage by booster circuit, and ionizes the air under the action of positive high voltage electric field and negative high voltage electric field to generate a large number of positive and negative ions.

Hint:
The connector of negative ion generator must be disconnected when cleaning the air conditioning line after sale to avoid fire.


AC5013002

■ AQS sensor

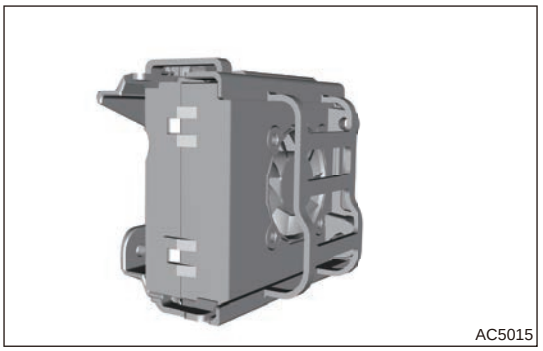
For OC output type, AQS PWM signal is connected to VPP_sleep power supply via a pull-up resistor. After transistor arrives at MCU capture port, the signal is transmitted in the opposite direction. MCU judges the air quality by duty ratio of signal.


AC5014002

No.	Function	Function Description	Note
1	PM2.5 air quality sensor signal collecting	Collect the corresponding duty ratio of local input and convert it into the corresponding S sensor value.	

■ PM2.5 sensor

PM2.5 sensor is also called dust sensor or dust sensor, which can be used to detect the concentration of dust in the air around people, that is, the value of PM2.5. Develop based on the principle of light scattering, particles and molecules will scatter light under the irradiation of light, and at the same time, they also absorb part of the irradiated light energy. When a beam of parallel monochromatic light is incident on the particle field under test, it will be affected by the scattering and absorption around the particle, and the light intensity will be attenuated. In this way, the relative attenuation rate of incident light passing through the concentration field to be measured can be obtained. The relative attenuation rate can basically linearly reflect the relative concentration of dust in the field to be measured. The intensity of light is proportional to the intensity of the electrical signal converted by photoelectricity. The relative attenuation rate can be obtained by measuring the electrical signal, and then the concentration of dust in the field to be measured can be determined.

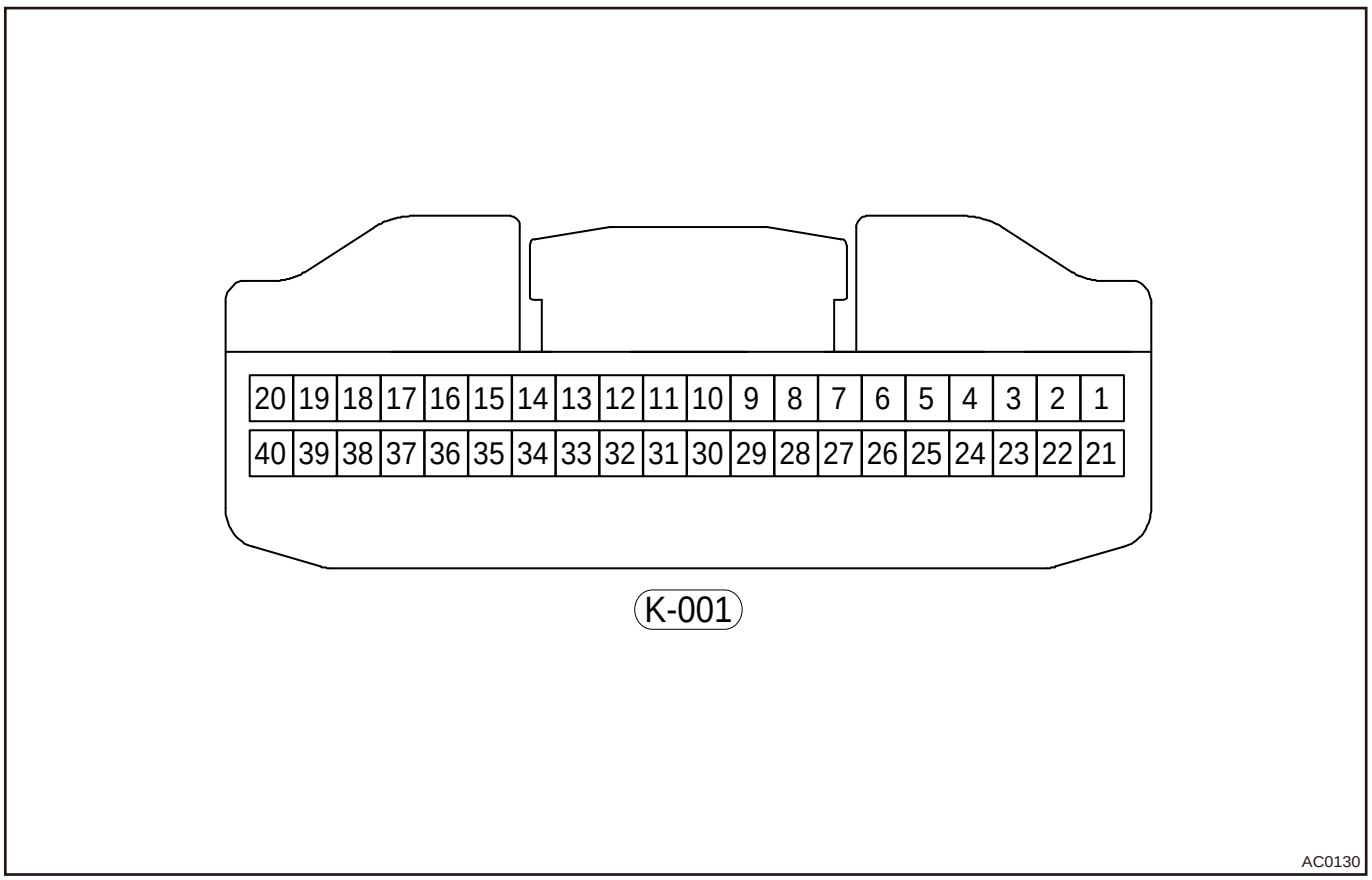

AC5015

Item	Description	Note
Component property	Laser type, equipped with fan	
Quantity	One	
Operating voltage range	9 ~ 16V	
Operating current	< 150 mA	
Frequency	1 Hz	
Measurement range	Max: 1~999 μg/m3 converted to Pwm recognition Low pulse time/detection period*1000 = dust concentration (μg/m3)	
Resolution	1ug/m3	
Fault diagnosis	Short to ground (0%) Short to power supply or open (100%)	Pwm of component and Pwm sampled by MCU are inverse
Invalid default	0ug/m3d	

3 System Circuit Diagram

3.1 Module Terminal Definition

■ **Automatic A/C module (CLM) - A**



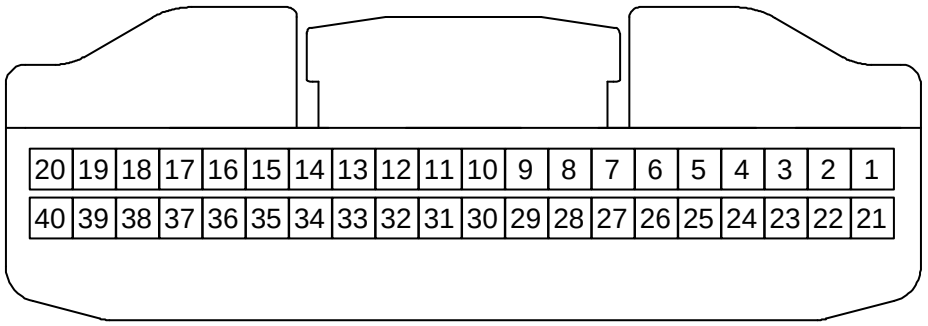
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	CAN_L	Power supply “ON”	2.4V
2	Body ground	Circulation damper motor drive +	Power supply “ACC”	Constant voltage is 11 V; when inner circulation turns to outer circulation, voltage becomes 0 V and then rises to 11 V
3	Body ground	Mode damper motor drive -	Power supply “ON”	Voltage is 11 V when not operating; Voltage is 0 V when operating
4	Body ground	Right temperature damper motor drive +	Power supply “ON”	Constant voltage is 11 V; when right temperature is adjusted to “LO” position, voltage

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
				becomes 0 V and then rises to 11 V
5	Body ground	Mode damper motor drive +	Power supply “ON”	11V
6	Body ground	Left temperature damper motor drive -	Power supply “ON”	Constant voltage is 11 V; when left temperature is adjusted to “LO” position, voltage becomes 0 V and then rises to 11 V
7	Body ground	Left temperature damper motor drive +	Power supply “ON”	Voltage is 11 V when A/C switch is not turned on, after A/C switch is turned on, instantaneous voltage is 0 V and then to 11 V
8	Body ground	Right temperature damper motor drive -	Power supply “ON”	Constant voltage is 11 V; when right temperature is adjusted to other position from “LO” position, voltage becomes 0 V and then rises to 11 V
9	Body ground	Circulation damper motor drive -	Power supply “ON”	Constant voltage is 11 V; when outer circulation turns to inner circulation, voltage becomes 0 V and then rises to 11 V
10	/	/	/	/
11	Body ground	IGN	Power supply “ON”	12V
12	Body ground	Damper motor position sensor total power supply	Power supply “ON”	5 V
13	Body ground	Circulation damper motor position information feedback	Power supply “ON”	Voltage is 1.5 V and turns to 3.5 V when inner circulation is turned on
14	Body ground	Mode damper motor position information feedback	Power supply “ON”	Foot 2.5 V; Face 4 V; Front defrosting 1 V; Face and foot 3.3 V; Defrosting and foot 1.6 V.

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
15	Body ground	Left temperature damper motor position information feedback	Power supply “ON”	“LO” 3.5 V; Others 1.5 V
16	Body ground	Right temperature damper motor position information feedback	Power supply “ON”	“LO” 1.5V; Others 3.5V
17	Body ground	Ground	Power supply “ON”	0V
18	Body ground	Ground	Power supply “ON”	0V
19	Body ground	Power supply	Power supply “ON”	12V
20	Body ground	Power supply	Power supply “ON”	12V
21	Body ground	CAN_H	Power supply “ON”	2.7V
22	/	/	/	/
23	/	/	/	/
24	Body ground	Evaporator temperature sensor	Power supply “ON”	8 ℃ 1.7 V
25	Body ground	Ambient temperature sensor	Power supply “ON”	8 ℃ 3.2V
26	/	/	/	/
27	Body ground	PM2.5 sensor signal	Power supply “ON”	8 ℃ 0.4V
28	/	/	/	/
29	/	/	/	/
30	/	/	/	/
31	/	/	/	/
32	Body ground	Blower positive terminal voltage feedback	Power supply “ON”	OFF: 0 V; ON: 12 V
33	/	/	/	/
34	Body ground	Blower speed control signal	Power supply “ON”	OFF: 8.9 V; level 1: 3.6 V; level 2: 4 V; level 3: 5 V; level 4: 6 V; level 5: 7.5 V; level 6: 9 V; level 7: 11 V; others 11.5 V. (Measured value in real vehicle) the

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
				voltage is 0 V with OFF, when it is in other levels, the voltage value is uncertain (it will fluctuate according to power supply voltage).
35	Body ground	Blower negative terminal voltage feedback	Power supply “ON”	OFF: 0 V
36	Body ground	Damper motor position sensor ground	Power supply “ON”	0V
37	Body ground	Temperature sensor ground	Power supply “ON”	0V
38	Body ground	PM2.5 AQS sensor power supply	Power supply “ON”	12V
39	Body ground	Compressor solenoid valve drive +	Power supply “ON”	0V
40	Body ground	Compressor solenoid valve drive -	Power supply “ON”	0V

■ **Automatic A/C module (CLM) - B**



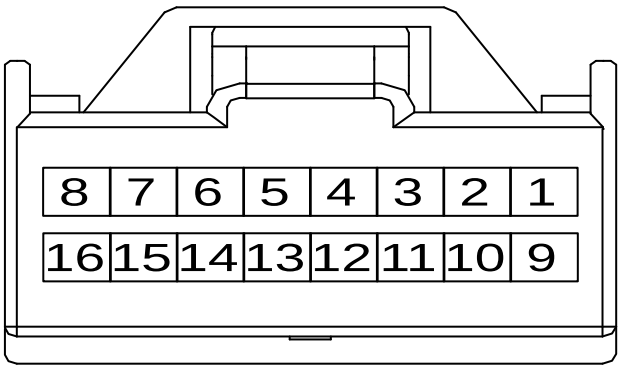
K-002

AC0140

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	PM2.5 sensor switch (enabling)	Power supply “ON”	0.2V
2	Body ground	AQS sensor signal	Power supply “ON”	2.1V
3	/	/	/	/
4	/	/	/	/
5	/	/	/	/
6	/	/	/	/
7	/	/	/	/
8	/	/	/	/
9	/	/	/	/
10	/	/	/	/
11	/	/	/	/
12	/	/	/	/
13	/	/	/	/
14	/	/	/	/

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
15	/	/	/	/
16	/	/	/	/
17	/	/	/	/
18	/	/	/	/
19	/	/	/	/
20	/	/	/	/
21	/	/	/	/
22	/	/	/	/
23	/	/	/	/
24	Body ground	Left face temperature sensor signal	Power supply “ON”	8℃: 3 V
25	Body ground	Right face temperature sensor signal	Power supply “ON”	8℃: 3 V
26	Body ground	Left foot temperature sensor signal	Power supply “ON”	8℃: 3 V
27	Body ground	Right foot temperature sensor signal	Power supply “ON”	8℃: 3 V
28	/	/	/	/
29	Body ground	Micro light sensor signal	Power supply “ON”	5 V
30	Body ground	Left solar sensor signal	Power supply “ON”	5 V
31	Body ground	Right solar sensor signal	Power supply “ON”	5 V
32	/	/	/	/
33	/	/	/	/
34	Body ground	Blower relay control signal	Power supply “ON”	OFF: 12 V; Blower ON: 0.2 V
35	/	/	/	/
36	/	/	/	/
37	/	/	/	/
38	/	/	/	/
39	/	/	/	/
40	/	/	/	/

■ **Front A/C control panel**



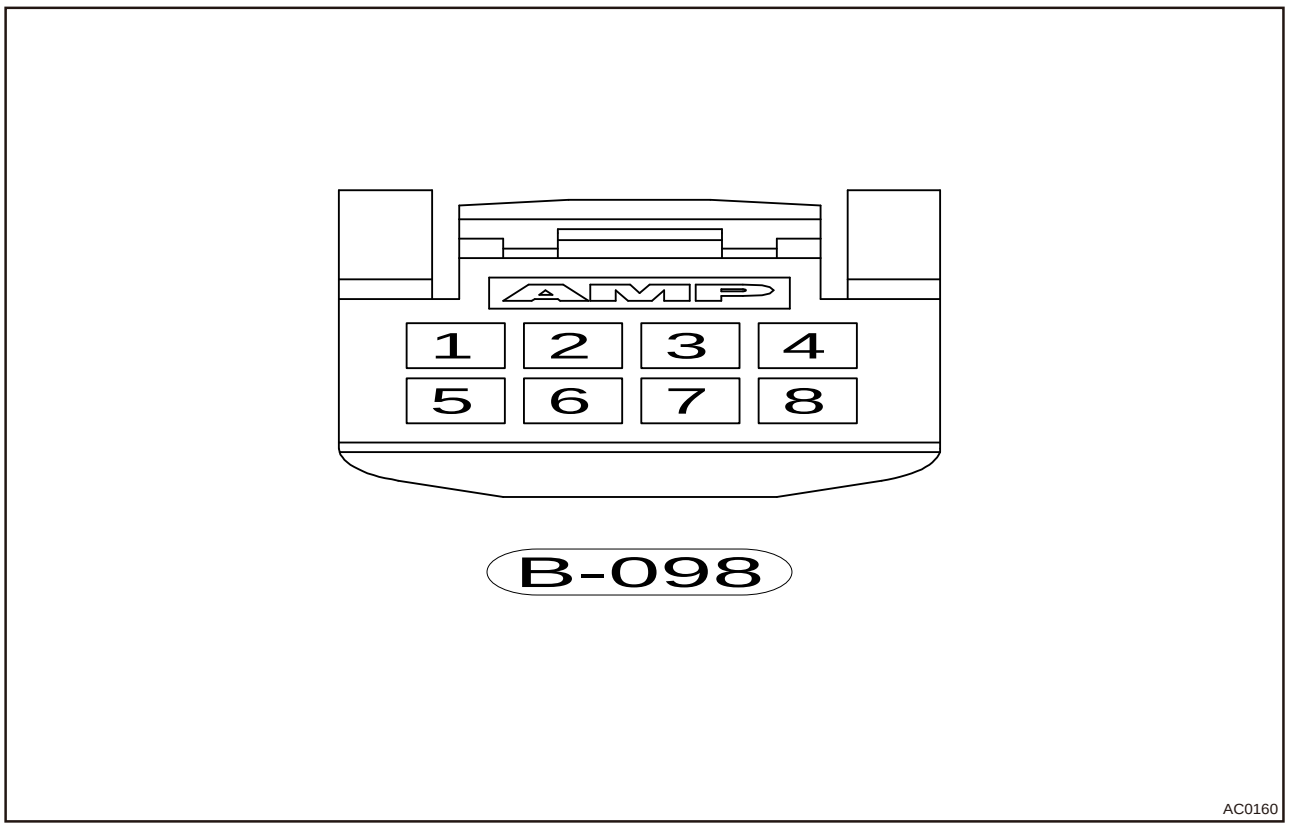
I-037

AC0150

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	\	\	\	\
2	\	\	\	\
3	\	\	\	\
4	Body ground	CAN-H	Power supply “ON”	2.6V
5	Body ground	CAN-L	Power supply “ON”	2.4V
6	\	\	\	\
7	Body ground	GND	Power supply “ON”	0V
8	Body ground	\	Power supply “ON”	-
9	Body ground	\	Power supply “ON”	-
10	\	\	\	\
11	\	\	\	\
12	\	\	\	\
13	\	\	\	\

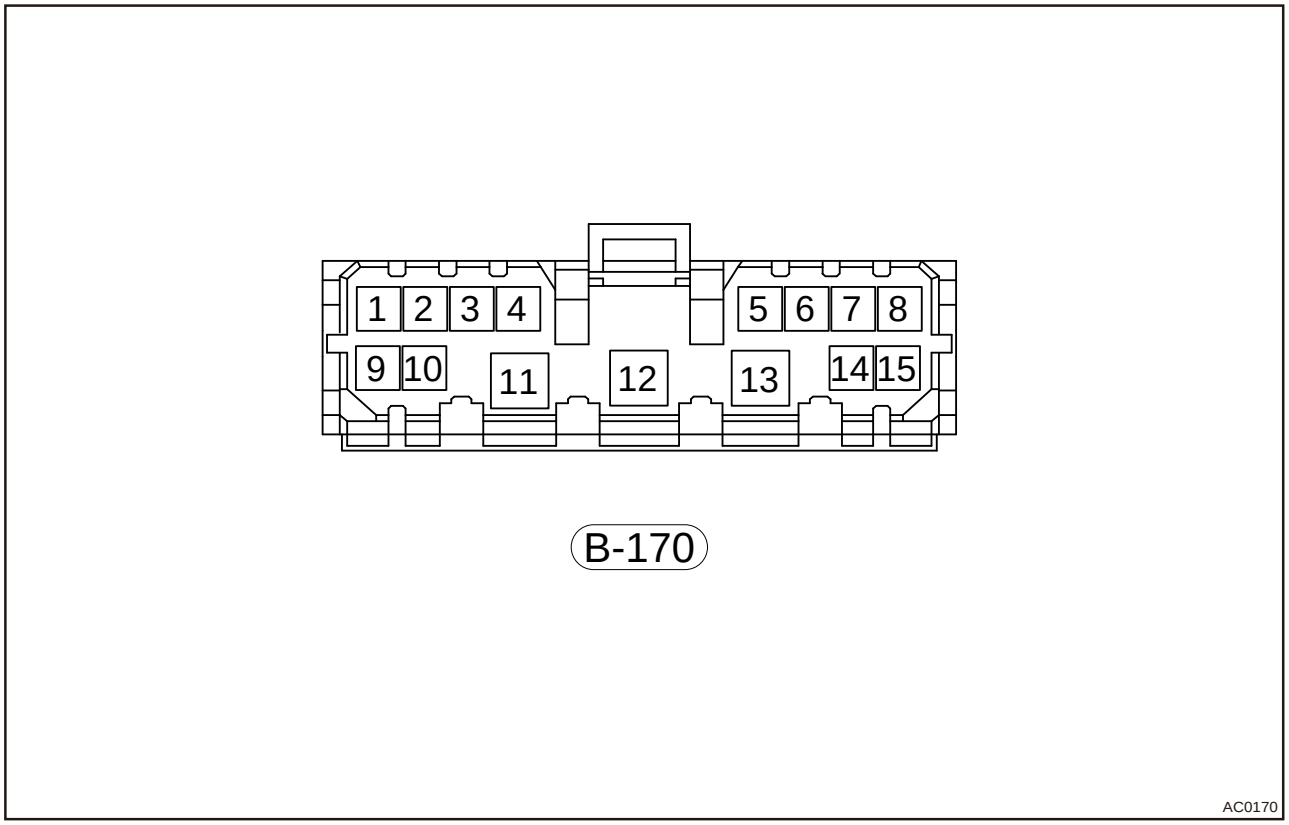
14	\	\	\	\
15	\	\	\	\
16	Body ground	KL30	Power supply “ON”	12V

■ **Rear A/C panel (CCPR)**



Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	\	\	\	\
2	Body ground	KL30	\	12V
3	\	\	\	\
4	\	\	\	\
5	Body ground	GND	Power supply “ON”	0V
6	\	\	\	\
7	Body ground	CAN-L	Power supply “ON”	2.4V
8	Body ground	CAN-H	Power supply “ON”	2.6V

■ **Automatic A/C rear module (CLMR)**

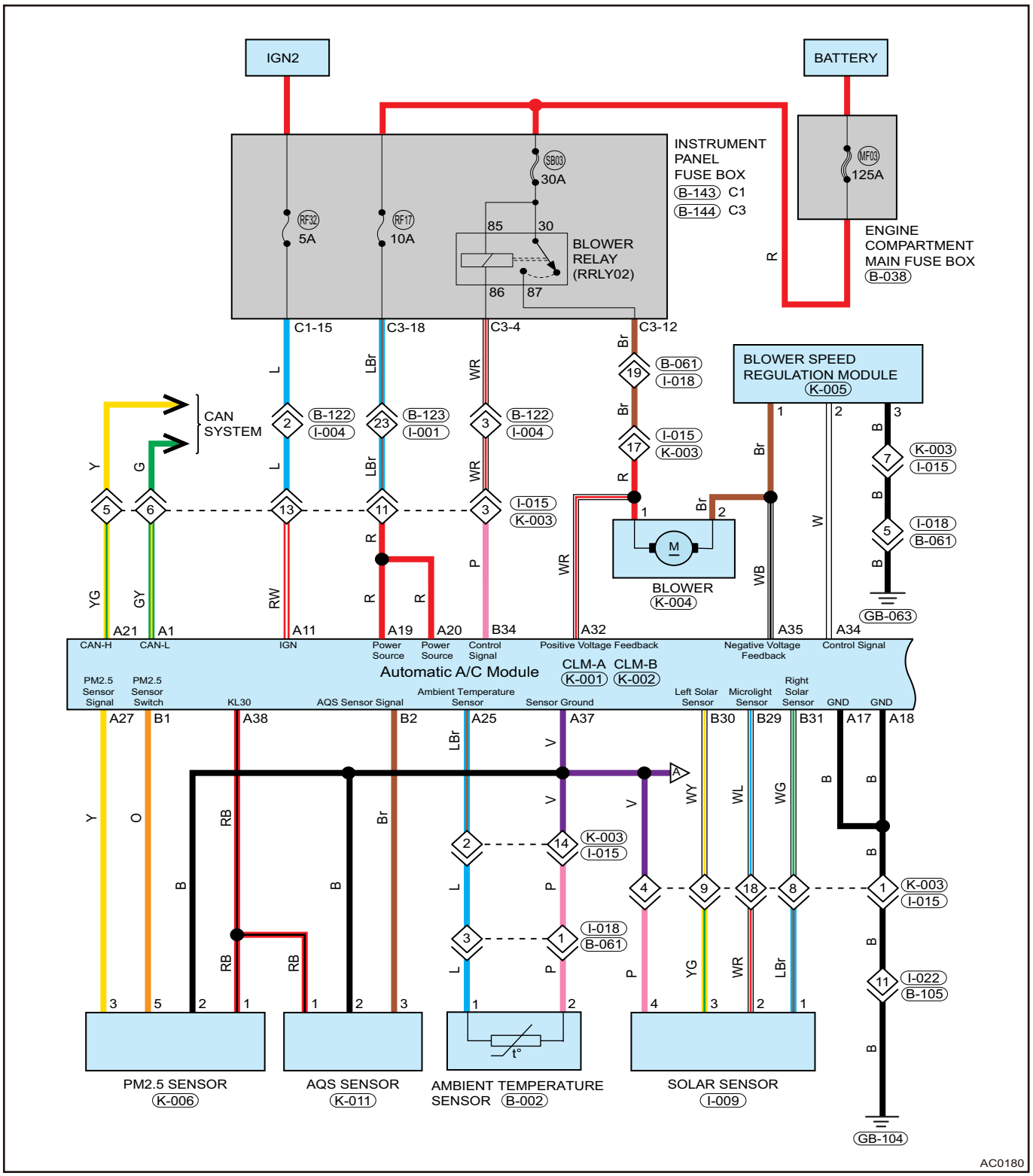


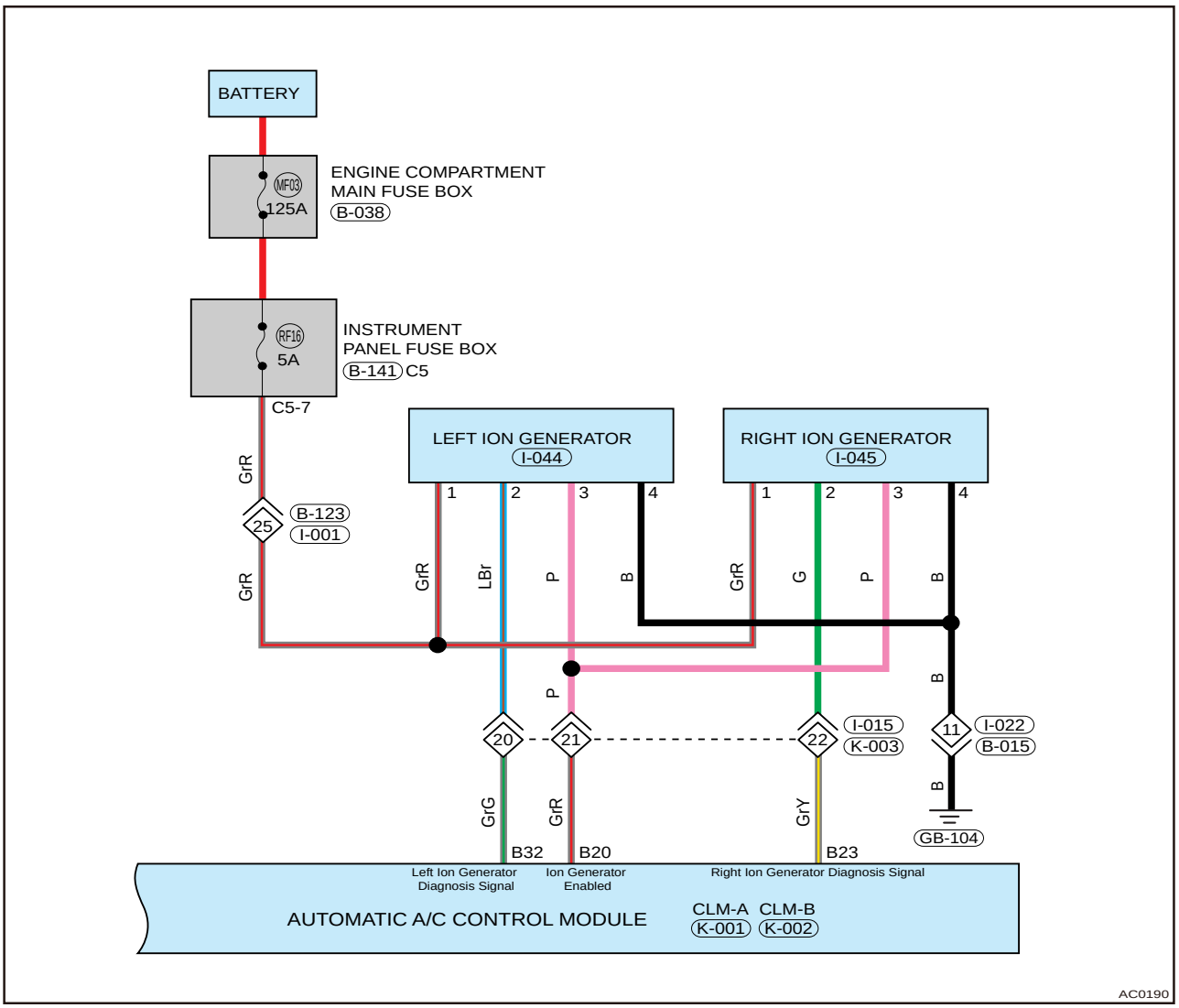
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	\	Power supply “ON”	-
2	Body ground	\	Power supply “ON”	-
3	Body ground	\	Power supply “ON”	-
4	Body ground	Temperature damper motor drive 1	Power supply “ON”	LO gear 7.6 V; Other gears 13 V\
5	Body ground	Temperature damper motor drive 2	Power supply “ON”	LO gear 7.6 V; Other gears 13 V
6	Body ground	Temperature damper motor drive 3	Power supply “ON”	LO gear 7.6 V; Other gears 13 V
7	Body ground	Temperature damper motor drive 4	Power supply “ON”	LO gear 7.6 V; Other gears 13 V
8	\	\	\	\
9	\	\	\	\
10	Body ground	CAN high	Power supply “ON”	2.7V
11	Body ground	CAN low	Power supply “ON”	2.3V
12	Body ground	IGN (ignition power supply)	Power supply “ON”	12V

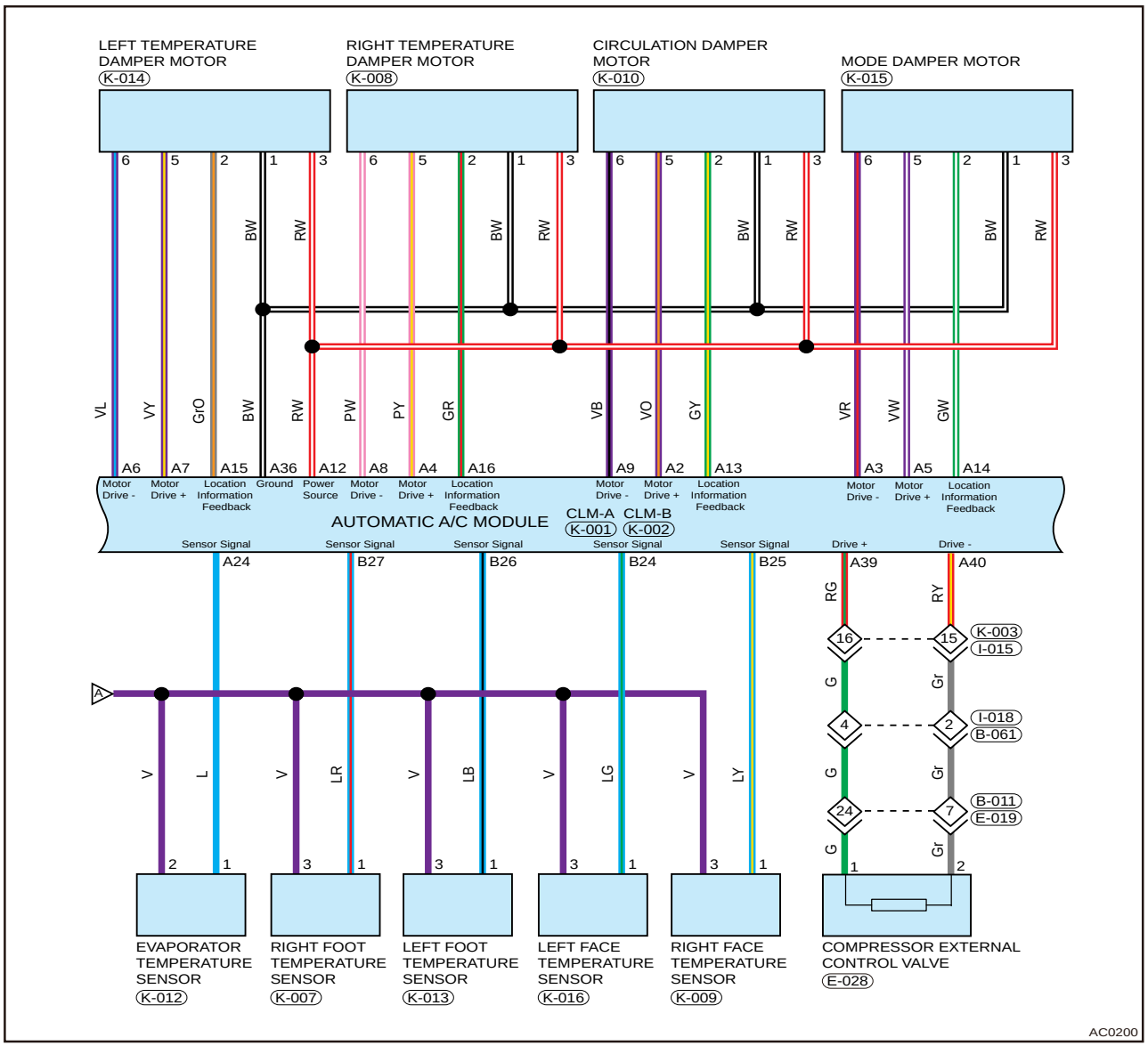
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
13	Body ground	Mode damper motor drive 1	Power supply “ON”	7.6 V at pressing moment, and then return to 13 V
14	Body ground	Mode damper motor drive 2	Power supply “ON”	7.6 V at pressing moment, and then return to 13 V
15	Body ground	Mode damper motor drive 3	Power supply “ON”	7.6 V at pressing moment, and then return to 13 V

3.2 Circuit Diagram

Circuit diagram


IGN2
BATTERY
INSTRUMENT PANEL FUSE BOX
B-143 C1
B-144 C3
SB03
30A
RF32
5A
RF17
10A
85
30
86
87
BLOWER RELAY (RRLY02)
MF03
125A
ENGINE COMPARTMENT MAIN FUSE BOX
B-038
C1-15
C3-18
C3-4
C3-12
BLOWER SPEED REGULATION MODULE
K-005
CAN SYSTEM
B-122
I-004
B-123
I-001
B-061
I-018
I-015
K-003
K-004
BLOWER
M
K-004
GB-063
CAN-H
CAN-L
IGN
Power Source
Power Source
Control Signal
Positive Voltage Feedback
Negative Voltage Feedback
Control Signal
A21
A1
A11
A19
A20
B34
A32
A35
A34
Automatic A/C Module
CLM-A K-001
CLM-B K-002
PM2.5 Sensor Signal
PM2.5 Sensor Switch
KL30
AQS Sensor Signal
Ambient Temperature Sensor
Sensor Ground
Left Solar Sensor
Microlight Sensor
Right Solar Sensor
GND
GND
A27
B1
A38
B2
A25
A37
B30
B29
B31
A17
A18
PM2.5 SENSOR
K-006
AQS SENSOR
K-011
AMBIENT TEMPERATURE SENSOR
B-002
SOLAR SENSOR
I-009
GB-104
AC0180


BATTERY
MF03
125A
ENGINE COMPARTMENT
MAIN FUSE BOX
B-038
RF16
5A
INSTRUMENT
PANEL FUSE BOX
B-141 C5
C5-7
GrR
25
B-123
I-001
GrR
LEFT ION GENERATOR
I-044
RIGHT ION GENERATOR
I-045
1 2 3 4
1 2 3 4
GrR
LBr
P
B
GrR
G
P
B
P
B
20
21
22
I-015
K-003
11
I-022
B-015
B
GB-104
GrG
GrR
GrY
B32
B20
B23
Left Ion Generator Diagnosis Signal
Ion Generator Enabled
Right Ion Generator Diagnosis Signal
AUTOMATIC A/C CONTROL MODULE
CLM-A
K-001
CLM-B
K-002
AC0190



4 DIAGNOSIS & TEST

4.1 Problem Symptoms Table

⚠ Caution

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
A/C no heating	Blower fuse (damaged)
	Blower relay (damaged)
	Blower speed regulation switch (damaged)
	Blower motor (damaged)
	Mix damper control mechanism (stuck or damaged)
	Mix damper control knob (stuck or damaged)

Symptom	Possible Cause
	Heating pipe (blocked or damaged)
	Heater core assembly (blocked or damaged)
	Wire harness or connector (open or short)
A/C no cooling	Leak in system
	Refrigerant (overcharged)
	A/C pressure sensor (damaged)
	Evaporator temperature sensor (damaged)
	A/C switch (damaged)
	Compressor assembly fuse (damaged)
	Compressor assembly relay (damaged)
	Compressor assembly belt (loose)
	Compressor assembly (damaged)
	Condenser assembly (blocked or damaged)
	Expansion valve (blocked or frosted)
	Evaporator core assembly (blocked or damaged)
	Wire harness or connector (open or short)
A/C intermittent cooling	Moisture in system
	Refrigerant (overcharged)
A/C insufficient cooling	Leak in system
	Refrigerant (insufficient)
	Refrigerant (overcharged)
	Air in refrigerant
	Moisture in refrigerant
	Condenser (dirty or blocked)
	Expansion valve (dirty or blocked)
	Condenser core (dirty or blocked)
	A/C high/low pressure line (dirty or blocked)
	Blower speed regulation switch (damaged)
	Blower motor (damaged)
	Compressor assembly belt (loose)
Too much noise in system	Compressor assembly belt (slip)
	Compressor assembly clutch bearing (worn or excessive clearance)

Symptom	Possible Cause
	Compressor assembly solenoid coil (faulty or loose connector)
	Compressor assembly belt (over tightened)
	Compressor assembly mounting bolt (loose)
	Cooling fan blade (distorted)
	Refrigerant oil (insufficient)
During operation, pressure on low pressure side switches between normal and vacuum	Moisture in refrigerant (excessive)
Pressure is too low for low pressure side and high pressure side, cooling performance is insufficient	A/C system (leaked)
	Refrigerant (insufficient)
Pressures at low pressure side and high pressure side are low, frost exists on line from condenser to A/C unit	Condenser (dirty or blocked)
Vacuum occurs at low pressure side, and pressure at high pressure side is too low, frost exists on lines on both sides of condenser or expansion valve	Moisture in refrigerant (excessive)
	Expansion valve (dirty or blocked)
	A/C line (leaked)
	Condenser (dirty or blocked)
Pressure at low pressure side and pressure at high pressure side is too high	Expansion valve (faulty)
	Refrigerant oil (excessive)
Pressure at low pressure side is normal or slightly low, and pressure at high pressure side is too high	Condenser surface (dirty)
	Cooling fan (not operating)
	Refrigerant (overcharged)
	Air in refrigerant
	Engine (overheating)
Pressure at low pressure side is too high, and pressure at high pressure side is too low	Compressor assembly belt (slip)
	Compressor assembly (faulty)
Pressure at low pressure side is too low, and pressure at high pressure side is too high	A/C high pressure line (blocked)
	Expansion valve (faulty)

4.2 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

NEXT

2	**Examine vehicle and check basic items**

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK

3	**Using a diagnostic tester, read related DTC and data stream information**

Result

Result	Go to
No DTC	A
DTC	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B

5	**According to system malfunction repair completion inspection and delivery, confirm if malfunction is resolved.**

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A	**Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

4.3 DTC Confirmation Procedure

Confirm that battery voltage is normal before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in supplemental restraint system.
- Turn the ENGINE START STOP switch to OFF and wait for several seconds.
- Turn ENGINE START STOP switch to ON, and then select Read DTC.
- If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B14E011	Left Solar Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if left solar sensor signal is short to ground; 2. Replace solar sensor.
B14E015	Left Solar Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if solar sensor connector or lead falls off; 2. Check if left solar sensor signal is short to power supply; 3. Replace solar sensor.
B14E111	Right Solar Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if right solar sensor signal is short to ground; 2. Replace solar sensor.
B14E115	Right Solar Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if solar sensor connector or lead falls off;. 2. Check if right solar sensor signal is short to power supply; 3. Replace solar sensor.
B14E211	Micro Light Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if micro light sensor signal is short to ground; 2. Replace solar sensor.
B14E215	Micro Light Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if solar sensor connector or lead falls off; 2. Check if micro light sensor signal is short to power supply; 3. Replace solar sensor.
B14E329	Internal Temperature Sensor Signal Invalid	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that inside temperature signal from AIPM has an invalid value.	Inside temperature sensor on AIPM is abnormal.	1. Check if inside temperature sensor on AIPM is abnormal (open or short); 2. Replace AIPM.
B14E411	Evaporator Temperature Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if evaporator temperature sensor wire harness is short to ground; 2. Replace evaporator temperature sensor.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B14E415	Evaporator Temperature Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if evaporator temperature sensor connector or lead falls off;. 2. Check the evaporator temperature sensor is short to power supply; 3. Replace evaporator temperature sensor.
B14E511	Left Foot Air Outlet Temperature Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if left foot air outlet temperature sensor wire harness is short to ground; 2. Replace left foot air outlet temperature sensor.
B14E515	Left Foot Air Outlet Temperature Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if left foot air outlet temperature sensor connector or lead falls off;. 2. Check if left foot air outlet temperature sensor signal is short to power supply; 3. Replace left foot air outlet temperature sensor.
B14E611	Right Foot Air Outlet Temperature Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if right foot air outlet temperature sensor wire harness is short to ground; 2. Replace right foot air outlet temperature sensor.
B14E615	Right Foot Air Outlet Temperature Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if right foot air outlet temperature sensor connector or lead falls off;. 2. Check if right foot air outlet temperature sensor signal is short to power supply; 3. Replace right foot air outlet temperature sensor.
B14E911	PM2.5 Sensor Short to Ground (Pulse Width Modulation = 0%)	Meet CLM normal operating condition. Meet PM2.5 sensor normal operating condition, turn on PM2.5 function after power-on for 3 seconds, it is detected that PWM input of PM2.5 is 0% for more than 2 seconds.	Sensor is damaged, wire harness is short or PWM frequency is abnormal.	1. Check if PM2.5 sensor signal circuit is short to ground; 2. Replace PM2.5 sensor.
B14E915	PM2.5 Sensor Short to Power Supply or Open (- Pulse Width Modulation = 0%)	Meet CLM normal operating condition. Meet PM2.5 sensor normal operating condition, turn on PM2.5 function after power-on for 3 seconds, it is detected that	Sensor is damaged, wire harness is short or PWM frequency is abnormal.	1. Check if PM2.5 sensor wire harness or lead falls off;.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		PWM input of PM2.5 is 100% for more than 2 seconds.		2. Check if PM2.5 sensor signal circuit is short to power supply; 3. Replace PM2.5 sensor.
B14EA12	PM2.5 Enable Short To Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, and when CLM output is low level, it is detected that the feedback voltage exceeds 1.0 V for more than 2 seconds.	Sensor is damaged, wire harness is short or PWM frequency is abnormal.	1. Check if PM2.5 enable signal is short to power supply; 2. Replace PM2.5 sensor.
B14EA14	PM2.5 Enable Short To Ground Or Open	Meet CLM normal operating condition. After power-on for 3 seconds, and when CLM output is high level, it is detected that the feedback voltage is lower than 0.5 V for more than 2 seconds.	Sensor is damaged, wire harness is open, short or PWM frequency is abnormal.	1. Check if PM2.5 sensor wire harness or lead falls off;. 2. Check if PM2.5 enable signal circuit is short to ground; 3. Replace PM2.5 sensor.
B14EB11	Air Quality Sensor Short to Ground (Pulse Width Modulation = 0%)	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that AQS input PWM signal is 0 for more than 2 seconds.	Sensor is damaged, wire harness is short or PWM frequency is abnormal.	1. Check if AQS signal is short to ground; 2. Replace AQS sensor.
B14EB15	Air Quality Sensor Short to Power Supply or Open (Pulse Width Modulation = 100%)	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that AQS input PWM signal is 100% for more than 2 seconds.	Sensor is damaged, wire harness is open, short or PWM frequency is abnormal.	1. Check if AQS sensor wire harness or lead falls off;. 2. Check if AQS sensor signal circuit is short to ground; 3. Replace AQS sensor.
B14EC10	Mode Motor Blocked (Except Calibration Procedure)	Meet CLM normal operating condition. After power-on for 3 seconds, the motor has no open fault. At this time, there is a demand for mode damper adjustment, but within continuous 2 seconds, motor feedback voltage change rate cannot reach 100 mV/100 ms.	Foreign matter will block motor, damage motor, and damage CLM drive circuit.	1. Check if motor is blocked by foreign matter; 2. Replace mode damper motor; 3. Replace CLM.
B14EC11	Mode Motor Control Circuit Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, and when mode motor drive output of CLM is high level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged	1. Check if mode motor drive circuit is short to ground; 2. Replace CLM; 3. Replace mode motor.
B14EC12	Mode Motor Control Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, and when mode motor drive output of CLM is low level, an overcurrent	Wire harness is short or drive chip is damaged	1. Check if mode motor drive circuit is short to power supply; 2. Replace CLM;

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		signal is detected for more than 2 seconds.		3. Replace mode motor.
B14EC13	Mode Motor Control Circuit Open	Meet CLM normal operating condition. After power-on for 3 seconds, and when mode motor drive is available, drive current is too small for more than 2 seconds.	Wire harness is open, drive chip is damaged or drive circuit is open	1. Check if mode motor wire harness connector or lead falls off; 2. Replace CLM; 3. Replace mode motor.
B14ED12	Mode Motor Control Feedback Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that mode motor feedback voltage is higher than 4.9 V for more than 2 seconds.	Wire harness is short or motor is damaged.	1. Check if mode motor feedback wire harness is short to power supply; 2. Replace mode motor; 3. Replace CLM.
B14ED14	Mode Motor Control Feedback Circuit Short to Ground or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that mode motor feedback voltage is lower than 0.1 V for more than 2 seconds.	Wire harness is open, short or motor is damaged.	1. Check if mode motor wire harness connector or lead falls off; 2. Check if mode motor feedback wire harness is short to ground; 3. Replace mode motor; 4. Replace CLM.
B14EE10	Left Temperature Motor Blocked (-Except Calibration Procedure)	Meet CLM normal operating condition. After power-on for 3 seconds, the motor has no open fault. At this time, there is a demand for left temperature damper adjustment, but within continuous 2 seconds, motor feedback voltage change rate cannot reach 100 mV/ 100 ms.	Foreign matter will block motor, damage motor, and damage CLM drive circuit.	1. Check if motor is blocked by foreign matter; 2. Replace left temperature damper motor; 3. Replace CLM.
B14EE11	Left Temperature Motor Control Circuit Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, and when left temperature motor drive output of CLM is high level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged.	1. Check if left temperature motor drive circuit is short to ground; 2. Replace CLM; 3. Replace left temperature motor.
B14EE12	Left Temperature Motor Control Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, and when left temperature motor drive output of CLM is low level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged.	1. Check if left temperature motor drive circuit is short to power supply; 2. Replace CLM; 3. Replace left temperature motor.
B14EE13	Left Temperature Motor Control Circuit Open	Meet CLM normal operating condition. After power-on for 3 seconds, and when left temperature motor drive is available, drive current is too	Wire harness is open, drive chip is damaged or drive circuit is open	1. Check if left temperature motor wire harness connector or lead falls off; 2. Replace CLM;

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		small for more than 2 seconds.		3. Replace left temperature motor.
B14EF12	Left Temperature Motor Control Feedback Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that left temperature motor feedback voltage is higher than 4.9 V for more than 2 seconds.	Wire harness is short or motor is damaged.	1. Check if left temperature motor feedback wire harness is short to power supply; 2. Replace left temperature motor; 3. Replace CLM.
B14EF14	Left Temperature Motor Control Feedback Circuit Short to Ground or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that left temperature motor feedback voltage is lower than 0.1 V for more than 2 seconds.	Wire harness is open, short or motor is damaged.	1. Check if left temperature motor wire harness connector or lead falls off; 2. Check if left temperature motor feedback wire harness is short to ground; 3. Replace left temperature motor; 4. Replace CLM.
B14F010	Right Temperature Motor Blocked (- Except Calibration Procedure)	Meet CLM normal operating condition. After power-on for 3 seconds, the motor has no open fault. At this time, there is a demand for right temperature damper adjustment, but within continuous 2 seconds, motor feedback voltage change rate cannot reach 100 mV/ 100 ms.	Foreign matter will block motor, damage motor, and damage CLM drive circuit.	1. Check if motor is blocked by foreign matter; 2. Replace right temperature damper motor; 3. Replace CLM.
B14F011	Right Temperature Motor Control Circuit Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, and when right temperature motor drive output of CLM is high level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged.	1. Check if right temperature motor drive circuit is short to ground; 2. Replace CLM; 3. Replace right temperature motor.
B14F012	Right Temperature Motor Control Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, and when right temperature motor drive output of CLM is low level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged.	1. Check if right temperature motor drive circuit is short to power supply; 2. Replace CLM; 3. Replace right temperature motor.
B14F013	Right Temperature Motor Control Circuit Open	Meet CLM normal operating condition. After power-on for 3 seconds, and when right temperature motor drive is available, drive current is too small for more than 2 seconds.	Wire harness is open, drive chip is damaged or drive circuit is open	1. Check if right temperature motor wire harness connector or lead falls off; 2. Replace CLM; 3. Replace right temperature motor.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B14F112	Right Temperature Motor Control Feedback Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that right temperature motor feedback voltage is higher than 4.9 V for more than 2 seconds.	Wire harness is short or motor is damaged.	1. Check if right temperature motor feedback wire harness is short to power supply; 2. Replace right temperature motor; 3. Replace CLM.
B14F114	Right Temperature Motor Control Feedback Circuit Short to Ground or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that right temperature motor feedback voltage is lower than 0.1 V for more than 2 seconds.	Wire harness is open, short or motor is damaged.	1. Check if right temperature motor wire harness connector or lead falls off; 2. Check if right temperature motor feedback wire harness is short to ground; 3. Replace right temperature motor; 4. Replace CLM.
B14F210	Intake Motor Blocked (Except Calibration Procedure)	Meet CLM normal operating condition. After power-on for 3 seconds, the motor has no open fault. At this time, there is a demand for circulation damper adjustment, but within continuous 2 seconds, motor feedback voltage change rate cannot reach 100 mV/100 ms.	Foreign matter will block motor, damage motor, and damage CLM drive circuit.	1. Check if motor is blocked by foreign matter; 2. Replace circulation damper motor; 3. Replace CLM.
B14F211	Intake Motor Control Circuit Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, and when circulation motor drive output of CLM is high level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged.	1. Check if circulation motor drive circuit is short to ground; 2. Replace CLM.
B14F212	Intake Motor Control Circuit Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, and when circulation motor drive output of CLM is low level, an overcurrent signal is detected for more than 2 seconds.	Wire harness is short or drive chip is damaged.	1. Check if circulation motor drive circuit is short to power supply; 2. Replace CLM.
B14F213	Intake Motor Control Circuit Open	Meet CLM normal operating condition. After power-on for 3 seconds, and when circulation motor drive is available, drive current is too small for more than 2 seconds.	Wire harness is open, drive chip is damaged or drive circuit is open	1. Check if circulation motor wire harness connector or lead falls off; 2. Replace CLM.
B14F312	Intake Motor Control Feedback Circuit	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that	Wire harness is short or motor is damaged.	1. Check if circulation motor feedback wire

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Short to Power Supply	circulation motor feedback voltage is higher than 4.9 V for more than 2 seconds.		harness is short to power supply; 2. Replace circulation motor; 3. Replace CLM.
B14F314	Intake Motor Control Feedback Circuit Short to Ground or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that circulation motor feedback voltage is lower than 0.1 V for more than 2 seconds.	Wire harness is open, short or motor is damaged.	1. Check if circulation motor wire harness connector or lead falls off; 2. Check if circulation motor feedback wire harness is short to ground; 3. Replace circulation motor; 4. Replace CLM.
B14F412	Blower Relay Output Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, relay control output is low level, but it is detected that feedback voltage is high level for more than 2 seconds.	Wire harness is short or relay is short.	1. Check if relay control circuit wire harness is short to power supply; 2. Replace blower relay.
B14F414	Blower Relay Output Short to Ground or Open	Meet CLM normal operating condition. After power-on for 3 seconds, relay control output is high level, but it is detected that feedback voltage is high level or has open fault for more than 2 seconds.	Relay fuse is damaged, wire harness is open, short, relay is damaged.	1. Check if relay fuse is damaged. 2. Check if relay control circuit wire harness is open or short to ground; 3. Replace blower relay.
B14F529	Blower Signal Invalid Control Failed	Meet CLM normal operating condition. After power-on for 3 seconds, blower is turned on, feedback voltage is higher than 2 V, but it cannot change with gear change for more than 2 seconds.	Wire harness is short or speed regulation module is damaged.	1. Check if blower control signal is short; 2. Check if blower negative terminal circuit is short; 3. Replace blower speed regulation module.
B14F531	Blower Control Failed	Meet CLM normal operating condition. After power-on for 3 seconds, when blower is in the range of 1 to 5, blower negative terminal feedback voltage is lower than 2 V	Wire harness is short or speed regulation module is damaged.	1. Check if blower control signal is short; 2. Check if blower negative terminal circuit is short; 3. Replace blower speed regulation module.
B14F611	Sensor PM2.5, AQS + 12 V Output Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, turn on 12 V power supply output, IS pin feedback voltage of 5180 chip is higher than 4.9 V.	Wire harness is short, sensor is short, and 5180 chip of CLM is damaged.	1. Check if 12 V sensor supply circuit is short to ground; 2. Check if AQS and PM2.5 is short; 3. Replace CLM.
B14F612	Sensor PM2.5, AQS + 12 V Output Short to Power Supply	Meet CLM normal operating condition. After power-on for 3 seconds, turn off 12 V power supply output, IS pin	Wire harness is short, 5180 chip of CLM is damaged.	1. Check if 12 V sensor supply circuit is a short to power supply;

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		feedback voltage of 5180 chip is higher than 4.9 V		2. Replace CLM.
B14F711	ECV Control Circuit Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, turn on external control valve and it is detected that IS pin feedback voltage of 5180 chip is higher than 4.9 V (- short or over current).	Wire harness is short, 5180 chip of CLM is damaged.	1. Check if positive drive wire harness of external control valve is short to ground; 2. Replace CLM.
B14F715	ECV Control Circuit Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, turn on external control valve and it is detected that IS pin feedback voltage of 5180 chip is higher than 4.9 V (- short or over current). Turn on external control valve, it is detected that the IS pin feedback voltage of 5180 chip is lower than 0.1 V (open).	Wire harness is short, 5180 chip of CLM is damaged.	1. Check if external control valve wire harness connector or lead falls off, check external control valve wire harness from CLM to HVAC for continuity; 2. Replace CLM; 3. Replace compressor external control valve.
B14FB11	External Temperature Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if ambient temperature sensor wire harness is short to ground; 2. Replace ambient temperature sensor.
B14FB15	External Temperature Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if ambient temperature sensor connector or lead falls off; 2. Check if ambient temperature sensor signal is short to power supply; 3. Replace ambient temperature sensor.
B14FC1C	Abnormal Power Supply Voltage	Network is waked up, IG is powered on, CLM can operate, it is detected that battery voltage is 8.5 V or higher than 16.5 V.	Battery or alternator fails.	1. Check if battery is normal; 2. Check if alternator is normal.
B14E711	Left Face Air Outlet Temperature Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if left face air outlet temperature sensor wire harness is short to ground; 2. Replace left face air outlet temperature sensor.
B14E715	Left Face Air Outlet Temperature Sensor Short to	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if left face air outlet temperature sensor connector or lead falls off; 2. Check if left face air outlet temperature sensor

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Power Supply or Open	higher than 4.9 V for more than 2 seconds.		signal is short to power supply; 3. Replace left face air outlet temperature sensor.
B14E811	Right Face Air Outlet Temperature Sensor Short to Ground	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if right face air outlet temperature sensor wire harness is short to ground; 2. Replace right face air outlet temperature sensor.
B14E815	Right Face Air Outlet Temperature Sensor Short to Power Supply or Open	Meet CLM normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if right face air outlet temperature sensor connector or lead falls off; 2. Check if right face air outlet temperature sensor signal is short to power supply; 3. Replace right face air outlet temperature sensor.
B14FD10	Humidity Sensor Failure	Received humidity value signal from BCM node is error.	Received humidity value from BCM node is invalid; Received humidity value from BCM node is lost;	1. Check that received humidity signal value from BCM is valid; 2. Check if BCM node loses the signal.

■ **Automatic A/C rear module (CLMR) DTC summary**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B15461C	Abnormal Power Supply Voltage	Network is waked up, IG is powered on, CLMR can operate, it is detected that battery voltage is 8.5 V or higher than 16.5 V.	Battery or alternator fails.	1. Check if battery is normal; 2. Check if alternator is normal.
B154011	Evaporator Temperature Sensor Short to Ground	Meet CLMR normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if rear evaporator temperature sensor wire harness is short to ground; 2. Replace rear evaporator temperature sensor.
B154015	Evaporator Temperature Sensor Short to Power Supply or Open	Meet CLMR normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if rear evaporator temperature sensor connector or lead falls off; 2. Check if rear evaporator temperature sensor signal is short to power supply; 3. Replace rear evaporator temperature sensor.
B154111	Foot Air Outlet Temperature	Meet CLMR normal operating condition. After power-on for 3 seconds, it is	Sensor is damaged or wire harness is short.	1. Check if rear foot air outlet temperature sensor

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Sensor Short to Ground	detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.		wire harness is short to ground; 2. Replace left foot air outlet temperature sensor.
B154115	Foot Air Outlet Temperature Sensor Short to Power Supply or Open	Meet CLMR normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if rear foot air outlet temperature sensor connector or lead falls off; 2. Check if rear foot air outlet temperature sensor signal is short to power supply; . 3. Replace rear foot air outlet temperature sensor.
B154211	Face Air Outlet Temperature Sensor Short to Ground	Meet CLMR normal operating condition. After power-on for 3 seconds, it is detected that the signal input voltage is lower than 0.1 V for more than 2 seconds.	Sensor is damaged or wire harness is short.	1. Check if rear face air outlet temperature sensor wire harness is short to ground; 2. Replace rear face air outlet temperature sensor.
B154215	Face Air Outlet Temperature Sensor Short to Power Supply or Open	Meet CLMR normal operating condition turn on power-on for 3 seconds, it is detected that the signal input voltage is higher than 4.9 V for more than 2 seconds.	Sensor is not connected, sensor is damaged or wire harness is short.	1. Check if rear face air outlet temperature sensor connector or lead falls off; 2. Check if rear face air outlet temperature sensor signal is short to power supply; 3. Replace rear face air outlet temperature sensor.
B154311	Mode Motor Control Circuit Short to Ground	Meet CLMR normal operating condition. After power-on for 3 seconds, and when mode motor drive output of CLMR is high level, but it is detected that feedback voltage is low level.	Wire harness is open, short or drive chip is damaged.	1. Check if rear mode motor drive circuit is short to ground; 2. Check if rear mode motor drive circuit is open; 3. Replace CLMR; 4. Replace the rear mode motor.
B154312	Mode Motor Control Circuit Short to Power Supply	Meet CLMR normal operating condition. After power-on for 3 seconds, when mode motor drive output of CLMR is low level, but it is detected that feedback voltage is high level.	Wire harness is short or drive chip is damaged.	1. Check if rear mode motor drive circuit is short to power supply; 2. Replace CLMR; 3. Replace the rear mode motor.
B154411	Temperature Motor Control Circuit Short to Ground	Meet CLMR normal operating condition. After power-on for 3 seconds, when temperature motor drive output of CLMR is high level, but it is detected that feedback voltage is low level.	Wire harness is open, short or drive chip is damaged.	1. Check if rear temperature motor drive circuit is short to ground; 2. Check rear temperature motor drive circuit is open; 3. Replace CLMR;

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
				4. Replace rear temperature motor.
B154412	Temperature Motor Control Circuit Short to Power Supply	Meet CLMR normal operating condition. After power-on for 3 seconds, when temperature motor drive output of CLMR is low level, but it is detected that feedback voltage is high level.	Wire harness is short or drive chip is damaged.	1. Check if rear temperature motor drive circuit is short to power supply; 2. Replace CLMR; 3. Replace rear temperature motor.
B154512	Blower Relay Output Short to Power Supply	Meet CLMR normal operating condition. After power-on for 3 seconds, relay control output is low level, but it is detected that feedback voltage is high level for more than 2 seconds.	Wire harness is short or relay is short.	1. Check if relay control circuit wire harness is short to power supply; 2. Replace rear blower relay.
B154514	Blower Relay Output Short to Ground or Open	Meet CLMR normal operating condition. After power-on for 3 seconds, relay control output is high level, but it is detected that feedback voltage is low level or has open fault for more than 2 seconds.	Relay fuse is damaged, wire harness is open, short, relay is damaged.	1. Check if relay fuse is damaged. 2. Check if relay control circuit wire harness is open or short to ground; 3. Replace rear blower relay.
B154529	Blower Signal Invalid Control Failed	Meet CLMR normal operating condition. After power-on for 3 seconds, blower is turned on, feedback voltage is higher than 2 V, but it cannot change with gear change for more than 2 seconds.	Wire harness is short or speed regulation module is damaged.	1. Check if rear blower control signal is short; 2. Check if rear blower negative terminal circuit is short; 3. Replace rear blower speed regulation module.
B154531	Blower Control Failed	Meet CLMR normal operating condition. After power-on for 3 seconds, when blower is in the range of 1 to 5, blower negative terminal feedback voltage is lower than 2 V	Wire harness is short or speed regulation module is damaged.	1. Check if rear blower control signal is short; 2. Check if rear blower negative terminal circuit is short; 3. Replace rear blower speed regulation module.

■ **Front A/C control panel (APIM) DTC summary**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B137016	System Power Supply Voltage - Voltage Below Threshold	Detected power supply voltage is lower than threshold.	• Power supply fault; • Line connection fault.	Check if supply voltage is lower than 9 V.
B137017	System Power Supply Voltage - Voltage Above Threshold	Detected power supply voltage is higher than threshold		Check if supply voltage is higher than 16 V.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B137101	AIPM Auto Button Stuck	/	• Button is faulty; • Circuit is faulty.	1. After any button is pressed, check if it works normally. 2. Check if supply voltage is normal.
B137201	AIPM Synchronization Button Stuck	/		

■ **Rear A/C control panel (CCPR) DTC summary**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B137016	System Power Supply Voltage - Voltage Below Threshold	Detected power supply voltage is lower than threshold.	• Power supply fault; • Line connection fault.	Check if supply voltage is less than normal voltage.
B137017	System Power Supply Voltage - Voltage Above Threshold	Detected power supply voltage is higher than threshold.		Check if supply voltage is higher than normal voltage.

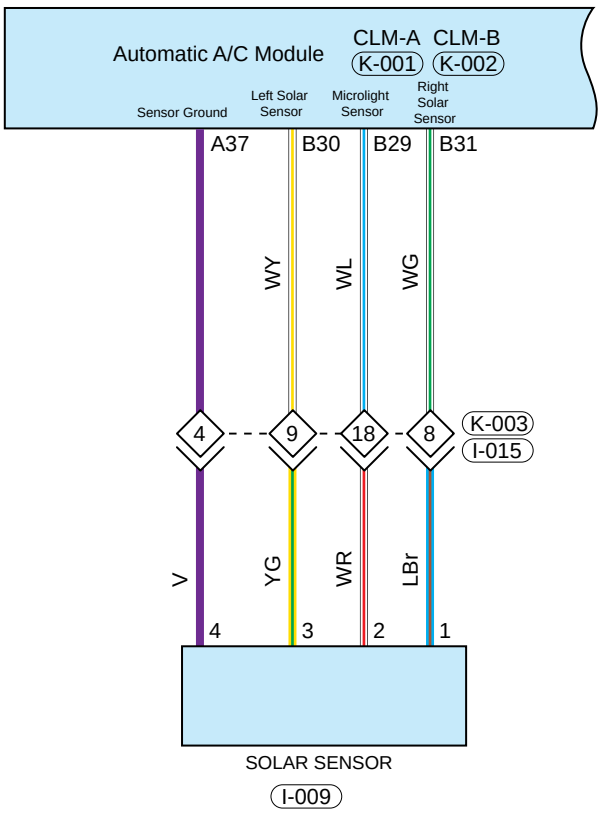
4.7 DTC Diagnosis Procedure

■ **Left solar sensor short malfunction**

DTC	B14E011	Left Solar Sensor Short to Ground

■ **Description**

Control schematic diagram



AC0111

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

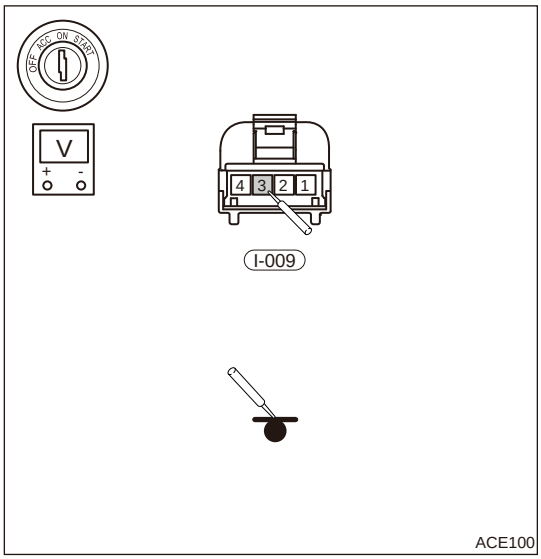
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check left solar sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of solar sensor signal I-009(3). Use a flashlight to light the solar sensor, and the voltage normally changes with the light intensity.



NG → **Repair wire harness or replace solar sensor.**

OK ↓

2	Check automatic A/C control module

(a) Remove automatic A/C control module from malfunctioning vehicle.

(b) Install a new automatic A/C control module to malfunctioning vehicle.

OK → **Repair or replace new module.**

NG ↓

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

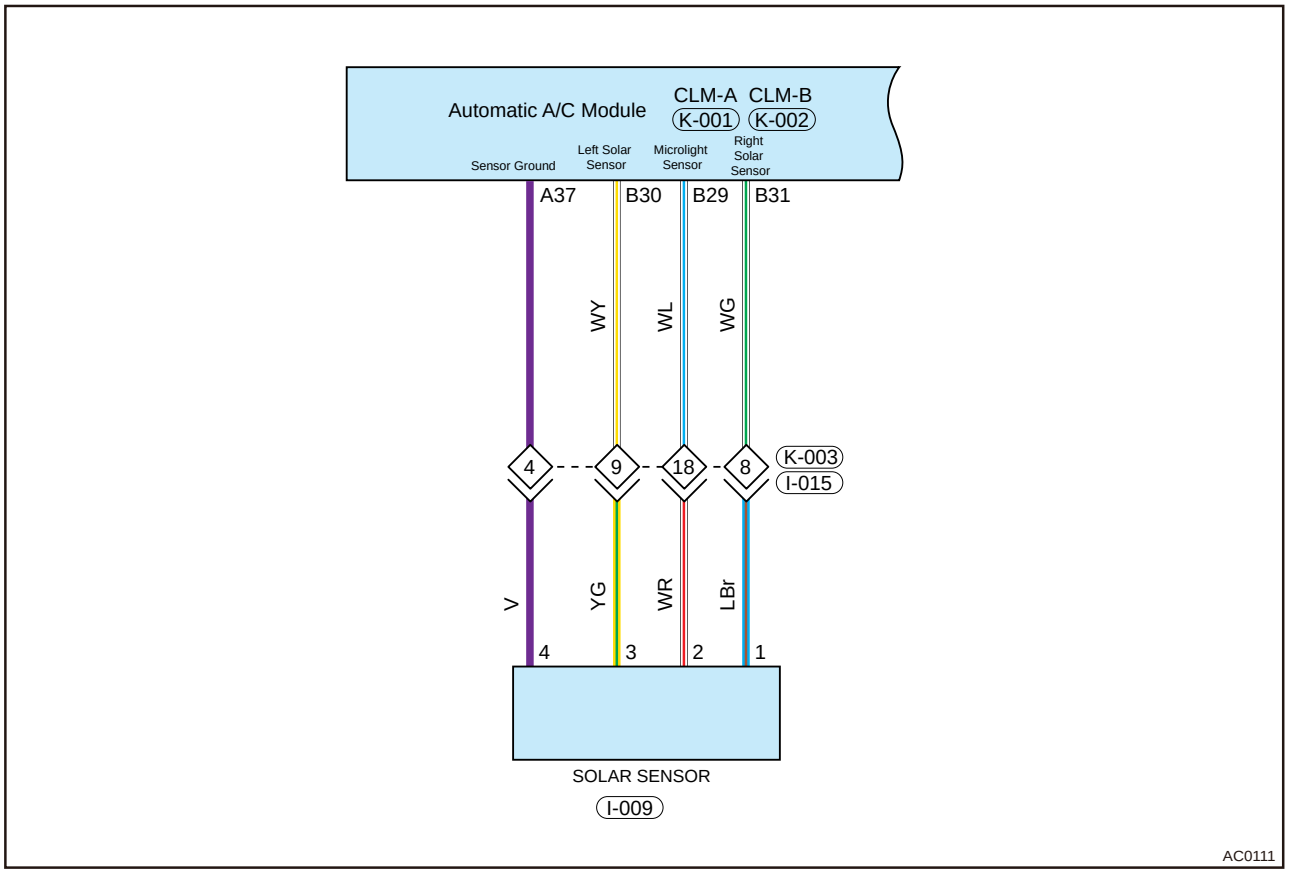
OK → **Conduct test and confirm malfunction has been repaired.**

■ Left solar sensor short to power supply malfunction

DTC	B14E015	Left Solar Sensor Short to Power Supply or Open

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

■ Circuit diagram



1	Check wire harness connector

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Check if solar sensor connector or lead falls off.

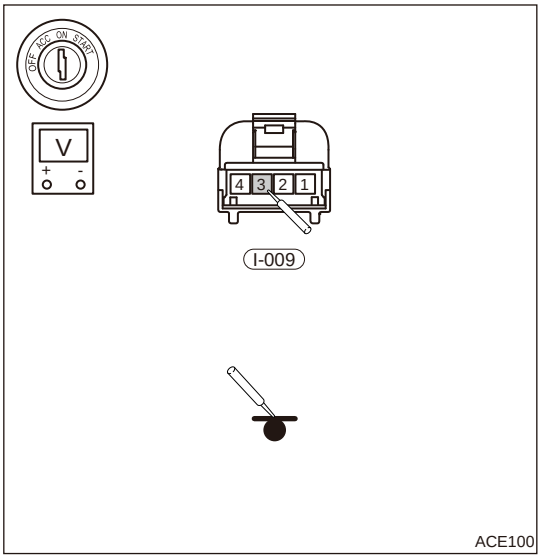
NG → **Repair or replace wire harness.**

OK

2	Check left solar sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of solar sensor signal I-009(3). Use a flashlight to light the solar sensor, and the voltage normally changes with the light intensity.



NG → **Check if left solar sensor signal is short to power supply or replace solar sensor.**

OK →

3	Check automatic A/C control module

(a) Remove automatic A/C control module from malfunctioning vehicle.

(b) Install a new automatic A/C control module to malfunctioning vehicle.

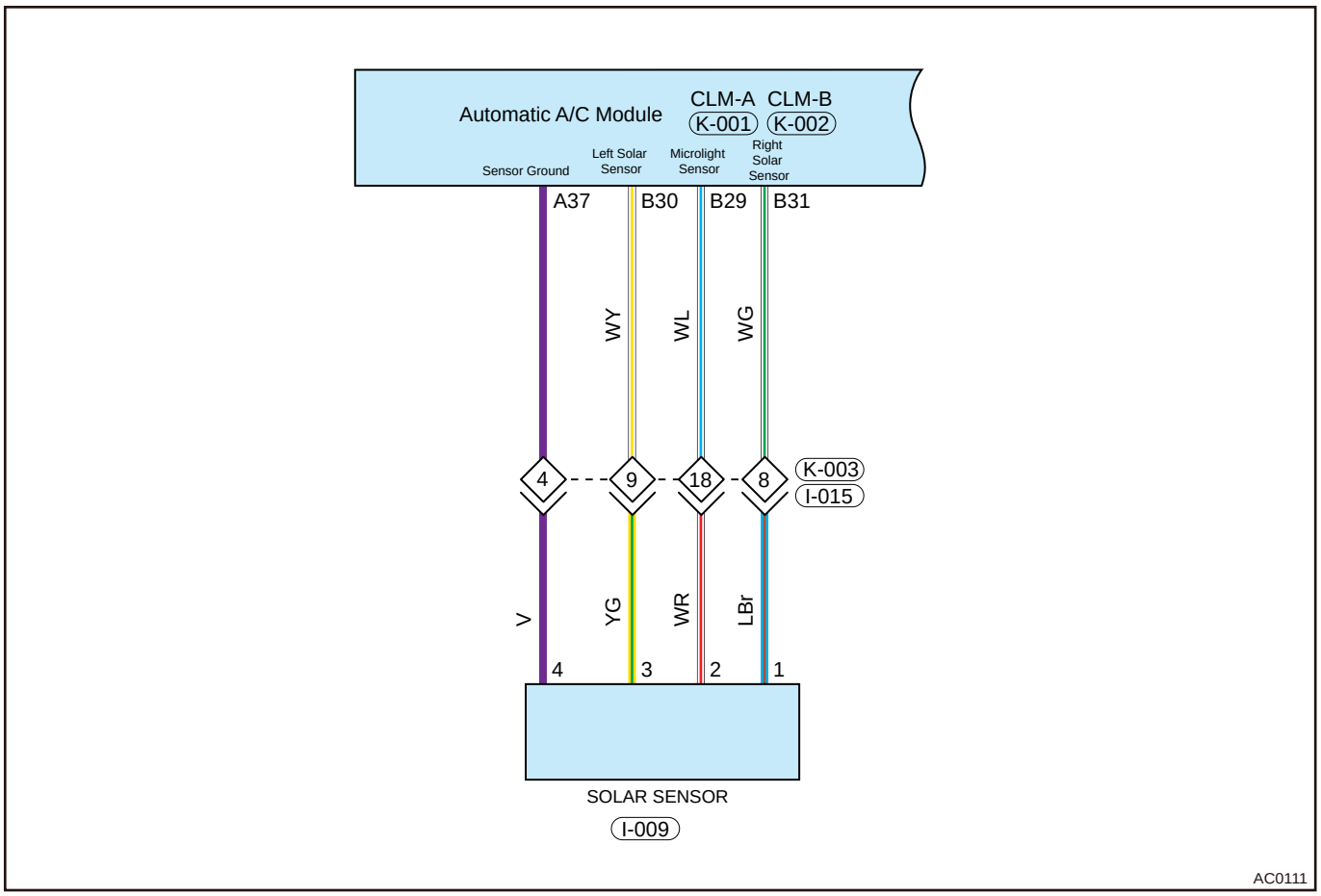
(c) System operates normally.

■ **Right solar sensor short malfunction**

DTC	B14E111	Right Solar Sensor Short to Ground

■ **Description**

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

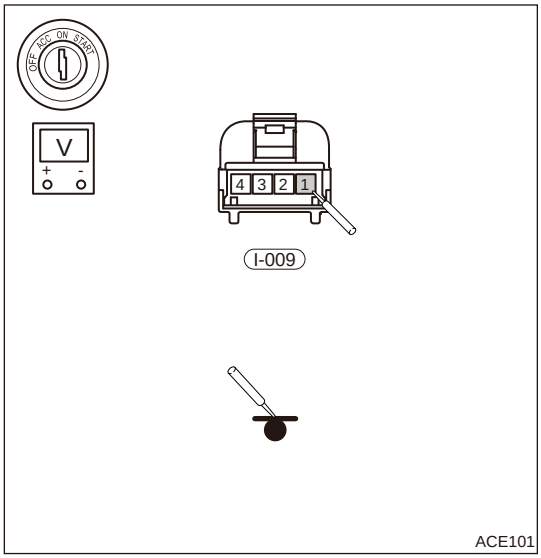
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check right solar sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of solar sensor signal I-009(1). Use a flashlight to light the solar sensor, and the voltage normally changes with the light intensity.



NG → **Repair wire harness or replace solar sensor.**

OK

2	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

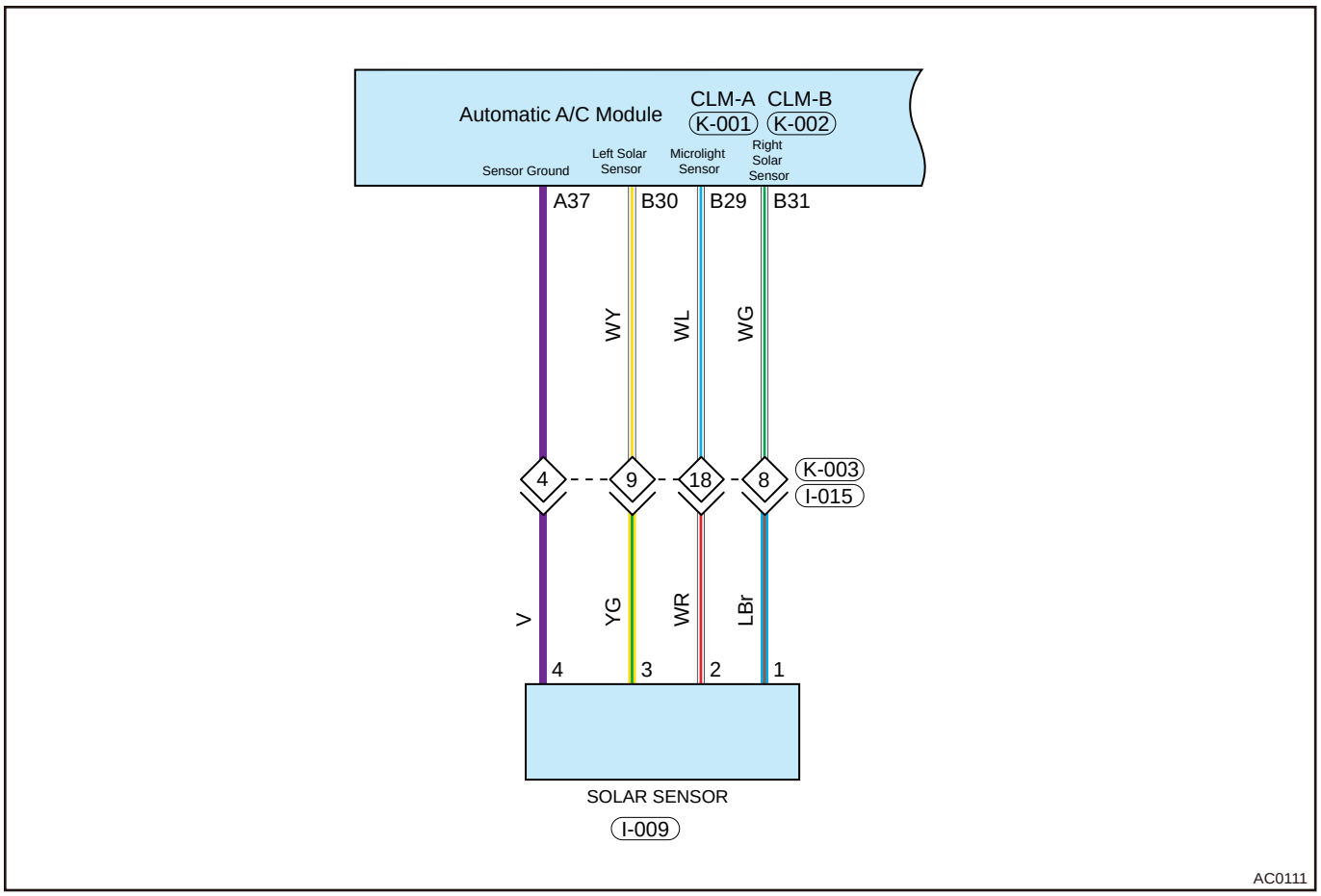
OK → **Conduct test and confirm malfunction has been repaired.**

■ Right solar sensor short to power supply malfunction

DTC	B14E115	Right Solar Sensor Short to Power Supply or Open

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check if solar sensor connector or lead falls off.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

NG → **Repair or replace wire harness connector.**

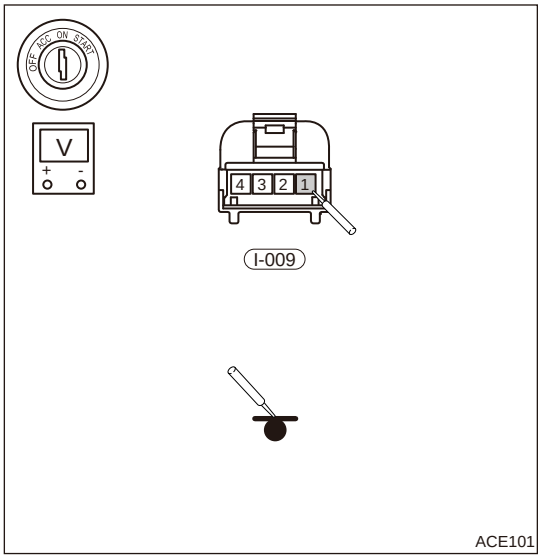
OK

2	**Check right solar sensor signal voltage**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of solar sensor signal I-009(1). Use a flashlight to light the solar sensor, and the voltage normally changes with the light intensity.



NG → **Check if right solar sensor signal is short to power supply or replace solar sensor.**

OK →

3	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

OK → **Conduct test and confirm malfunction has been repaired.**

■ Inside temperature sensor malfunction

DTC	B14E329	Internal Temperature Sensor Signal Invalid

■ Description

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check AIPM

(a) Turn ENGINE START STOP switch to OFF.
(b) Remove AIPM from malfunctioning vehicle.
(c) Install a new AIPM to malfunctioning vehicle.

OK	**Replace AIPM with a new one.**

NG

2	**Reconfirm DTCs**

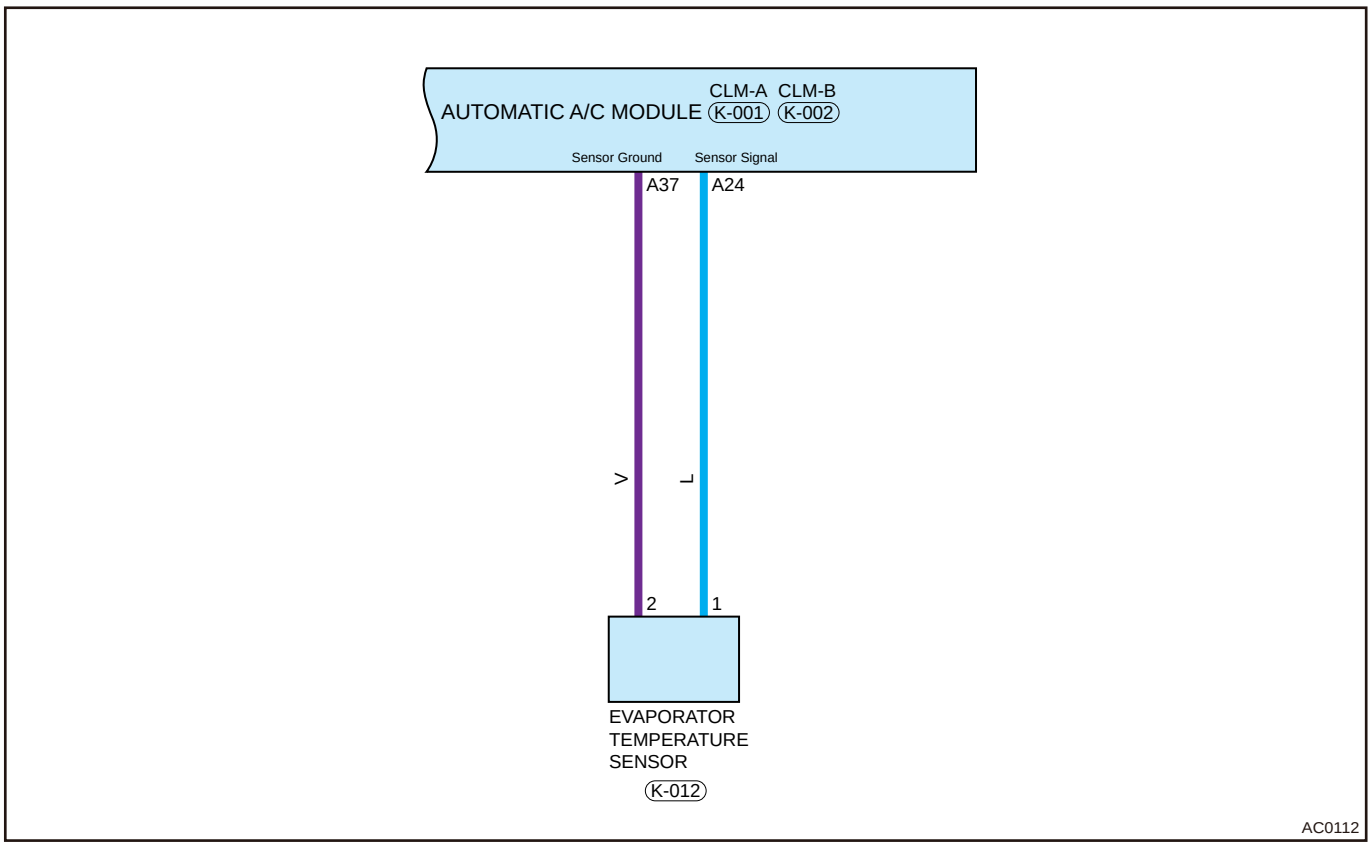
Use circuit diagram as a guide to perform the following inspection procedures:
(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG	**Replace with a new ECM to check if fault reoccurs.**
OK	**Conduct test and confirm malfunction has been repaired.**

DTC	B14E411	Evaporator Temperature Sensor Short to Ground

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.

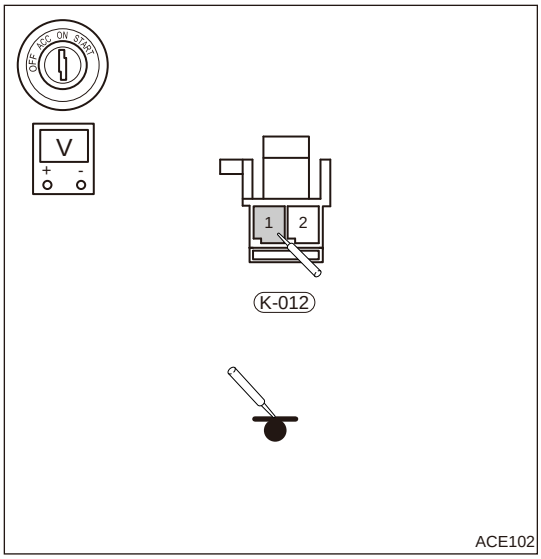
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check the evaporator temperature sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of evaporator temperature sensor signal K-012 (1). Normal signal voltage changes with A/C temperature.



NG → **Check if evaporator temperature sensor wire harness or replace evaporator temperature sensor.**

OK

2	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

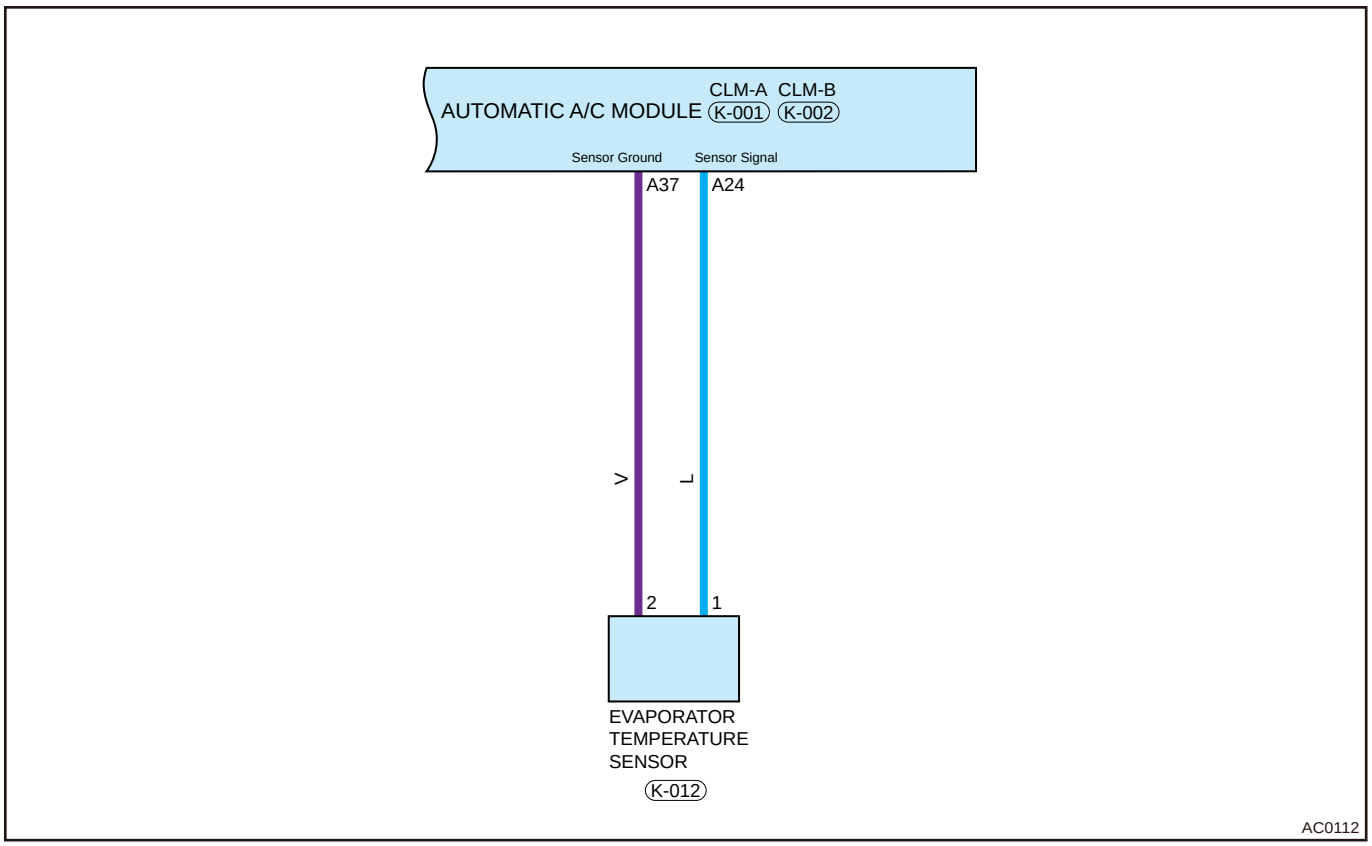
OK → **Conduct test and confirm malfunction has been repaired.**

■ Evaporator temperature sensor short to power supply malfunction

DTC	B14E415	Evaporator Temperature Sensor Short to Power Supply or Open

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness connector**

(a) Use circuit diagram as a guide to perform the following inspection procedures:
(b) Turn ENGINE START STOP switch to OFF.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

NG → **Repair or replace wire harness.**

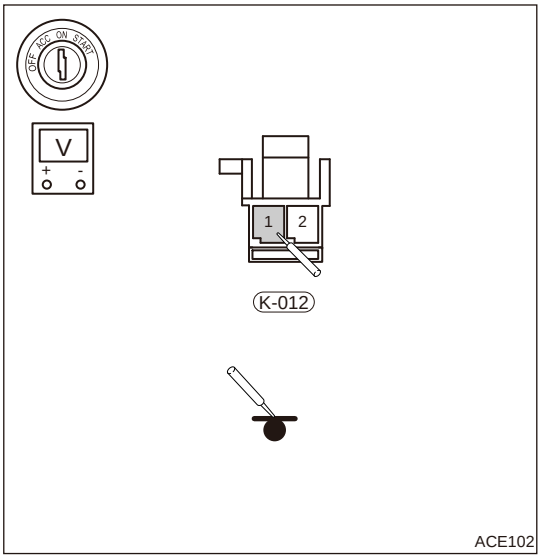
OK

2	**Check the evaporator temperature sensor signal voltage**

(a) Use circuit diagram as a guide to perform the following inspection procedures:

(i) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(ii) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of evaporator temperature sensor signal K-012 (1). Normal signal voltage changes with A/C temperature.



NG	**Check evaporator temperature sensor wire harness or replace evaporator temperature sensor.**

OK

3	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

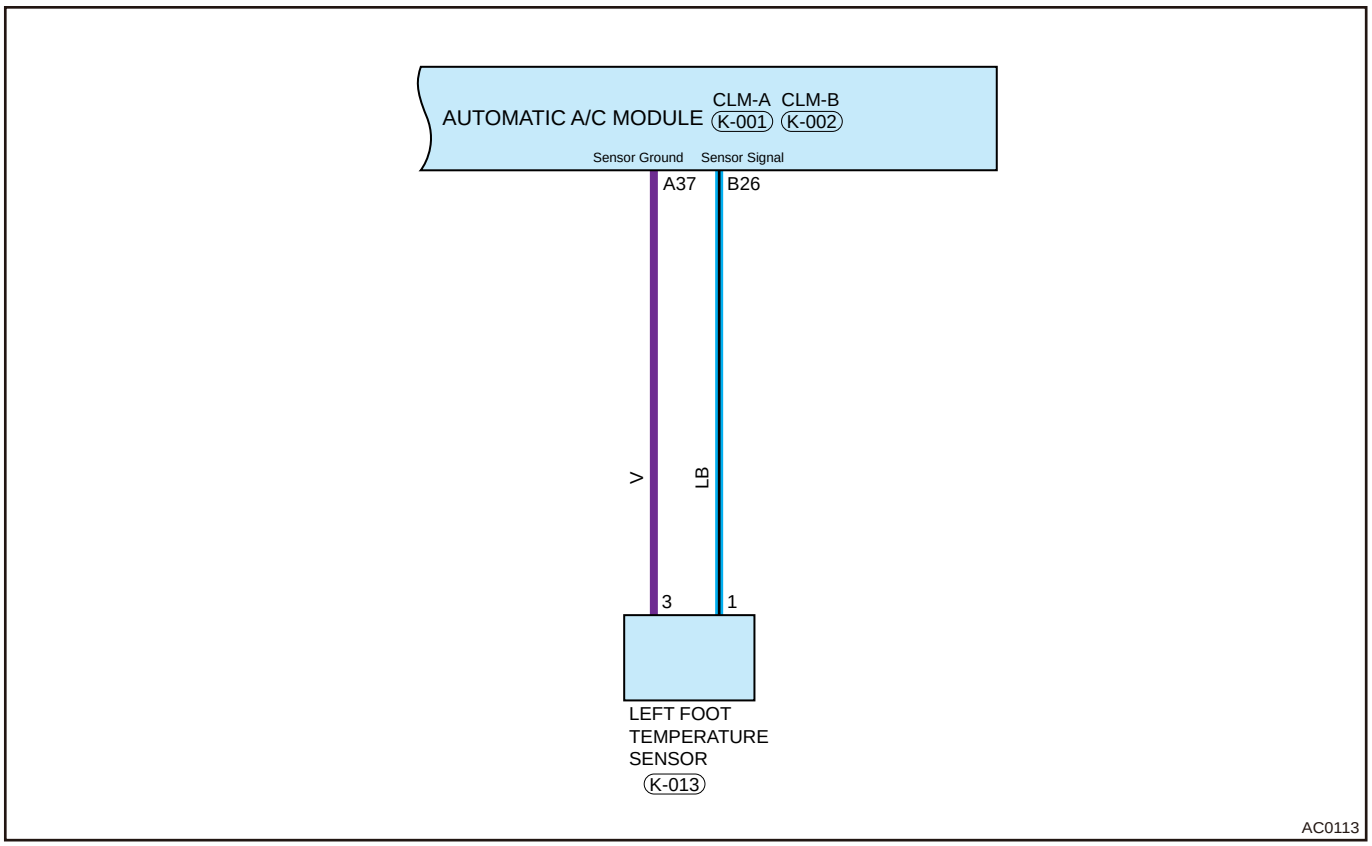
NG	**Replace with a new ECM to check if fault reoccurs.**
OK	**Conduct test and confirm malfunction has been repaired.**

■ Left foot air outlet temperature sensor short to ground malfunction

DTC	B14E511	Left Foot Air Outlet Temperature Sensor Short to Ground

■ Description

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

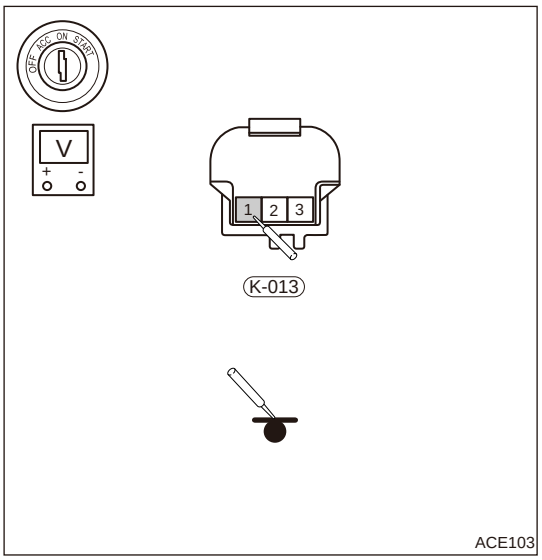
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check left foot air outlet temperature sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of left foot air outlet temperature sensor signal K-013 (1). Normal signal voltage changes with A/C temperature.



NG → **Check left foot air outlet temperature sensor wire harness or replace left foot air outlet temperature sensor.**

OK →

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

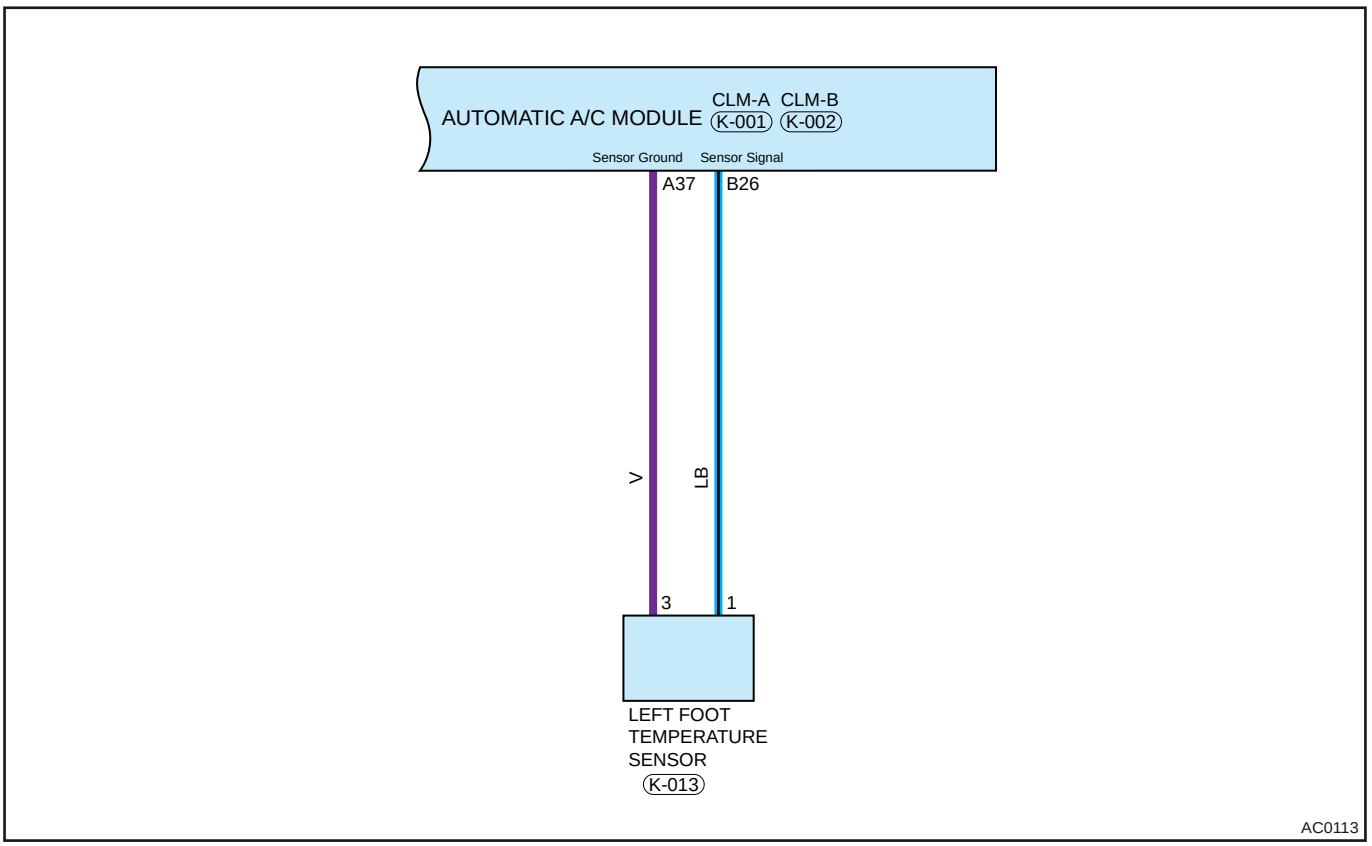
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Left foot air outlet temperature sensor short to power supply or open malfunction**

DTC	B14E515	Left Foot Air Outlet Temperature Sensor Short to Power Supply or Open

■ **Description**

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.

- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check if left foot air outlet temperature sensor connector or lead falls off**

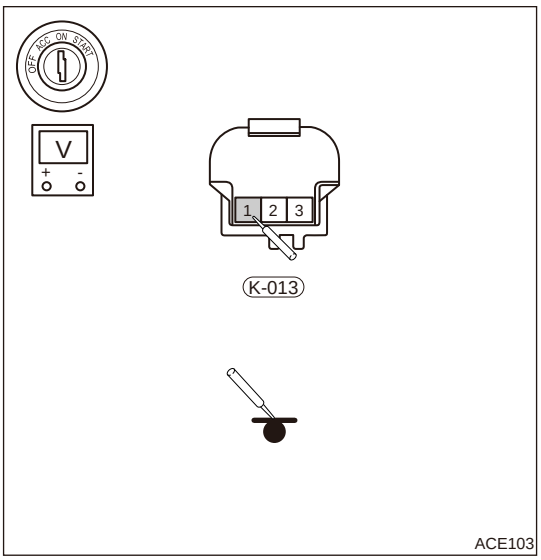
(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

NG → **Repair or replace wire harness.**

OK

2	**Check left foot air outlet temperature sensor signal voltage.**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of left foot air outlet temperature sensor signal K-013 (1). Normal signal voltage changes with A/C temperature.



NG → **Check if left foot air outlet temperature sensor wire harness or replace left foot air outlet temperature sensor.**

OK

3	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

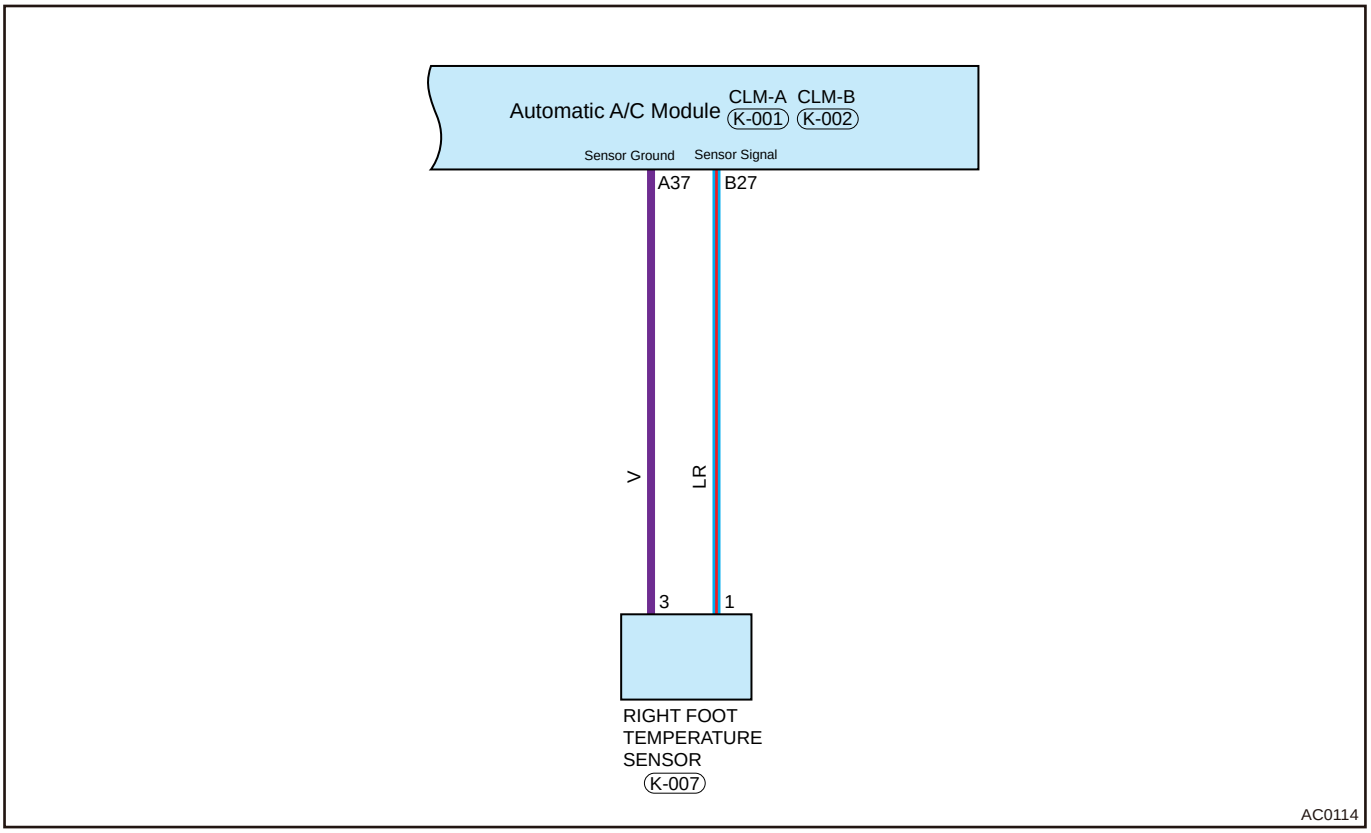
OK → **Conduct test and confirm malfunction has been repaired.**

■ Right foot air outlet temperature sensor short to ground

DTC	B14E611	Right Foot Air Outlet Temperature Sensor Short to Ground

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

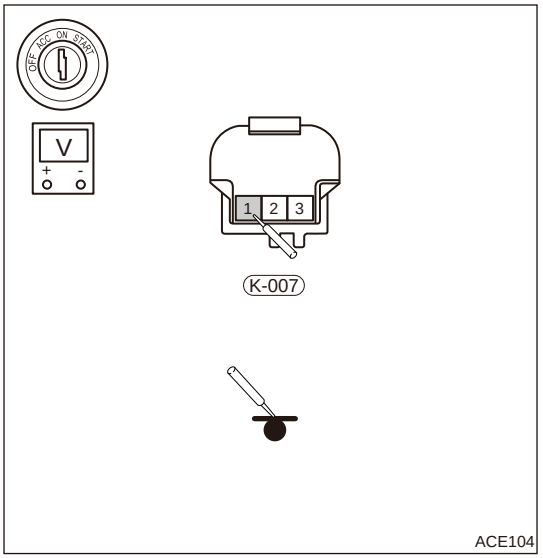
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check right foot air outlet temperature sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of right foot air outlet temperature sensor signal K-007 (1). Normal signal voltage changes with A/C temperature.



NG → **Check right foot air outlet temperature sensor wire harness or replace right foot air outlet temperature sensor.**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

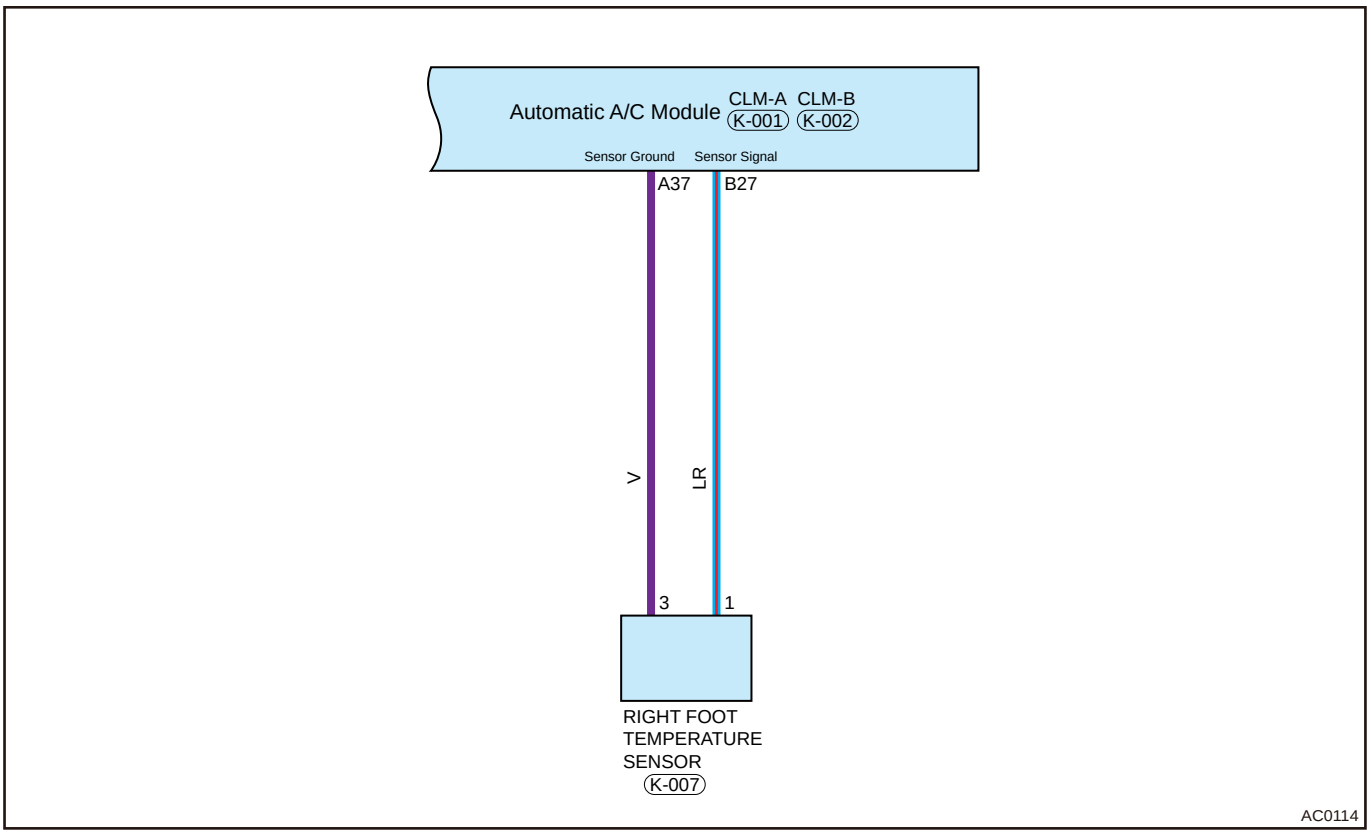
NG → **Replace with a new ECM to check if fault reoccurs.**

OK → **Conduct test and confirm malfunction has been repaired.**

DTC	B14E615	Right Foot Air Outlet Temperature Sensor Short to Power Supply or Open

■ **Description**

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check if right foot air outlet temperature sensor connector or lead falls off**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

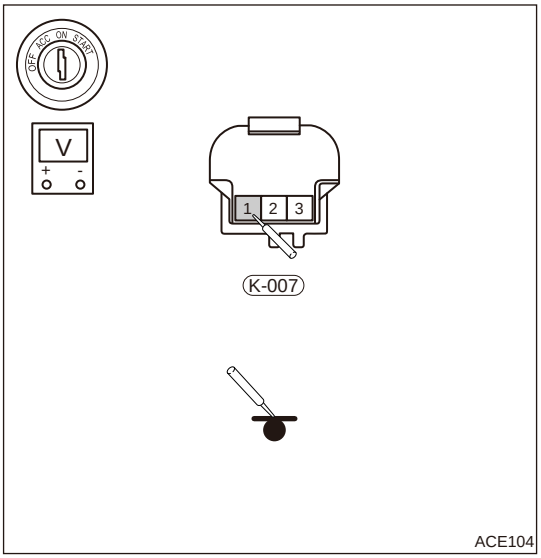
NG → **Repair or replace wire harness connector.**

OK

2	**Check right foot air outlet temperature sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of right foot air outlet temperature sensor signal K-007 (1). Normal signal voltage changes with A/C temperature.



NG → **Check right foot air outlet temperature sensor wire harness or replace right foot air outlet temperature sensor.**

OK →

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

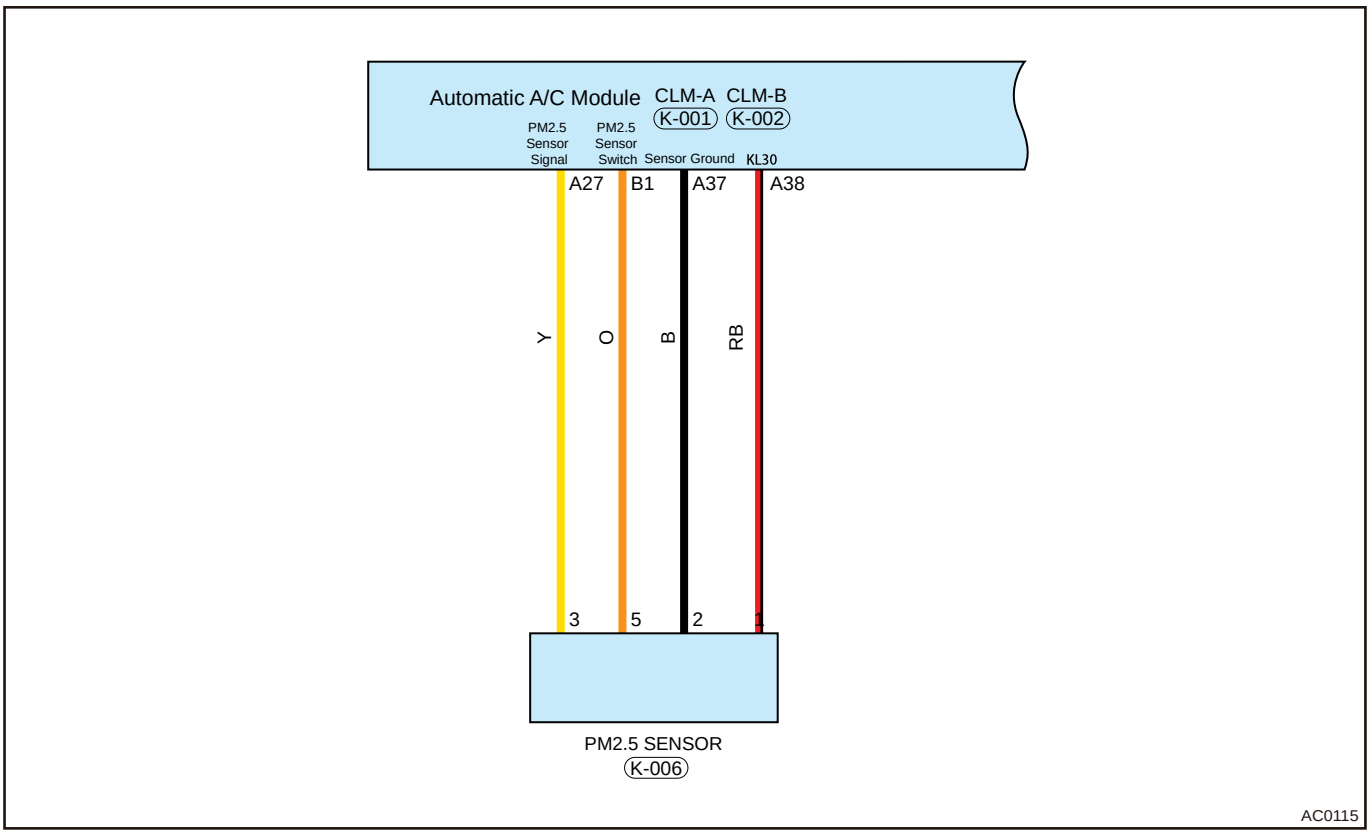
OK → **Conduct test and confirm malfunction has been repaired.**

■ **PM2.5 sensor malfunction**

DTC	**B14E911**	**PM2.5 Sensor Short to Ground (Pulse Width Modulation = 0%)**
DTC	**B14E915**	**PM2.5 Sensor Short to Power Supply or Open (Pulse Width Modulation = 0%)**
DTC	**B14EA12**	**PM2.5 Enable Short To Power Supply**
DTC	**B14EA14**	**PM2.5 Enable Short To Ground Or Open**

■ **Description**

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect PM2.5 sensor K-006 and automatic A/C module connector K-001.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

NG → **Repair or replace wire harness.**

OK

2	**Check PM2.5 sensor**

(a) Turn ENGINE START STOP switch to OFF.
(b) Remove PM2.5 sensor from malfunctioning vehicle.
(c) Install new PM2.5 sensor to malfunctioning vehicle.
(d) Check if DTC exists.

OK → **Repair or replace PM2.5 sensor ground wire harness**

NG

3	Check wire harness (automatic A/C control module - PM2.5 sensor)

(a) Turn off all electrical equipment and ENGINE START STOP switch.

(b) Disconnect the negative battery cable.

(c) Disconnect PM2.5 sensor connector K-006 and automatic A/C module connector K-001.

(d) Using a digital multimeter, measure the wire harness between PM2.5 sensor connector K-006 and automatic A/C module connector K-001 according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-006 (1) - K-001 (38)	ENGINE START STOP switch “OFF”	＜ 1 Ω
K-006 (2) - K-001 (37)	ENGINE START STOP switch “OFF”	＜ 1 Ω
K-006 (5) - K-002 (1)	ENGINE START STOP switch “OFF”	＜ 1 Ω
K-006 (3) - K-001 (27)	ENGINE START STOP switch “OFF”	＜ 1 Ω

NG → **Repair or replace related wire harness.**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

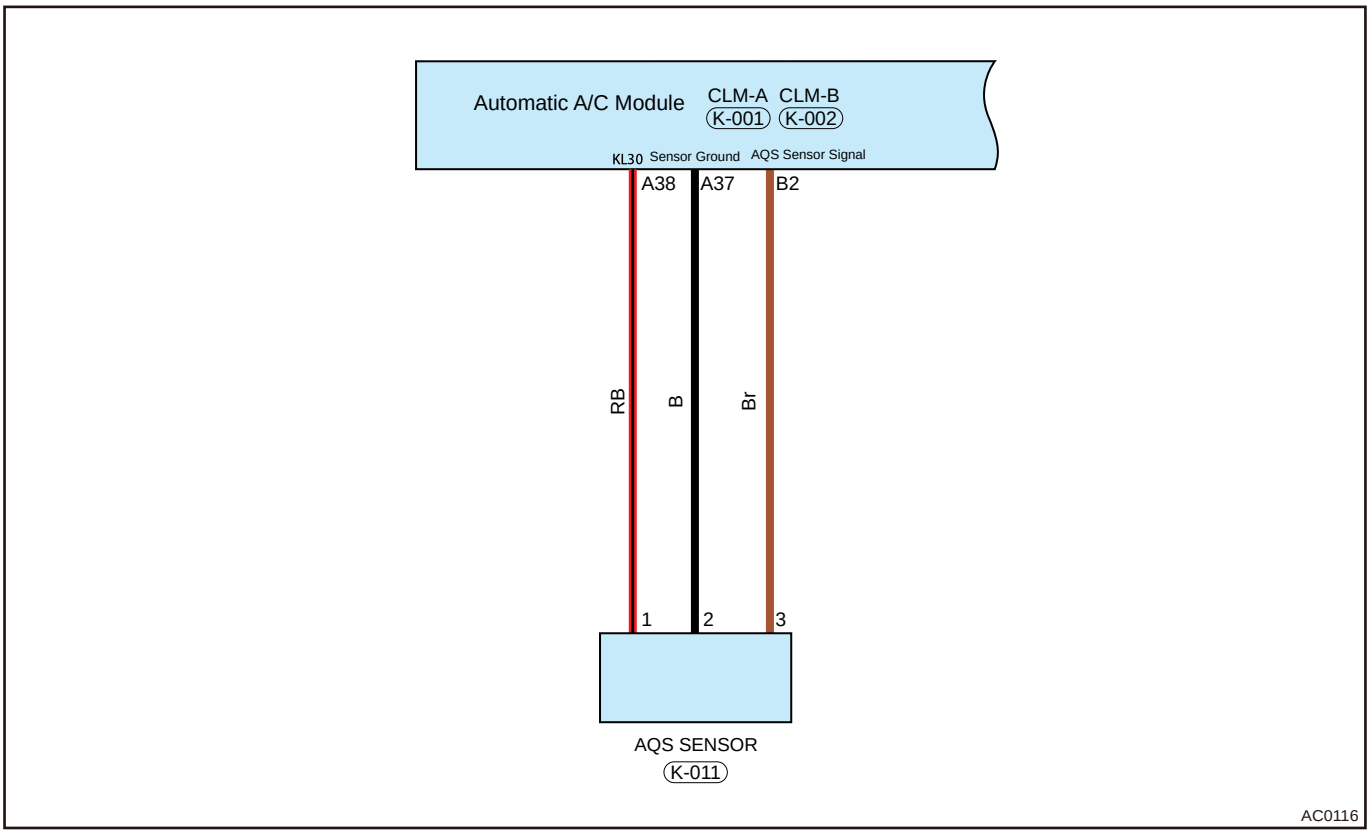
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Air quality sensor malfunction**

DTC	**B14EB11**	**Air Quality Sensor Short to Ground (Pulse Width Modulation = 0%)**
DTC	**B14EB15**	**Air Quality Sensor Short to Power Supply or Open (Pulse Width Modulation = 100%)**

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect air quality sensor K-011 and automatic A/C module connector K-001.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

NG → **Repair or replace wire harness.**

OK

2	**Check air quality sensor**

(a) Turn ENGINE START STOP switch to OFF.
(b) Remove air quality sensor from malfunctioning vehicle.
(c) Install new air quality sensor to malfunctioning vehicle.
(d) Check if DTC exists.

OK → **Repair or replace air quality sensor ground wire harness.**

NG

3	Check wire harness (automatic A/C control module - air quality sensor)

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Disconnect air quality sensor connector K-009 and automatic A/C module connector K-001.
(d) Using a digital multimeter, measure the wire harness between air quality sensor connector K-009 and automatic A/C module connector K-001 according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-011 (1) - K-001 (38)	ENGINE START STOP switch "OFF"	< 1 Ω
K-011 (2) - K-001 (37)	ENGINE START STOP switch "OFF"	< 1 Ω
K-011 (3) - K-002 (2)	ENGINE START STOP switch "OFF"	< 1 Ω

NG → **Repair or replace related wire harness.**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

OK → **Conduct test and confirm malfunction has been repaired.**

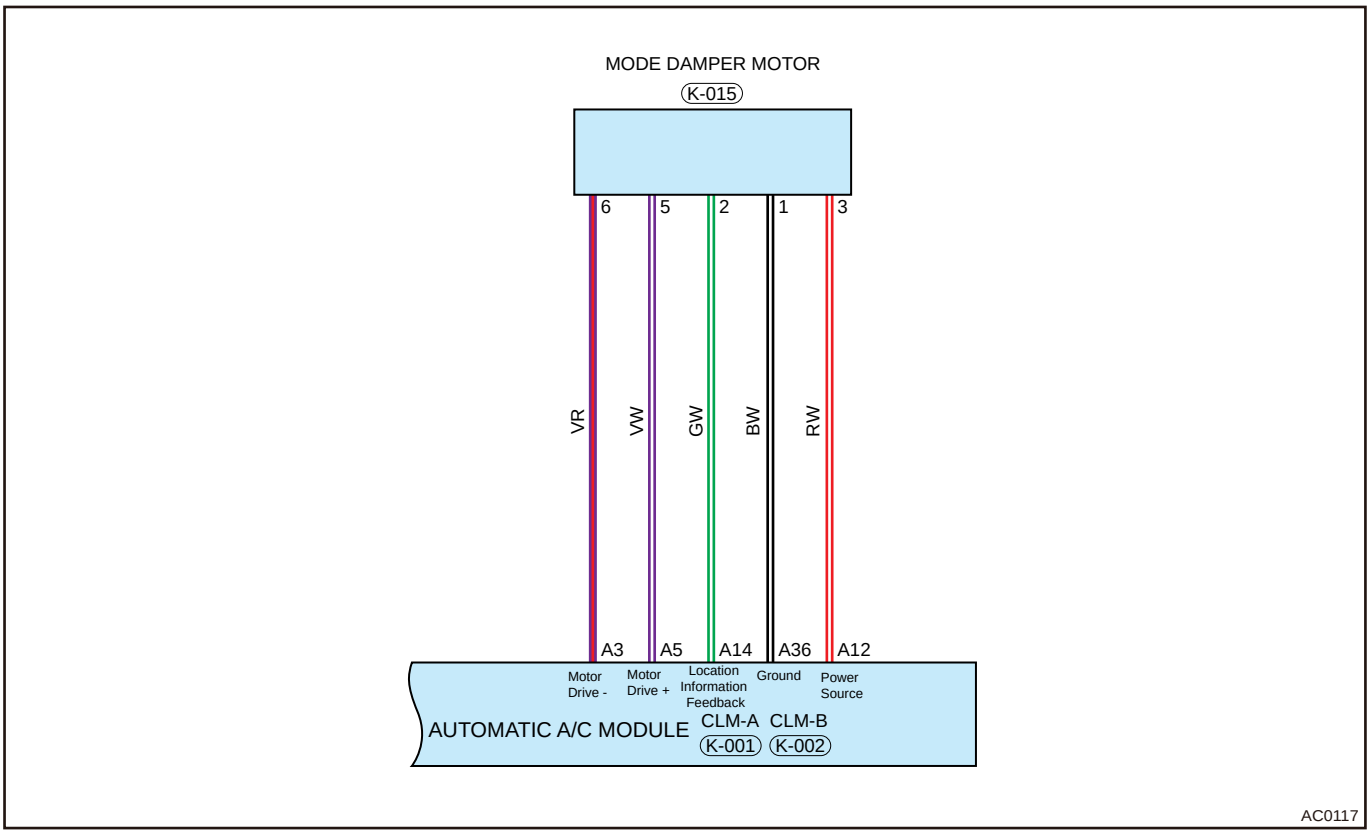
■ **Mode motor malfunction**

DTC	**B14EC10**	**Mode Motor Blocked (Except Calibration Procedure)**
DTC	**B14EC11**	**Mode Motor Control Circuit Short to Ground**

DTC	B14EC12	Mode Motor Control Circuit Short to Power Supply
DTC	B14EC13	Mode Motor Control Circuit Open
DTC	B14ED12	Mode Motor Control Feedback Circuit Short to Power Supply
DTC	B14ED14	Mode Motor Control Feedback Circuit Short to Ground or Open

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect mode damper motor connector K-015 and automatic A/C control module connector K-001.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

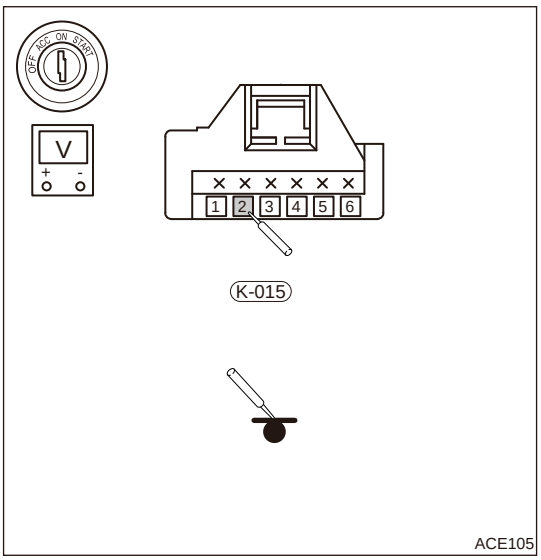
NG	**Repair or replace wire harness.**

OK

2	Check mode damper motor operating signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of mode damper motor signal K-015 (2). Normal signal voltage changes with A/C mode adjustment



NG → **Check mode damper motor wire harness or replace mode damper motor.**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

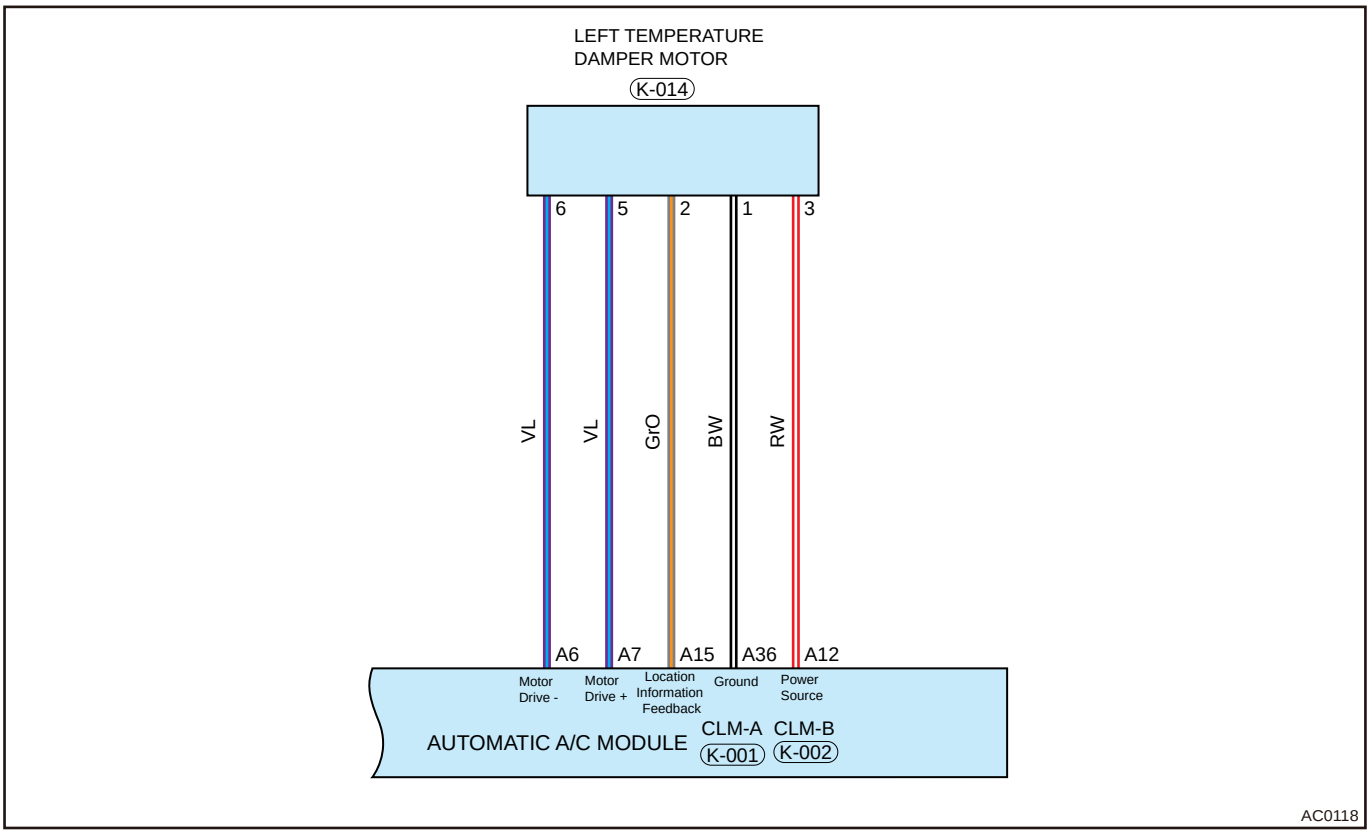
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Left temperature motor malfunction**

DTC	B14EE10	Left Temperature Motor Blocked (Except Calibration Procedure)
DTC	B14EE11	Left Temperature Motor Control Circuit Short to Ground
DTC	B14EE12	Left Temperature Motor Control Circuit Short to Power Supply
DTC	B14EE13	Left Temperature Motor Control Circuit Open
DTC	B14EF12	Left Temperature Motor Control Feedback Circuit Short to Power Supply
DTC	B14EF14	Left Temperature Motor Control Feedback Circuit Short to Ground or Open

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect left temperature adjustment motor connector K-014 and automatic A/C control module connector K-001.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

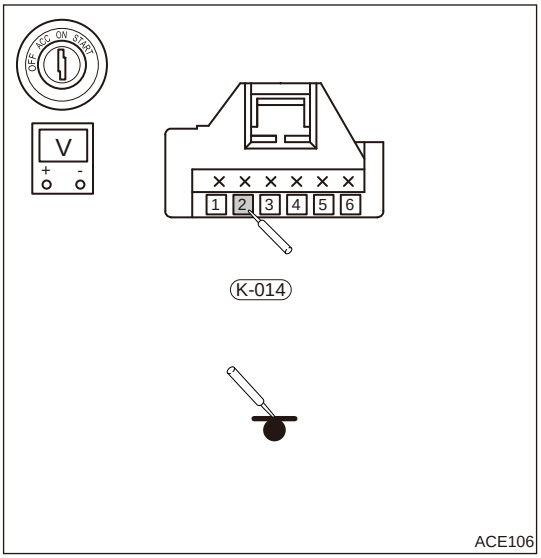
NG → **Repair or replace wire harness.**

OK

2	**Check temperature adjustment motor (left) operating signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of temperature adjustment motor (left) signal K-014 (2). Normal signal voltage changes with A/C left temperature adjustment



NG → **Check temperature adjustment motor (left) wire harness or replace temperature adjustment motor (left).**

OK →

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

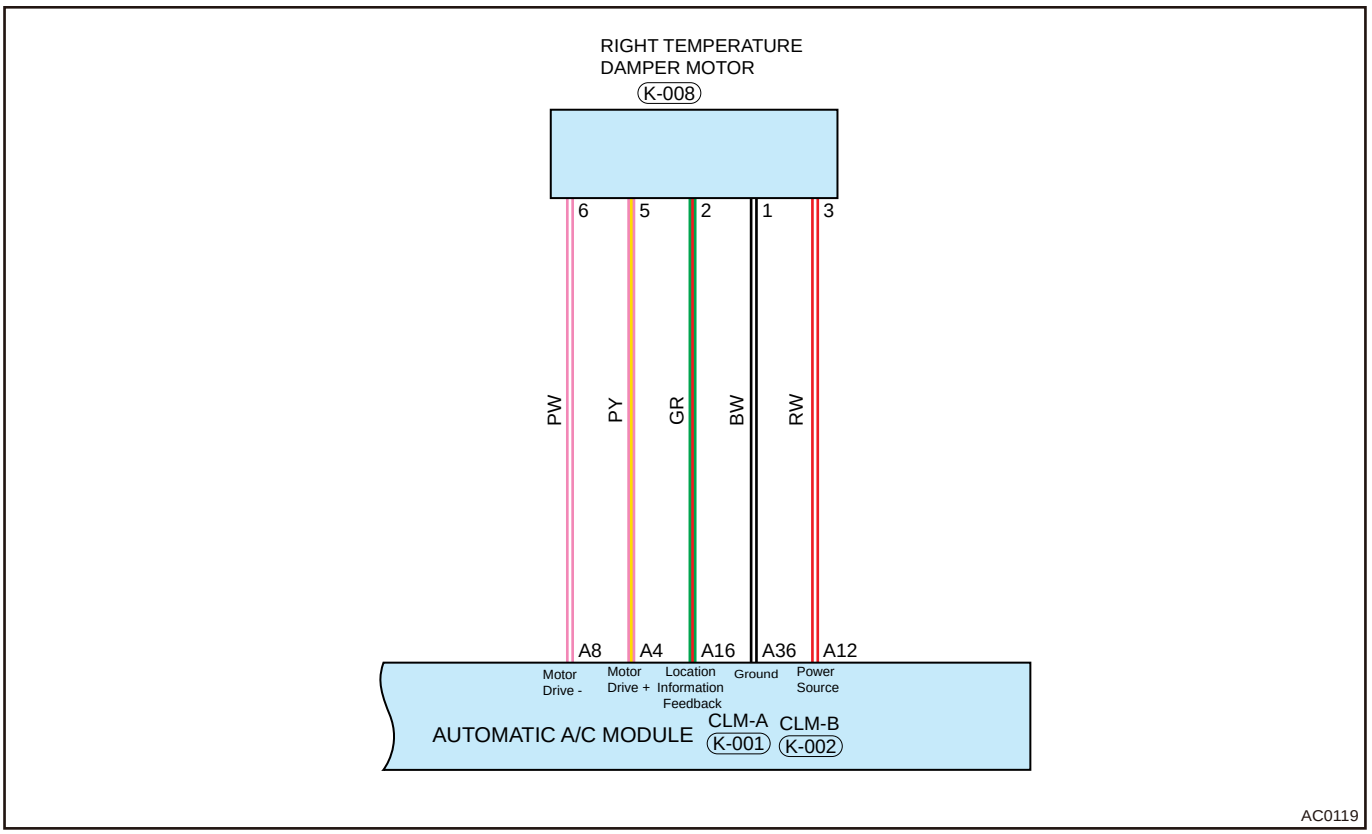
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Right temperature motor malfunction**

DTC	B14F010	Right Temperature Motor Blocked (Except Calibration Procedure)
DTC	B14F011	Right Temperature Motor Control Circuit Short to Ground
DTC	B14F013	Right Temperature Motor Control Circuit Open
DTC	B14F013	Right Temperature Motor Control Circuit Open
DTC	B14F112	Right Temperature Motor Control Feedback Circuit Short to Power Supply
DTC	B14F114	Right Temperature Motor Control Feedback Circuit Short to Ground or Open

■ **Description**

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect right temperature adjustment motor connector K-008 and automatic A/C control module connector K-001.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

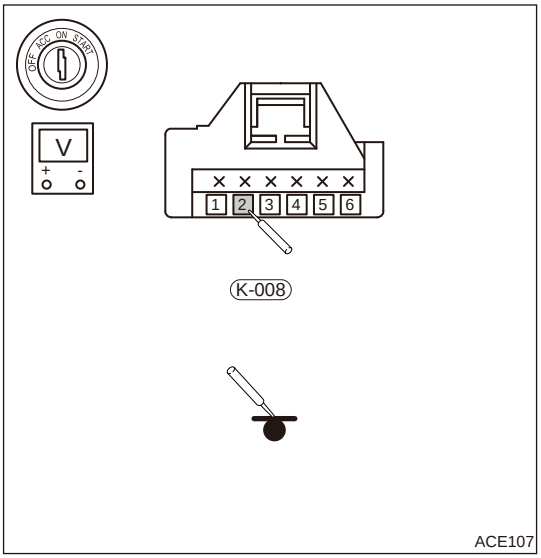
NG → **Repair or replace wire harness.**

OK

2	**Check temperature adjustment motor (right) operating signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of temperature adjustment motor (right) signal K-008 (2). Normal signal voltage changes with A/C right temperature adjustment



NG → **Check temperature adjustment motor (right) wire harness or replace temperature adjustment motor (right).**

OK →

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

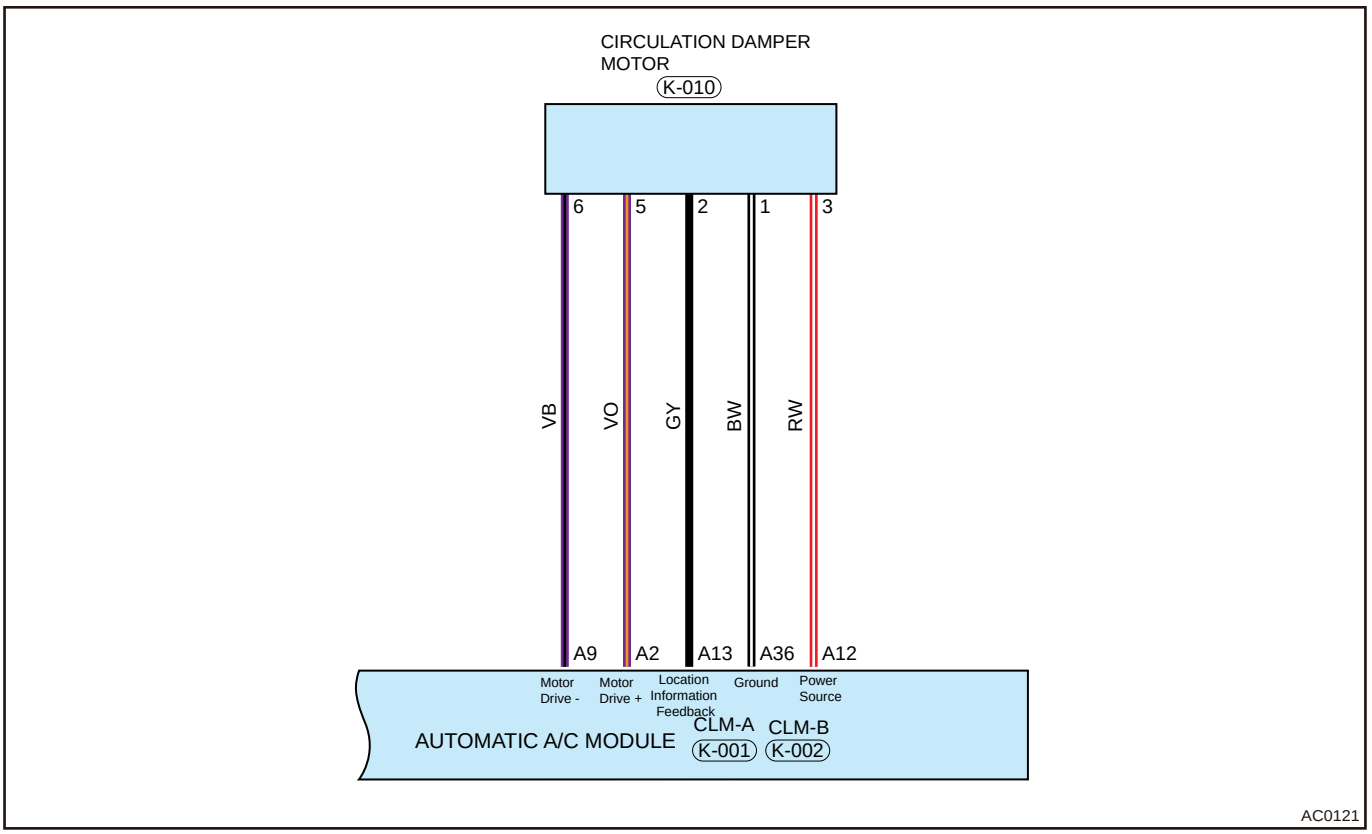
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Intake motor malfunction**

DTC	B14F210	Intake Motor Blocked (Except Calibration Procedure)
DTC	B14F211	Intake Motor Control Circuit Short to Ground
DTC	B14F212	Intake Motor Control Circuit Short to Power Supply
DTC	B14F213	Intake Motor Control Circuit Open
DTC	B14F312	Intake Motor Control Feedback Circuit Short to Power Supply
DTC	B14F314	Intake Motor Control Feedback Circuit Short to Ground or Open

■ **Description**

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect inner/outer circulation motor connector K-010 and automatic A/C control module connector K-001.
(c) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

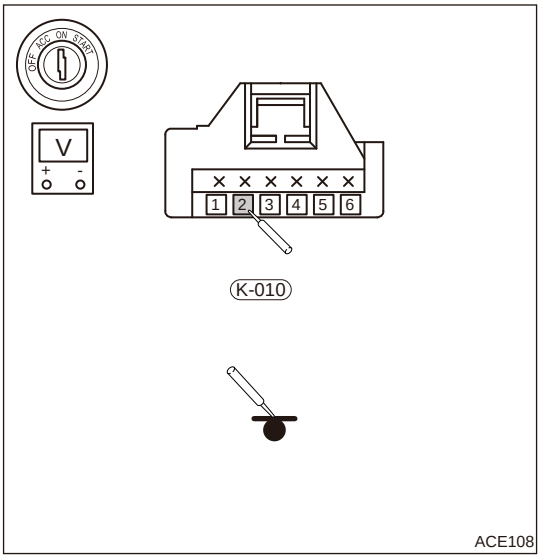
NG → **Repair or replace wire harness.**

OK

2	**Check inner/outer circulation motor operating signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of inner/outer circulation motor signal K-010 (2). Normal signal voltage changes with A/C inner/outer circulation adjustment



NG → **Check inner/outer circulation motor wire harness or replace inner/outer circulation motor.**

OK →

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

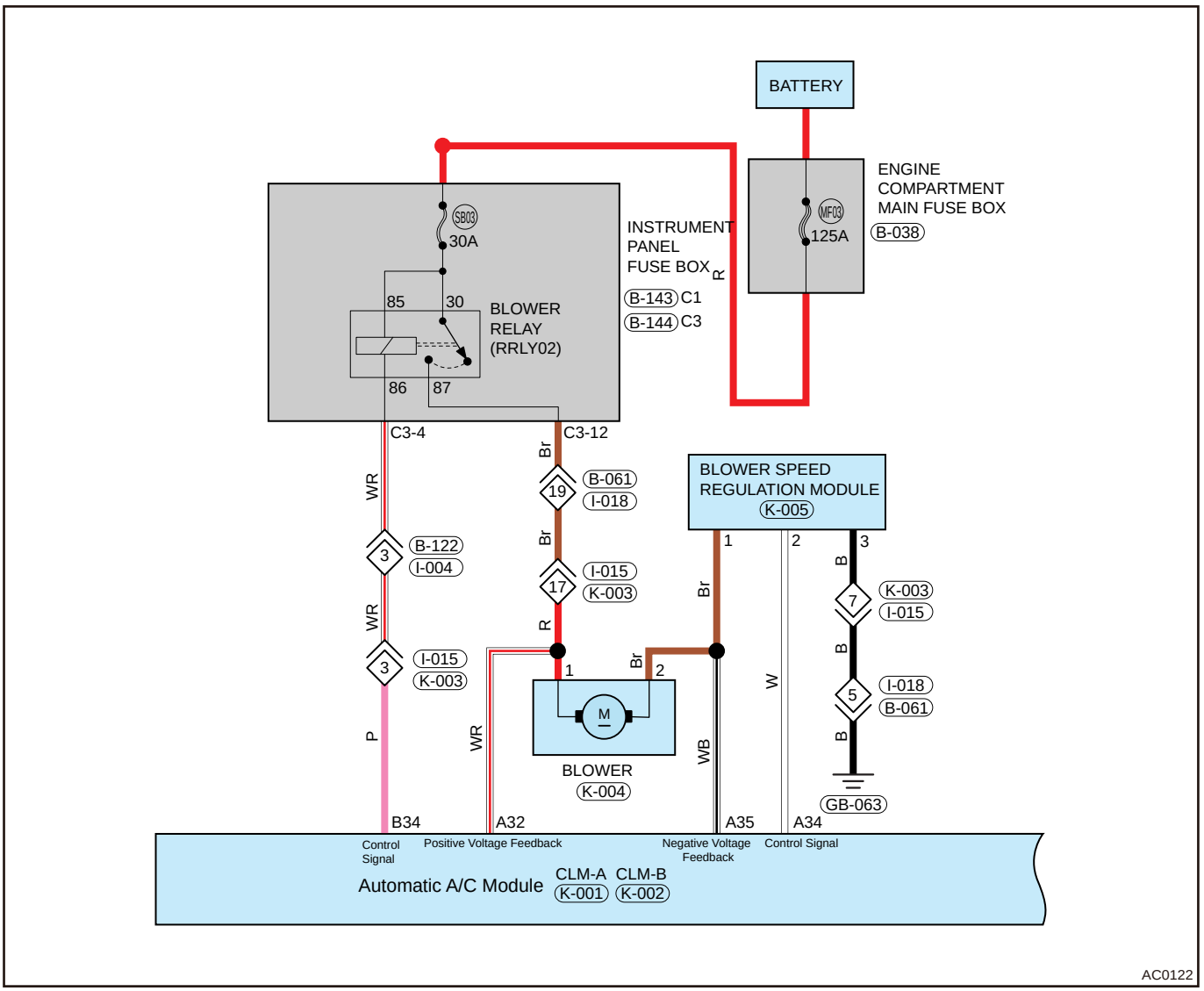
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Blower malfunction**

DTC	**B14F412**	**Blower Relay Output Short to Power Supply**
DTC	**B14F414**	**Blower Relay Output Short to Ground or Open**
DTC	**B14F529**	**Blower Signal Invalid Control Failed**
DTC	**B14F531**	**Blower Control Failed**

■ **Description**

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.
(c) Disconnect blower connector K-004 and blower speed regulation module connector K-005.

NG	**Repair or replace wire harness.**

OK

2	Check blower

(a) Turn ENGINE START STOP switch to OFF.
(b) Remove the blower from malfunctioning vehicle.
(c) Install a new blower to malfunctioning vehicle.
(d) Check if DTC exists.

OK → **Replace the blower.**

NG

3	Check wire harness connector

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Disconnect blower connector K-005 and speed regulation module connector K-004.
(d) Using a digital multimeter, measure the wire harness between speed regulation module connector K-004 and blower connector K-005 according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-005 (1) - K-004 (2)	ENGINE START STOP switch “OFF”	＜ 1 Ω
K-004(1)- B-144 （12）	ENGINE START STOP switch “OFF”	＜ 1 Ω

(e) Using a digital multimeter, measure the wire harness between blower connector K-004 and automatic A/C control module connector K-001 according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-004 (1) - K-001 (32)	ENGINE START STOP switch “OFF”	＜ 1 Ω
K-004 (2) - K-001 (35)	ENGINE START STOP switch “OFF”	＜ 1 Ω

NG → **Repair or replace related wire harness.**

OK

4	Check blower speed regulation module circuit

(a) Use circuit diagram as a guide to perform the following inspection procedures:

(b) Using a digital multimeter, measure the wire harness between blower speed regulation module connector K-004 and automatic A/C module according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-005 (2) - K-001 (34)	ENGINE START STOP switch “OFF”	＜ 1 Ω

(c) Using a digital multimeter, measure the wire harness between blower speed regulation module connector K-004 and body ground according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-005 (3) - GB-137	ENGINE START STOP switch “OFF”	＜ 1 Ω

NG → **Repair or replace related wire harness.**

OK ↓

5	Check power circuit of blower

(a) Connect all connectors and disconnect A/C speed regulation module connector.

(b) Connect the negative battery cable.

(c) Turn ENGINE START STOP switch to ON.

(d) Using a digital multimeter, measure the voltage between terminal 1 of blower connector K-005 and body ground according to value(s) in table below.

Multimeter Test Terminal	Condition	Normal Condition
K-004 (1) - Body ground	ENGINE START STOP switch “ON”	Not less than 12 V

NG → **Repair or replace related wire harness.**

OK ↓

6	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

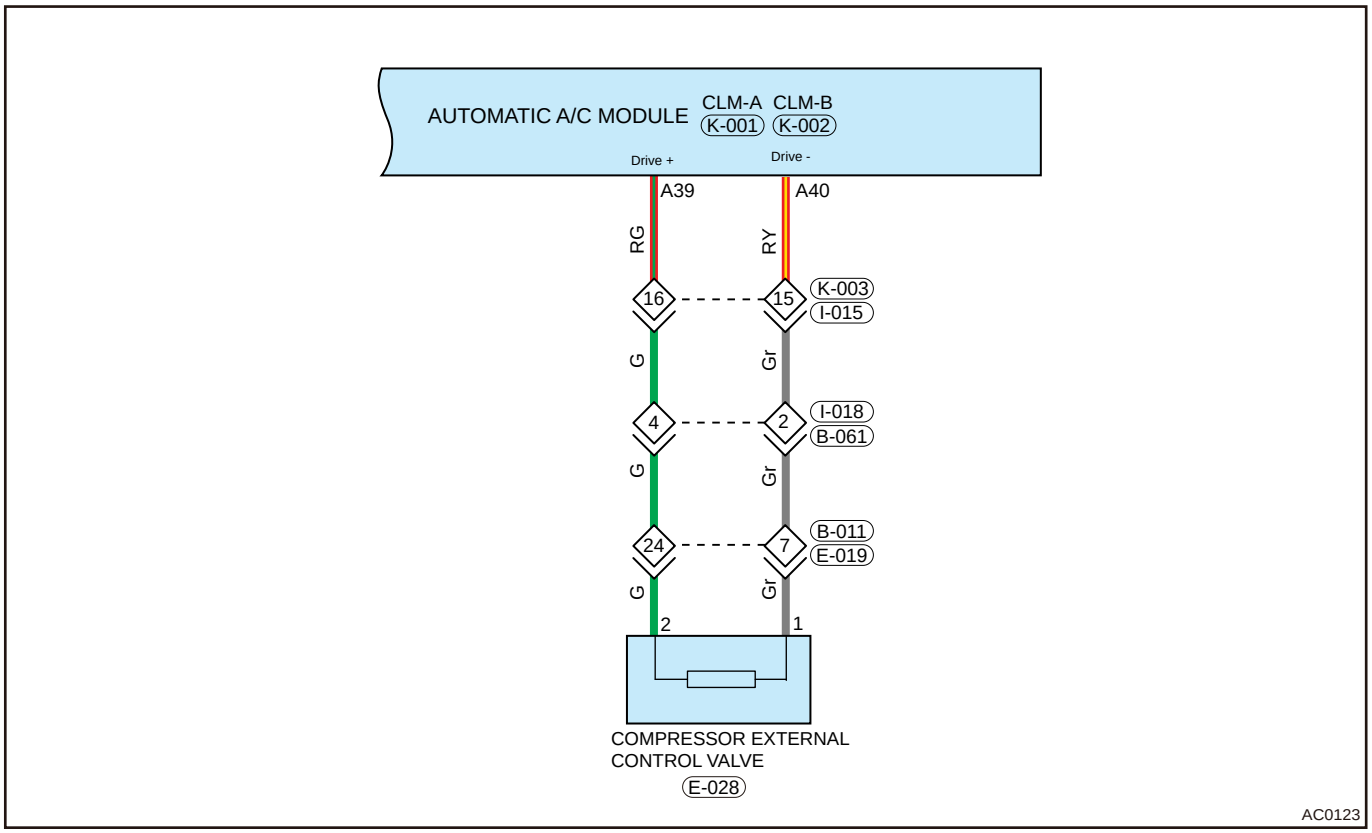
OK	Conduct test and confirm malfunction has been repaired.

■ **Compressor external control valve malfunction**

DTC	B14F711	ECV Control Circuit Short to Ground
DTC	B14F715	ECV Control Circuit Short to Power Supply or Open

■ **Description**

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check wire harness and connector.

(a) Turn ENGINE START STOP switch to OFF.

(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.

(c) Disconnect external control compressor solenoid valve connector E-028 and automatic A/C control module connector K-001.

NG	Repair or replace wire harness.

OK

2	Check external control compressor solenoid valve operating signal

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using an oscilloscope, connect black probe to battery negative terminal (or body ground) and use red probe to measure the external control compressor solenoid valve K-001 (40). Duty ratio signal is output normally according to compressor operation.

NG → **Check external control compressor solenoid valve wire harness or replace external control compressor solenoid valve.**

NG

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

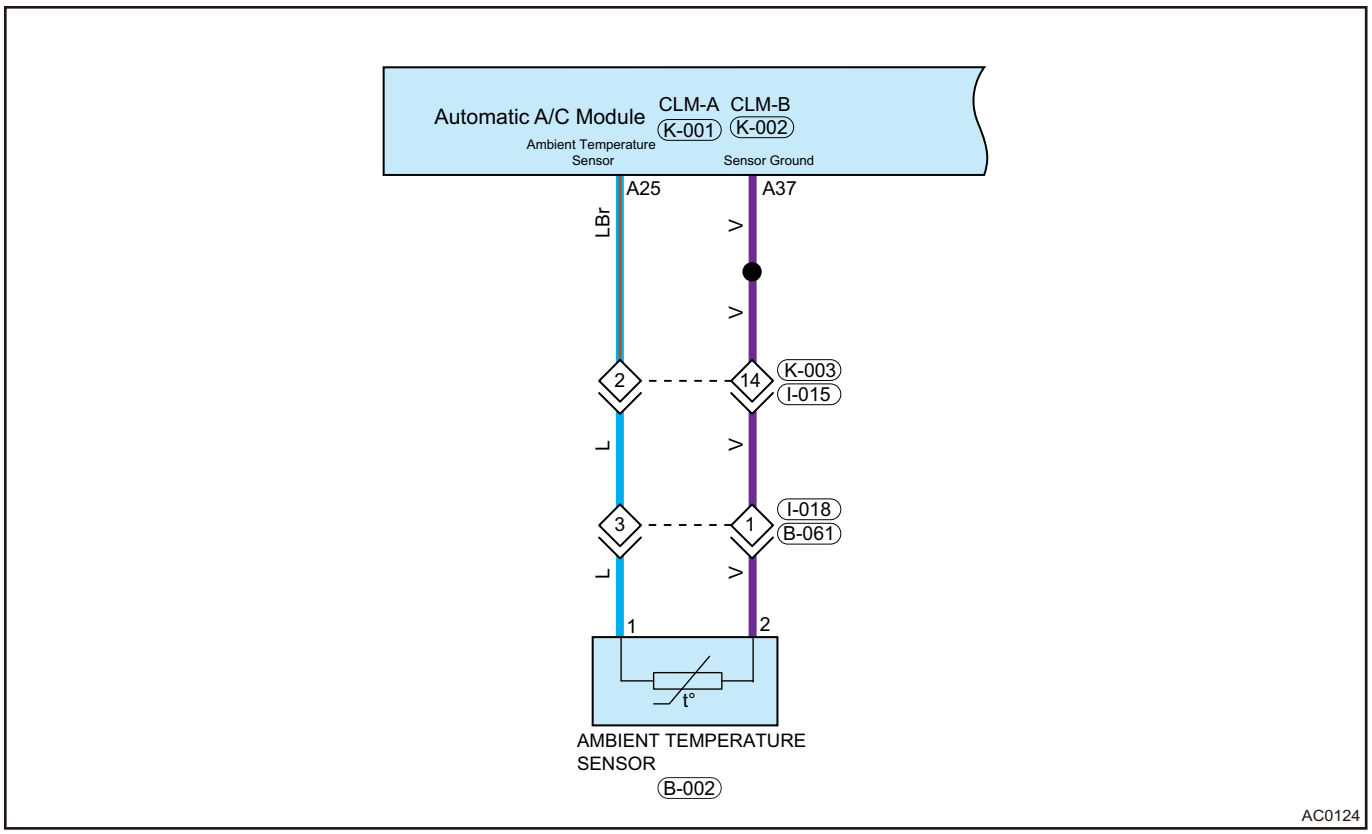
OK → **Conduct test and confirm malfunction has been repaired.**

■ External temperature sensor malfunction

DTC	B14FB11	External Temperature Sensor Short to Ground
DTC	B14FB15	External Temperature Sensor Short to Power Supply or Open

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.
(c) Check if ambient temperature sensor connector or lead falls off.

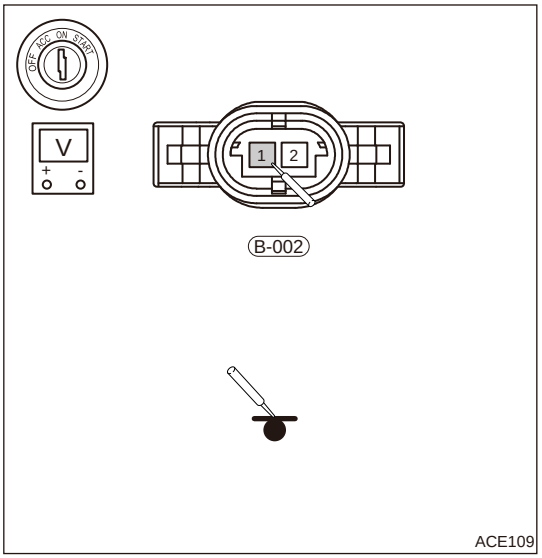
NG → **Repair or replace wire harness.**

OK

2	**Check ambient temperature sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of ambient temperature sensor signal B-002 (1). Turn on blower to blow ambient temperature sensor, and the voltage normally changes with air temperature.



NG → **Check if ambient temperature sensor wire harness or replace ambient temperature sensor.**

OK →

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

OK → **Conduct test and confirm malfunction has been repaired.**

■ **Power supply voltage abnormal malfunction**

DTC	B14FC1C	Abnormal Power Supply Voltage
DTC	B15461C	Abnormal Power Supply Voltage

■ **Description**

Control schematic diagram

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check wire harness and connector.

(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.
(c) Check if wire harness between battery to alternator is aging or are connected poorly.

NG → **Repair or replace wire harness.**

OK

2	Check battery voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle.
(b) Measure battery voltage with multimeter voltage band. Under unloaded status, the normal voltage of the vehicle battery is about 13 V, and the normal load voltage is no less than 11 V. If the voltage is lower than 11 V, it may be difficult to start the next time. After starting, because alternator starts to generate electricity, the normal voltage of the vehicle battery should be between 13.5 V - 14.5 V.

NG → **Replace battery.**

OK

3	Check alternator

(a) Remove alternator from malfunctioning vehicle.
(b) Install a new alternator to malfunctioning vehicle.
(c) System operates normally.

NG → **Repair or replace the corresponding components.**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

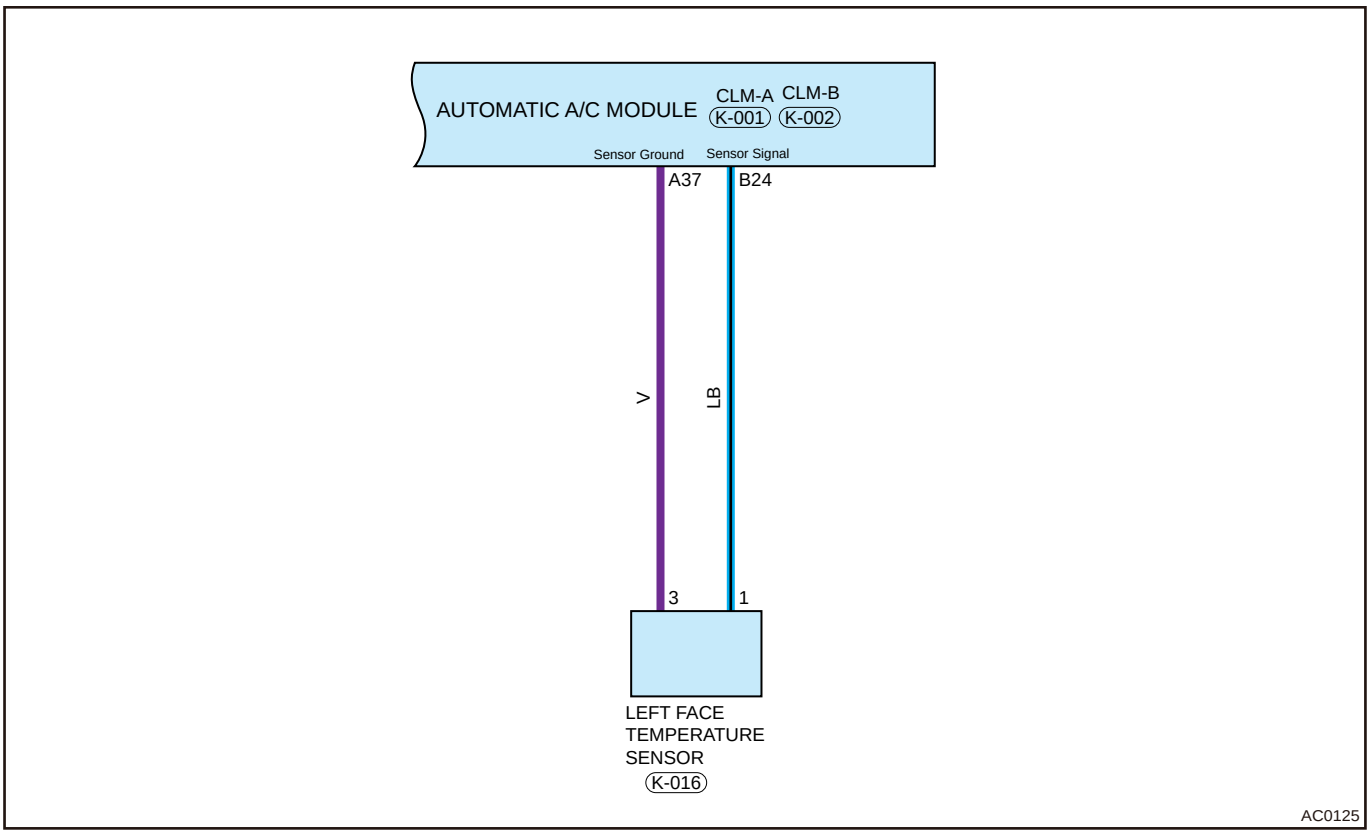
OK → **Conduct test and confirm malfunction has been repaired.**

■ Left face air outlet temperature sensor short to ground malfunction

DTC	B14E711	Left Face Air Outlet Temperature Sensor Short to Ground

■ Description

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

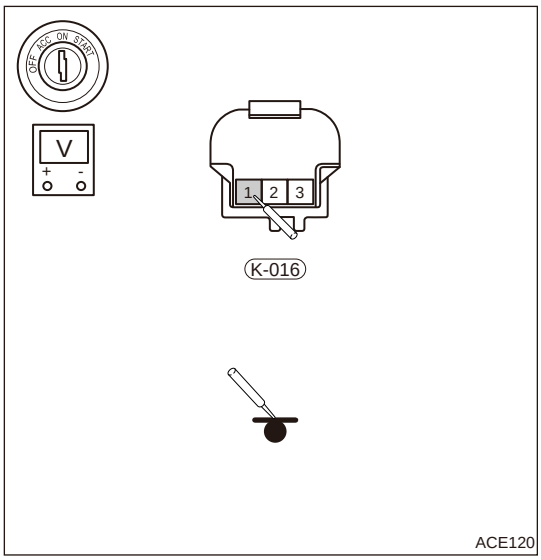
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check left face air outlet temperature sensor signal voltage.**

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of left face air outlet temperature sensor signal K-016 (1). Normal signal voltage changes with A/C temperature.



NG → **Check if left face air outlet temperature sensor wire harness or replace left face air outlet temperature sensor.**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

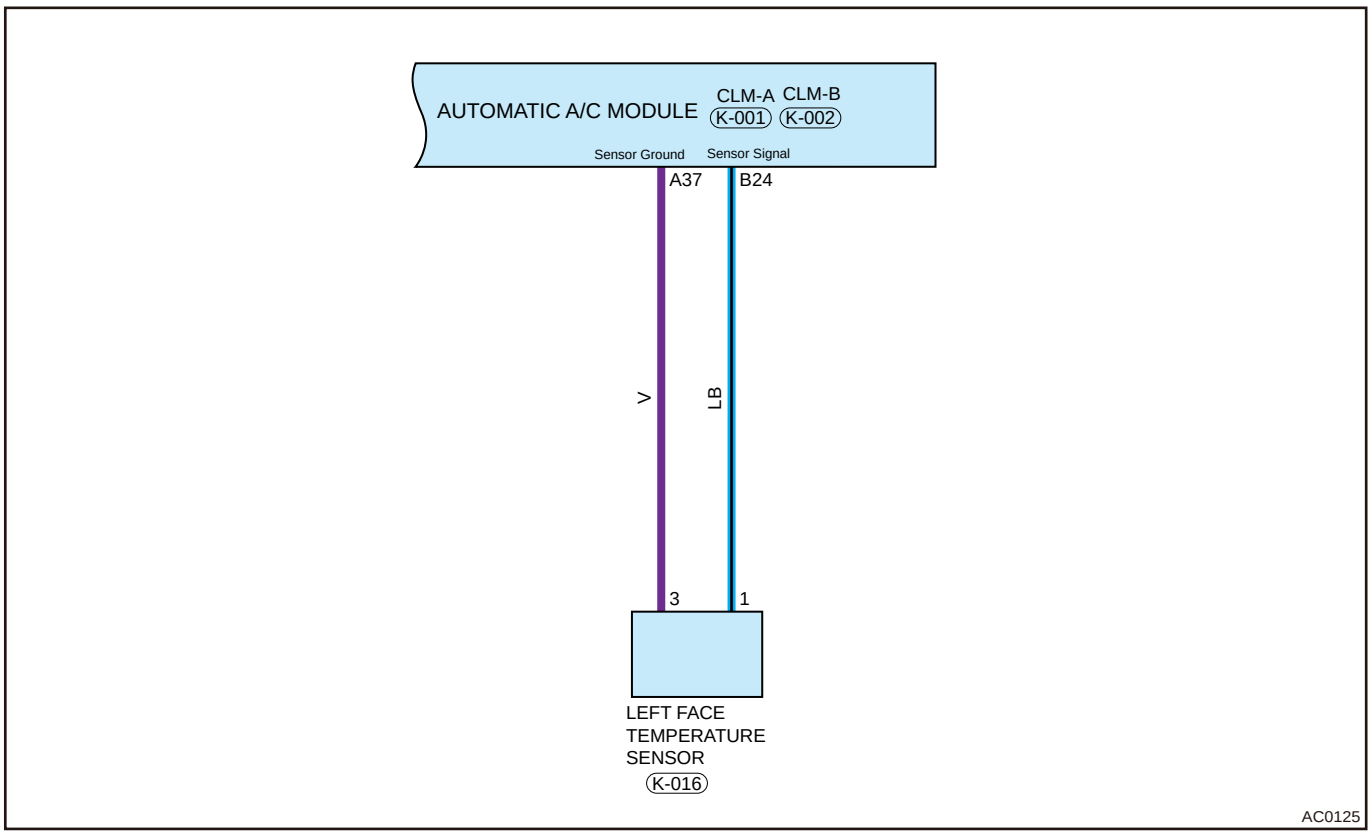
OK → **Conduct test and confirm malfunction has been repaired.**

■ **Left face air outlet temperature sensor short to power supply or open malfunction**

DTC	B14E715	Left Face Air Outlet Temperature Sensor Short to Power Supply or Open

■ **Description**

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).

- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check wire harness and connector.

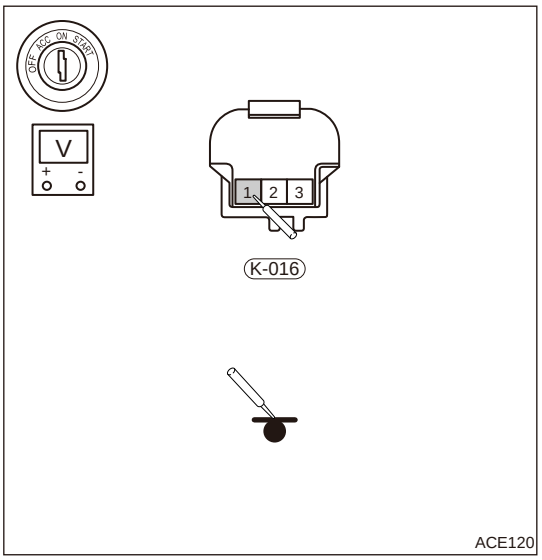
(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.
(c) Check if left face air outlet temperature sensor connector or lead falls off.

NG → **Repair or replace wire harness.**

OK

2	Check left face air outlet temperature sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of left face air outlet temperature sensor signal K-016 (1). Normal signal voltage changes with A/C temperature.



OK → **Check if left face air outlet temperature sensor signal is short to power supply or replace left face air outlet temperature sensor.**

NG

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

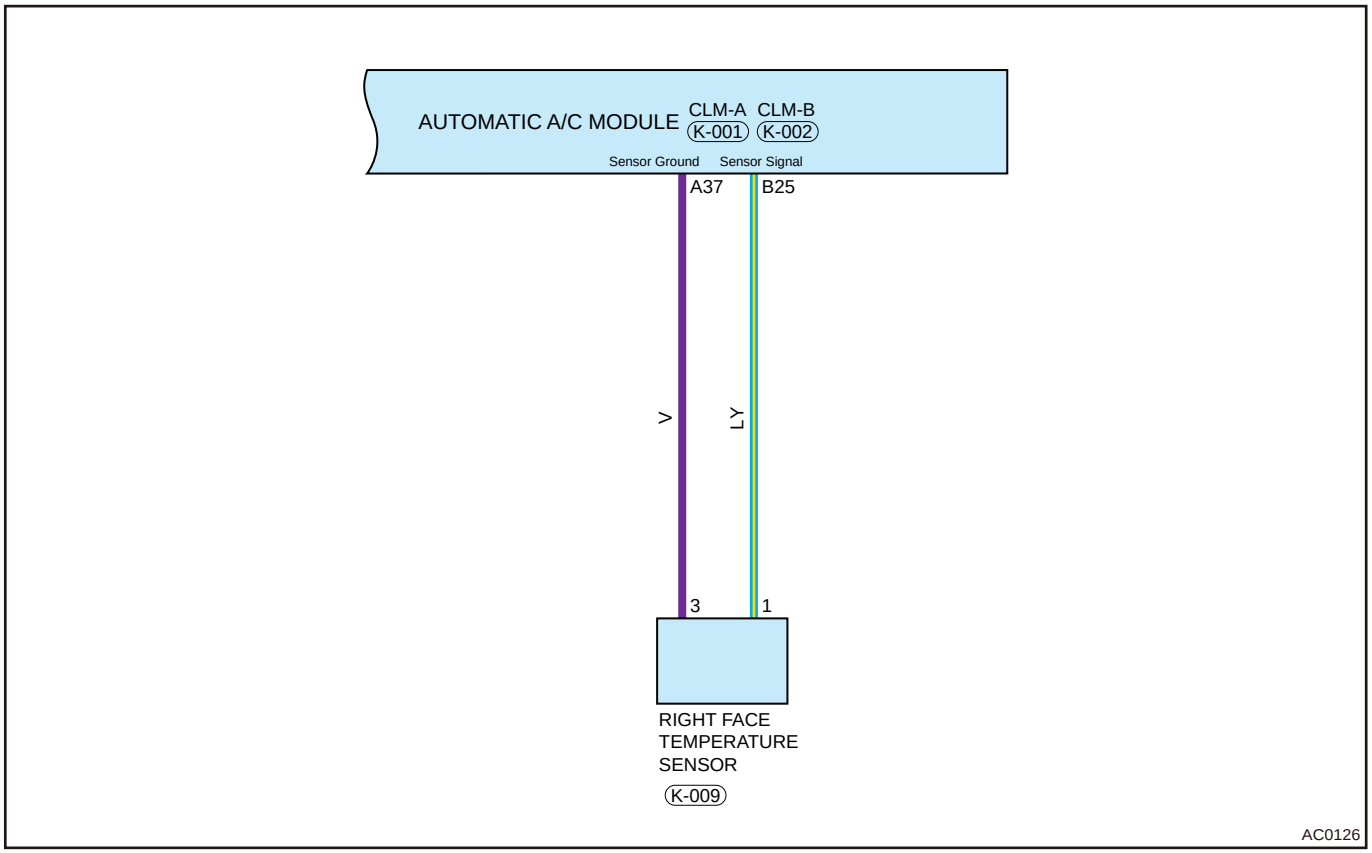
OK	Conduct test and confirm malfunction has been repaired.

■ **Right face air outlet temperature sensor short to ground**

DTC	B14E811	Right Face Air Outlet Temperature Sensor Short to Ground

■ **Description**

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

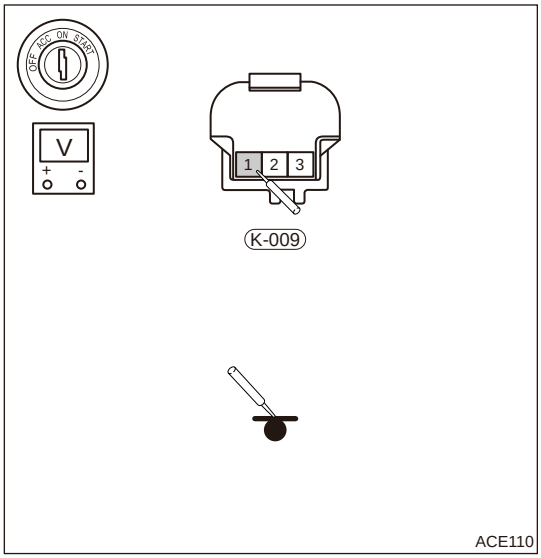
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check right face air outlet temperature sensor signal voltage.

(a) Turn ENGINE START STOP switch to ON, start the vehicle and turn on A/C.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of right face temperature sensor signal K-009 (1). Signal voltage also changes with A/C temperature.



NG	**Repair wire harness or replace right face temperature sensor.**

OK

2	**Reconfirm DTCs**

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

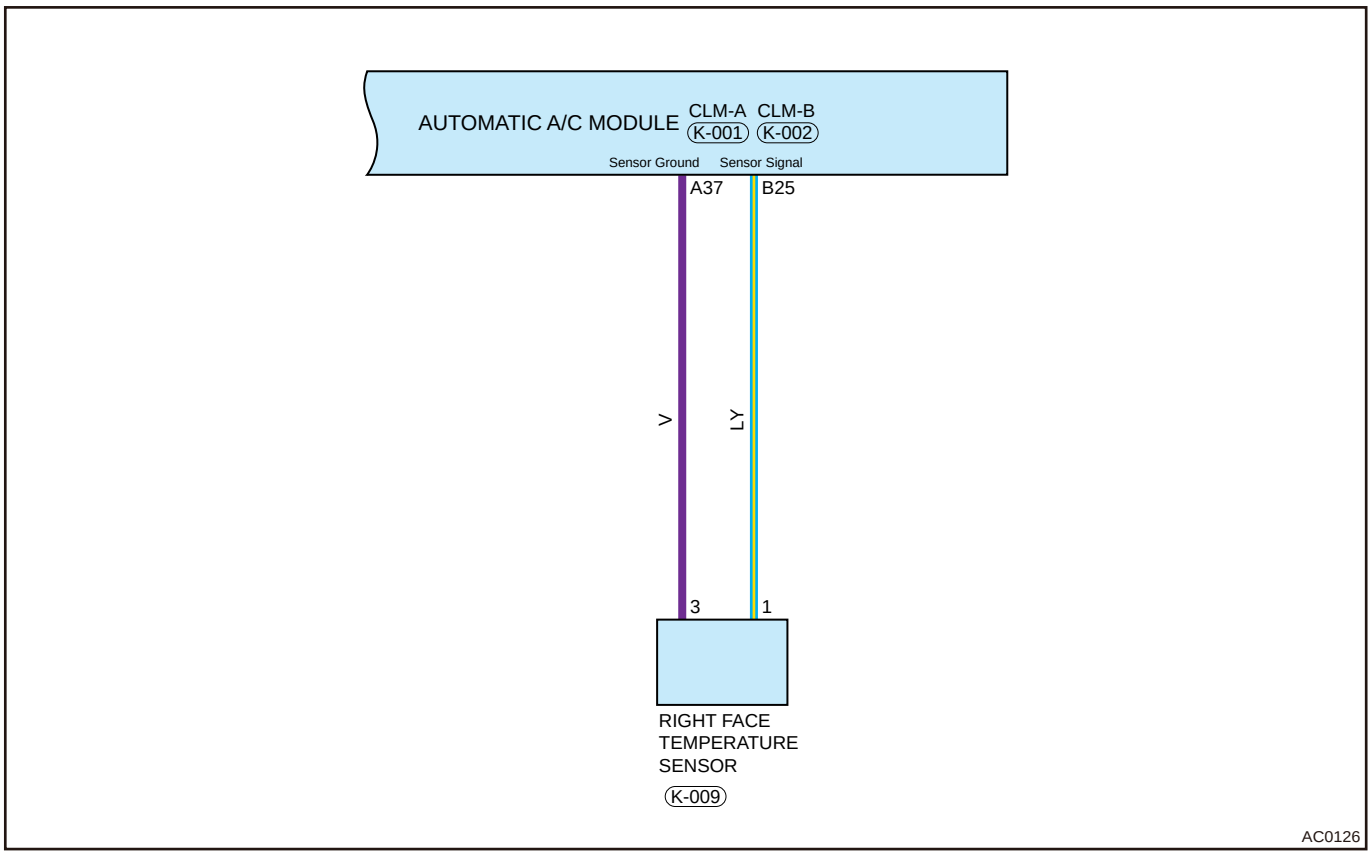
NG	**Replace with a new ECM to check if fault reoccurs.**
OK	**Conduct test and confirm malfunction has been repaired.**

■ Right face air outlet temperature sensor short to power supply or open

DTC	**B14E815**	**Right Face Air Outlet Temperature Sensor Short to Power Supply or Open**

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check wire harness and connector.**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check whether the connector is in bad contact, bending, distortion, poor contact etc.
(c) Check if right face air outlet temperature sensor connector or lead falls off.

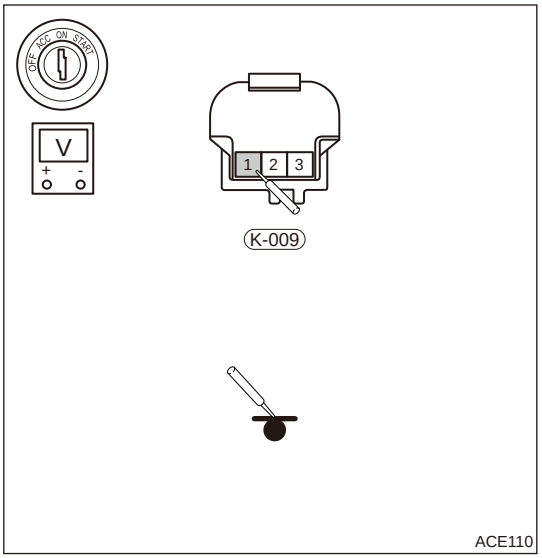
NG → **Repair or replace wire harness.**

OK

2	**Check right face air outlet temperature sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of right face air outlet temperature sensor signal K-009 (1). Normal signal voltage changes with A/C temperature.



NG → **Check if right face temperature sensor signal is short to power supply or replace right face temperature sensor.**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new ECM to check if fault reoccurs.**

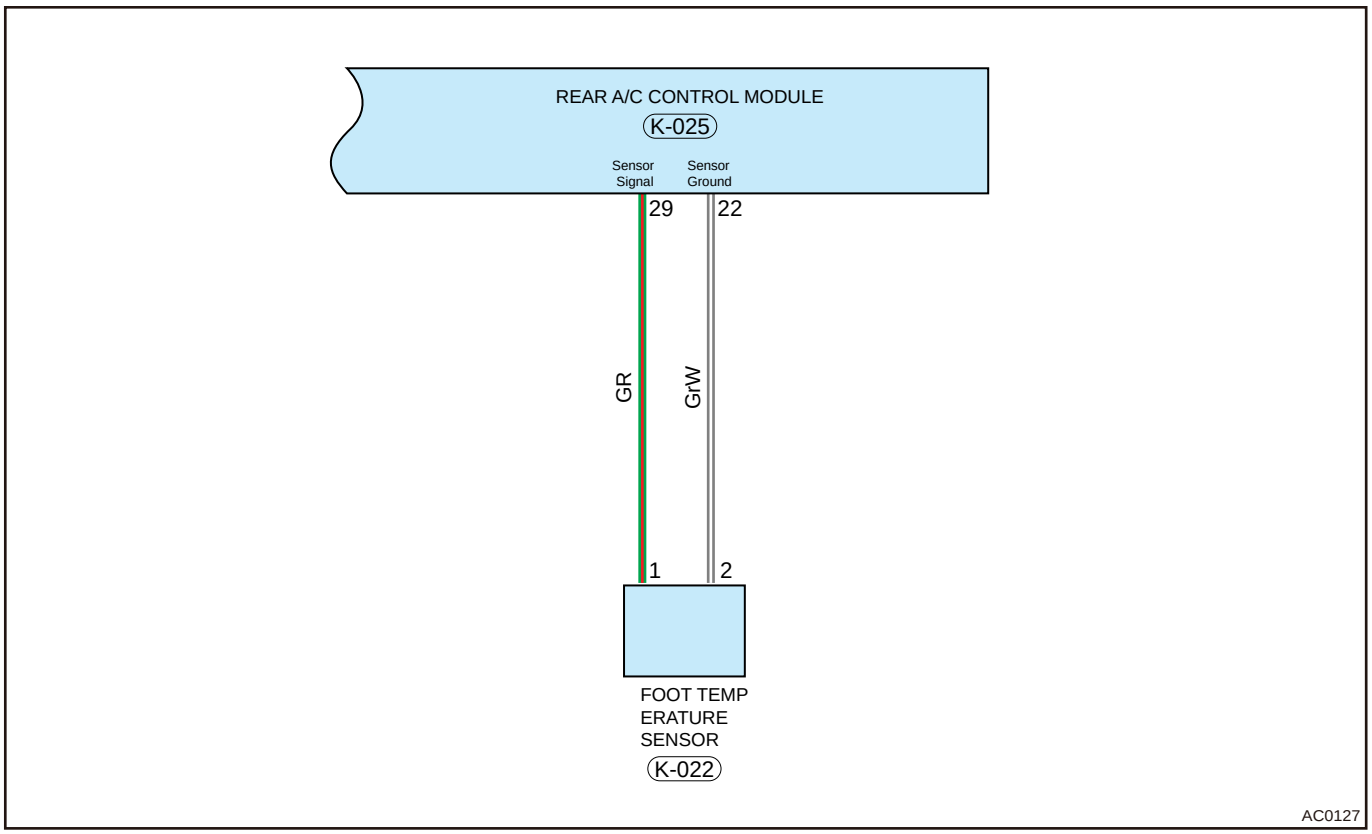
OK → **Conduct test and confirm malfunction has been repaired.**

■ Foot air outlet temperature sensor short to ground malfunction

DTC	B154111	Foot Air Outlet Temperature Sensor Short to Ground

■ Description

Control schematic diagram



■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

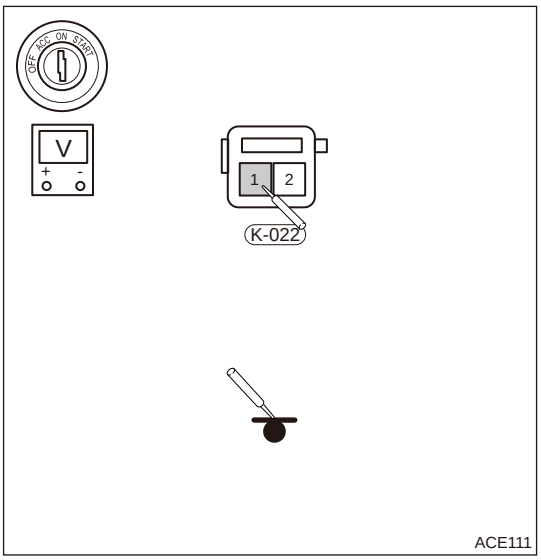
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check foot air outlet temperature sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of foot air outlet temperature sensor signal K-022 (1). Normal signal voltage changes with A/C temperature.



NG

Check foot air outlet temperature sensor wire harness or replace foot air outlet temperature sensor.

OK

2	Check automatic A/C control module

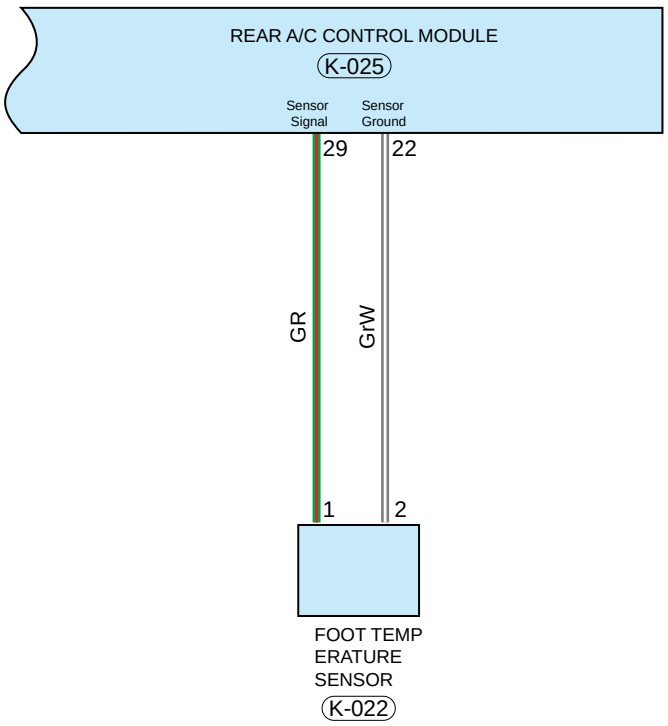
Use circuit diagram as a guide to perform the following inspection procedures:
(a) Remove automatic A/C control module from malfunctioning vehicle.
(b) Install a new automatic A/C control module to malfunctioning vehicle.
(c) System operates normally.

■ Foot air outlet temperature sensor short to power supply or open

DTC	B154115	Foot Air Outlet Temperature Sensor Short to Power Supply or Open

■ Description

Control schematic diagram



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■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check wire harness and connector.

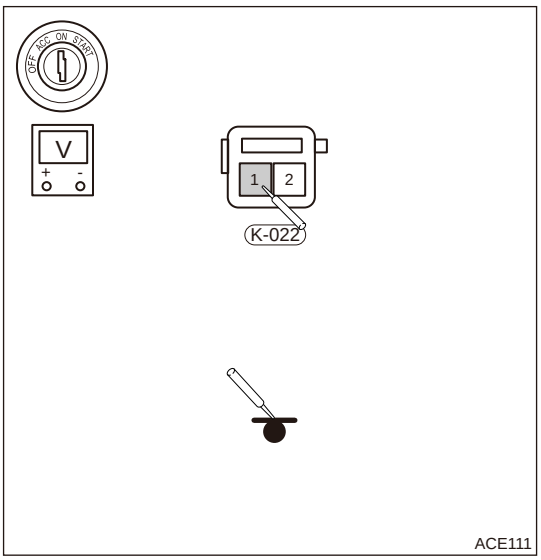
(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Check if foot air outlet temperature sensor connector or lead falls off.

NG → **Repair or replace wire harness.**

OK

2	Check foot air outlet temperature sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle.
(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of foot air outlet temperature sensor signal K-022 (1). Normal signal voltage changes with A/C temperature.



NG → **Check if foot air outlet temperature sensor signal is short to power supply or replace foot air outlet temperature sensor.**

OK

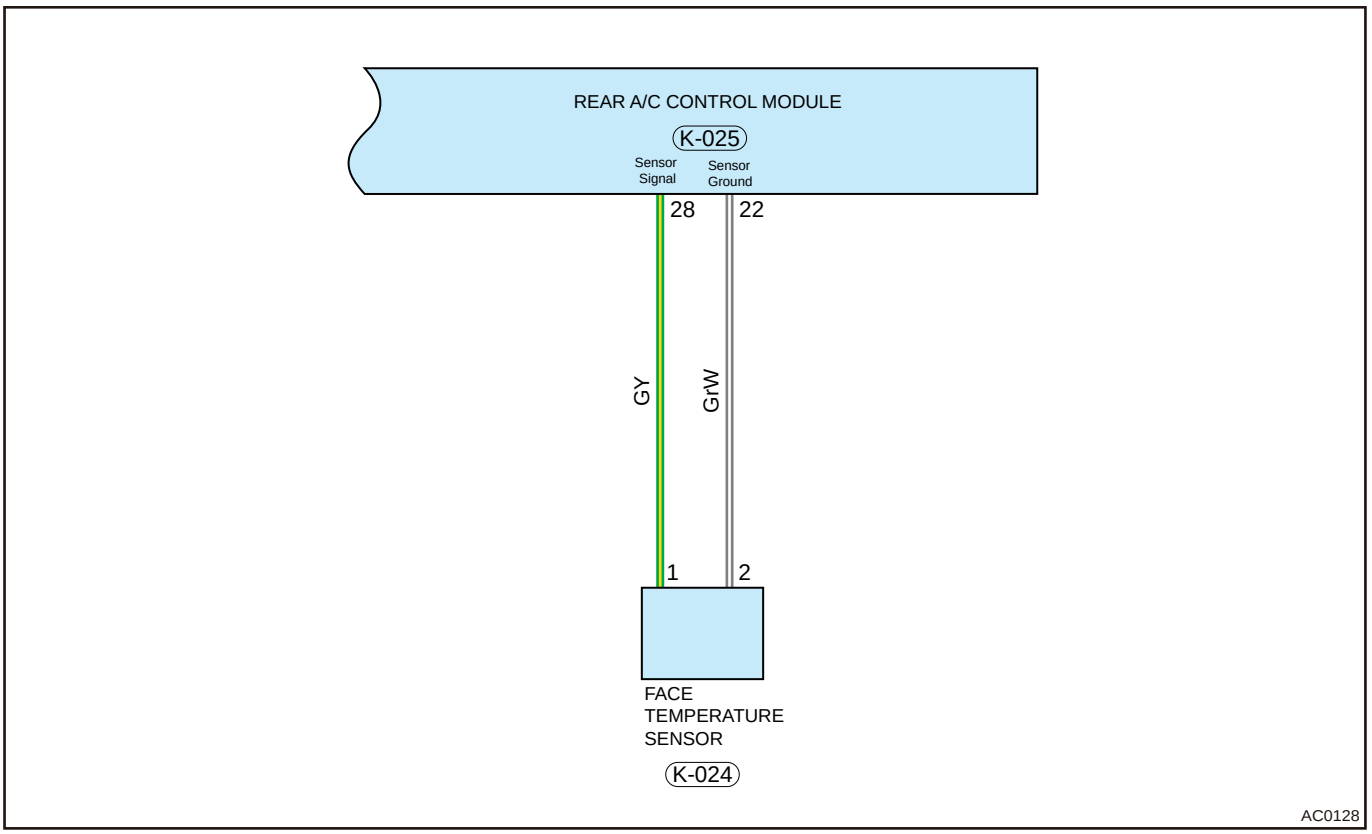
3	Check automatic A/C control module

Use circuit diagram as a guide to perform the following inspection procedures:
(a) Remove automatic A/C control module from malfunctioning vehicle.
(b) Install a new automatic A/C control module to malfunctioning vehicle.
(c) System operates normally.

■ **Face air outlet temperature sensor short to ground malfunction**

DTC	B154211	Fae Air Outlet Temperature Sensor Short to Ground

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

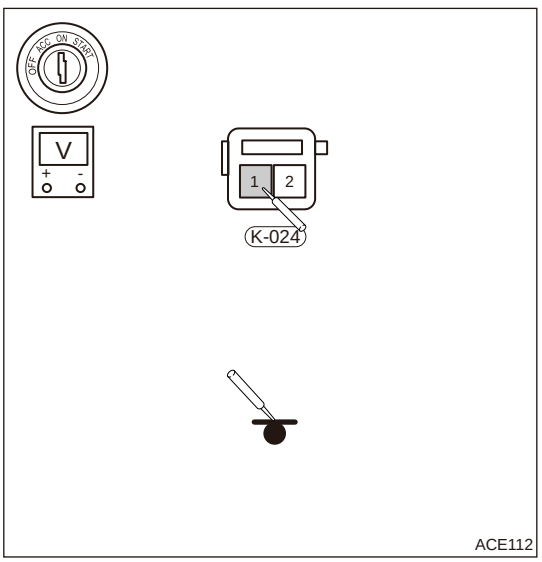
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check face air outlet temperature sensor signal voltage**

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground)

(c) and use red probe to measure the voltage of face air outlet temperature sensor signal K-024(1). Normal signal voltage changes with A/C temperature.



NG → **Check face air outlet temperature sensor wire harness or replace face air outlet temperature sensor.**

OK ↓

2	Check automatic A/C control module

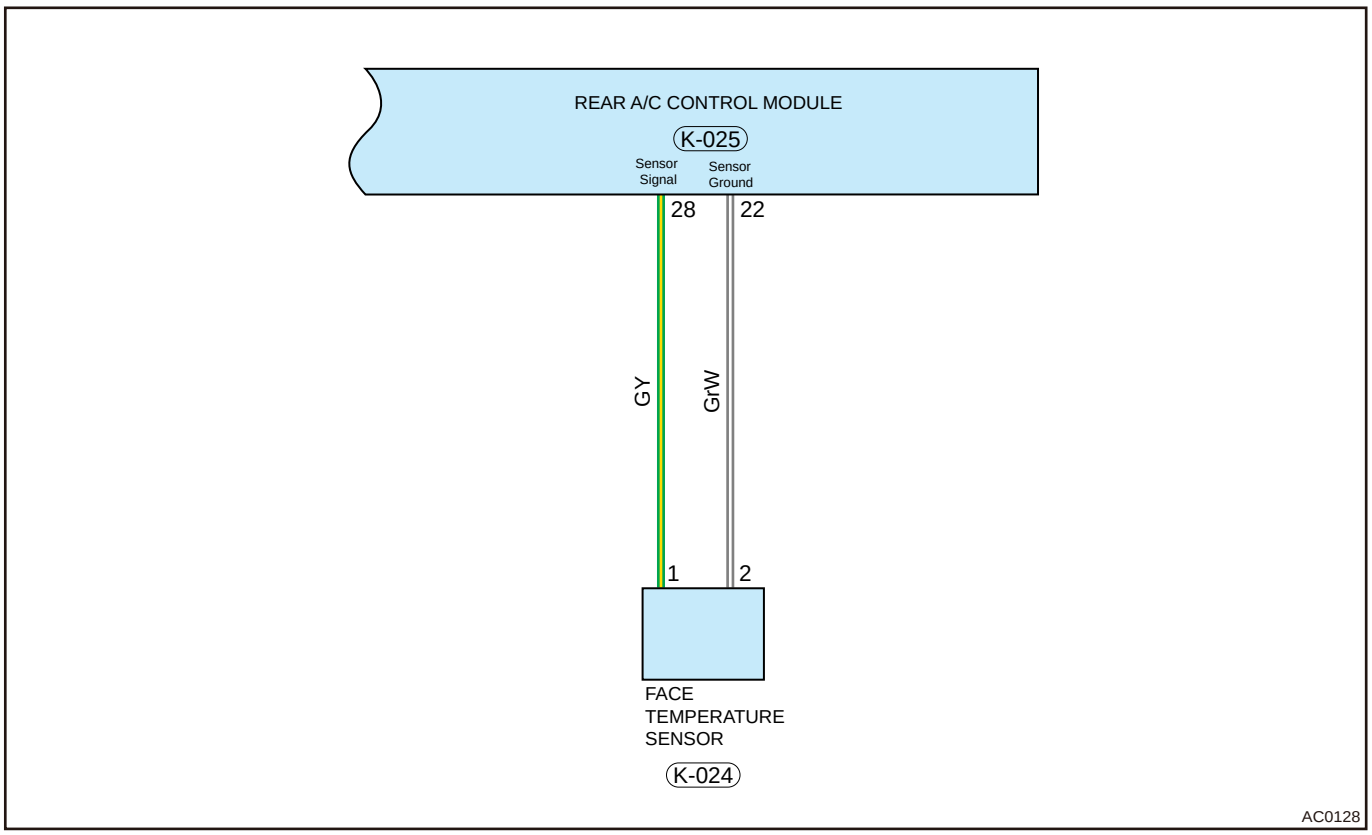
Use circuit diagram as a guide to perform the following inspection procedures:
(a) Remove automatic A/C control module from malfunctioning vehicle.
(b) Install a new automatic A/C control module to malfunctioning vehicle.
(c) System operates normally.

■ Face air outlet temperature sensor short to power supply or open malfunction

DTC	B154215	Face Air Outlet Temperature Sensor Short to Power Supply or Open

■ Description

Control schematic diagram



■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check wire harness and connector.

(a) Turn off all electrical equipment and ENGINE START STOP switch.

(b) Disconnect the negative battery cable.

(c) Check if face air outlet temperature sensor connector or lead falls off.

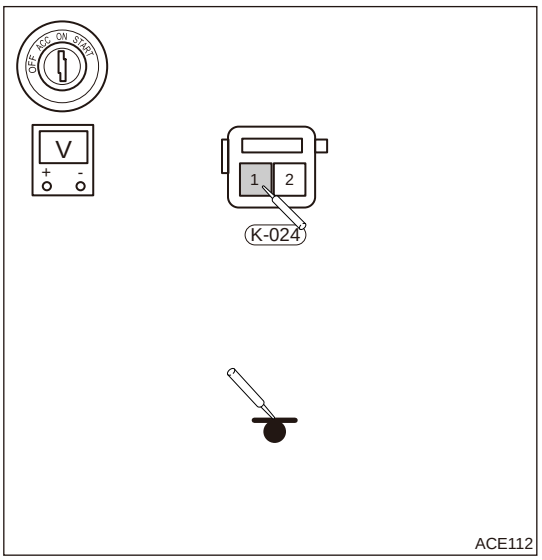
NG → **Repair or replace wire harness.**

OK →

2	Check foot air outlet temperature sensor signal voltage

(a) Turn ENGINE START STOP switch to ON, start the vehicle.

(b) Using voltage band of multimeter, connect black probe to battery negative terminal (or body ground) and use red probe to measure the voltage of foot air outlet temperature sensor signal K-024 (1). Normal signal voltage changes with A/C temperature.



NG → **Check if foot air outlet temperature sensor signal is short to power supply or replace foot air outlet temperature sensor.**

OK →

3	Check automatic A/C control module

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Remove automatic A/C control module from malfunctioning vehicle.

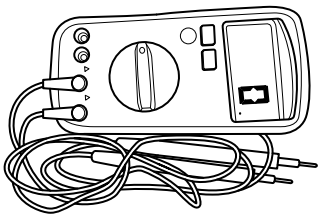
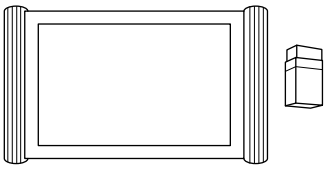
(b) Install a new automatic A/C control module to malfunctioning vehicle.

(c) System operates normally.

5 ON-VEHICLE SERVICE

5.1 Tools

■ General Tools

Tool Name	Tool Drawing
Digital Multimeter	 AC0000
Diagnostic Tester	 AC0002

5.2 Removal of A/C Control Module

■ Removal

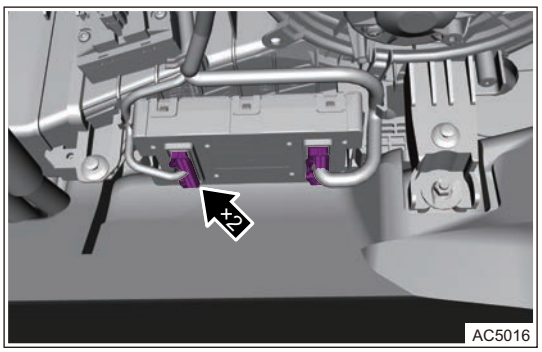
(1) Turn off all electrical equipment and the ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the automatic A/C control module.

1) Disconnect the automatic A/C control module connector.

2) Loosen 2 fixing clips (arrow) and remove automatic A/C control module.



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■ Installation

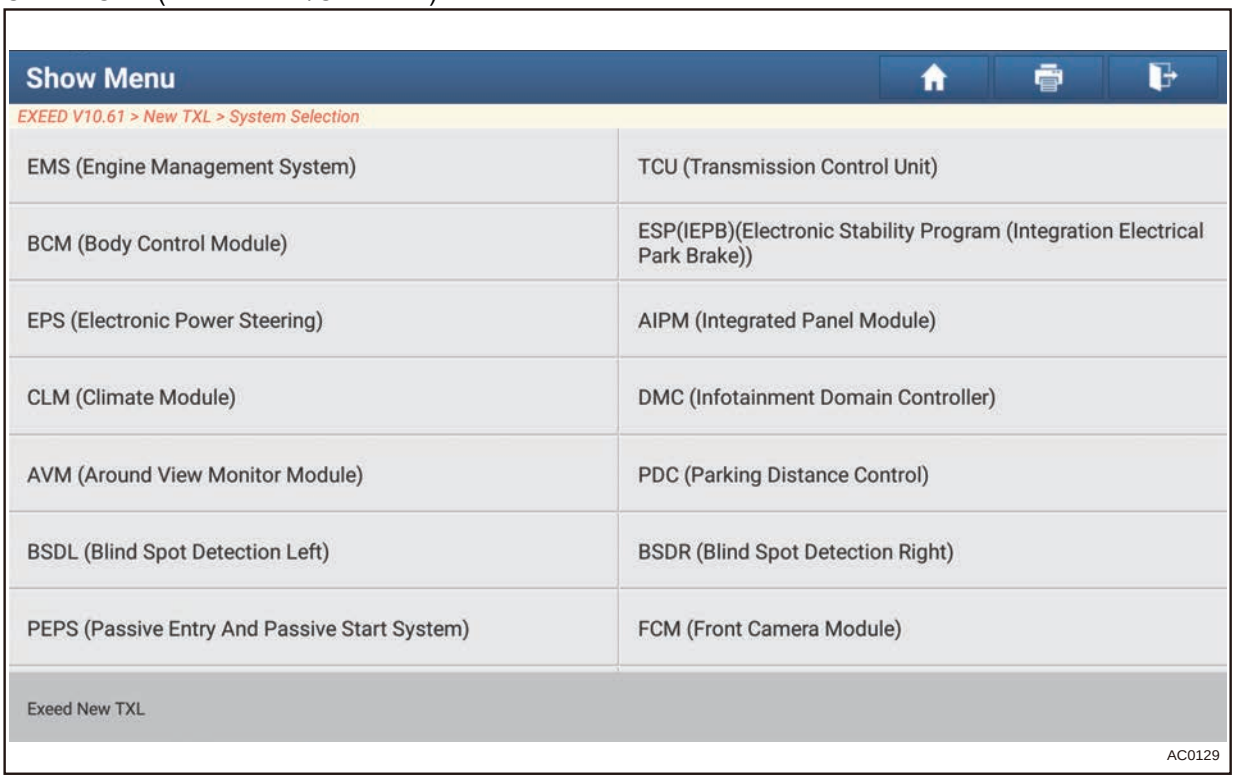
(1) Installation is in the reverse order of removal.

■ Write automatic A/C module (CLM) configuration data

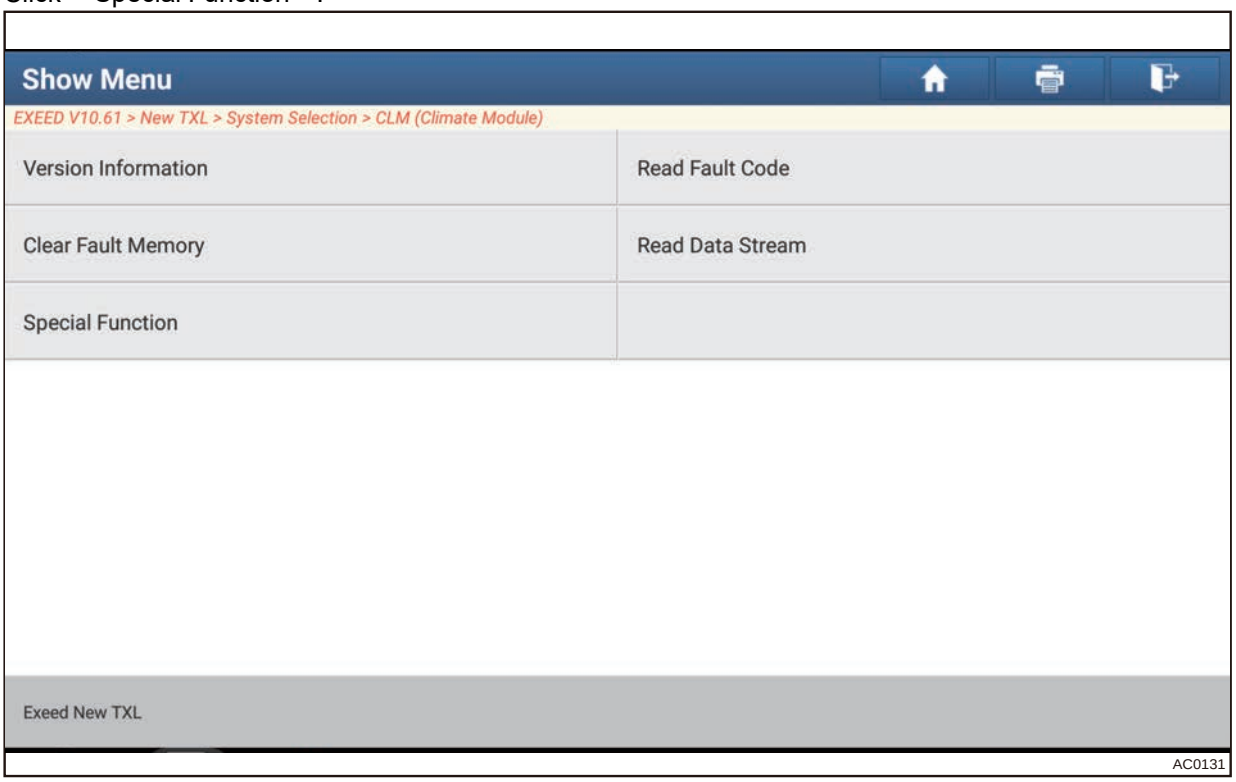
(1) Store the configuration data.

(2) Connect the diagnostic tester, turn ENGINE START STOP switch to ON and select “EXEED New TXL” model.

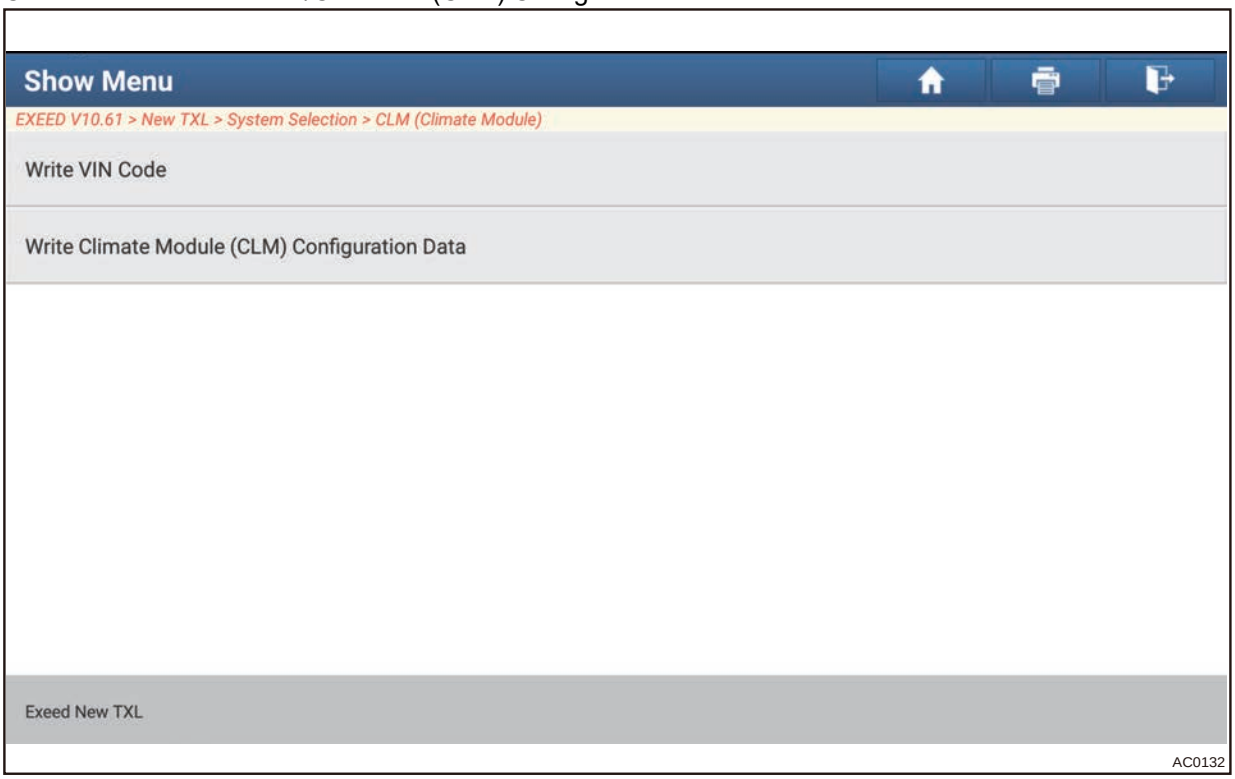
(3) Click “CLM (Automatic A/C Module)”.



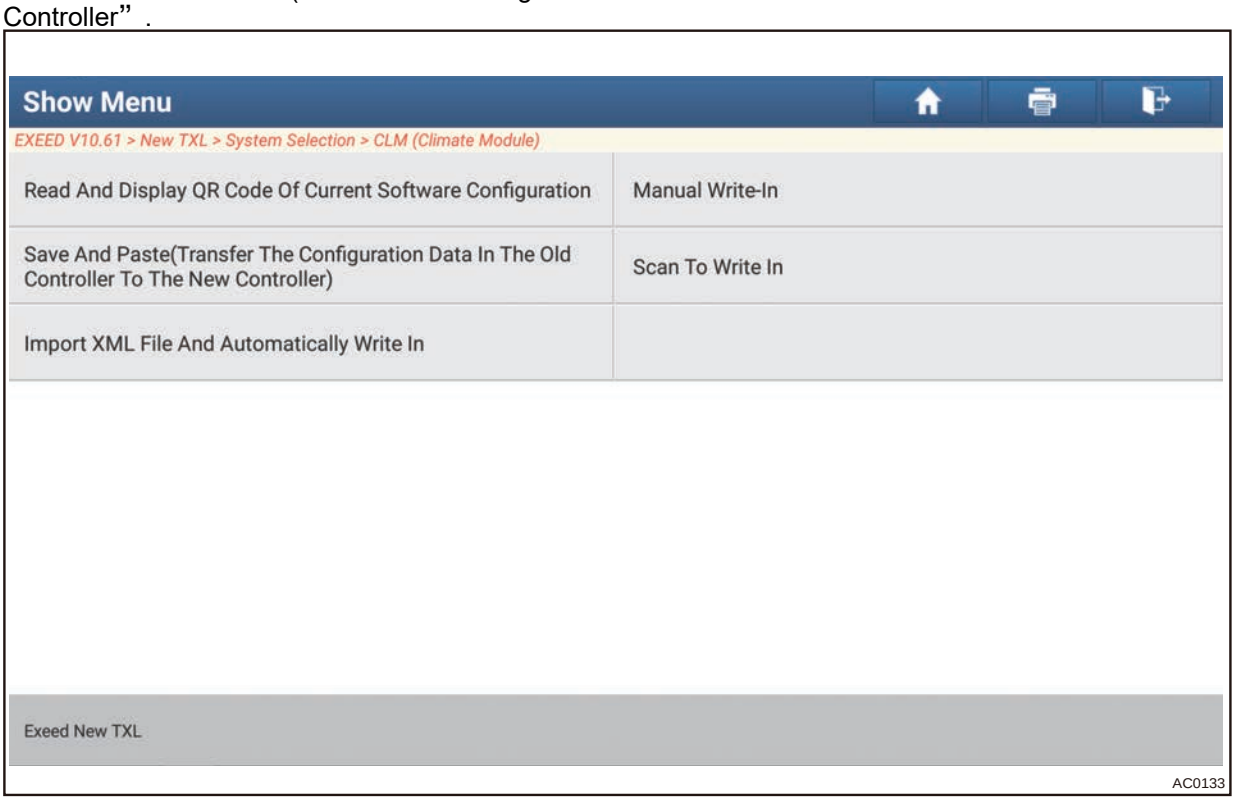
(4) Click “Special Function”.



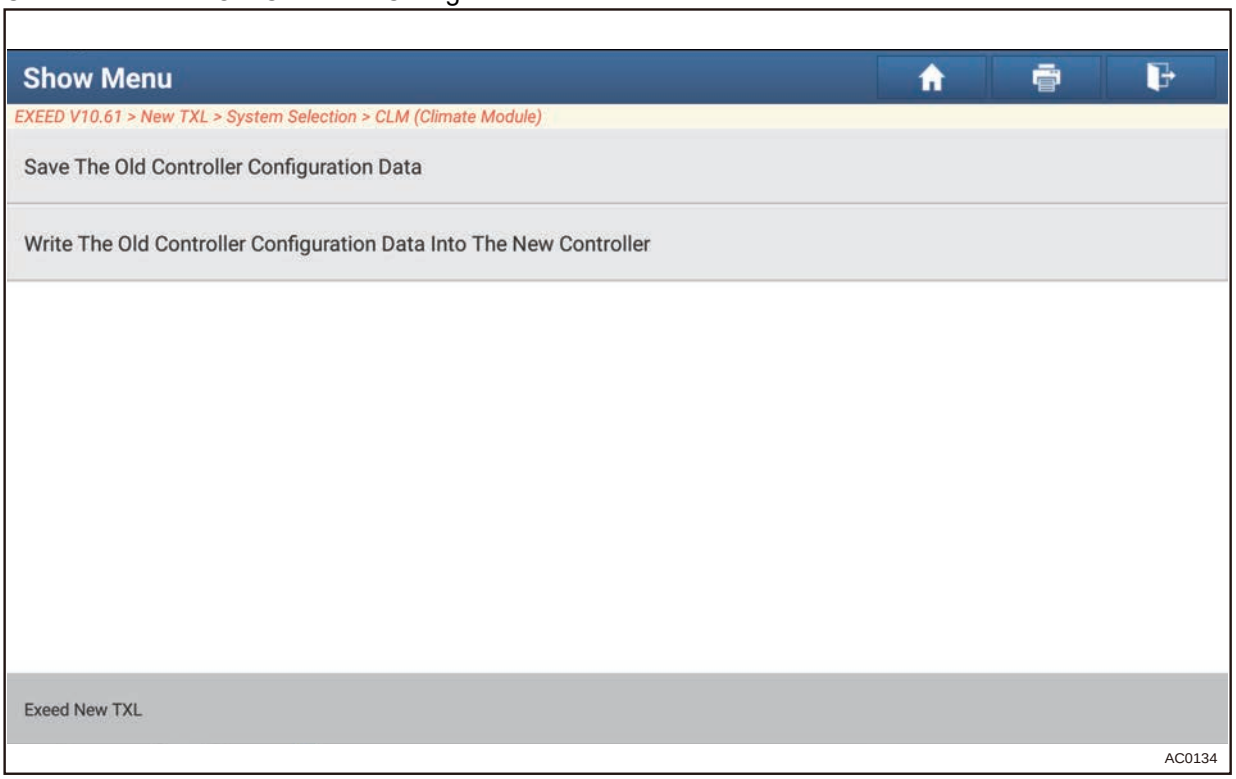
(5) Click “Write Automatic A/C Module (CLM) Configuration Data”.



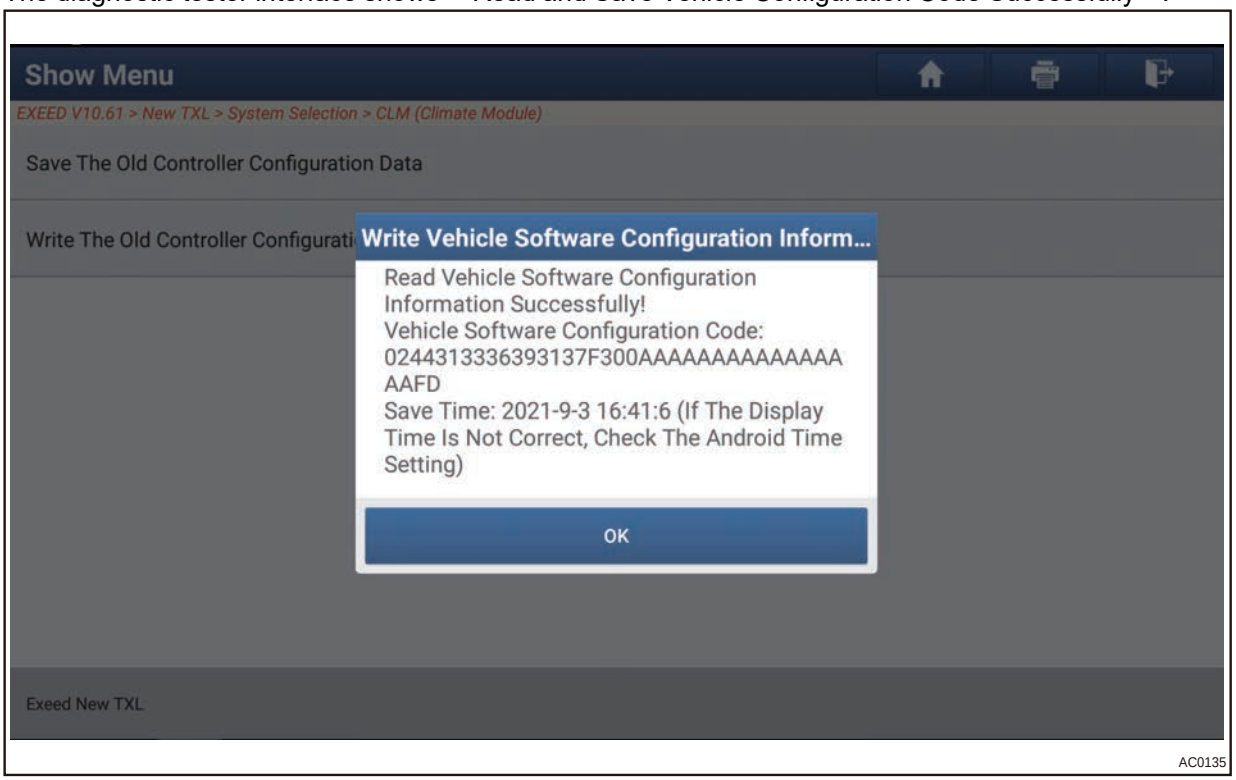
(6) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



(7) Click “Save The Old Controller Configuration Data”.



(8) The diagnostic tester interface shows “Read and Save Vehicle Configuration Code Successfully”.



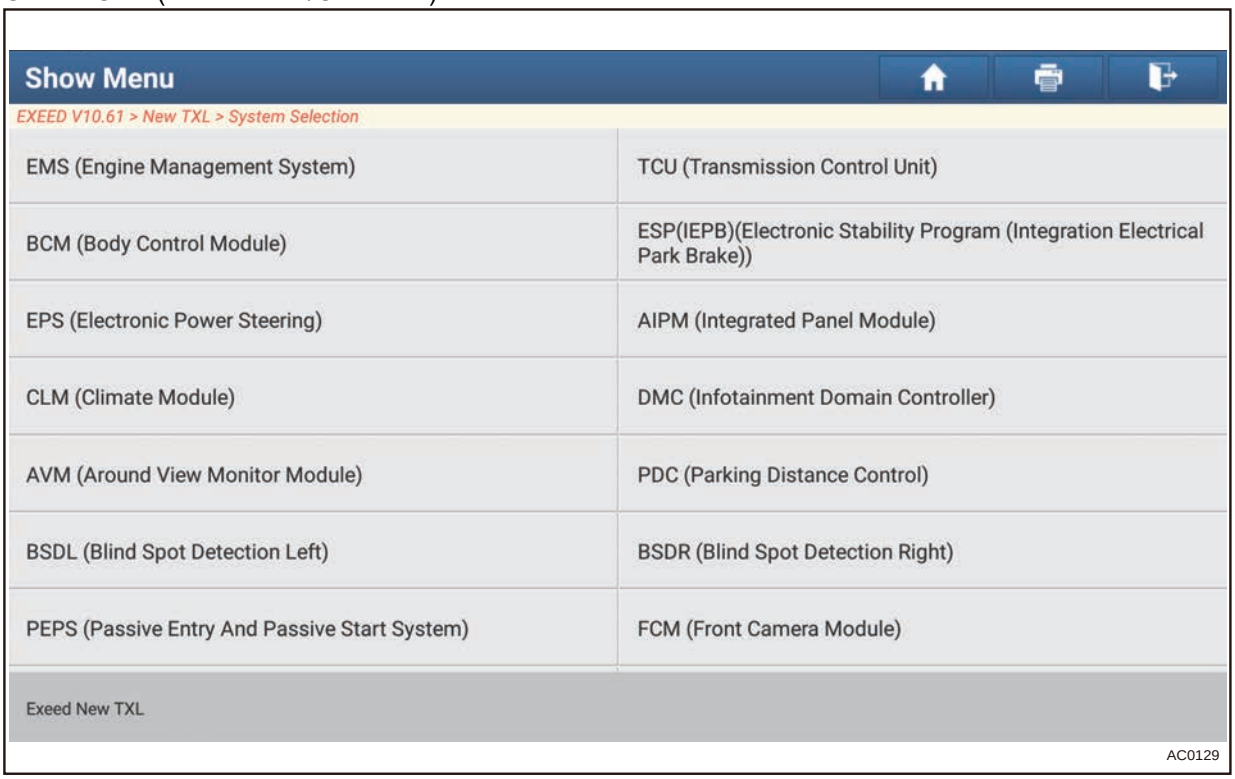
Click “OK” to return.

⚠ Caution

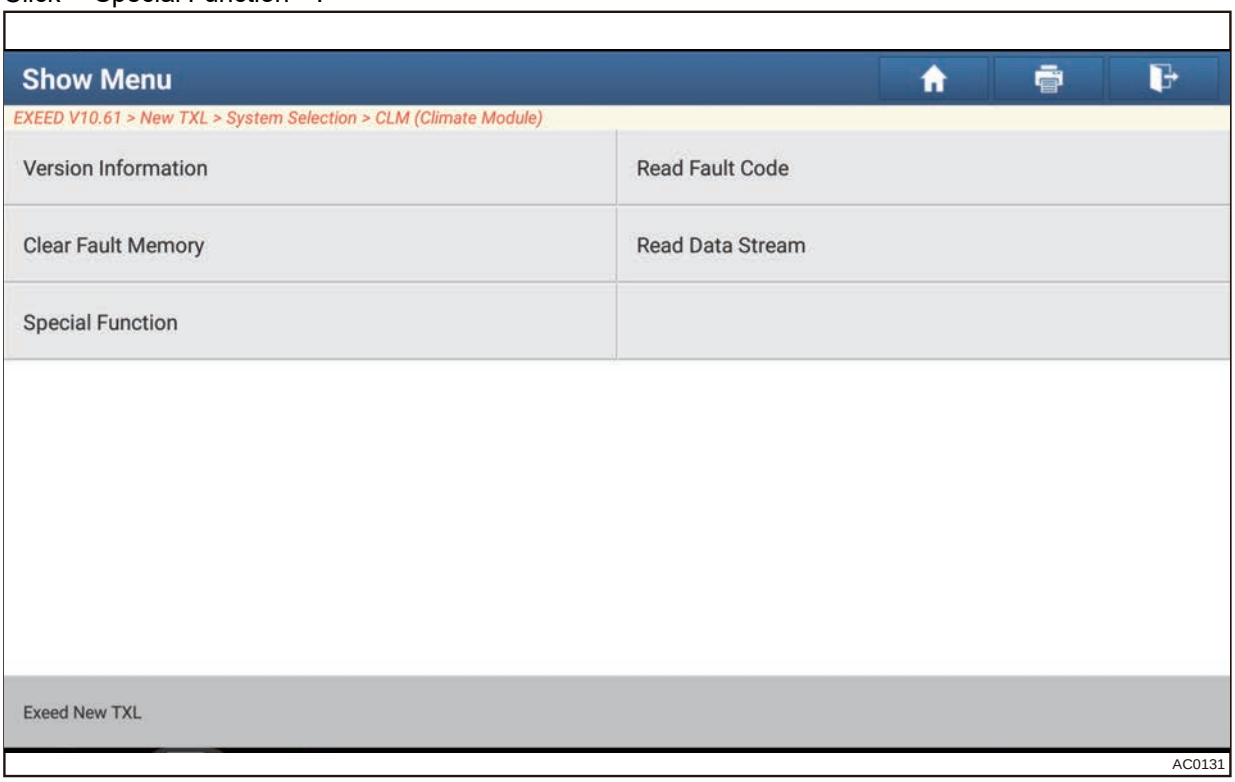
If module is damaged, the configuration code of module can be applied to the company by DMS system when it can not be read out with diagnostic tester.

(9) Write automatic A/C module (CLM) configuration data.

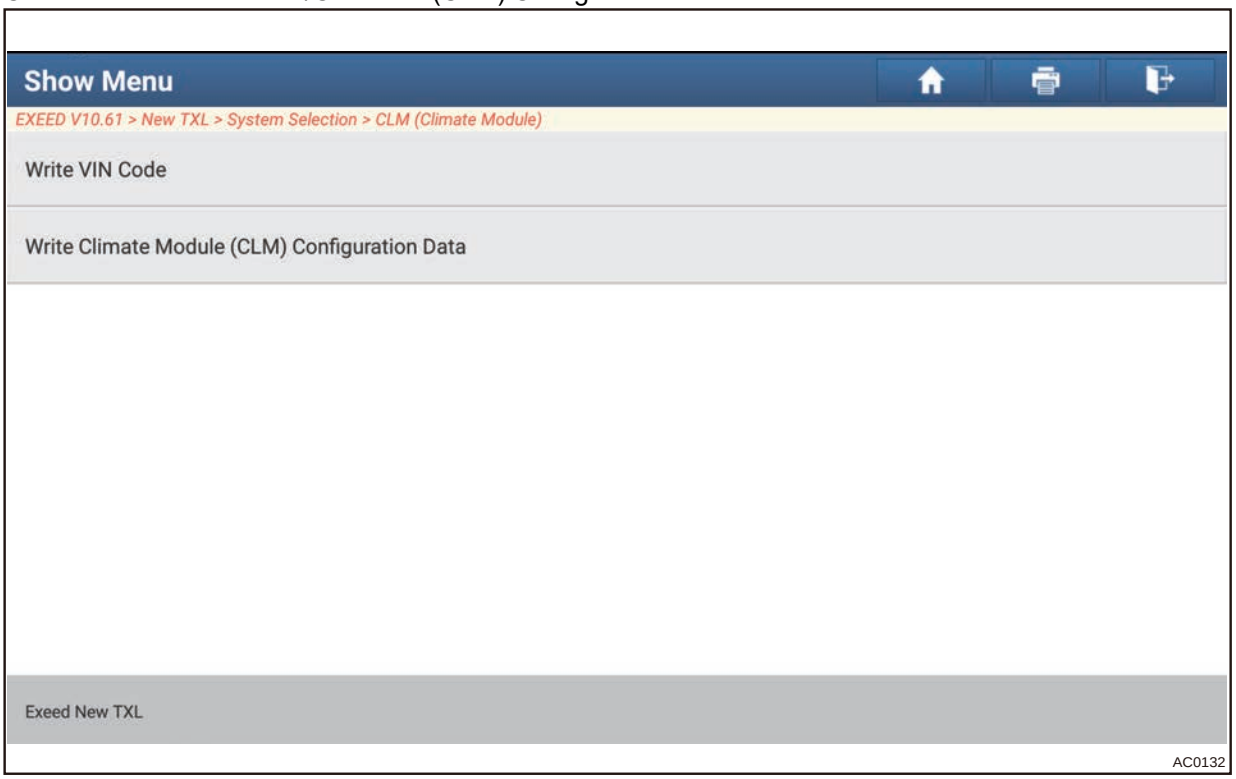
(10) Click “CLM (Automatic A/C Module)”.



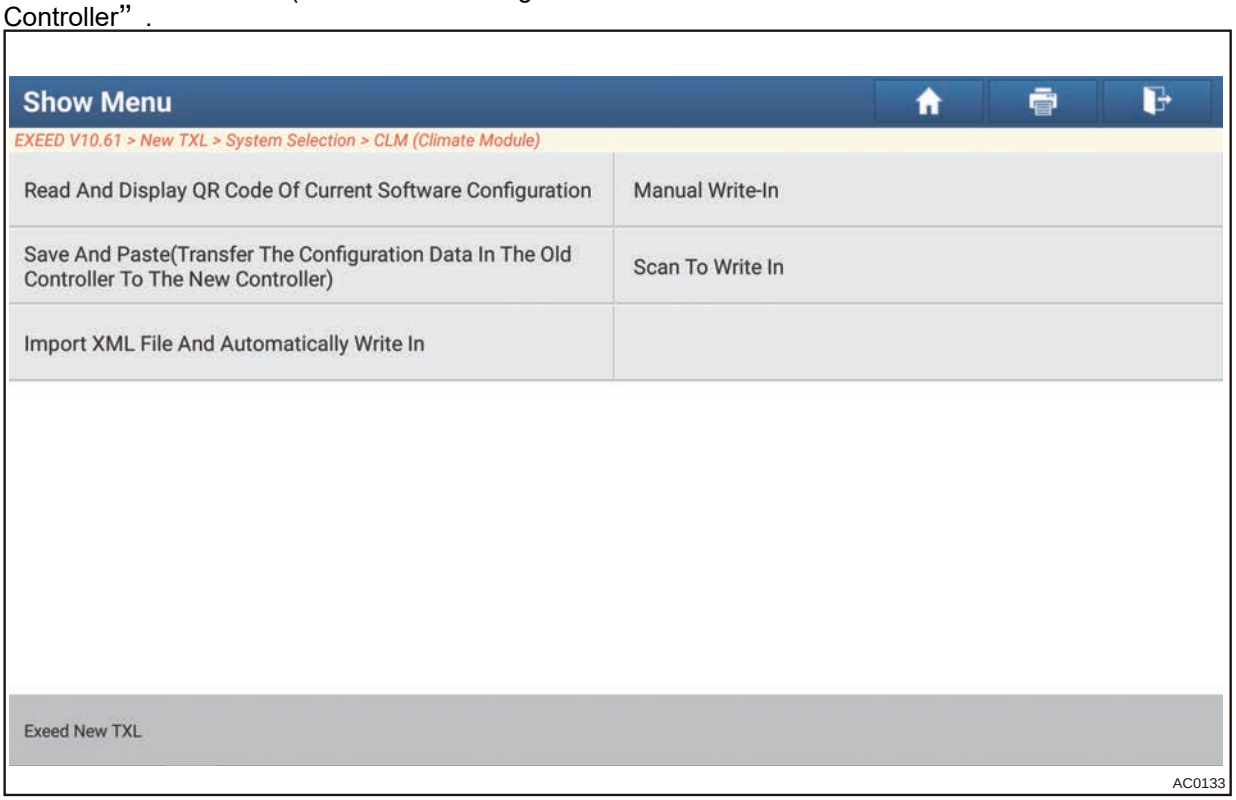
(11) Click “Special Function”.



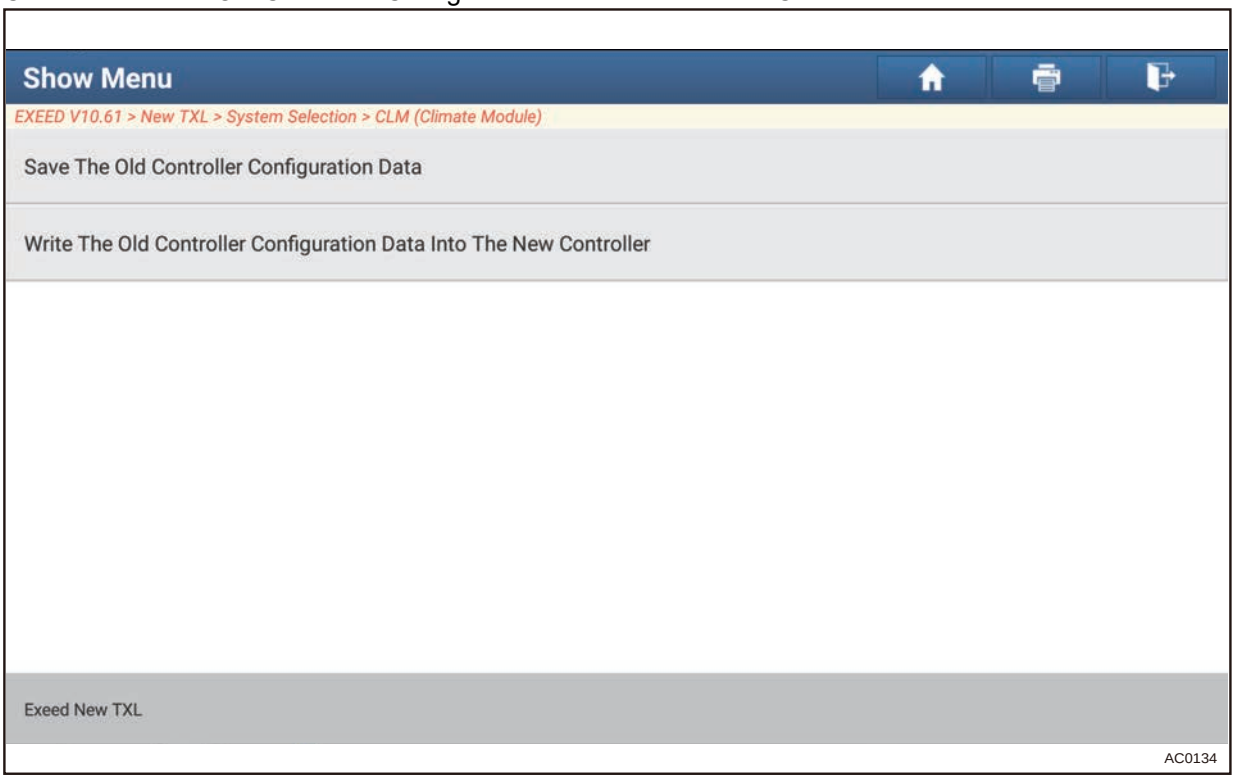
(12) Click “Write Automatic A/C Module (CLM) Configuration Data”.



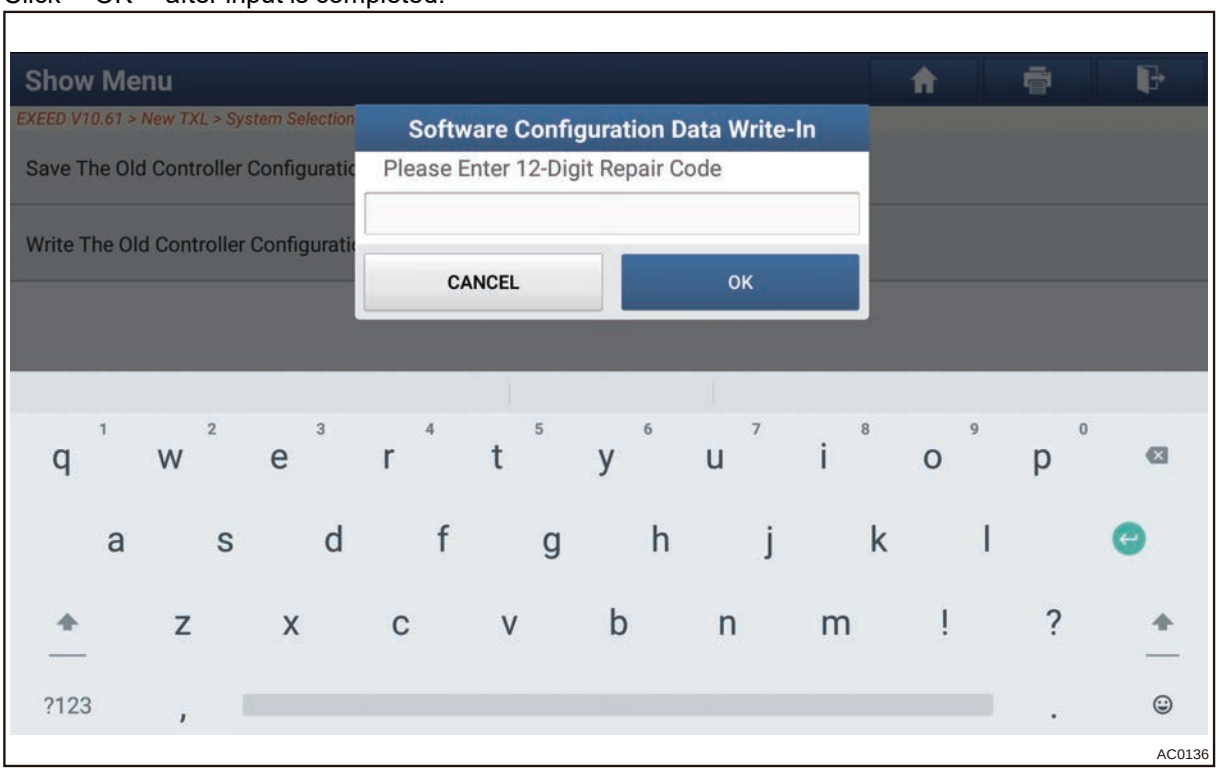
(13) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



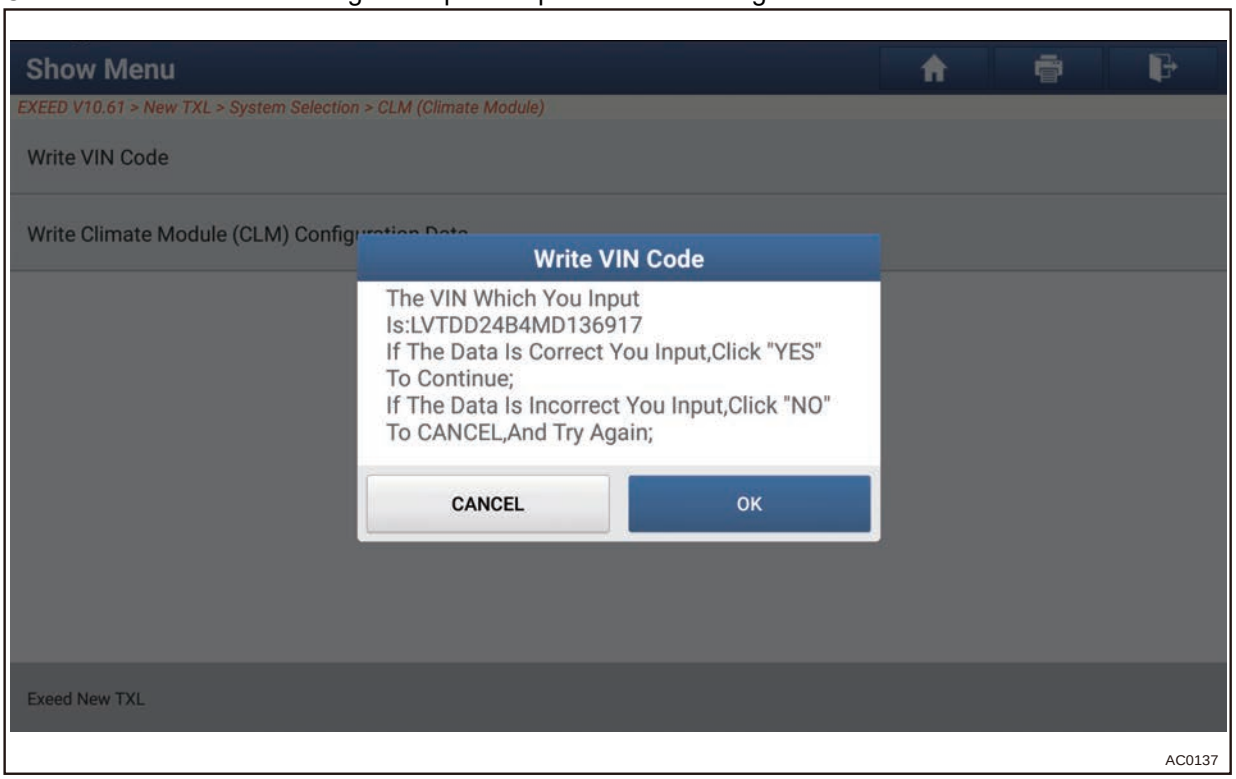
(14) Click “Write The Old Controller Configuration Data Into The New Controller”.



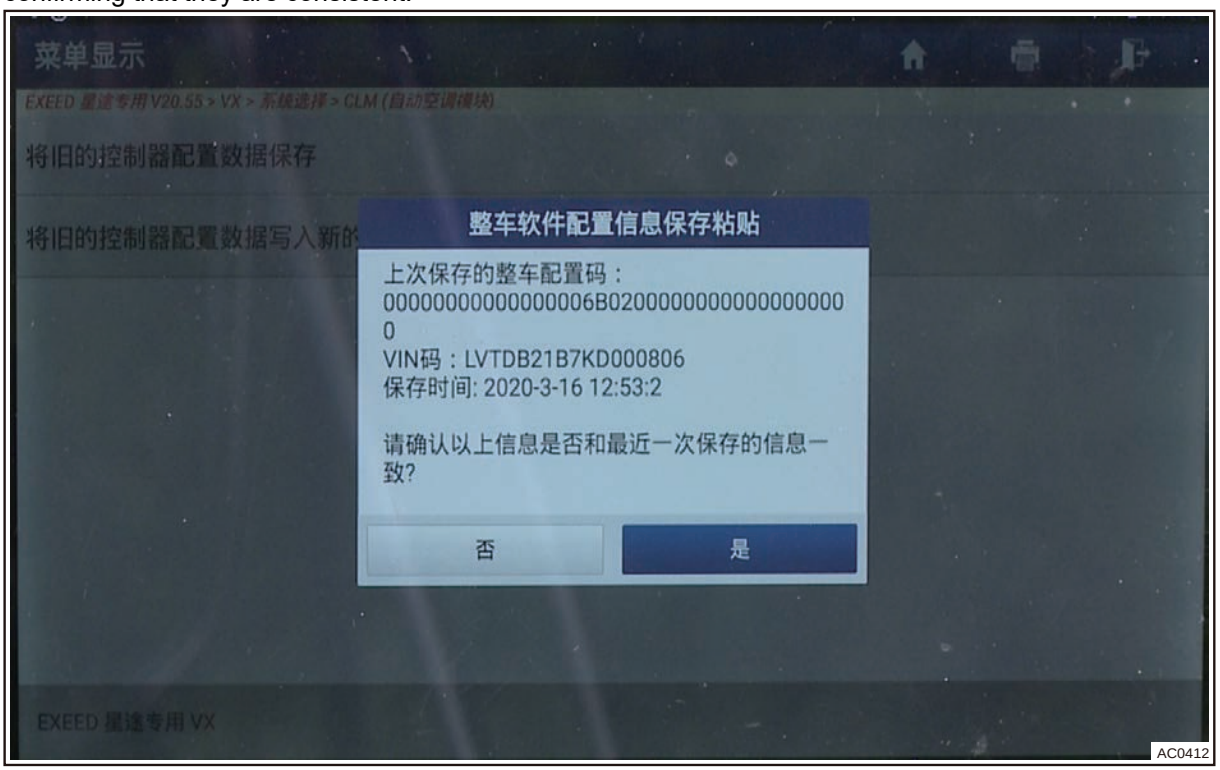
(15) The diagnostic tester interface shows “Enter 12-digit Repair Shop Code”.
Click “OK” after input is completed.



(16) Click “YES” after confirming that repair shop code is correct again.

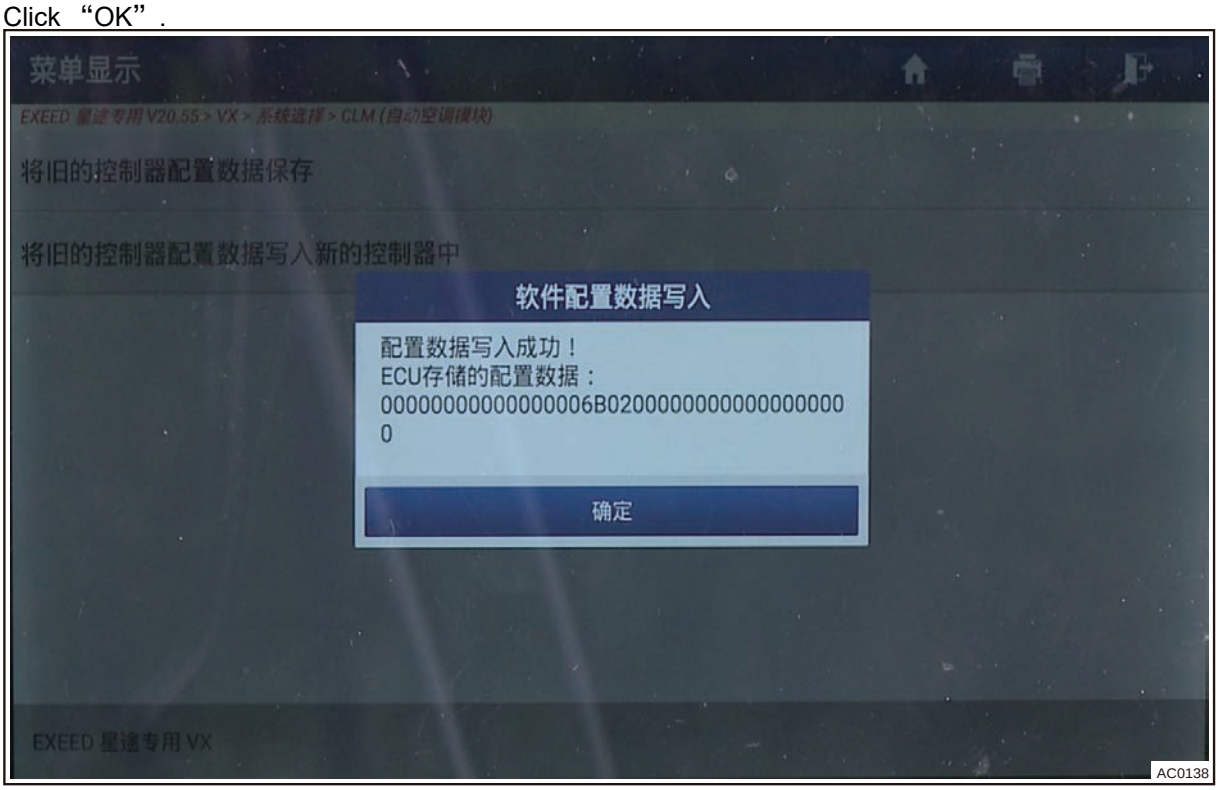


(17) The diagnostic tester interface shows “Saved Vehicle Configuration Code Last Time”. Click "Yes" after confirming that they are consistent.

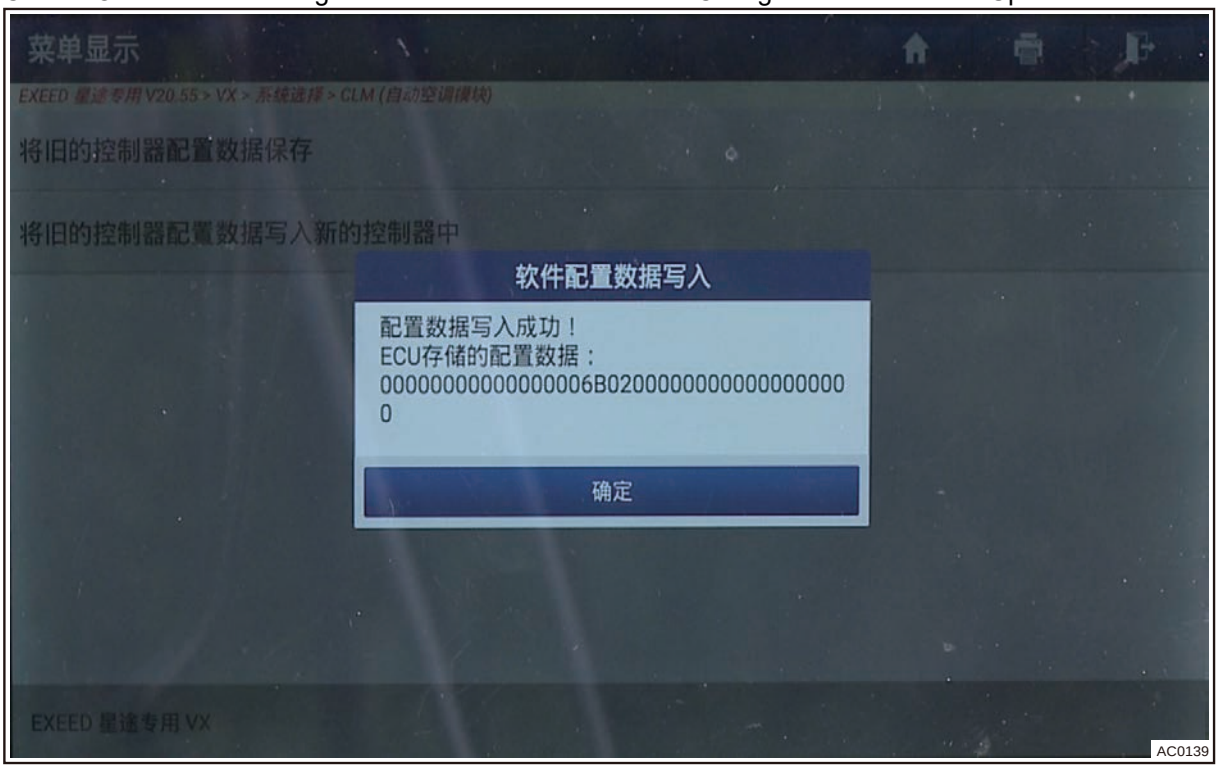


(18) The diagnostic tester interface shows “Write Configuration Data Successfully”.

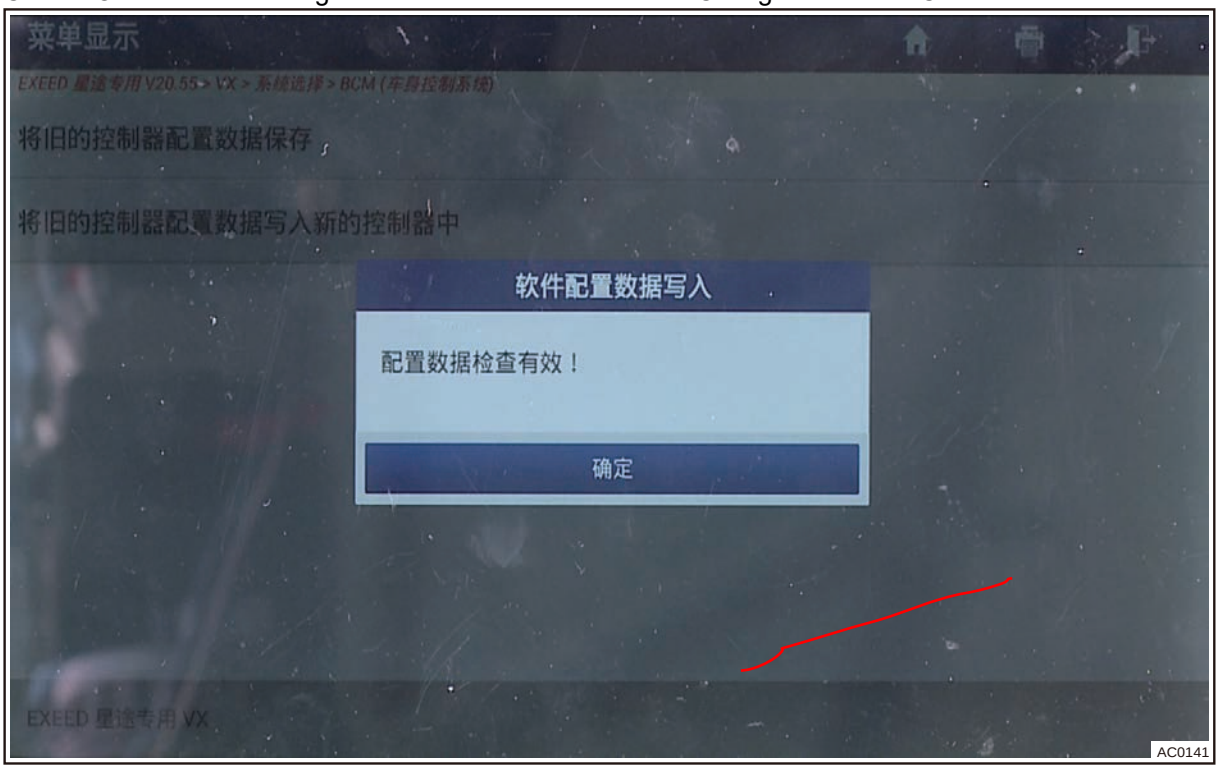
Click “OK”.



(19) Click “OK” when the diagnostic tester interface shows “Configuration Data Back Up is Successful".



(20) Click “OK” when the diagnostic tester interface shows “Configuration data Check is Valid".



⚠ Caution

- **The first 5 digits of repair shop code are the dealer code (ERP), and the last 7 digits can be entered at will.**
- **The correct vehicle configuration code must be entered, otherwise the normal functions of the vehicle will be affected, so please check again after entering it.**

5.3 Replacement of A/C control panel

■ Removal

Refer to Auxiliary Fascia Console.

■ Installation

Refer to Auxiliary Fascia Console.

⚠ Caution

- **When replacing the A/C control panel, it is not necessary to write VIN. A/C control panel does not have a coding configuration function. The software can be refreshed with the diagnostic tester.**

9.2 A/C COOLING

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Take extra care when servicing A/C system under high pressure.

(2) Because there is refrigerant under high pressure in A/C system. It must be serviced by professional technician. Otherwise, a wrong service procedure may cause a serious danger or fatal injury.

(3) If A/C system pressure is released unexpectedly, ventilate work area before servicing. In a closed work place, if a large amount of refrigerant is discharged, it may cause oxygen reduction and result in smothering, causing a serious or fatal injury.

(4) Never drain refrigerant in A/C system into the atmosphere directly, and avoid environmental contamination.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Special service equipment for R134a refrigerant must be used to recover/charge refrigerant.

(2) Disconnected A/C line and connecting part should be sealed to prevent foreign matter from entering.

2 System Overview

2.1 System Description

This model adopts an integrated heating and cooling air conditioning, which way with external control variable displacement compressor + expansion valve control method, and uses environment-friendly refrigerant R134a. This system consists of basic components: compressor, condenser, HVAC, lines, AIPM (Front A/C Control Panel), CLM (A/C Control Module), CLMR (Rear A/C Control Module), CCPR (Rear A/C control Panel, Not Equipped with Low Configuration Model) as well as other accessories such as pressure switch, O-ring, etc.

■ **Refrigerant Charging Specification**

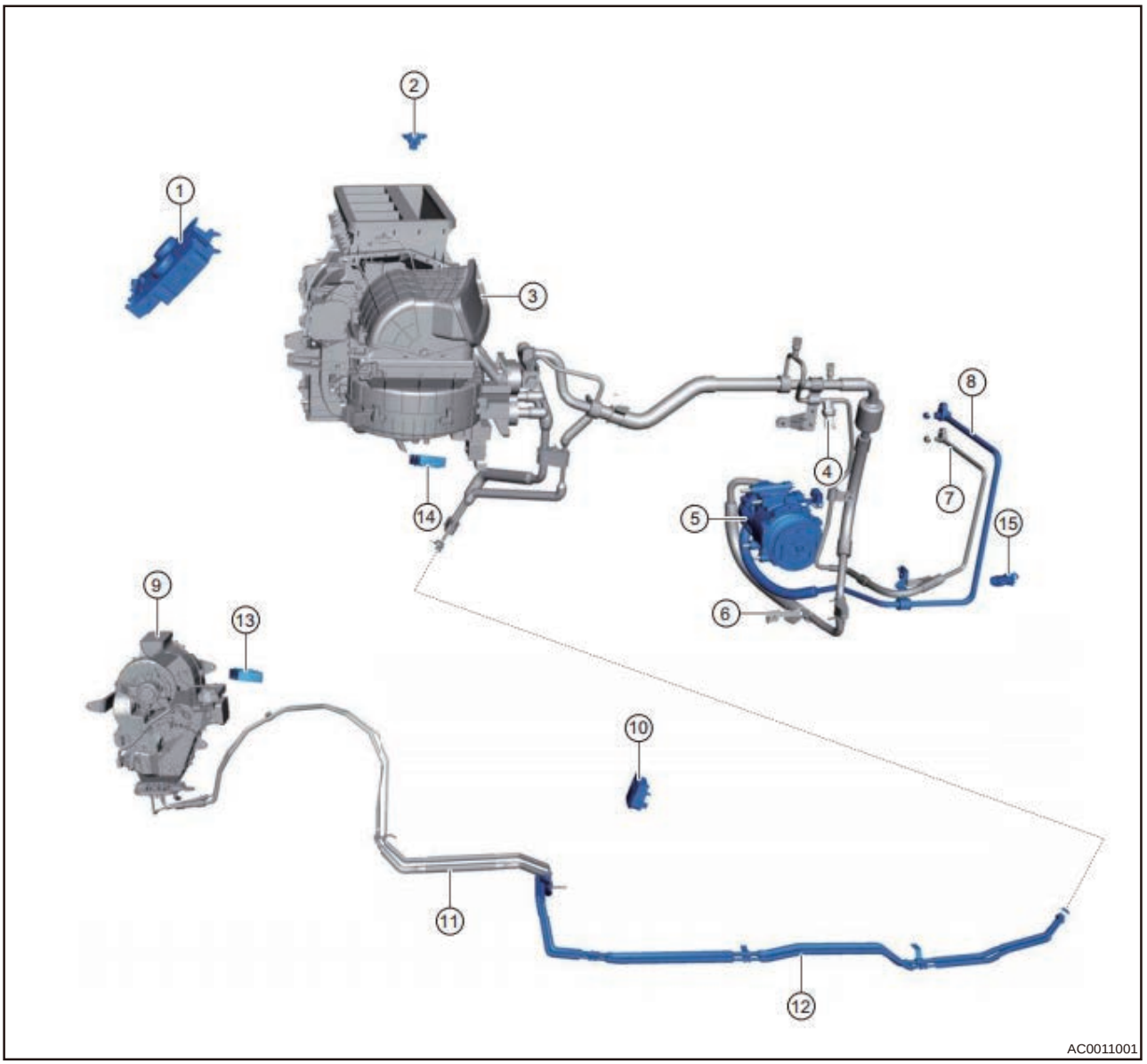
Refrigerant Type	Charging Capacity (g)
R134a refrigerant	950 ± 10

■ **Refrigerant Oil Charging Specifications**

Refrigerant Oil Type	Charging Capacity (ml)
PAG	150

Hint:
Newly installed air conditioning system refrigeration oil does not need to be refilled. Refill when repairing a part or after driving a certain distance. The reference quantity of oil to be added when replacing parts: Evaporator, condenser, rear evaporator: 30ml each; Line: 10ml; Rear evaporator line: 10ml.

2.2 System Components Diagram

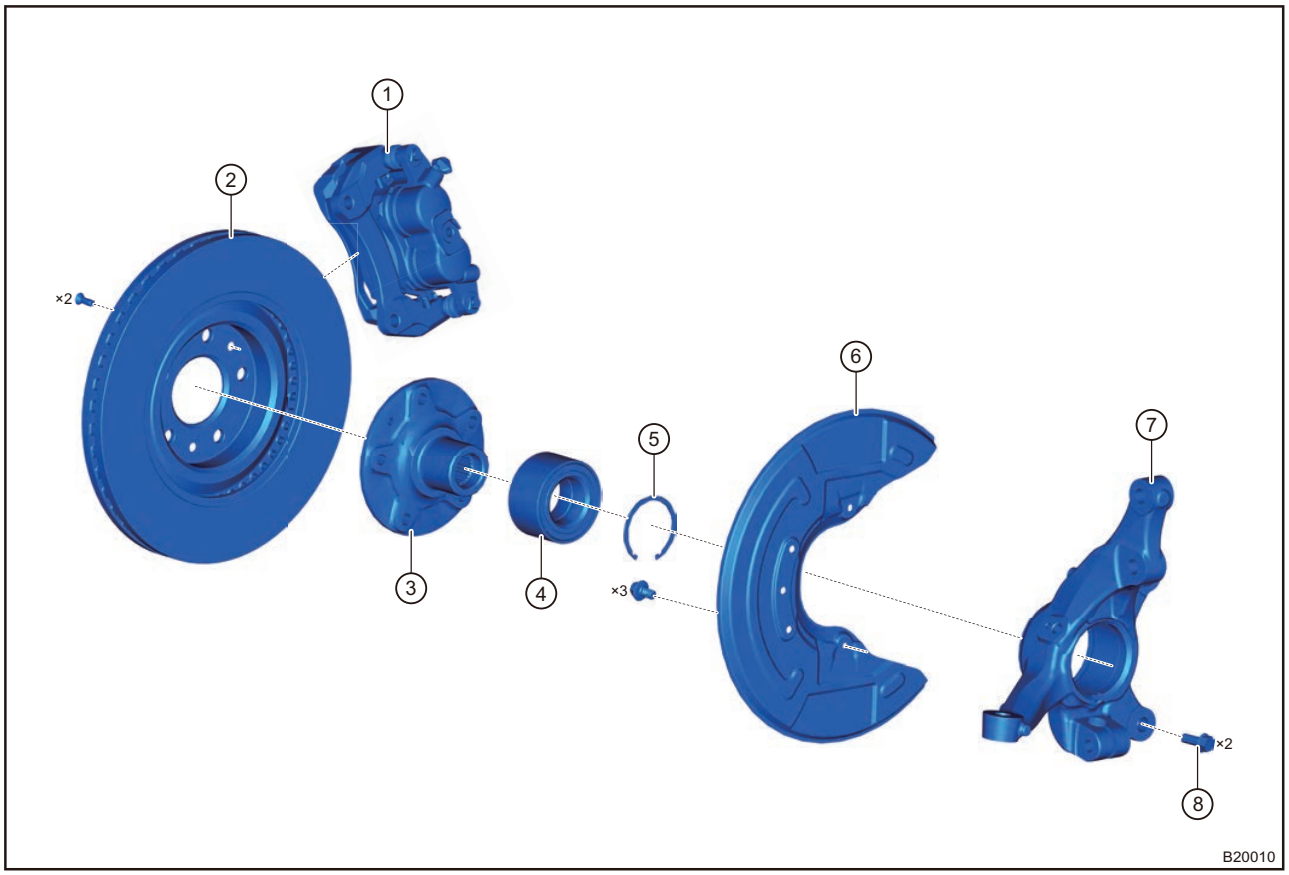


1	Auto A/C Control Panel Assembly	9	Rear HVAC Assembly Single Refrigeration
2	Solar Sensor Assembly	10	Rear A/C Control Panel Assembly
3	Auto Double Zone A/C HVAC Assembly	11	Condenser to Rear Evaporator Line Assembly II
4	A/C Pressure Sensor	12	Condenser to Rear Evaporator Line Assembly I
5	A/C Compressor Assembly	13	CLMR (Rear A/C Control Module)
6	Evaporator to Compressor Line Assembly	14	CLM (A/C Control Module)
7	A/C Coaxial Line Assembly	15	Ambient Temperature Sensor
8	Compressor to Condenser Line Assembly		

CHERY M36T+1.6TGDI model adopts an integrated heating and cooling air conditioning, which way with external control variable displacement compressor + expansion valve control method, and uses environment-

friendly refrigerant R134a. This system consists of basic components: compressor, condenser, HVAC, lines, AIPM (Front A/C Control Panel), CLM (A/C Control Module), CLMR (Rear A/C Control Module), CCPR (Rear A/C control Panel, Not Equipped with Low Configuration Model) as well as other accessories such as pressure switch, O-ring, etc.

2.3 System Schematic Diagram



(1) A/C cooling system of vehicle is mainly composed of compressor, expansion valve, condenser, evaporator and blower. The various components are connected by high pressure rubber pipes and steel pipes to form a closed system. When the refrigeration system is operating, the refrigerant circulates in this space in different states. And this cycle is divided into four processes:

1) Compression process: The compressor sucks the low temperature/pressure refrigerant gas at the outlet of evaporator, then compresses it to high temperature/pressure gas and discharges it from compressor.

2) Cooling process: High temperature/pressure superheated refrigerant gas enters the condenser. Due to the decrease in pressure and temperature, the refrigerant gas condenses into liquid and discharges a large amount of heat.

3) Throttling process: The refrigerant liquid with higher temperature and pressure becomes larger after passing through the expansion device, the pressure and temperature drop sharply, and it is discharged from expansion device with mist (small droplets).

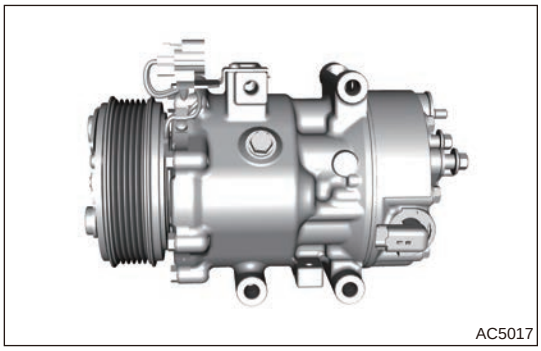
4) Heat absorption process: The mist refrigerant liquid enters the evaporator. At this time, the boiling point of the refrigerant is much lower than the temperature in the evaporator, so the refrigerant liquid evaporates into gas. In the evaporation process, a large amount of surrounding heat is absorbed, and then the low temperature/pressure refrigerant vapor enters the compressor again. The above process is operated cyclically, so as to achieve the purpose of reducing the air temperature around the evaporator.

2.4 Component Operation Description

■ A/C Compressor

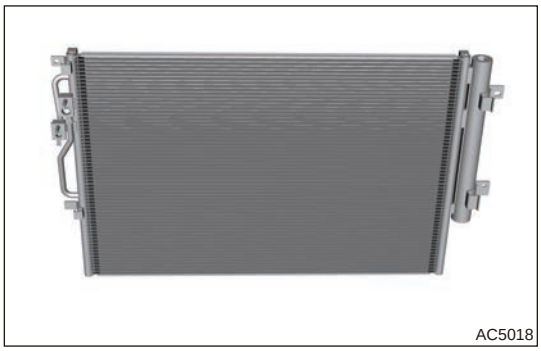
Compressor is an important element of refrigeration system. It compresses the low temperature/pressure refrigerant vapor from evaporator and makes it become high temperature/pressure refrigerant vapor.

M36T model uses a variable capacity compressor. When refrigeration system is operating, the electromagnetic clutch of variable capacity compressor is always in the engaged status. It can change the piston displacement continuously and steadily within a certain range by external control valve according to the change of refrigeration load and engine speed, so as to realize the regulation of system flow.


AC5017

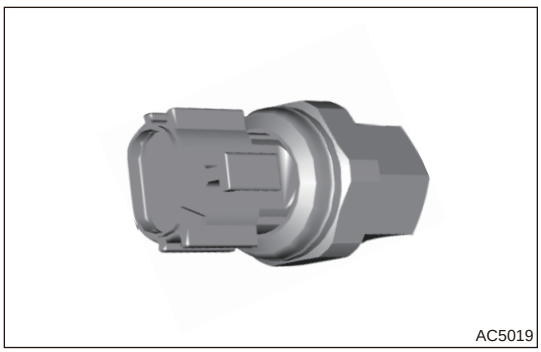
■ Condenser

Condenser contains desiccant that is used to remove water from the refrigerant in line. Compressor compresses the refrigerant into high temperature/pressure refrigerant gas, which is then discharged into the condenser, in which heat is released to the cooling medium air and condensed into high pressure liquid.


AC5018

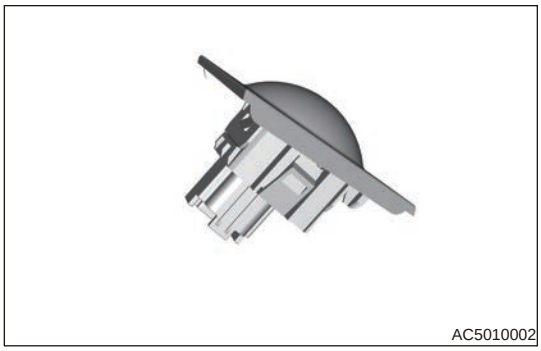
■ A/C Pressure Sensor

A/C pressure sensor is installed on high pressure pipe and used to monitor the refrigerant pressure and output the refrigerant pressure signal to ECM. ECM controls compressor based on the signal transmitted from A/C pressure sensor.


AC5019

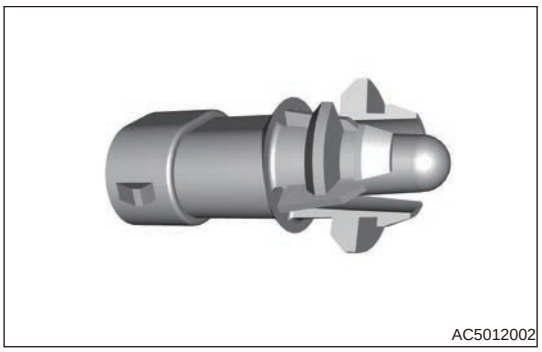
■ Solar Sensor

Solar sensor is installed on instrument panel and used to detect light intensity in the area where the vehicle is located and control the automatic mode of air conditioning.


AC5010002

■ Ambient Temperature Sensor

Ambient temperature sensor is installed at lower left of front impact beam and used to detect the ambient temperature and control the automatic mode of air conditioning. The sensor sends signal to automatic A/C module. The resistance of ambient temperature sensor changes with the change of ambient temperature. Resistance increases as temperature decreases. Resistance decreases as temperature increases.

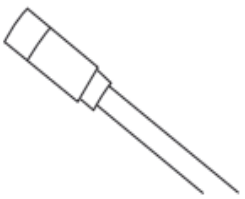

AC5012002

■ Evaporator

The function of evaporator is to boil and vaporize the low temperature/pressure liquid refrigerant in the evaporator line after throttling and depressurization. Absorb the heat of the air around evaporator surface to cool down. Then fan blows the cold air into the cabin to achieve the purpose of cooling down. At the same time, it can dehumidify the air. There are condensed water droplets discharged from the outlet pipe under the evaporator.

3 Tools

3.1 General Tools

Tool Name	Tool Drawing
Refrigerant Recycling Machine	 AC4010
Refrigerant Recycling Machine	 AC4011

4 On-Vehicle Service

4.1 Inspection

■ On-Vehicle Inspection

- A/C refrigerant lines and hoses are used to transfer refrigerant among A/C system components. Any twist or bend in refrigerant lines and hoses will reduce performance of A/C system and refrigerant flow in system.

- There remains high pressure in refrigerant when A/C compressor assembly is operating. It is necessary to ensure that each connecting part in A/C system is sealed well. Check all system lines at least once a year to ensure that they are in good condition and properly routed. Refrigerant lines and hoses cannot be repaired and must be replaced if leakage or damage exists.

■ General Inspection

- Check if there exists any oil or dust in each joint of A/C line. If this occurs, there may exist leak.
- Check if condenser surface is dirty and if fins are deformed.
- Check if there are harsh noises while compressor assembly is operating normally.
- Temperature difference should be noticeable by touching intake line and exhaust line of compressor assembly with hand. Normally, temperature of low pressure line is relatively low and that of high pressure line is relatively hot. Feel the temperature difference between condenser inlet pipe and outlet pipe, under normal conditions, temperature of inlet pipe is higher than that of outlet pipe. If you feel the temperature difference between expansion valve inlet and outlet line with hand, under normal conditions, temperature of expansion valve inlet line is relatively hot and that of outlet line is relatively cool, and the temperature difference between them is noticeable.

■ Using pressure gauge set, check the refrigerant pressure.

Connect pressure gauge set. After following conditions are met, read pressure values on pressure gauge.
Measurement Condition:

- Inner/outer circulation switch is in outer circulation position.
- Engine runs at approximately 2000 rpm.
- Adjust temperature knob to Max. Cool.
- Set blower speed control switch to highest band.
- Turn on A/C switch.

Hint:
Observe the pressure value on pressure gauge, under normal condition, low pressure is 0.15-0.20 Mpa, high pressure is 1.3-1.7 Mpa.

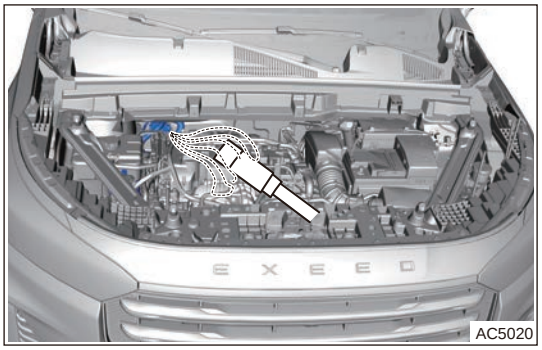
■ Refrigerant Leakage Inspection

⚠ Warning

- **DO NOT perform a pressure test or a leakage test to R134a service device or vehicle A/C system with compressed air. Mixture of air and R134a is inflammable at high pressure. This mixture has potential danger, and it may cause a fire or explosion, resulting in vehicle damage, personal injury or death.**
- **Avoid inhaling vapor or moisture from the A/C refrigerant and refrigerant oil.**
- **Only use technical service device to discharge R134a system. If system discharges unexpectedly, ventilate work place before servicing.**
- **If A/C refrigerant filling amount is empty or low, A/C system may have leak. Check all A/C lines, joints and parts for remaining oil. The remaining oil is indication mark of A/C system leaking position.**

(1) After recharging refrigerant, use gas leak detector to check refrigerant gas for leakage.
(2) Perform operations under following conditions:
  - ENGINE START STOP switch is in OFF.
  - Ensure the ventilation is well (gas leak detector may react to volatile gases which are not from refrigerant, such as gasoline vapor or exhaust gas).
  - Repeat the test for 2 or 3 times.
  - Make sure that there is some refrigerant remaining in the refrigeration system.

(3) Place gas leak detector near the joint of A/C line, and check the A/C line for leakage. If gas leak detector makes a sound, it indicates that a leakage exists. Repair or replace the leakage A/C line as necessary.



(4) Disconnect A/C pressure sensor connector, and use same procedures to check A/C pressure sensor for leakage. Replace the A/C pressure sensor as necessary.

(5) Insert gas leak detector into evaporator tank assembly, and use same procedures to check evaporator for leakage. Clean or replace the evaporator core assembly as necessary.

(6) Use same procedures to check condenser for leakage. Clean or replace the condenser assembly as necessary.

4.2 Refrigerant Recovering/Draining

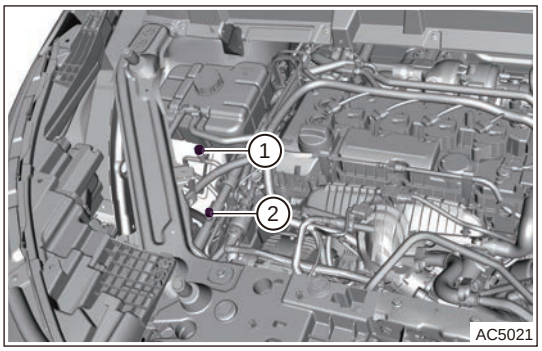
⚠ Warning

- **Take extra care when servicing A/C system under high pressure.**
- **Because there is refrigerant under high pressure in A/C system. It must be serviced by professional technician. Otherwise, a wrong service procedure may cause a serious danger or fatal injury.**
- **If A/C system pressure is released unexpectedly, ventilate work area before servicing. In a closed work place, if a large amount of refrigerant is discharged, it may cause oxygen reduction and result in smothering, causing a serious or fatal injury.**
- **Never drain refrigerant in A/C system into the atmosphere directly, and avoid environmental contamination.**
- **It is necessary to recover refrigerant with R134a refrigerant special recycling machine.**
- **DO NOT work near open flames.**
- **Always dispose of recovered refrigerant as specified.**
- **Never charge R-12 to refrigerant system which is designed to use R134a. This refrigerant is incompatible, which could damage the A/C system.**
- **DO NOT race engine when vacuum pump operates or vacuum exists in A/C system. Otherwise, A/C compressor assembly will be damaged seriously.**

(1) Open the engine hood and remove the engine compartment trim cover assembly.

(2) Loosen the joint cover of A/C high/low pressure line.

(3) Connect the red connector to A/C high pressure line joint (1), and connect the blue connector to A/C low pressure line joint (2).



(4) Open the high pressure valve and low pressure valve of refrigerant recycling machine.

(5) Choose "recovering" item on machine and make it start to operate.

(6) Check the low pressure value on pressure gauge to ensure that recycling is completed, and then turn off machine.

(7) Disconnect the connection between refrigerant recycling machine and A/C line joint.

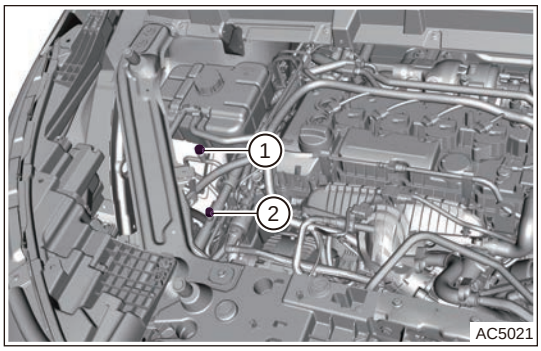
(8) Reinstall the cover onto refrigerant line joint.

4.3 Vacuum Pumping

(1) Open the engine hood and remove the engine compartment trim cover assembly.

(2) Loosen the joint cover of A/C high/low pressure line.

(3) Connect the red connector to A/C high pressure line joint (1), and connect the blue connector to A/C low pressure line joint (2).



(4) Open the high pressure valve and low pressure valve of refrigerant recycling machine.

(5) Choose "vacuum pumping" item on machine and the time setting is 15 minutes, then choose OK and make it start to operate.

(6) Wait for 10 minutes after completing operation, check if there is any change in A/C system vacuum. If there is any change, the A/C system leakage may exist, you should check and repair the A/C system. If there is no change, proceed to perform refrigerant charging procedures.

4.4 Refrigerant Recharging

⚠ Warning

- **A small amount of refrigerant oil in A/C system will be discharged when recovering and draining refrigerant. When filling A/C system, be sure to supplement refrigerant oil, as some amount of refrigerant oil are lost during recovering.**
- **DO NOT fill excessive refrigerant. Otherwise, it will cause excessive pressure to compressor assembly, resulting in compressor assembly noise and A/C system failure.**
- **Always perform vacuum pumping before recharging refrigerant.**

(1) Perform vacuum pumping with a vacuum pump.

(2) Add refrigerant oil after checking that there is no leakage in A/C system.

(3) Perform vacuum pumping for 3 minutes again after adding refrigerant oil, then charge refrigerant.

(4) Choose "charging" item on machine and set the amount of charging to specified value, then choose "OK" and make it start to operate.

(5) Open the suction valve and close the discharging valve, and then open the charging valve to allow refrigerant to flow into the system.

(6) When the delivery of refrigerant has stopped, close the charging valve.

(7) If charged refrigerant is not delivered to specified position, start the engine to operate the A/C compressor assembly.

(8) Open the charging valve to deliver the remaining refrigerant to A/C system.

⚠ Warning

At this time, do not open exhaust (high pressure) valve. Failure to do so may result in personal injury or even death.

(9) Perform A/C system pressure test after charging.

(10) Remove the connecting pipe for refrigerant charging after the test is completed.

(11) Reinstall the cover onto A/C line joint.

4.5 Refrigerant Oil Recovering

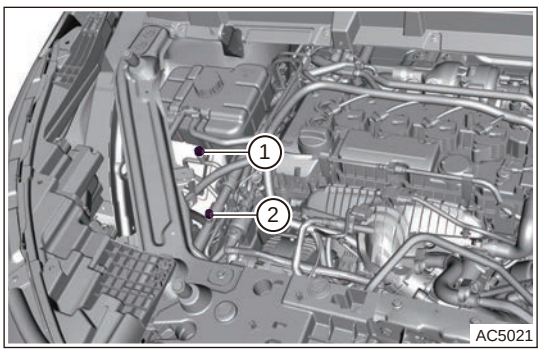
⚠ Warning

- **Special service equipment for R134a refrigerant must be used.**
- **Always keep work area in good ventilation, because A/C system is easy to leak.**
- **Always dispose of recovered refrigerant as specified.**
- **Refrigerant oil must be charged after replacing A/C system components or recovering refrigerant.**

(1) Open the engine hood and remove the engine compartment trim cover assembly.

(2) Loosen the joint cover of A/C high/low pressure line.

(3) Connect the red connector to A/C high pressure line joint (1), and connect the blue connector to A/C low pressure line joint (2).



(4) Open the high pressure valve and low pressure valve of refrigerant recycling machine.

(5) Recover refrigerant oil according to instructions on the machine.

(6) Record amount of recovered refrigerant oil.

(7) Disconnect the connection between refrigerant recycling machine and A/C line joint.

(8) Reinstall the joint cover onto refrigerant line joint.

4.6 Refrigerant Oil Charging

(1) Perform vacuum pumping with a vacuum pump. Wait for 10 minutes after completing operation, check if there is any change in A/C system pressure. If there is any change, the A/C system leakage may exist, you should check and repair the A/C system. If there is no change, proceed to perform refrigerant oil charging procedures.

(2) Open the suction valve and close the exhaust valve, and then open the charging valve to allow refrigerant oil to flow into the system.

(3) Close the charging valve after refrigerant oil charging is completed.

(4) Perform vacuum pumping again for 3 minutes.

(5) Continue to perform refrigerant charging procedures after operation is completed.

Refrigerant Oil Charging Specifications

Refrigerant Oil Charging Type	Charging Capacity (ml)
PAG	150

Hint:
Newly installed air conditioning system refrigeration oil does not need to be refilled. Refill when repairing a part or after driving a certain distance. The reference quantity of oil to be added when replacing parts: Evaporator, condenser, rear evaporator: 30ml each; Line: 10ml; Rear evaporator line: 10ml.

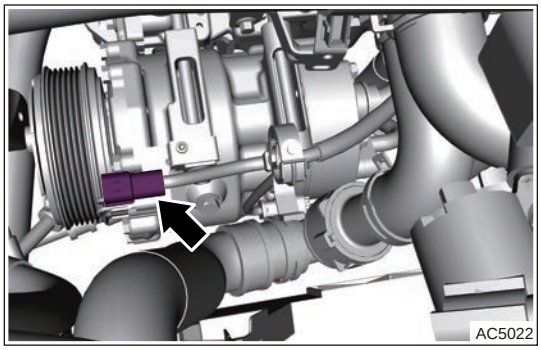
4.7 Replacement of Compressor Assembly

■ Removal

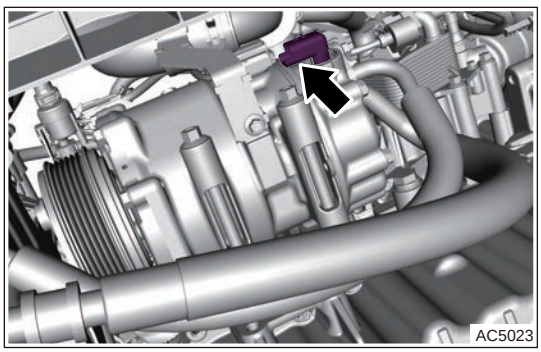
⚠ Warning

- **Be sure to follow safety precautions before performing this procedure. Failure to do so may result in serious personal injury or even death.**
- **Special service equipment for R134a refrigerant must be used to recover/charge refrigerant.**
- **Always keep work area in good ventilation.**
- **Disconnected A/C line and connecting part should be sealed to prevent foreign matter from entering.**
- **When replacing compressor assembly, it is necessary to measure the refrigerant oil amount removed from new A/C compressor assembly.**

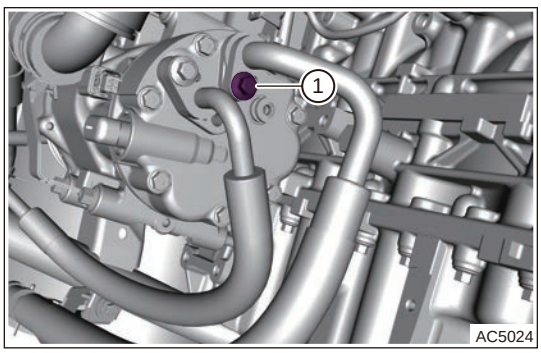
(1) Recover the refrigerant from A/C system.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the engine left and right lower protectors.
(5) Remove the intercooler outlet pipe.
(6) Remove the accessory drive belt.
(7) Disconnect compressor clutch connector.


AC5022

(8) Disconnect the external control compressor solenoid valve connector.


AC5023

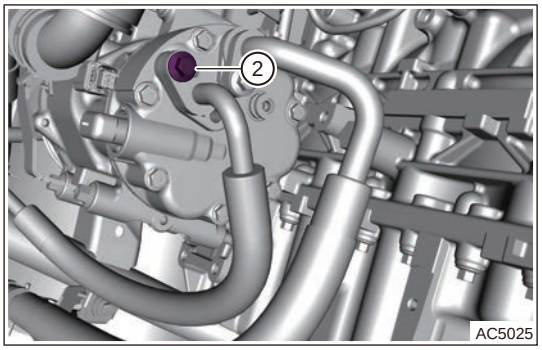
(9) Remove 1 fixing bolt (1) between A/C low pressure line and compressor assembly, disengage A/C low pressure line from compressor assembly.



AC5024

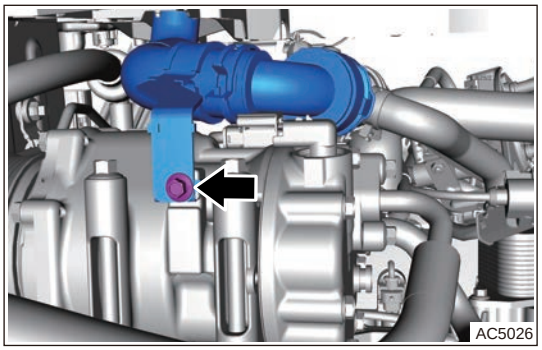
Hint:
Use the plugs to seal line joint and compressor joint.

(10) Remove 1 fixing bolt (2) between A/C high pressure line and compressor assembly, disengage A/C high pressure line from compressor assembly.

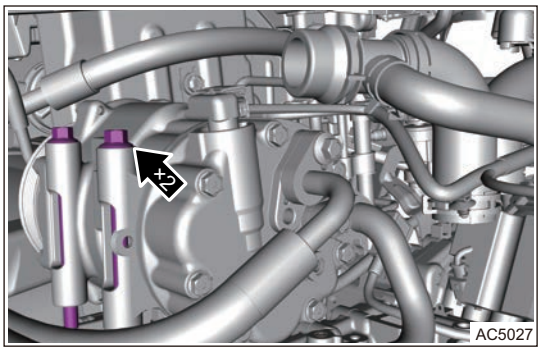


Hint:
Use the plugs to seal line joint and compressor joint.

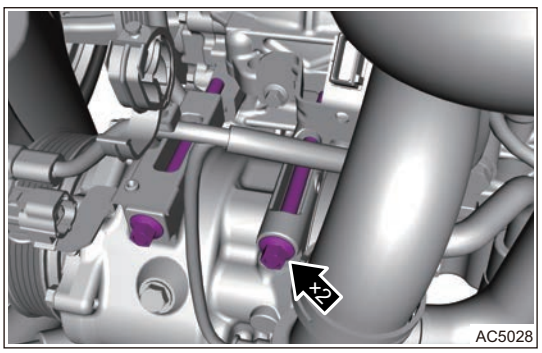
(11) Remove the engine outlet pipe assembly front bracket fixing bolt.



(12) Remove 2 fixing bolts between lower part of compressor assembly and mounting bracket.



(13) Remove 2 fixing bolts between upper part of compressor assembly and mounting bracket.



(14) Remove the compressor carefully.

■ **Inspection**

Hint:

- When checking noise related to A/C system, you must first know the conditions under which the noise occurs. These conditions include: Weather, vehicle speed, engine speed, engine temperature and any other special conditions. Loud noises during A/C operation can often mislead someone. For example, some sounds, like a failed bearing, may be caused by loose bolts, mounting brackets or a loose compressor assembly.
- A/C compressor assembly must be replaced if any abnormal noise is heard from compressor assembly.
- Noise may occur from drive belt at different engine speeds, and you may mistake it for a noise from A/C compressor assembly.

(1) Select a quiet place for testing.

(2) Listen to customer's feedback information as much as possible.

(3) Turn on and off A/C several times to identify compressor assembly noise clearly.

(4) Check the condition of compressor assembly belt.

(5) Check the hub, pulley, bearing assembly of compressor assembly. Make sure that hub and pulley are aligned correctly, and pulley bearing is securely installed to A/C compressor assembly.

(6) Check if refrigerant line routes incorrectly, and if it is damaged or has an interference that could result in an abnormal noise. Also, check the refrigerant line for twist or bend, otherwise the refrigerant will be limited to flow, which will cause a noise.

(7) Loosen all compressor assembly tightening bolts and retighten them.

(8) If noise occurs when liquid refrigerant in A/C suction line is under a slugging condition, replace the condenser and check refrigerant oil level and charging condition for refrigerant.

(9) If the slugging condition still exists after replacing condenser, replace the A/C compressor assembly.

⚠ Caution

DO NOT race engine when vacuum pump operates or vacuum exists in A/C system. Otherwise, A/C compressor assembly will be damaged seriously.

■ **Installation**

⚠ Caution

- **Tighten fixing bolts and nuts to specified torques.**
- **It is necessary to replace refrigerant line O-ring seal when installing refrigerant line. Failure to do so may result in refrigerant leaks.**
- **Lubricate new rubber O-ring with clean refrigerant oil and install it to refrigerant line joint.**
- **Only use specified O-ring, as it is made of special materials for R134a system.**
- **Only use recommended refrigerant oil which is applicable to A/C compressor assembly on vehicle.**
- **When installing a new compressor assembly, always remove a certain amount of refrigerant oil from new A/C compressor assembly as specified.**
- **Perform recharging for A/C system and check for refrigerant leakage.**

(1) Install the compressor on the correct position of the compressor bracket.

(2) Install 2 fixing bolts between upper part of compressor assembly and mounting bracket.

Torque: 23 ± 4N·m

(3) Install 2 fixing bolts between lower part of compressor assembly and mounting bracket.

Torque: 23 ± 4N·m

(4) Install the engine outlet pipe assembly front bracket fixing bolt.

(5) Install compressor assembly high pressure line, and install 1 fixing bolt between A/C high pressure line and compressor assembly.

Torque: 23 ± 4N·m

(6) Install compressor assembly low pressure line, and install 1 fixing bolt between A/C low pressure line and compressor assembly.

Torque: 23 ± 4N·m

(7) Connect the compressor assembly wire harness connector.
(8) Install the accessory drive belt.
(9) Install the intercooler outlet pipe.
(10) Install the engine lower protector assembly.
(11) Check system for leakage.
(12) Pump vacuum and recharge refrigerant.
(13) Connect the negative battery cable.
(14) Turn the ENGINE START STOP switch to ON, .and test compressor operation.

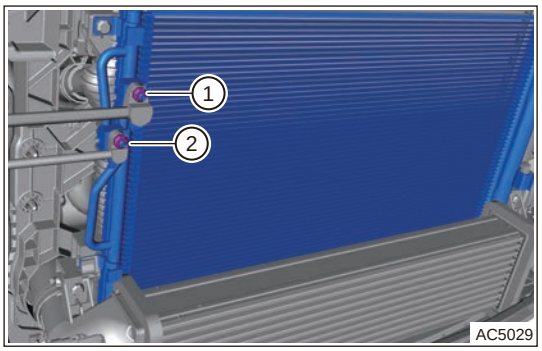
4.8 Replacement of Condenser Assembly

■ Removal

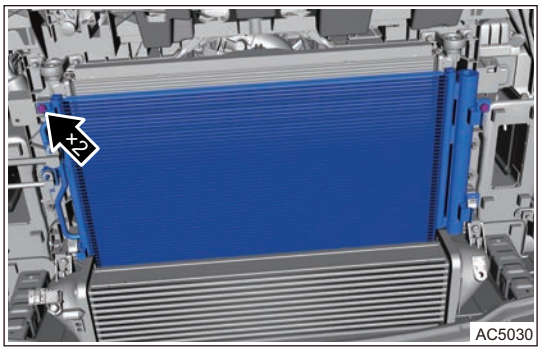
⚠ Warning

- **Be sure to follow safety precautions before performing this procedure. Failure to do so may result in serious personal injury or even death.**
- **Always keep work area in good ventilation.**
- **Disconnected A/C line and connecting part should be sealed to prevent foreign matter from entering.**

(1) Remove the engine compartment trim cover assembly.
(2) Recover the refrigerant from A/C system.
(3) Turn off all electrical equipment and ENGINE START STOP switch.
(4) Disconnect the negative battery cable.
(5) Remove the front bumper assembly.
(6) Remove the front impact beam assembly.
(7) Remove the air deflector assembly.
(8) Remove fixing nut (1) from compressor - condenser line assembly, and detach line from condenser assembly.
(9) Remove fixing nut (2) from condenser - evaporator line assembly, and detach line from condenser assembly.



(10) Remove 2 fixing bolts between radiator assembly and condenser assembly.



(11) Carefully remove the condenser assembly.

■ **Installation**

⚠ Caution

- **Tighten fixing bolts and nuts to specified torques.**
- **It is necessary to replace refrigerant line O-ring seal when installing refrigerant line. Failure to do so may result in refrigerant leaks.**
- **Lubricate new rubber O-ring with clean refrigerant oil and install it to refrigerant line joint.**
- **Only use specified O-ring, as it is made of special materials for R134a system.**
- **Only use recommended refrigerant oil which is applicable to A/C compressor assembly on vehicle.**
- **Perform recharging for A/C system and check for refrigerant leakage.**

(1) Clamp condenser assembly mounting bracket into radiator assembly bracket, and adjust position.

(2) Install 2 fixing bolts between radiator assembly and condenser assembly.

Torque: 5 ± 1 N·m

(3) Install condenser - evaporator line assembly, and install 1 fixing bolt.

Torque: 9 ± 1 N·m

(4) Install compressor - condenser line assembly, and install 1 fixing bolt.

Torque: 9 ± 1 N·m

(5) Install the air deflector assembly.

(6) Install the front impact beam assembly.

(7) Install the front bumper assembly.

(8) Check system for leakage.

(9) Pump vacuum and recharge refrigerant.

(10) Install the engine compartment trim cover assembly.

(11) Connect the negative battery cable.

4.9 Replacement of Outside Temperature Sensor

■ **Removal**

⚠ Warning

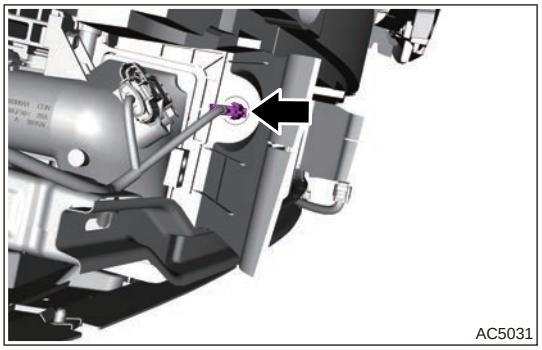
- **Be sure to wear necessary safety equipment to prevent accidents, when removing front bumper assembly.**
- **Appropriate force should be applied, when removing front bumper assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing front bumper assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

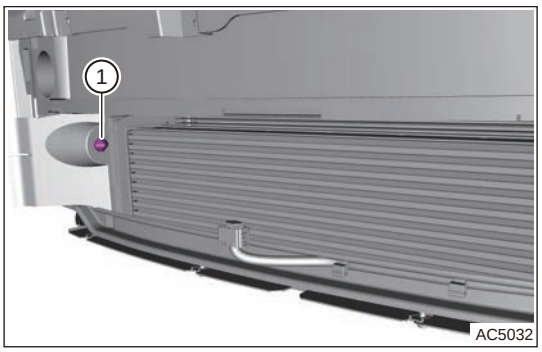
(2) Disconnect the negative battery cable.

(3) Remove the front bumper assembly.

(4) Disconnect the outside temperature sensor connector.



(5) Remove the outside temperature sensor (1).



■ Inspection

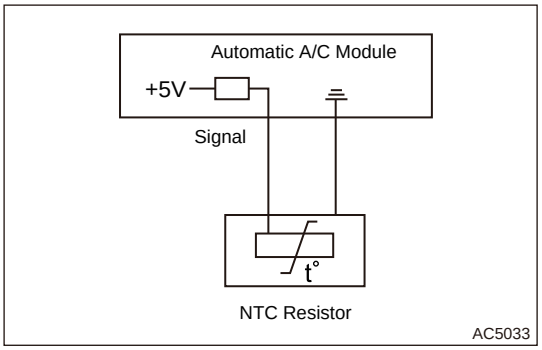
(1) The sensor is NTC resistance (including right face air outlet temperature sensor, left face air outlet temperature sensor, right foot air outlet temperature sensor, left foot air outlet temperature sensor, ambient temperature sensor and evaporator sensor), which is connected to the sensor power supply via the pull-up resistor. Different temperatures will result in different resistance values. Different voltage values are generated by NTC resistor and pull-up resistor at the sensor terminal and input it to A/C module to calculate the temperature.

(2) Insert the outside temperature sensor connector.

(3) Turn ignition switch to ON.

(4) Start the Engine.

(5) Using voltage band of multimeter, measure terminal signal voltage. As the outside temperature changes, the signal voltage changes.



■ Installation

(1) Install the outside temperature sensor to a proper position on body, and connect the connector.

(2) Install the front bumper assembly.

(3) Connect the negative battery cable.

4.10 Replacement of Solar Sensor

Refer to Instrument Panel section for removal & installation.

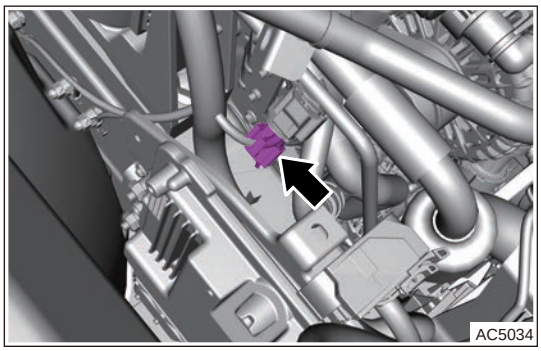
4.11 Replacement of Pressure Sensor

■ Removal

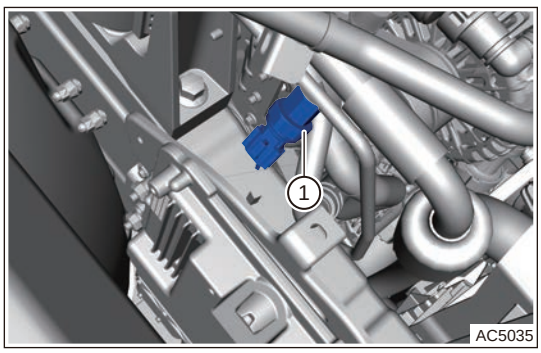
⚠ Warning

Appropriate force should be applied when removing pressure sensor. Be careful not to operate roughly.

(1) Remove the engine compartment trim cover assembly.
(2) Recover the refrigerant from A/C system assembly.
(3) Turn off all electrical equipment and ENGINE START STOP switch.
(4) Disconnect the negative battery cable.
(5) Disconnect the pressure sensor connector.



(6) Use wrench to remove the pressure sensor (1).



■ Installation

(1) Install the pressure sensor.
(2) Connect the pressure sensor connector.
(3) Check system for leakage.
(4) Pump vacuum and recharge refrigerant.
(5) Install the engine compartment trim cover assembly.
(6) Connect the negative battery cable.

4.12 Replacement of Compressor - Condenser Line Assembly

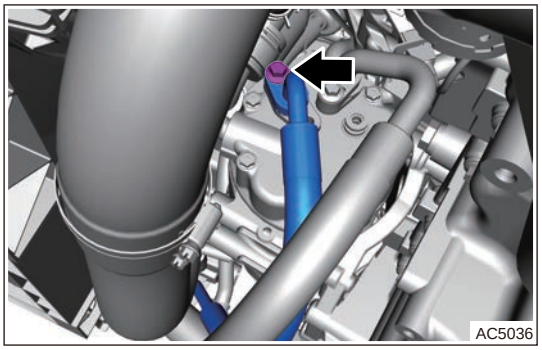
■ Removal

⚠ Warning

Appropriate force should be applied, when removing compressor - condenser line assembly. Be careful not to operate roughly.

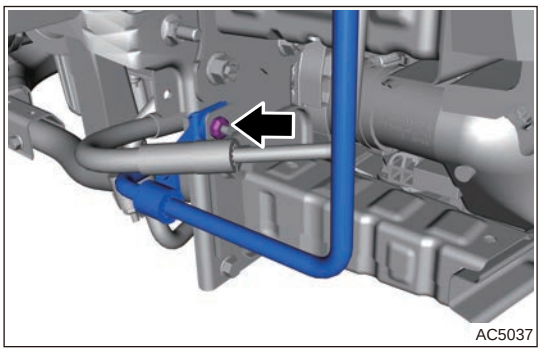
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine lower protector assembly.
(4) Remove the engine compartment trim cover assembly.
(5) Remove the front bumper assembly.
(6) Recover the refrigerant from A/C system assembly.

(7) Remove 1 fixing bolt between A/C high pressure line and compressor assembly, disengage A/C high pressure line from compressor assembly.

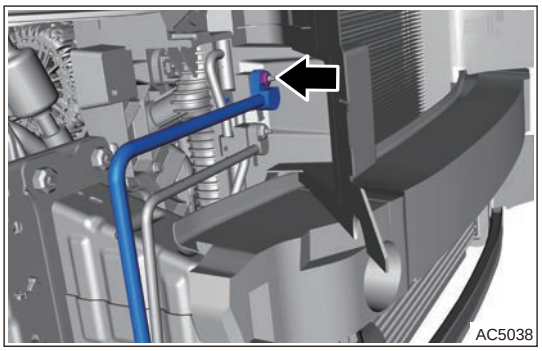


Hint:
Use the plugs to seal line joint and compressor joint.

(8) Remove 1 fixing nut from compressor - condenser line bracket.



(9) Remove fixing nut from compressor - condenser line assembly, and disengage line from condenser assembly.



Hint:
Use the plugs to seal line joint and compressor joint.

(10) Remove the compressor - condenser line assembly.

■ Installation

(1) Install compressor - condenser line and install fixing nut.

Torque: 9 ± 1 N·m

(2) Install 1 fixing nut on compressor - condenser line bracket.

Torque: 9 ± 1 N·m

(3) Install A/C high pressure line and compressor assembly line, and install fixing bolt.

Torque: 9 ± 1 N·m

(4) Check system for leakage.
(5) Pump vacuum and recharge refrigerant.
(6) Install the front bumper assembly.
(7) Install the engine compartment trim cover assembly.

(8) Install the engine lower protector assembly.

(9) Connect the negative battery cable.

4.13 Replacement of Evaporator- Compressor Line Assembly

■ Removal

⚠ Warning
Appropriate force should be applied, when removing evaporator- compressor line assembly. Be careful not to operate roughly.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

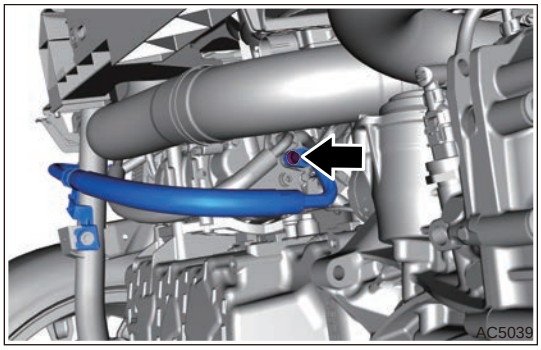
(3) Remove the engine lower protector assembly.

(4) Remove the engine compartment trim cover assembly.

(5) Remove the front bumper assembly.

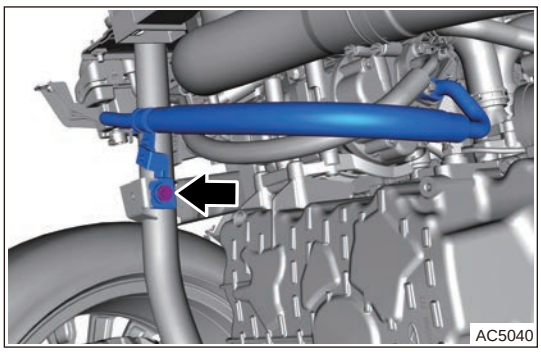
(6) Recover the refrigerant from A/C system assembly.

(7) Remove 1 fixing bolt between A/C low pressure line and compressor assembly, disengage A/C low pressure line from compressor assembly.

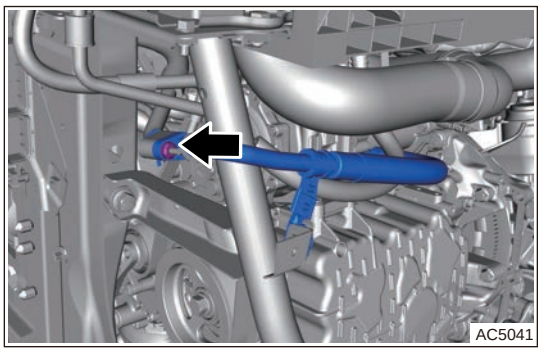


Hint:
Use the plugs to seal line joint and compressor joint.

(8) Remove 1 fixing bolt from evaporator - compressor line bracket.



(9) Remove fixing nut between evaporator - compressor line assembly and A/C coaxial line assembly.



Hint:
Use the plugs to seal line joint and compressor joint.

(10) Remove the evaporator - compressor line assembly.

■ **Installation**

(1) Install fixing nut between evaporator - compressor line assembly and A/C coaxial line assembly.

Torque: 9 ± 1 N·m

(2) Install 1 fixing bolt on evaporator - compressor line bracket.

Torque: 9 ± 1 N·m

(3) Install compressor low pressure line and fixing bolt.

Torque: 9 ± 1 N·m

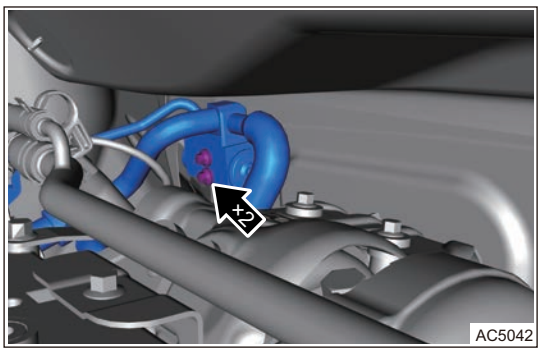
(4) Check system for leakage.
(5) Pump vacuum and recharge refrigerant.
(6) Install the front bumper assembly.
(7) Install the engine compartment trim cover assembly.
(8) Install the engine lower protector assembly.
(9) Connect the negative battery cable.

4.14 Replacement of A/C Coaxial Line Assembly

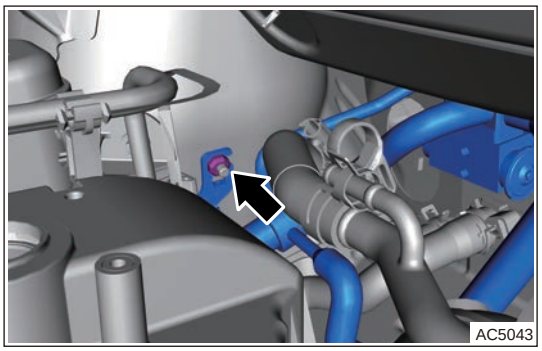
■ **Removal**

⚠ **Warning**
Appropriate force should be applied, when removing A/C coaxial line assembly. Be careful not to operate roughly.

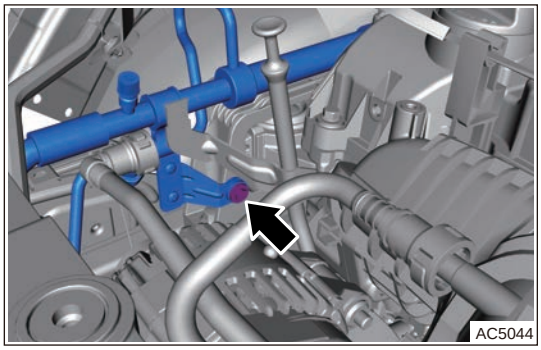
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine lower protector assembly.
(4) Remove the engine compartment trim cover assembly.
(5) Remove the front bumper assembly.
(6) Recover the refrigerant from A/C system assembly.
(7) Remove the pressure sensor.
(8) Remove 2 fixing bolts from expansion valve.



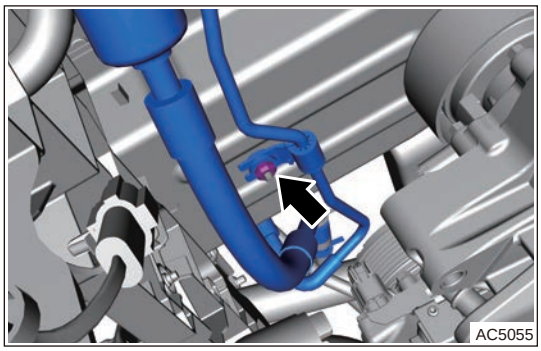
(9) Remove fixing nuts from A/C coaxial line assembly.



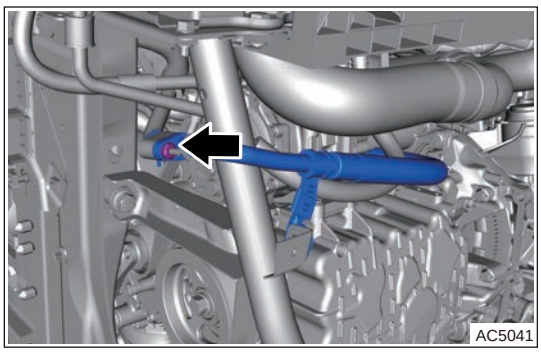
(10) Remove fixing bolts from A/C coaxial line assembly.



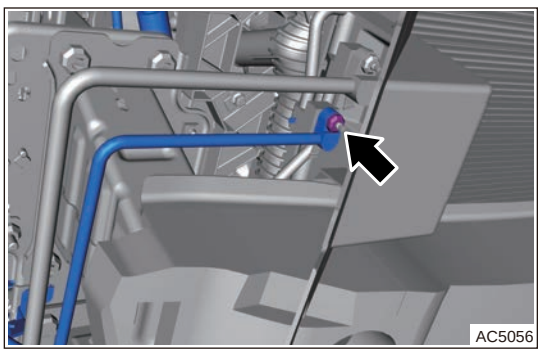
(11) Remove fixing nuts from A/C coaxial line assembly.



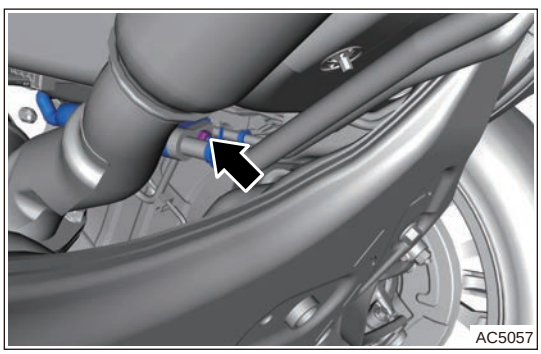
(12) Remove fixing nut between evaporator - compressor line assembly and A/C coaxial line assembly.



(13) Remove fixing nut between A/C coaxial line assembly and condenser.



(14) Remove fixing nut between A/C coaxial line assembly and condenser to rear evaporator line assembly Ⅰ.



(15) Remove the A/C coaxial line assembly.

■ **Installation**

(1) Install the A/C coaxial line assembly to a proper position on body.

(2) Install fixing nut between A/C coaxial line assembly and condenser to rear evaporator line assembly Ⅰ.

Torque: 9 ± 1 N·m

(3) Install fixing nut between A/C coaxial line assembly and condenser.

Torque: 9 ± 1 N·m

(4) Install fixing nut between evaporator - compressor line assembly and A/C coaxial line assembly.

Torque: 9 ± 1 N·m

(5) Install fixing nut to A/C coaxial line assembly.

Torque: 9 ± 1 N·m

(6) Install fixing bolt to A/C coaxial line assembly.

Torque: 9 ± 1 N·m

(7) Install fixing nut to A/C coaxial line assembly.

Torque: 9 ± 1 N·m

(8) Install 2 fixing bolts to expansion valve.

Torque: 9 ± 1 N·m

(9) Check system for leakage.

(10) Pump vacuum and recharge refrigerant.

(11) Install the front bumper assembly.

(12) Install the engine compartment trim cover assembly.

(13) Install the engine lower protector assembly.

(14) Connect the negative battery cable.

4.15 Replacement of Condenser - Rear Evaporator Line Assembly Ⅰ Ⅰ

■ **Removal**

⚠ **Warning**
Appropriate force should be applied when removing condenser - rear evaporator line assembly Ⅰ Ⅰ. Be careful not to operate roughly.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

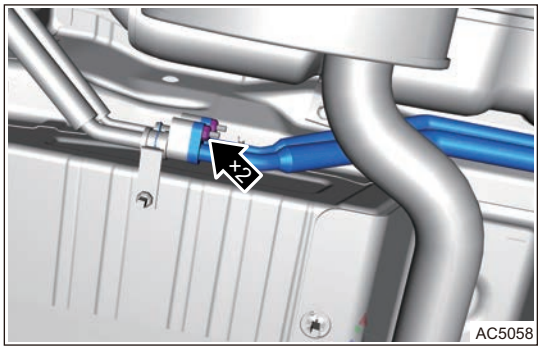
(2) Disconnect the negative battery cable.

(3) Remove the engine compartment trim cover assembly.

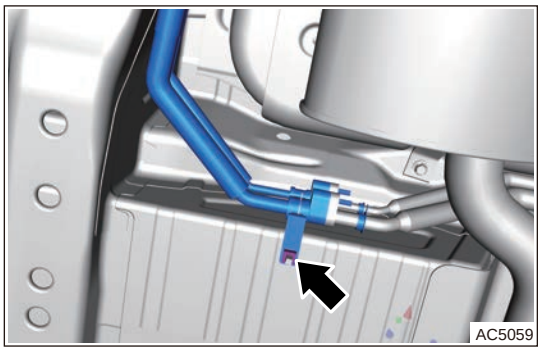
(4) Recover the refrigerant from A/C system assembly.

(5) Remove the rear wheel house protector.

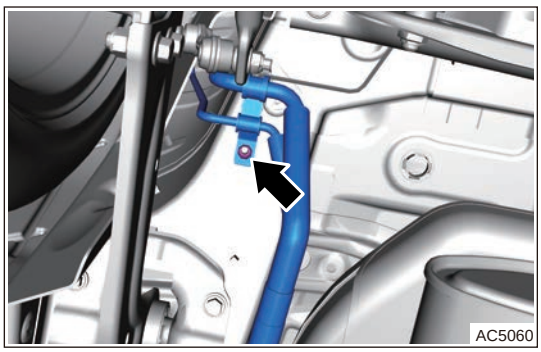
(6) Remove 2 fixing nuts between condenser - rear evaporator line assembly Ⅰ and condenser - rear evaporator line assembly Ⅰ Ⅰ.



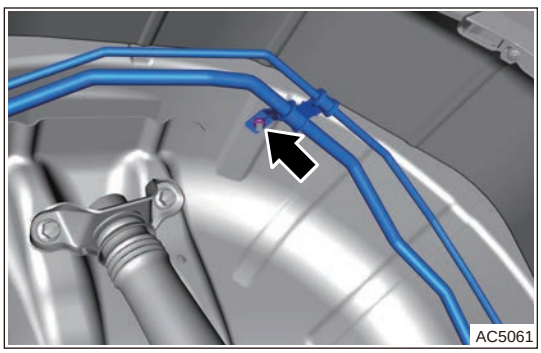
(7) Remove fixing nut between condenser - rear evaporator line assembly Ⅰ Ⅰ and body.



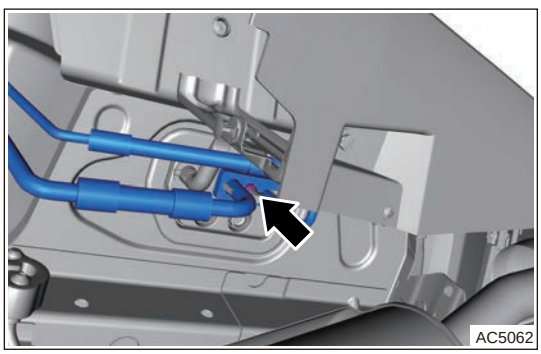
(8) Remove fixing nut between condenser - rear evaporator line assembly Ⅰ Ⅰ and body.



(9) Remove fixing nut between condenser - rear evaporator line assembly Ⅰ Ⅰ and body.



(10) Remove fixing nut between condenser - rear evaporator line assembly Ⅰ Ⅰ and body.



(11) Remove the condenser - rear evaporator line assembly
ㅣㅣ.

■ **Installation**

(1) Install condenser - rear evaporator line assembly ㅣㅣ to a proper position of body.
(2) Install fixing nut between condenser - rear evaporator line assembly ㅣㅣ and body.
Torque: 9 ± 1 N·m

(3) Install fixing nut between condenser - rear evaporator line assembly ㅣㅣ and body.
Torque: 9 ± 1 N·m

(4) Install fixing nut between condenser - rear evaporator line assembly ㅣㅣ and body.
Torque: 9 ± 1 N·m

(5) Install fixing nut between condenser - rear evaporator line assembly ㅣㅣ and body.
Torque: 9 ± 1 N·m

(6) Install fixing nut between condenser - rear evaporator line assembly ㅣㅣ and body.
Torque: 9 ± 1 N·m

(7) Install the rear wheel house protector.
(8) Check system for leakage.
(9) Pump vacuum and recharge refrigerant.
(10) Install the engine compartment trim cover assembly.
(11) Connect the negative battery cable.

9.3 A/C FAN BODY AND AIR DUCT

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Take extra care when servicing A/C system under high pressure.

(2) Because there is refrigerant under high pressure in A/C system. It must be serviced by professional technician. Otherwise, a wrong service procedure may cause a serious danger or fatal injury.

(3) If A/C system pressure is released unexpectedly, ventilate work area before servicing. In a closed work place, if a large amount of refrigerant is discharged, it may cause oxygen reduction and result in smothering, causing a serious or fatal injury.

(4) Never drain refrigerant in A/C system into the atmosphere directly, and avoid environmental contamination.

1.2 Precautions

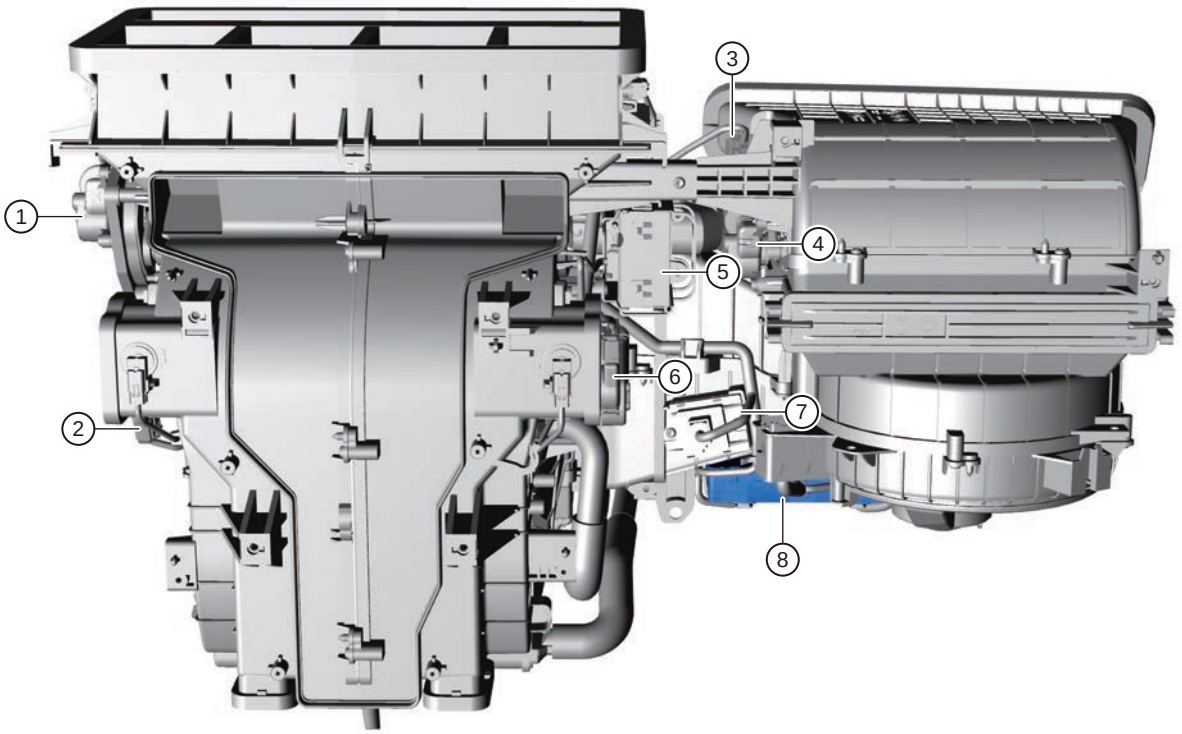
In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Special service equipment for R134a refrigerant must be used to recover/charge refrigerant.

(2) Disconnected A/C line and connecting part should be sealed to prevent foreign matter from entering.

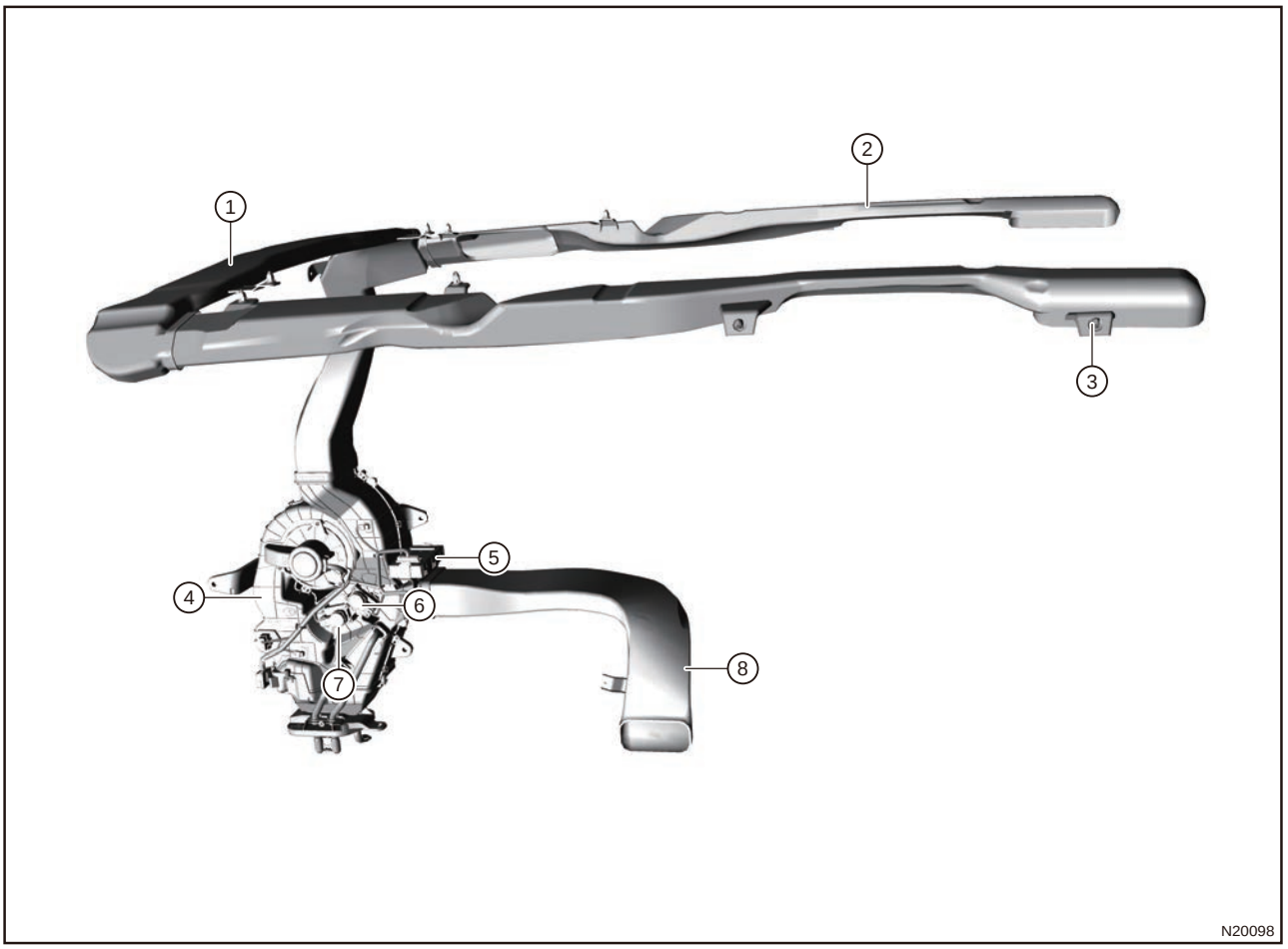
2 System Overview

2.1 Front HVAC Assembly



1	Mode Damper Motor	5	PM2.5 Sensor
2	Left Mix Damper Motor	6	Right Mix Damper Motor
3	Air Quality Sensor	7	Speed Regulation Module
4	Inner/Outer Circulation Damper Motor		

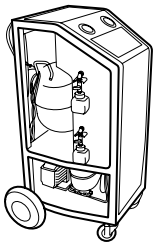
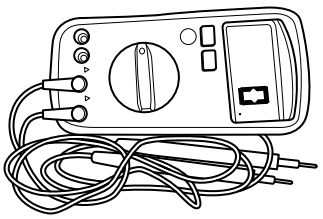
2.2 Rear HVAC Assembly



1	Roof Air Duct Assembly - Middle	5	Rear A/C Controller Assembly
2	Roof Left Duct Assembly	6	Rear A/C Mode Damper Motor
3	Roof Right Air Duct Assembly	7	Rear A/C Temperature Adjustment Motor
4	Rear HVAC Assembly	8	Third Row Left Air Duct

3 Tools

3.1 General Tools

Tool Name	Tool Drawing
Refrigerant Recycling Machine	 RCH004606
Digital Multimeter	 RCH0002006

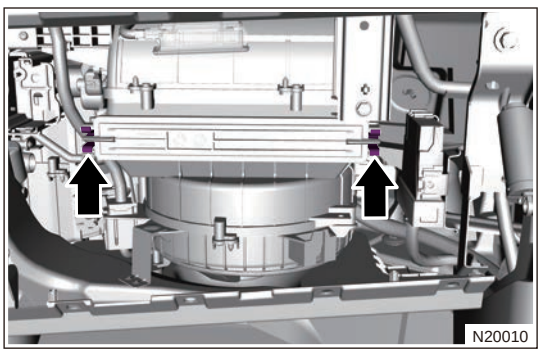
4 On-Vehicle Service

4.1 Replacement of A/C Element

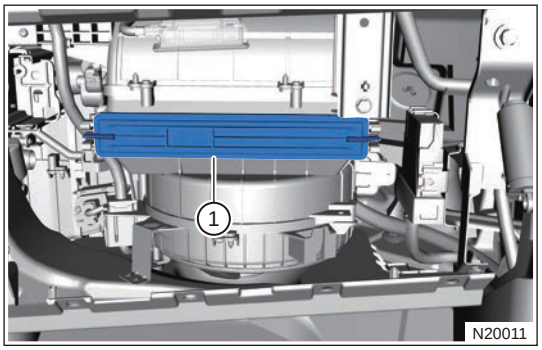
■ Removal

(1) Remove the glove box assembly.

(2) Press and hold 2 clips on A/C element protector cover.


N20010

(3) Remove the A/C element protector cover (1).



N20011

(4) Remove the A/C element assembly from air inlet position on upper side of blower.

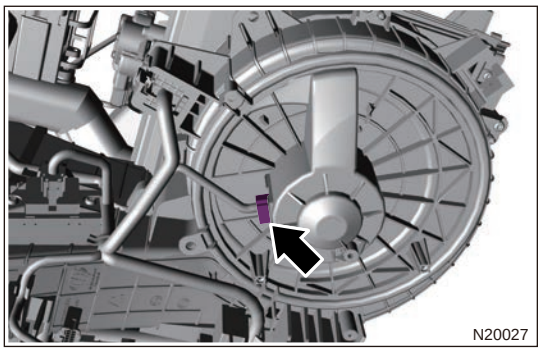
■ **Installation**

(1) Install the A/C element assembly to air inlet position on upper side of blower.
(2) Install the A/C element protector cover.
(3) Install the glove box assembly.

4.2 Replacement of Front Blower Assembly

■ **Removal**

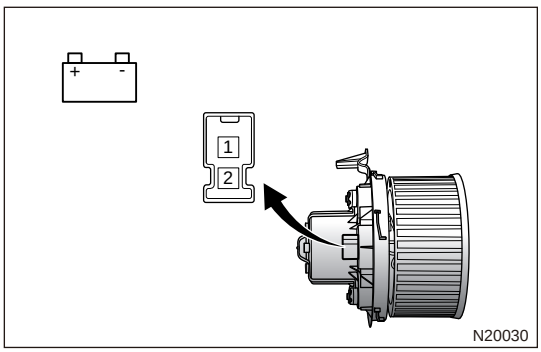
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Disconnect the blower assembly connector.



(4) Disengage the clip.
(5) Rotate and remove the blower assembly.

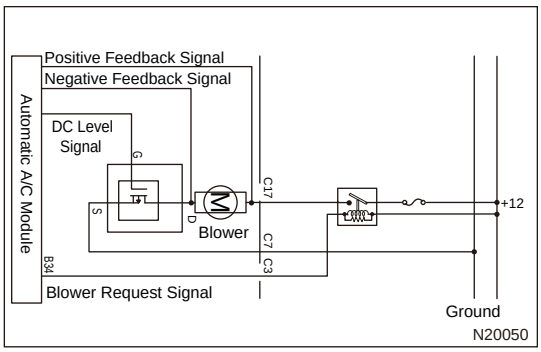
■ **Inspection**

(1) Remove the blower assembly.
(2) Connect the positive (+) battery lead to terminal 1 and negative (-) battery lead to terminal 2. Check that the blower motor operates smoothly.



■ **Signal Inspection**

(1) Check if relay is damaged.



(2) Check for 12 V power supply.
(3) Check for blower request signals.
(4) Check for DC level signal.

■ **Installation**

(1) Rotate and install blower assembly, and install clips in place.
(2) Connect the negative battery cable.

4.3 Replacement of Front Blower Speed Regulation Module

■ Removal

⚠ Warning

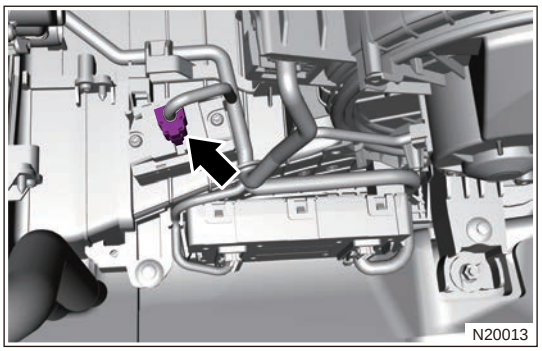
- **During normal operation, blower speed regulation module may be very hot. Turn off blower and wait for a few minutes to cool it before diagnosing or servicing, in order to avoid burns.**
- **DO NOT operate blower assembly when removing the blower speed regulation module from vehicle. Failure to do so may result in damage to the blower assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

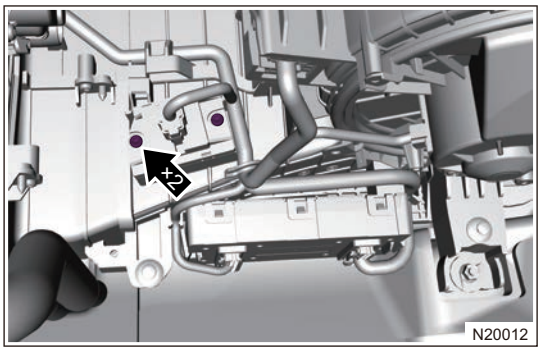
(3) Remove the glove box assembly.

(4) Disconnect the blower speed regulation module connector.



(5) Remove 2 fixing screws from blower speed regulation module.

(6) Remove the blower speed regulation module assembly.



■ Installation

(1) Install the blower speed regulation module assembly to a proper position of HVAC.

(2) Install 2 fixing screws to blower speed regulation module.

(3) Install the blower speed regulation module connector.

(4) Install the glove box assembly.

(5) Connect the negative battery cable.

(6) Connect diagnostic tester, read and clear DTCs.

4.4 Replacement of Inner/Outer Circulation Damper Motor

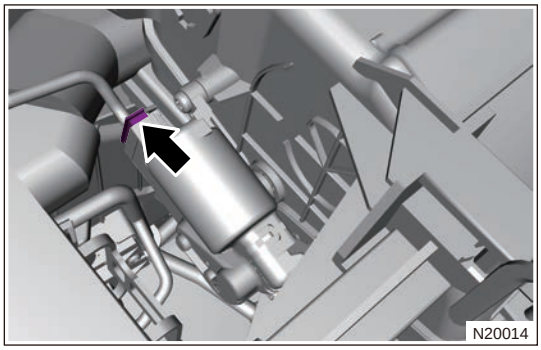
■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.

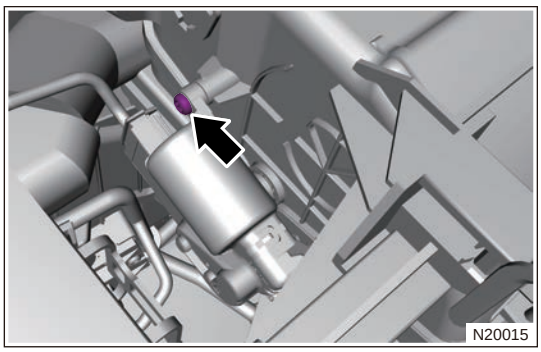
(2) Disconnect the negative battery cable.

(3) Remove the instrument panel assembly.

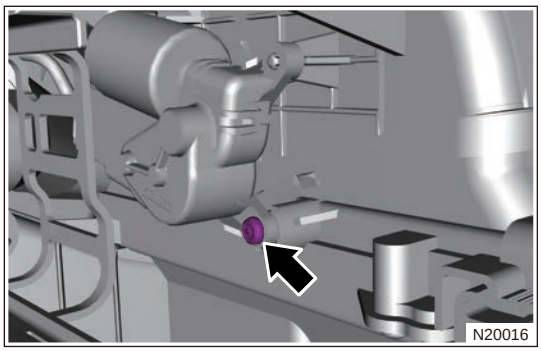
(4) Disconnect the inner/outer circulation damper motor connector.



(5) Remove 1 fixing screw above inner/outer circulation damper motor.



(6) Remove 1 fixing screw under inner/outer circulation damper motor.



(7) Remove the inner/outer circulation damper motor.

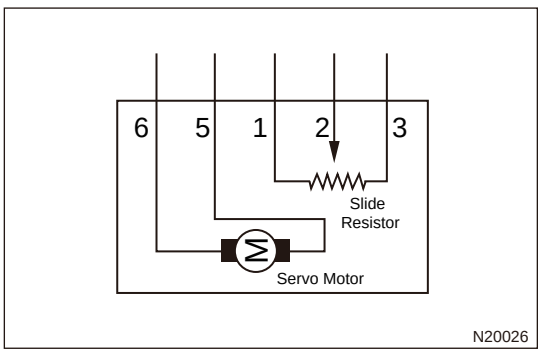
■ Inspection

⚠ Caution

- **When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.**

(1) Use ohm band of digital multimeter.

Terminal 1 - Terminal 2	3.83 KΩ
Terminal 2 - Terminal 3	1.79 KΩ
Terminal 1 - Terminal 3	Terminal 1 - Terminal 2 Resistance + Terminal 2 - Terminal 3 Resistance = 4.6 KΩ
Terminal 5 - Terminal 6	50 Ω



(2) Signal inspection.

1) Insert the inner/outer circulation damper motor connector.
2) Turn ignition switch to ON.
3) Start the engine, turn on A/C inner/outer circulation adjustment button.
4) Using voltage band of multimeter, measure terminal 2 signal voltage. As the inner/outer circulation adjust button operates, the signal voltage changes.

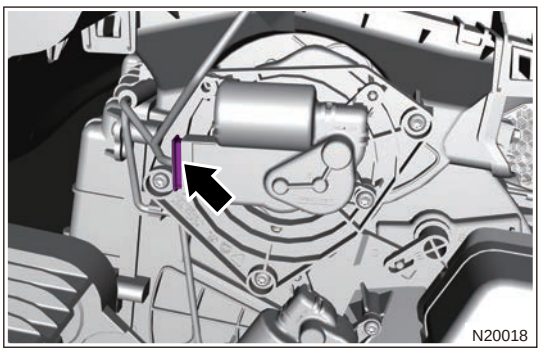
■ Installation

(1) Install inner/outer circulation damper motor to a proper position of HVAC.
(2) Install 1 fixing screw under inner/outer circulation damper motor.
(3) Install 1 fixing screw above inner/outer circulation damper motor.
(4) Install the inner/outer circulation damper motor connector.
(5) Install the instrument panel assembly.
(6) Connect the negative battery cable.

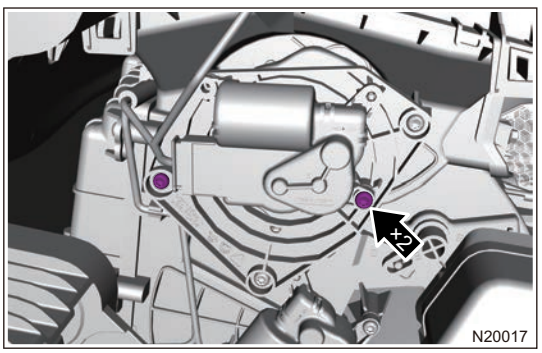
4.5 Replacement of Mode Damper Motor

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the instrument panel assembly.
(4) Disconnect the mode damper motor connector.



(5) Remove 2 fixing screws from mode damper motor assembly.



(6) Remove the mode damper motor.

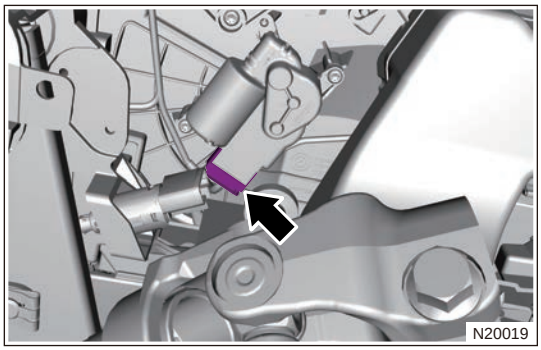
■ Installation

(1) Install mode damper motor to a proper position of HVAC.
(2) Install 2 fixing screws to mode damper motor assembly.
(3) Connect the mode damper motor connector.
(4) Install the instrument panel assembly.
(5) Connect the negative battery cable.

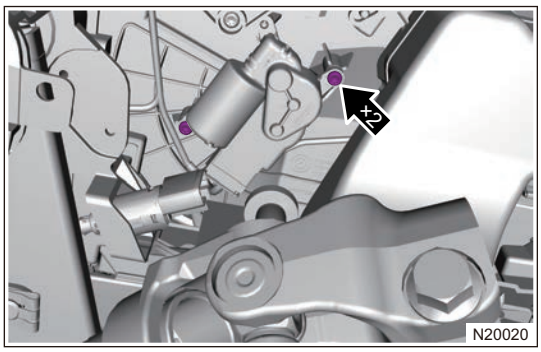
4.6 Replacement of Left Mix Damper Motor

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the instrument panel assembly.
(4) Disconnect the left mix damper motor connector.



(5) Remove 2 fixing screws from left mix damper motor assembly.



(6) Remove the left mix damper motor.

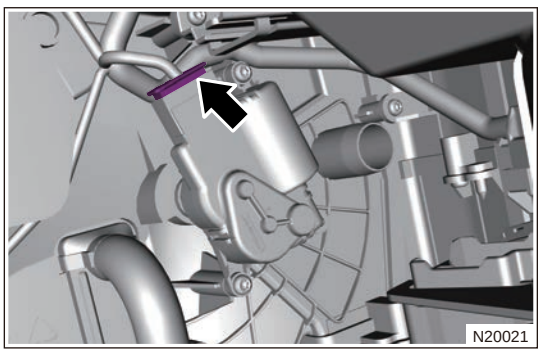
■ Installation

(1) Install left mix damper motor to a proper position of HVAC.
(2) Install 2 fixing screws to left mix damper motor.
(3) Install the left mix damper motor connector.
(4) Install the instrument panel assembly.
(5) Connect the negative battery cable.

4.7 Replacement of Right Mix Damper Motor

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the instrument panel assembly.
(4) Disconnect the right mix damper motor connector.
(5) Remove 2 fixing screws from right mix damper motor.



(6) Remove the right mix damper motor.

■ **Installation**

(1) Install right mix damper motor to a proper position of HVAC.

(2) Install 2 fixing screws to right mix damper motor.

(3) Connect the right mix damper motor connector.

(4) Install the instrument panel assembly.

(5) Connect the negative battery cable.

4.8 Replacement of Air Quality Sensor

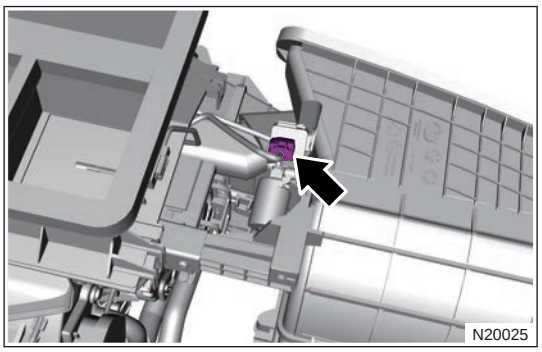
■ **Removal**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the instrument panel assembly.

(4) Disconnect air quality sensor connector, and rotate and remove air quality sensor.



■ **Installation**

(1) Rotate and install the air quality sensor.

(2) Connect the air quality sensor.

(3) Install the instrument panel assembly.

4.9 Replacement of Inside and Outside PM2.5 Sensor

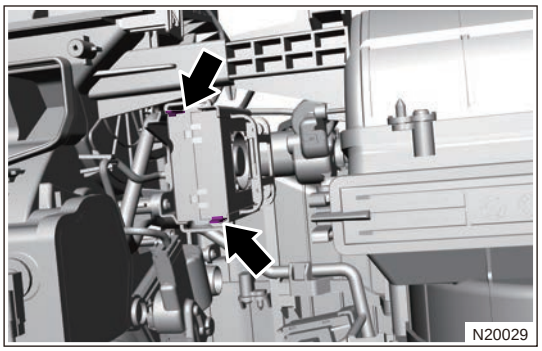
■ **Removal**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

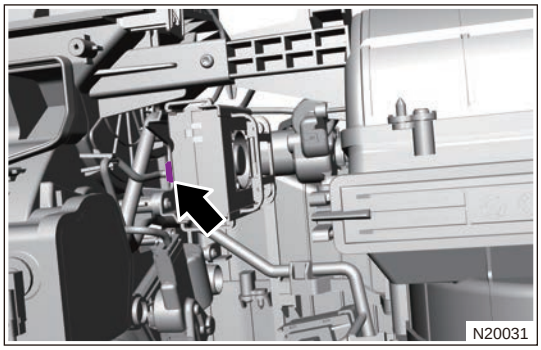
(2) Disconnect the negative battery cable.

(3) Remove the instrument panel assembly.

(4) Detach outside PM2.5 sensor fixing clip and remove outside PM2.5 sensor.



(5) Disconnect inside PM2.5 sensor connector, and remove PM2.5 sensor.



■ **Installation**

(1) Connect the PM2.5 sensor connector.

(2) Install inside and outside PM2.5 sensor and secure clip.

(3) Install the instrument panel assembly.

(4) Connect the negative battery cable.

4.10 Replacement of HVAC Assembly

■ **Removal**

⚠ Warning

- **Special service equipment for R134a refrigerant must be used to recover/charge refrigerant.**
- **Be careful not to damage hoses during removal and installation.**
- **Always keep work area in good ventilation.**
- **Disconnected A/C line and connecting part should be sealed to prevent foreign matter from entering.**

(1) Recover the refrigerant from A/C system.

(2) Turn off all electrical equipment and ENGINE START STOP switch.

(3) Disconnect the negative battery cable.

(4) Remove the driver airbag.

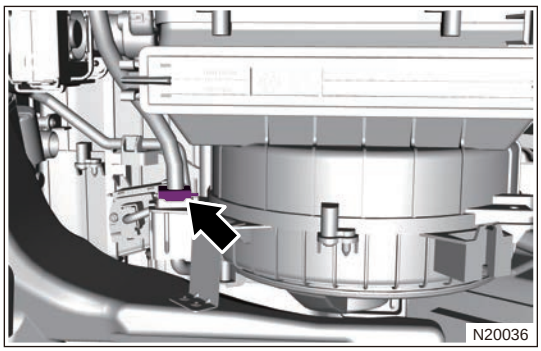
(5) Remove the steering wheel assembly.

(6) Remove the auxiliary fascia console assembly.

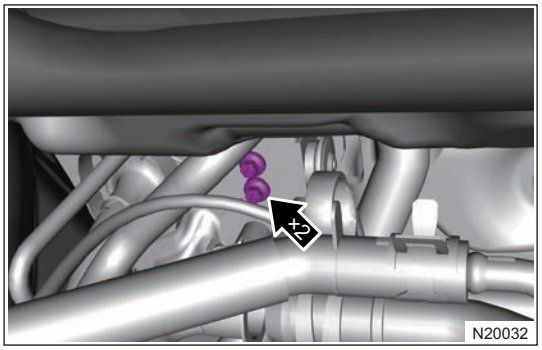
(7) Remove the instrument panel body assembly.

(8) Remove the instrument panel crossmember assembly.

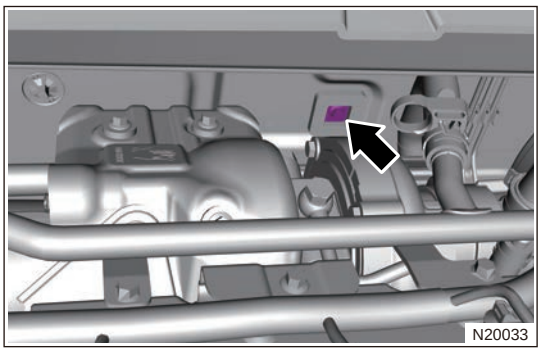
(9) Disconnect HVAC wire harness and interior wire harness.



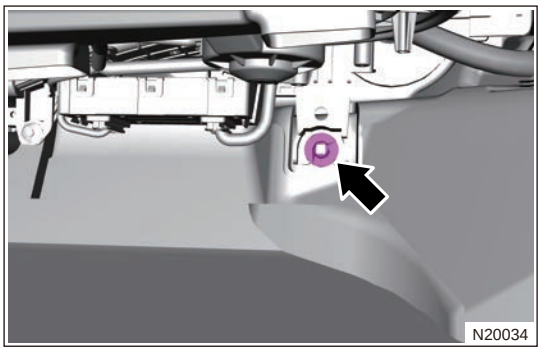
(10) Remove fixing bolt between A/C high/low pressure line and expansion valve.



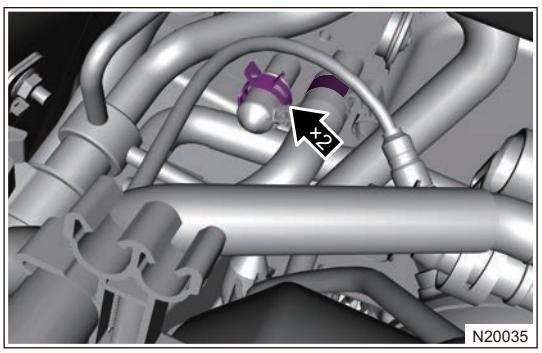
(11) Remove fixing bolt from HVAC engine compartment.



(12) Remove fixing bolt from HVAC assembly.



(13) Using snap spring pliers, disengage fixing clamp from heating inlet and outlet hoses to detach the inlet and outlet hoses.



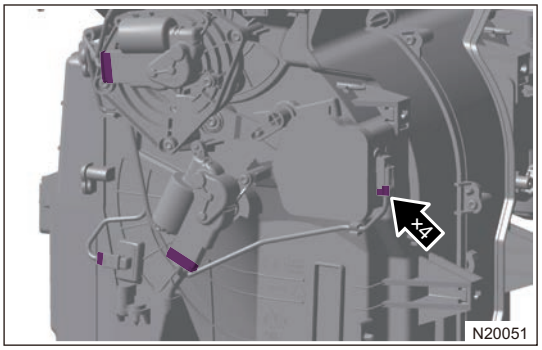
(14) Carefully remove HVAC assembly from cabin.

■ Disassembly

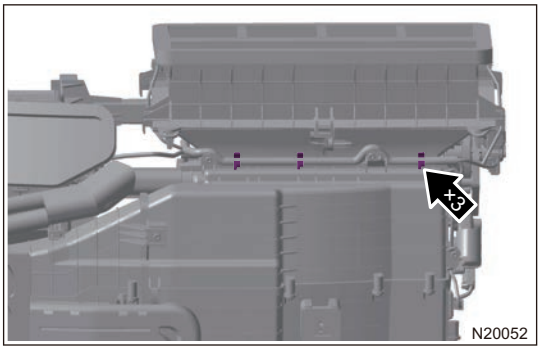
(1) Remove the blower assembly.
(2) Remove the blower speed regulation module.
(3) Remove the inner/outer circulation damper motor.
(4) Remove the left mix damper servo motor.
(5) Remove the mode damper motor.
(6) Remove the right mix damper motor.
(7) Remove the A/C element assembly.

(8) Remove the inner/outer damper set.

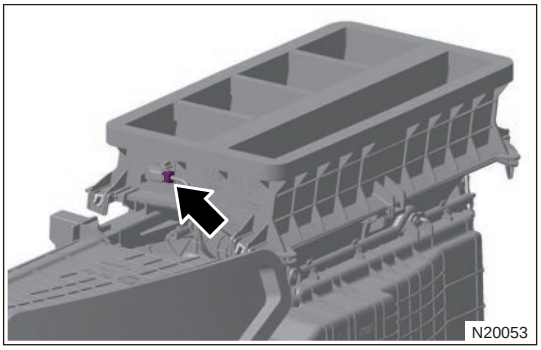
(1) Disconnect the A/C wire harness connectors.



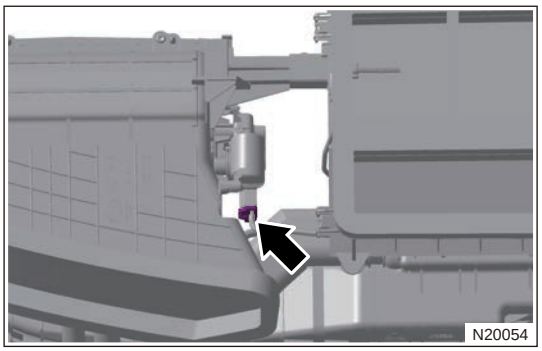
(2) Disengage the wire harness clips.



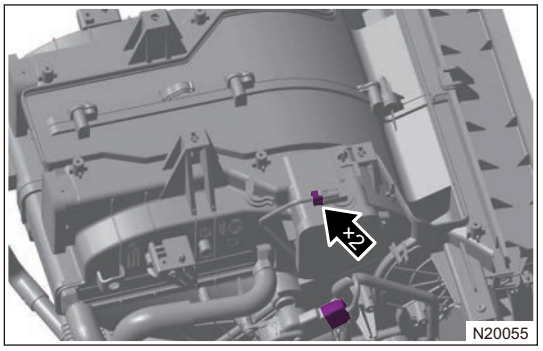
(3) Disconnect the A/C wire harness connector.



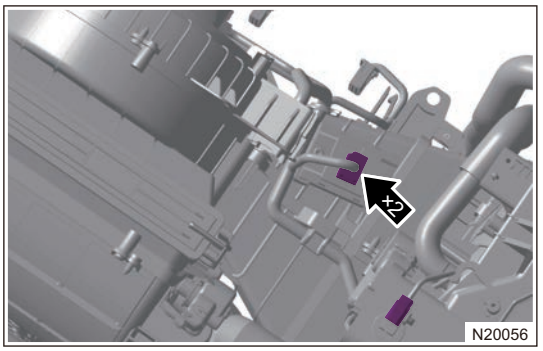
(4) Disconnect the A/C wire harness connector.



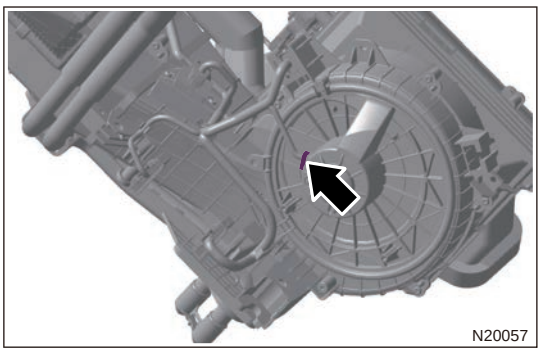
(5) Disconnect the A/C wire harness connectors.



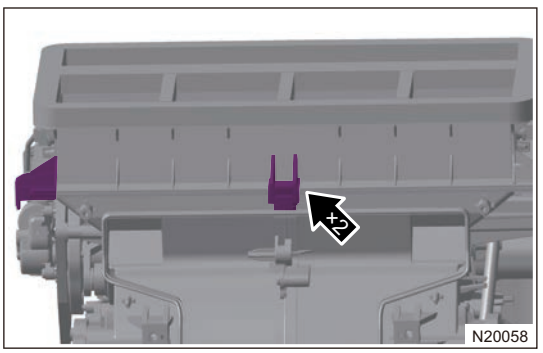
(6) Disconnect the A/C wire harness connectors.



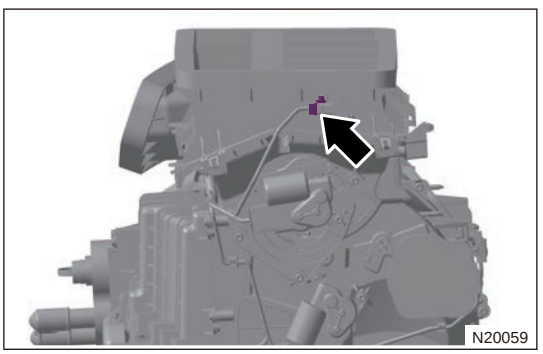
(7) Disconnect the A/C wire harness connector.



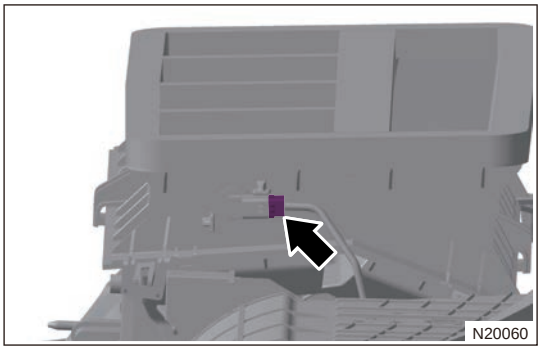
(8) Disengage the air duct clips.



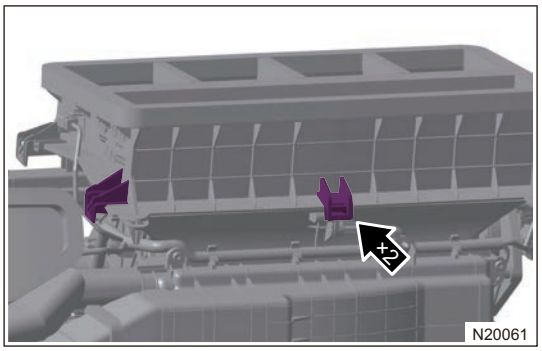
(9) Disconnect the air duct temperature sensor connector.



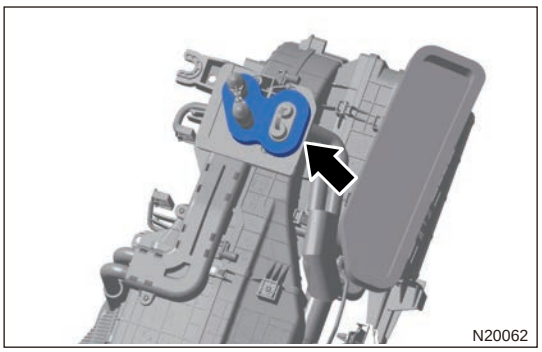
(10) Disconnect the air duct temperature sensor connector.



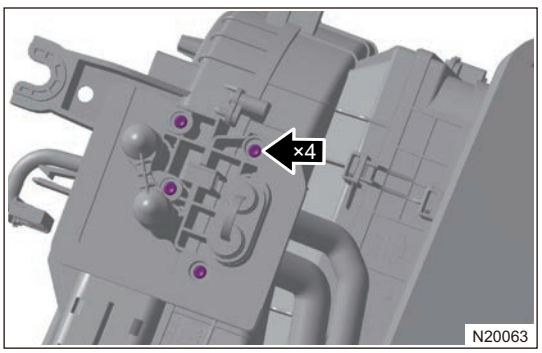
(11) Disengage the air duct clips.



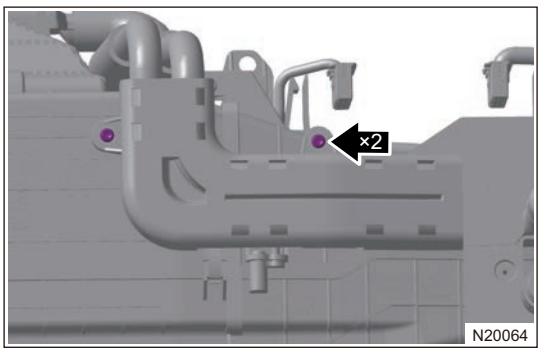
(12) Disengage the sponge.



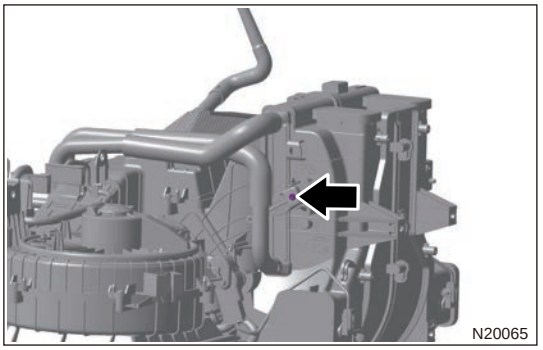
(13) Remove 4 fixing screws.



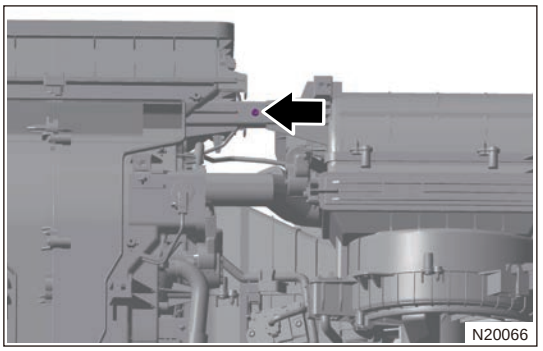
(14) Remove 2 fixing screws.



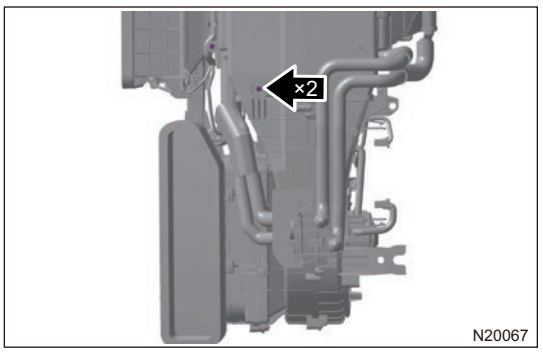
(15) Remove 1 fixing screw.



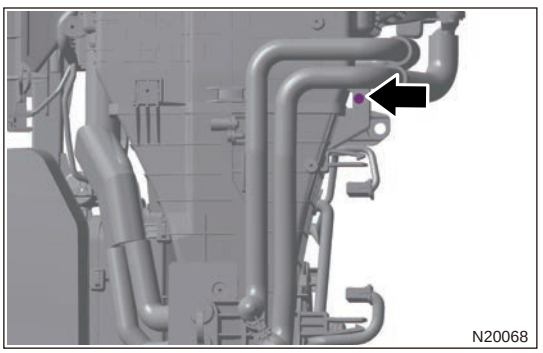
(16) Remove 1 fixing screw.



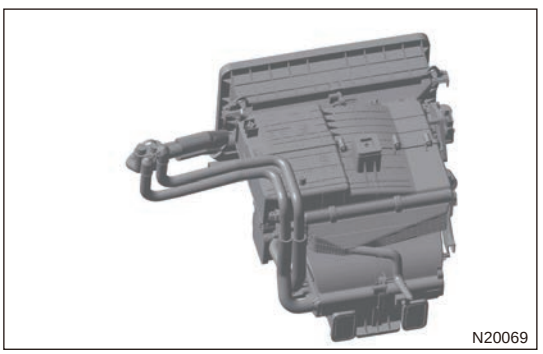
(17) Remove 2 fixing screws.



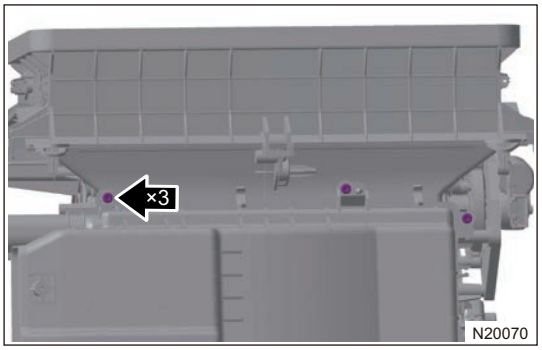
(18) Remove 1 fixing screw.



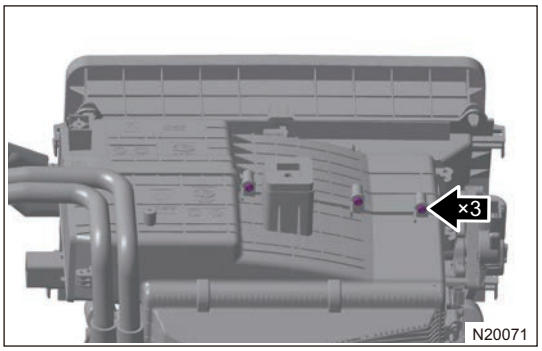
(19) Separate the evaporator assembly.



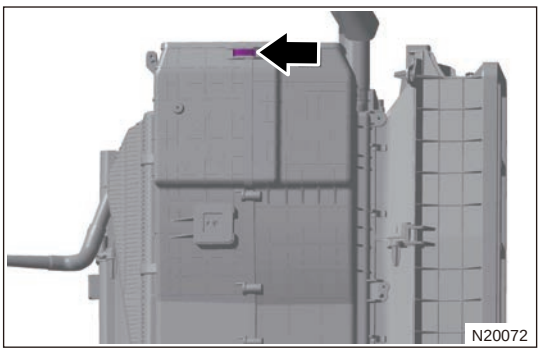
(20) Remove 3 fixing screws.



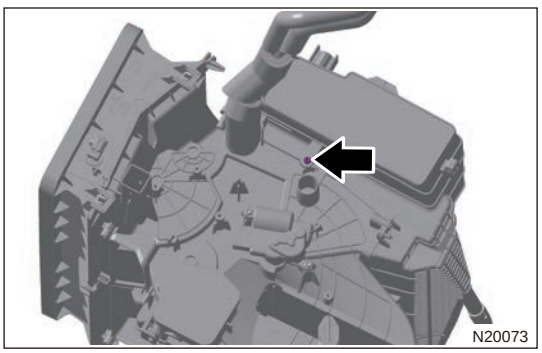
(21) Remove 3 fixing screws.



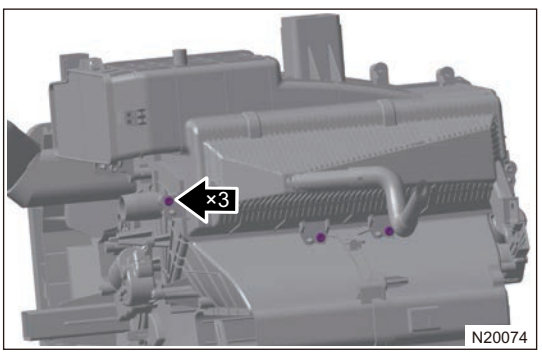
(22) Remove the spring clip.



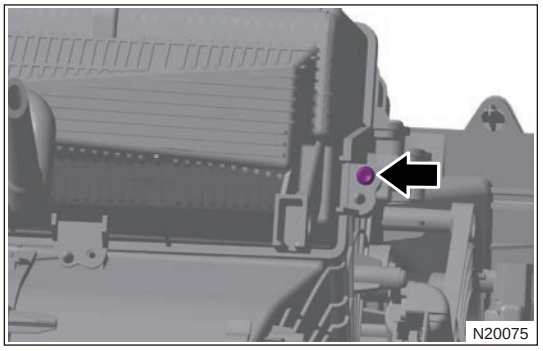
(23) Remove 1 fixing screw.



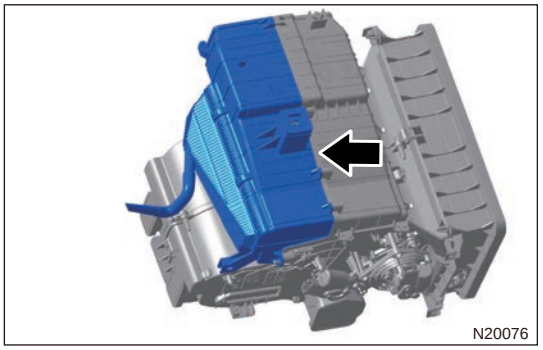
(24) Remove 3 fixing screws.



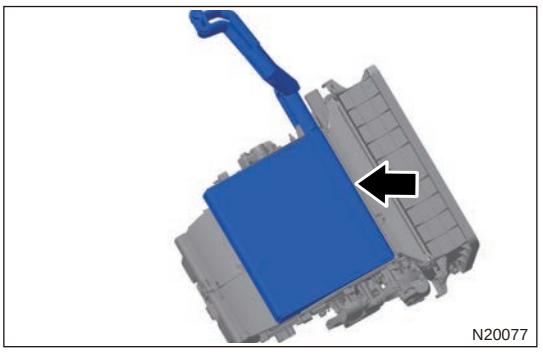
(25) Remove 1 fixing screw.



(26) Remove the evaporator cover.



(27) Remove the evaporator assembly.



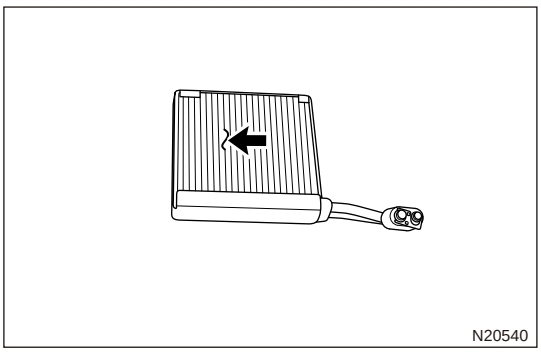
■ Inspection

Inspection of Evaporator Core Assembly

(1) Check if evaporator core assembly is cracked, damaged and leaked. If any problem is found, replace the evaporator core assembly.

(2) Check fin for bends.

(1) If any fin is bent, carefully straighten it with a screwdriver or pliers.

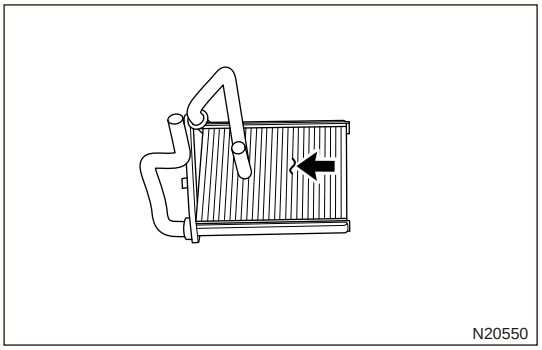


Inspection of Heater Core Assembly

(1) Check if heater core assembly is cracked, damaged or leaked. Check if heater core assembly is cracked, damaged or leaked.

(2) Check fin for bends.

(1) If any fin is bent, carefully straighten it with a screwdriver or pliers.



Inspection of Damper Control Mechanism Assembly

(1) Check if inner/outer circulation damper adjustment mechanism is stuck, deformed, damaged or if it has fallen out. Replace as necessary.

(2) Check if mode damper adjustment mechanism is stuck, deformed, damaged or if it has fallen out. Replace as necessary.

(3) Check if face/defrost damper set is stuck, deformed, damaged or if it has fallen out. Replace as necessary.

■ **Assembly of HVAC Assembly**

⚠ Caution

- **If evaporator core is reused, do not insert evaporator temperature sensor into its original position. Insert it to a location that is 1 fin to the right or left of its previous location.**
- **During installation, apply a small amount of grease to contact surface of the inner/outer circulation damper adjustment mechanism to ensure that it can operate smoothly.**
- **During installation, apply a small amount of grease to contact surface of the mix damper adjustment mechanism set to ensure that it can operate smoothly.**
- **During installation, apply a small amount of grease to contact surface of the face damper adjustment mechanism to ensure that it can operate smoothly.**
- **During installation, apply a small amount of grease to contact surface of the defrost damper adjustment mechanism to ensure that it can operate smoothly.**
- **Always check that inner/outer circulation damper mechanism assembly operates normally after installation.**
- **Always check that mix damper mechanism assembly operates normally after installation.**
- **Always check that face damper mechanism assembly operates normally after installation.**
- **Always check that defrost damper mechanism assembly operates normally after installation.**
- **Tighten fixing bolts and nuts to specified torques.**
- **It is necessary to replace refrigerant line O-ring seal when installing refrigerant line. Failure to do so may result in refrigerant leaks.**
- **It is necessary to replace refrigerant line O-ring seal when installing refrigerant line. Failure to do so may result in refrigerant leaks.**
- **Only use specified O-ring, as it is made of special materials for R134a system.**
- **Only use recommended refrigerant oil which is applicable to A/C compressor assembly on vehicle.**
- **Be sure to recharge refrigerant and check for refrigerant leakage after installation.**
- **Be sure to recharge engine cooling system and check for coolant leakage after installation.**

(1) Install evaporator assembly to a proper position of HVAC.

(2) Install the evaporator cover plate.

(3) Install 1 fixing screw.

(4) Install 3 fixing screws.

(5) Install 1 fixing screw.

(6) Install the spring clip.

(7) Install 3 fixing screws.
(8) Install 3 fixing screws.
(9) Assemble the evaporator assembly.
(10) Install 1 fixing screw.
(11) Install 2 fixing screws.
(12) Install 1 fixing screw.
(13) Install 1 fixing screw.
(14) Install 2 fixing screws.
(15) Install 4 fixing screws.
(16) Install the sponge.
(17) Install the air duct clip.
(18) Install the air duct temperature sensor connector.
(19) Connect the air duct temperature sensor connector.
(20) Install the air duct clip.
(21) Connect the A/C wire harness connector.
(22) Connect the wire harness clip.
(23) Install the inner/outer damper set.
(24) Install the A/C filter assembly.
(25) Install the right mix damper motor.
(26) Install the mode damper motor.
(27) Install the left mix damper servo motor.
(28) Install the inner/outer circulation damper motor.
(29) Install the blower speed regulation module.
(30) Install the blower assembly.

■ **Installation**

(1) Install HVAC assembly into cabin and secure bolts.
(2) Install heating inlet and outlet hoses and fixing clamp.
(3) Install fixing bolt to HVAC assembly.

Torque: 9 ± 1 N m

(4) Install fixing bolt to HVAC engine compartment.

Torque: 9 ± 1 N m

(5) Install fixing bolt between A/C high/low pressure line and expansion valve.

Torque: 9 ± 1 N m

(6) Connect HVAC wire harness and interior wire harness.
(7) Install the instrument panel crossmember assembly.
(8) Install the instrument panel body assembly.
(9) Install the auxiliary fascia console assembly.
(10) Install the steering wheel assembly.
(11) Install the driver airbag.
(12) Connect the negative battery cable.

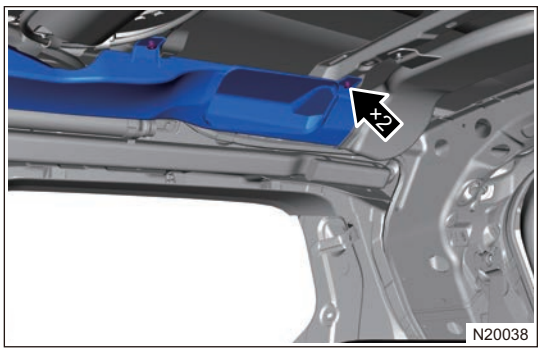
4.11 Replacement of Roof Right Air Duct Assembly

■ **Removal**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the roof assembly.

(4) Remove 2 fixing screws from roof right air duct assembly.

(5) Remove 2 fixing screws from roof right air duct assembly.



(6) Remove the roof right air duct assembly.

■ Installation

(1) Install the roof right air duct assembly to a proper position of body.

(2) Install 2 fixing screws to roof right air duct assembly.

(3) Install 2 fixing screws to roof right air duct assembly.

(4) Install the roof assembly.

(5) Connect the negative battery cable.

4.12 Replacement of Roof Air Duct Assembly - Middle

■ Removal

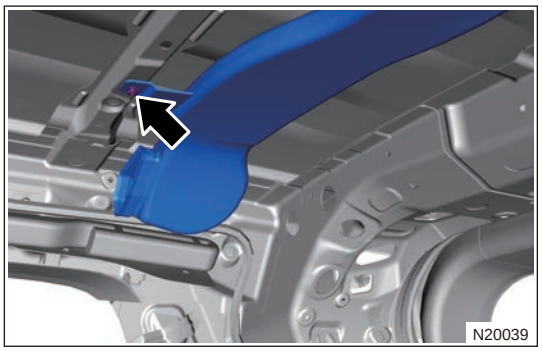
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

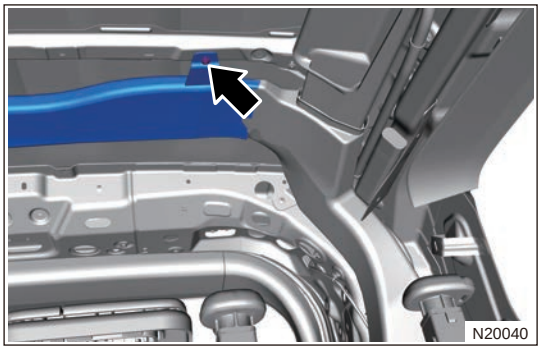
(3) Remove the roof assembly.

(4) Remove roof right air duct assembly.

(5) Remove 1 fixing screw from roof air duct assembly - middle assembly.



(6) Remove 1 fixing screw from roof air duct assembly - middle assembly.



(7) Remove the roof air duct assembly - middle.

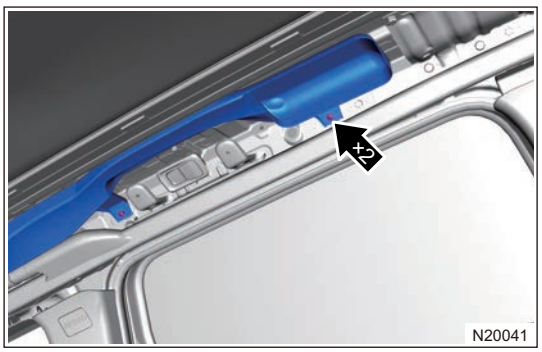
■ **Installation**

(1) Install the roof air duct assembly - middle to a proper position of body.
(2) Install 1 fixing screw to roof air duct assembly - middle assembly.
(3) Install 1 fixing screw to roof air duct assembly - middle assembly.
(4) Install the roof right air duct assembly.
(5) Install the roof assembly.
(6) Connect the negative battery cable.

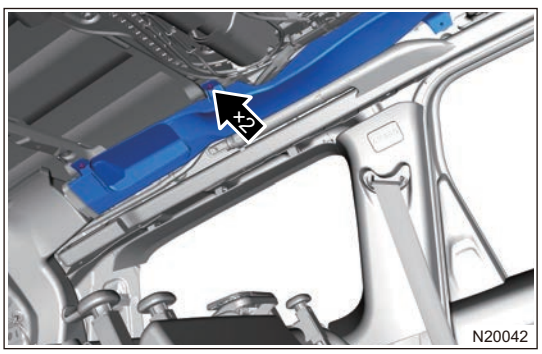
4.13 Replacement of Roof Left Air Duct Assembly

■ **Removal**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the roof assembly.
(4) Remove 2 fixing screws from roof left air duct assembly.



(5) Remove 2 fixing screws from roof left air duct assembly.



(6) Remove the roof left air duct assembly.

■ **Installation**

(1) Install the roof left air duct assembly to a proper position of body.
(2) Install 2 fixing screws to roof left air duct assembly.

(3) Install the roof assembly.

(4) Connect the negative battery cable.

4.14 Replacement of Third Row Left Air Duct

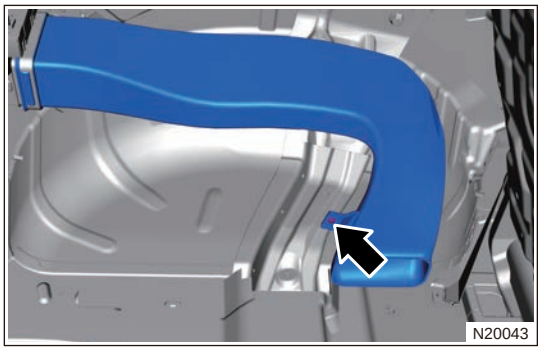
■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear seat cushion assembly.

(4) Remove 1 fixing screw from third row left air duct assembly.



(5) Remove the third row left air duct assembly.

■ Installation

(1) Install the third row left air duct assembly to a proper position of body.

(2) Install 1 fixing screw to third row left air duct assembly.

(3) Install the rear seat cushion assembly.

(4) Connect the negative battery cable.

4.15 Replacement of Rear A/C Mode Damper Motor

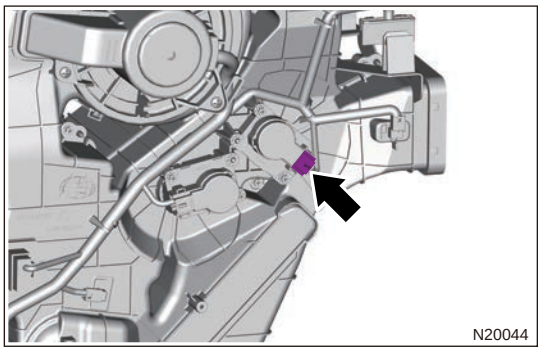
■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.

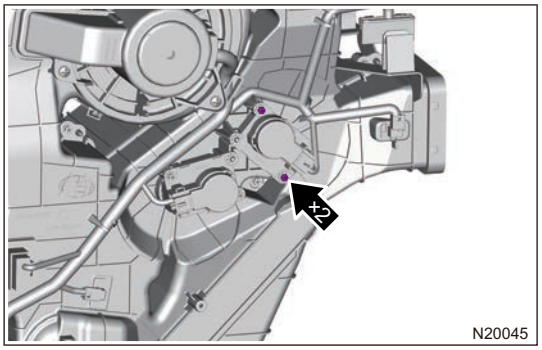
(2) Disconnect the negative battery cable.

(3) Remove the left luggage compartment protector body.

(4) Disconnect the rear A/C mode damper motor wire harness connector.



(5) Remove 2 fixing screws from rear A/C mode damper motor assembly.



(6) Remove the rear A/C mode damper motor.

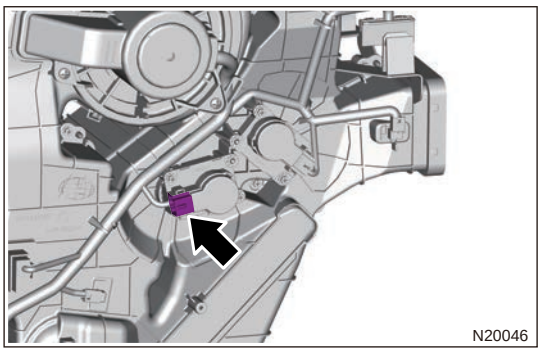
■ Installation

(1) Install rear A/C mode damper motor to a proper position of rear HVAC.
(2) Install 2 fixing screws to rear A/C mode damper motor assembly.
(3) Connect the rear A/C mode damper motor wire harness connector.
(4) Install the left luggage compartment protector body.
(5) Connect the negative battery cable.

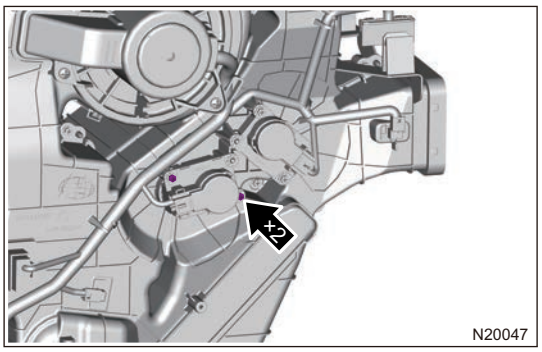
4.16 Rear A/C Temperature Adjustment Motor

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the left luggage compartment protector body.
(4) Disconnect the rear A/C temperature adjustment motor wire harness connector.



(5) Remove 2 fixing screws from rear A/C temperature adjustment motor assembly.



(6) Remove the rear A/C temperature adjustment motor.

■ Installation

(1) Install rear A/C temperature adjustment motor to a proper position of rear HVAC.
(2) Install 2 fixing screws to rear A/C temperature adjustment motor assembly.
(3) Connect the rear A/C temperature adjustment motor wire harness connector.
(4) Install the left luggage compartment protector body.
(5) Connect the negative battery cable.

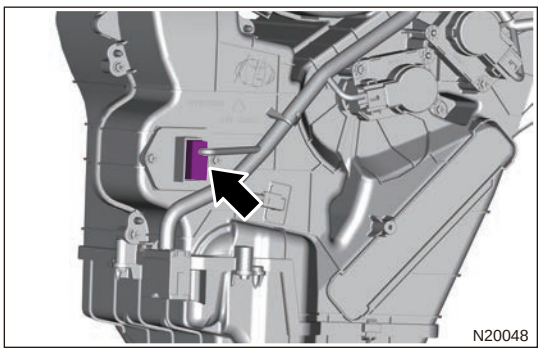
4.17 Rear Blower Speed Regulation Module

■ Removal

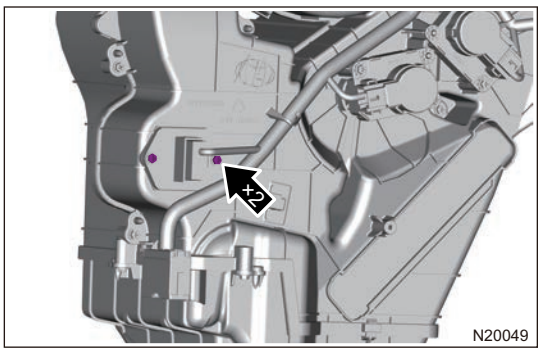
⚠ Warning

- **During normal operation, blower speed regulation module may be very hot. Turn off blower and wait for a few minutes to cool it before diagnosing or servicing, in order to avoid burns.**
- **DO NOT operate blower assembly when removing the blower speed regulation module from vehicle. Failure to do so may result in damage to the blower assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the left luggage compartment protector body.
(4) Disconnect the rear blower speed regulation module wire harness connector.



(5) Remove 2 fixing screws from rear blower speed regulation module.



(6) Remove the rear blower speed regulation module.

■ Installation

(1) Install the rear blower speed regulation module to a proper position of HVAC.
(2) Install 2 fixing screws to rear blower speed regulation module.
(3) Connect the rear blower speed regulation module wire harness connector.
(4) Install the left luggage compartment protector body.
(5) Connect the negative battery cable.

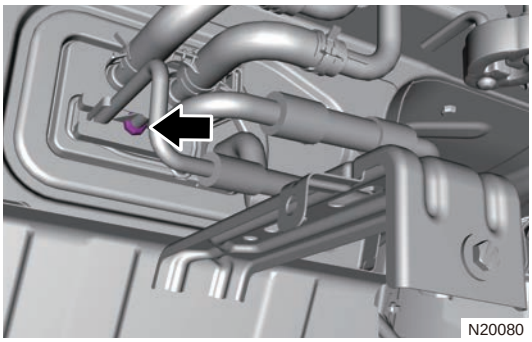
4.18 Rear HVAC Assembly

■ Removal

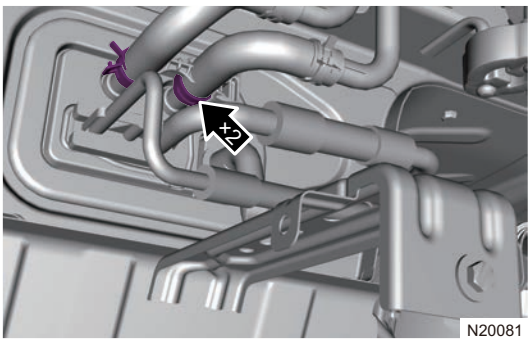
⚠ Warning

- **Special service equipment for R134a refrigerant must be used to recover/charge refrigerant.**
- **Be careful not to damage hoses during removal and installation.**
- **Always keep work area in good ventilation.**
- **Disconnected A/C line and connecting part should be sealed to prevent foreign matter from entering.**

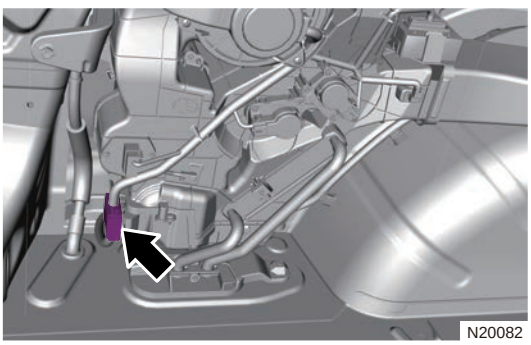
(1) Recover the refrigerant from A/C system.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Remove the left luggage compartment protector body.
(5) Remove the C-pillar upper protector.
(6) Remove fixing nut from expansion valve.


N20080

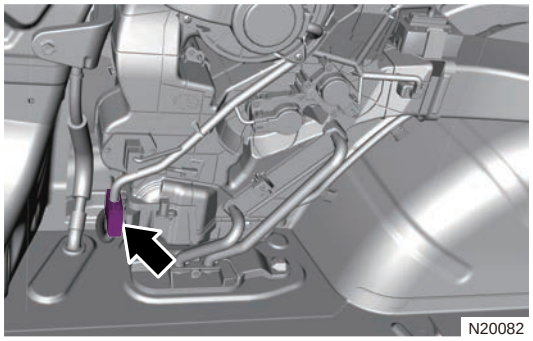
(7) Using snap spring pliers, disengage fixing clamp from heating inlet and outlet hoses to detach the inlet and outlet hoses.


N20081

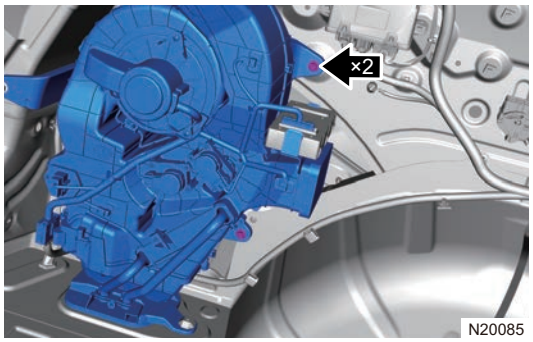
(8) Disconnect the rear A/C wire harness connector.


N20082

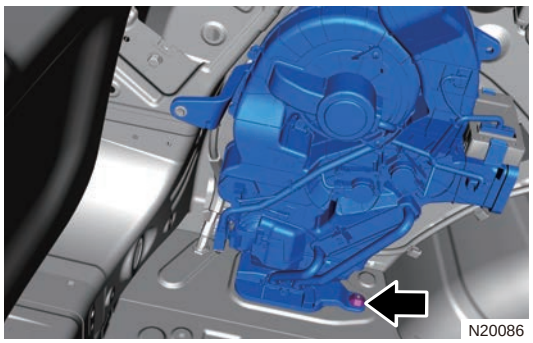
(9) Remove fixing nut from the upper part of rear HVAC assembly.



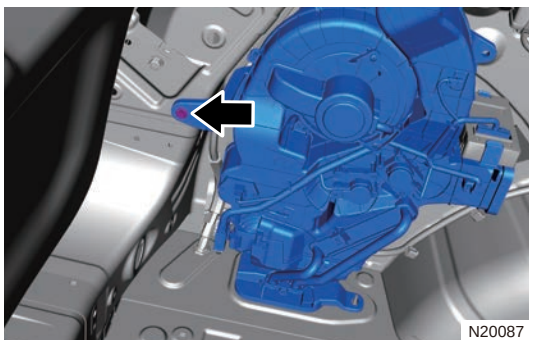
(10) Remove fixing bolt from the right side of rear HVAC assembly.



(11) Remove fixing nut from the lower part of rear HVAC assembly.



(12) Remove fixing bolt from the left side of rear HVAC assembly.



(13) Carefully remove rear HVAC assembly from back door.

■ Installation

(1) Install the rear HVAC assembly to a proper position of body.

(2) Install fixing bolt on the left side of rear HVAC assembly.

Torque: 5 ± 1 N m

(3) Install fixing nut to the lower part of rear HVAC assembly.

Torque: 5 ± 1 N m

(4) Install fixing bolt on the right side of rear HVAC assembly.
Torque: 5 ± 1 N m

(5) Install fixing nut to the upper part of rear HVAC assembly.
Torque: 5 ± 1 N m

(6) Connect the rear A/C wire harness connector.
(7) Connect the hose fixing clamp.
(8) Install fixing nut to expansion valve.
(9) Install the C-pillar upper protector.
(10) Install the left luggage compartment protector body.
(11) Install the negative battery cable.

SUPPLEMENTAL RESTRAINT SYSTEM

SUPPLEMENTAL RESTRAINT SYSTEM

10.1 AIRBAG CONTROL SYSTEM

1 Warnings and Precautions

1.1 Warnings

(1) Before removing airbag system components, disconnect the negative battery cable and wait for at least 90 seconds. Before servicing steering system, remove the driver airbag and spiral cable for safekeeping.

(2) If vehicle has been involved in a minor collision but the airbags do not deploy, always inspect airbag components.

(3) If airbags may be touched during servicing, remove the airbags as necessary and keep it properly before servicing.

(4) Never use airbag components from another vehicle. When replacing the airbag components, parts of the same model should be selected for replacement.

(5) If an airbag component is dropped or if there are any cracks, dents or other defects in the case, bracket or connector, it must be replaced with an airbag component with same model.

(6) Information labels are attached to the periphery of airbag components. Always follow the cautions and instructions on labels.

(7) Do not use a common multimeter to measure the resistance of airbag. Only use a multimeter with high impedance for measurement. Otherwise, the airbag may be deployed.

1.2 Precautions

(1) Never expose airbag components directly to hot air or open flame.

(2) Never attempt to disassemble or repair airbag components.

(3) Removed airbags should be kept properly. Never put other objects on them. If triggered accidentally, it may cause personal injury.

(4) As a disposable component, the airbag must be replaced after deployment and never reuse.

(5) Always dispose of vehicle together with airbags, or the airbags may be triggered accidentally to cause personal injury.

■ Precautions During Usage

Airbag is passive safety system component. In order to actually protect the passengers in collision with airbag, users should follow the precautions related to airbag usage:

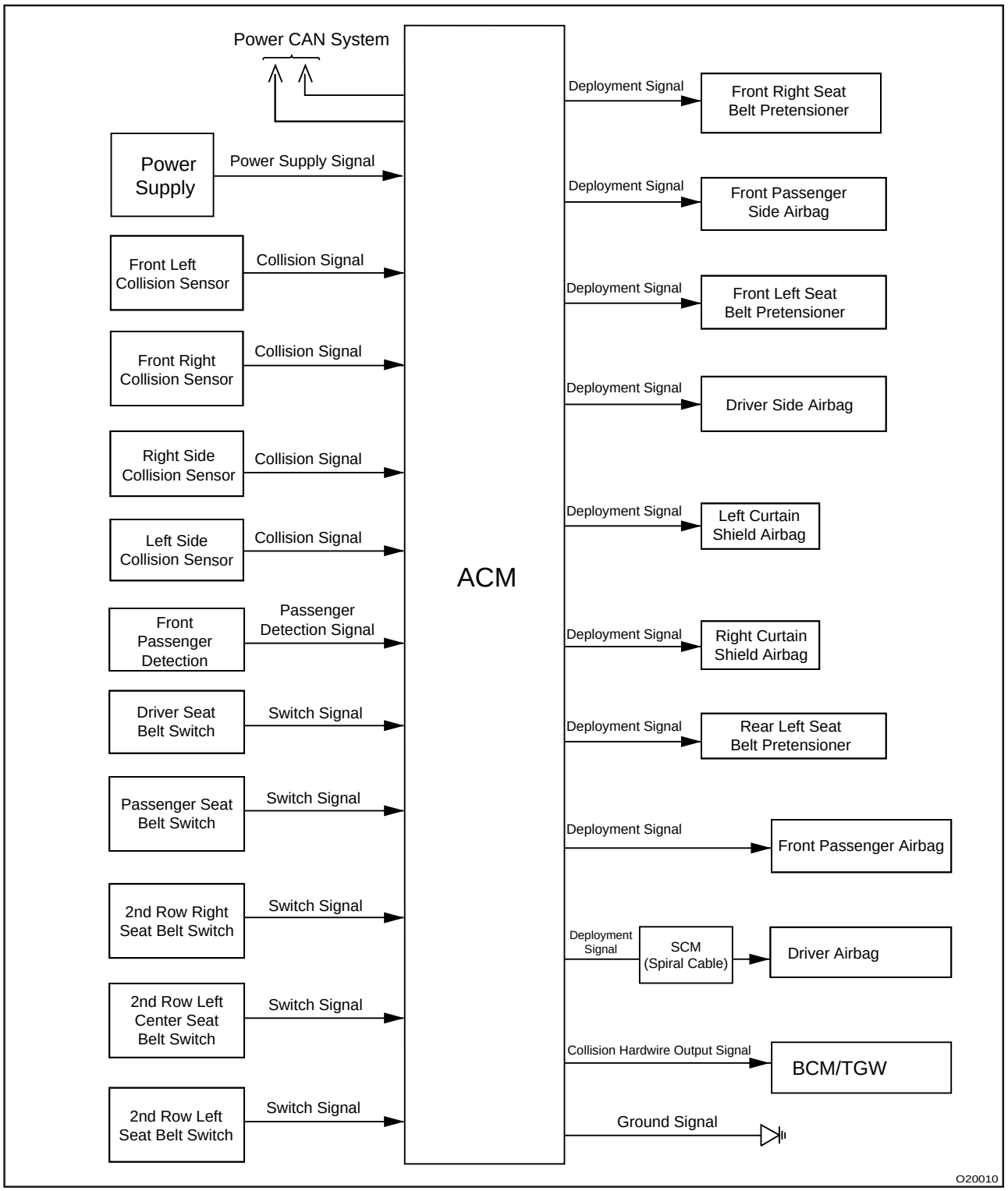
- Driver and passengers should use belt correctly. Correct belt usage can protect human body and reduce the personal injury in accidents.
- DO NOT add any additional units without permission that may interfere or damage belt pretensioner or airbag.
- DO NOT place any objects on steering wheel and front passenger side instrument panel, or these objects may cut into the inflated airbag or become trajectile to injure human body.
- DO NOT add or reversely place seat cover for seats with side airbag.
- Children that are under twelve are not allowed to sit in front seat. For vehicles equipped with passenger airbag, backward facing child seat is not allowed to use on front passenger seat.
- It’s only allowed to install genuine spare parts.
- Only authorized personnel can remove the controller, wire harness and connector from airbag.
- If airbag and belt pretensioner are deployed in accident, airbag controller and all wire harness with airbag connectors must be replaced together with airbag and belt.
- Airbag controller in all vehicles have been matched and verified and it’s forbidden to change vehicle structure and airbag controller. Random addition and modification of airbag controller and wire harness will make airbag controller operate abnormally, leading to airbag fault deployment and undeployment, which results in personal injury.
- Airbag manufacturer suggests that the airbag should be replaced after 10 years.

2 System Overview

2.1 System Description

Supplemental restraint system (SRS) consists of Airbag Control Module (ACM), driver airbag/front passenger airbag, front side airbag, curtain airbag, seat belt and other components. Circuit is continuously monitored and controlled by the airbag controller assembly. Airbag indicator on instrument cluster illuminates for approximately 6 seconds for a test each time ENGINE START STOP switch is turned to “ON”. Airbag indicator goes off after the test is completed. If indicator comes on at any time other than test time, it indicates that there is a problem in supplemental restraint system circuit.

2.2 System Components Diagram



- Whether the airbag is deployed depends on the deceleration signal of the vehicle during the collision. When the deceleration signal reaches the set actviation conditions; The microprocessor in the airbag controller of the supplemental restraint system sends signal to inflator unit of the corresponding airbag to rapidly deploy the airbag, thus protecting the occupant.

(1) The airbag controller controls the airbag and seat belt.

- Seat belt signals of front passenger and rear seat belt are directly transmitted to the airbag controller through hard wire connection.

- The airbag controller directly controls whether the airbags and curtain shield actuators are activated. When a collision occurs, the airbag controller will determine whether to issue the ignition command according to the detailed ignition condition strategy.

(2) This vehicle adopts the occupant restraint system, which includes active and supplemental types. Active restraint system requires occupants to take some actions, such as fastening seat belt; while supplemental restraint system requires no actions from occupants.

Airbag controller is a real-time embedded electronic control unit designed for passenger protection in cabin.

The main function of airbag controller is to trigger passive safety related devices such as airbags and pretensioner in the event of a crash.

1) Active restraint system

i. Driver seat belt and front passenger seat belt.

ii. Rear seat belt.

2) Supplemental restraint system

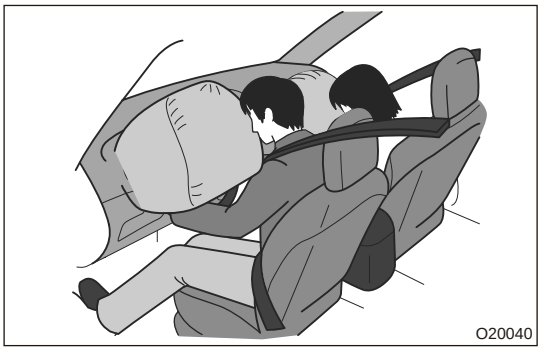
i. Airbag system.

■ Collision Operating Condition

Hint:
When the collision reaches the set ignition threshold.

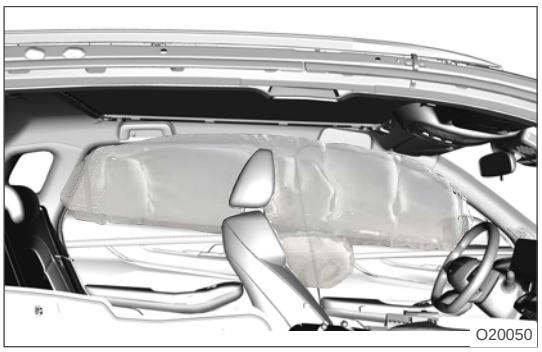
(1) Front collision

- Front collision is detected by the sensor in controller;
- Front collision ignition deployment circuit: driver and passenger front airbags, all seat belt with pretensioners.



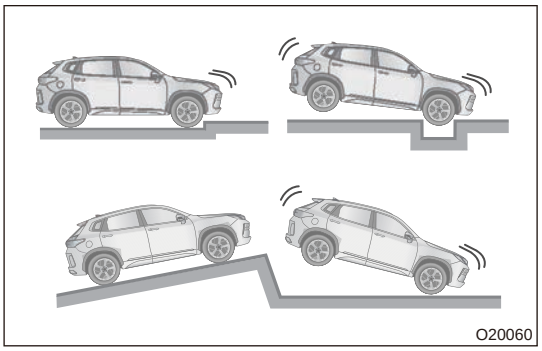
(2) Side collision

- Side collision is detected by the side collision sensor in B-pillar and the Sensor in controller.

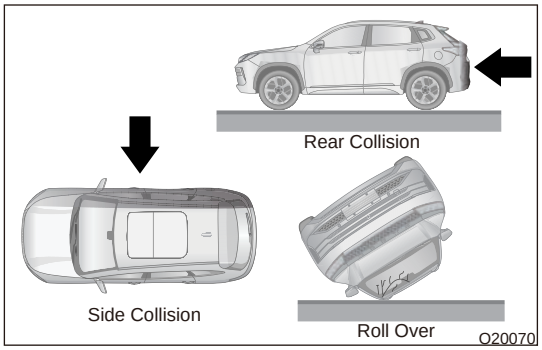


(3) Other collisions

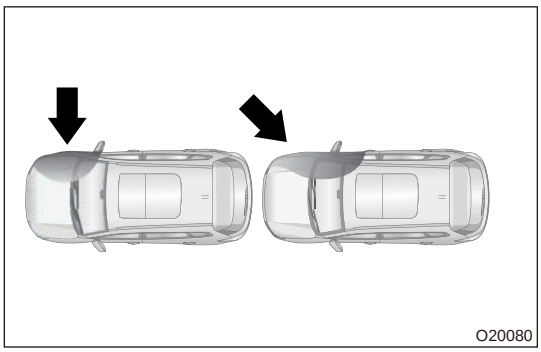
- If the bottom of vehicle is subjected to a severe impact, the driver airbag and front passenger airbag may also deploy as shown in illustration.



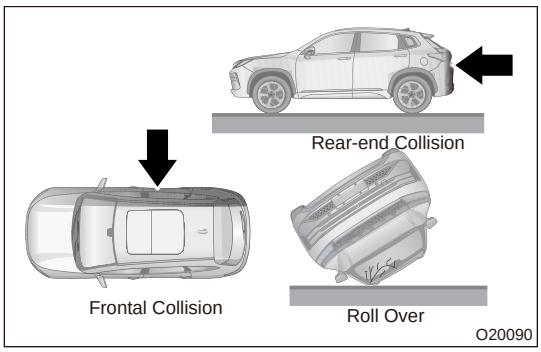
- When vehicle is involved in side collision, rear collision, roll over or frontal collision at low speed as shown in illustration, the driver airbag and front passenger airbag will not generally deploy.



- As shown in illustration, if a collision to the side of the vehicle body other than the passenger compartment, or the vehicle is subjected to a collision from the side at certain angles, the front side airbag and curtain shield airbag may not deploy.



- The side airbag and curtain shield airbag will not generally deploy if the vehicle is involved in a front collision, rear collision or roll over.



2.3 System Components Description

■ Airbag Control Module

The controller controls ignition circuit and activates airbag (and belt pretensioner) according to set activation threshold to keep occupants at proper position in the cabin when accident occurs, thus protecting occupants.

■ Driver Front Airbag and Passenger Front Airbag

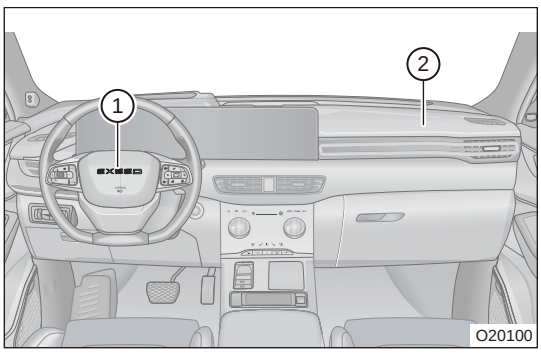
Driver front airbag is located on the steering wheel and integrated with the horn switch. Passenger front airbag is located above the glove box and inside the instrument panel upper body. As shown in illustration:

(1) Position of driver front airbag.

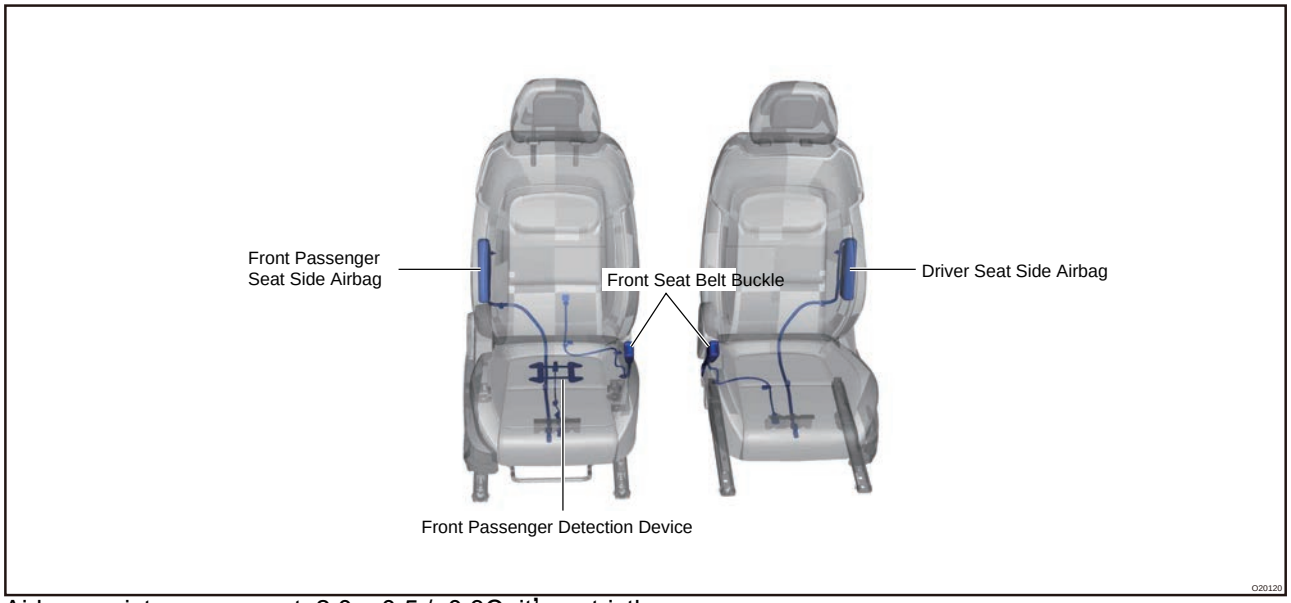
Resistance: 2.0 ± 0.3 Ω

(2) Position of front passenger front airbag.

Resistance: 2.0 ± 0.3 Ω

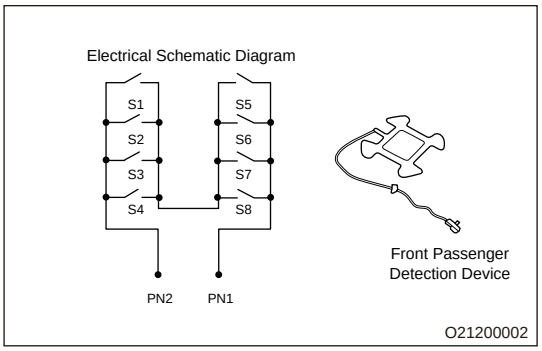


■ Front Passenger Side Airbag and Front Passenger Seat Belt Buckle

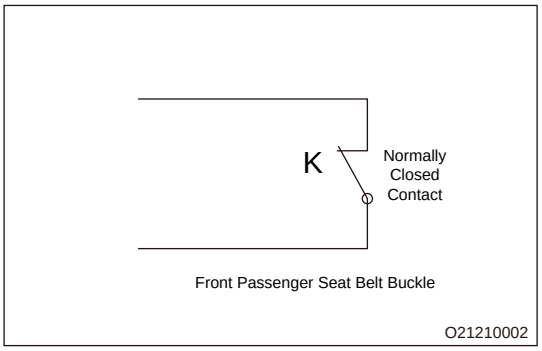


Airbag resistance on seat: 2.0 + 0.5 / -0.3Ω, it’ s strictly forbidden to measure resistance with multimeter!

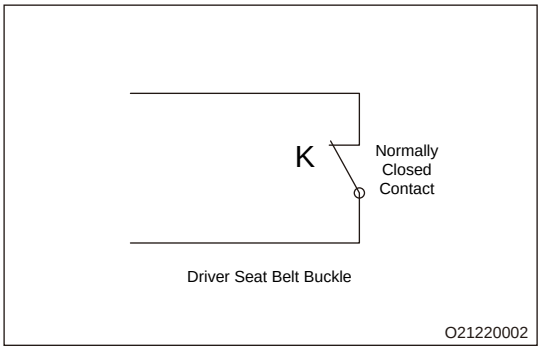
- Front passenger detection device schematic diagram as shown in illustration: Passenger loading status: When detected external resistance is lower than 100 Ω, it’ s judged that there is passenger. When resistance is higher than 400 Ω, it’ s judged that there is no passenger.



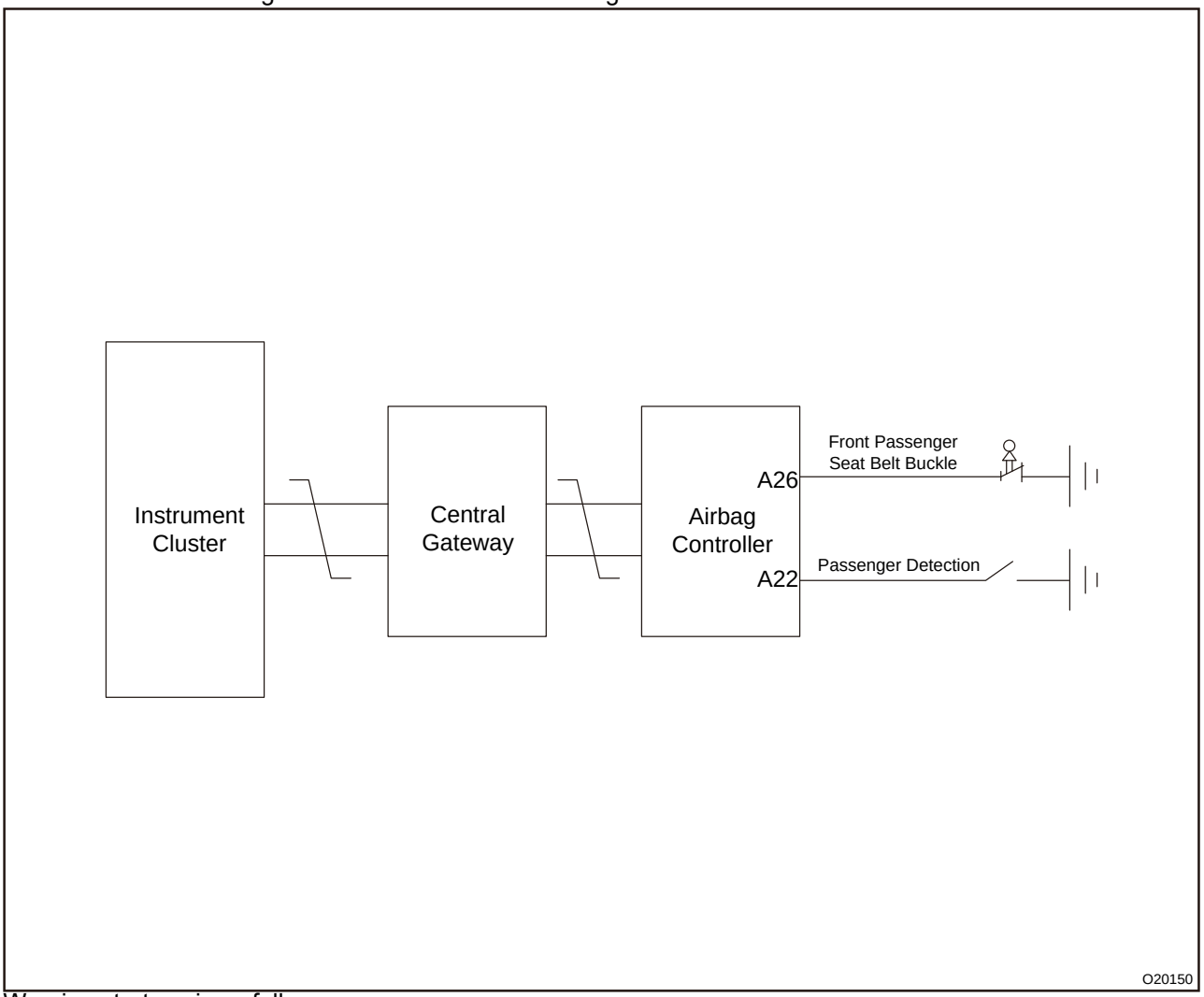
- Front passenger seat belt buckle schematic diagram is as shown in illustration. Front passenger seat belt buckle status: When detected external resistance is lower than 400 Ω, it’ s judged that the seat belt is not fastened. When resistance is higher than 900 Ω, it’ s judged that the seat belt is fastened.



- Driver seat belt buckle schematic diagram is as shown in illustration. The buckle is connected to the 19# terminal of instrument cluster. When ENGINE START STOP switch is ON, if the 19# terminal is high level / suspending, the driver seat belt warning in instrument cluster does not alarm; if the 19# terminal is low level, it will alarm.



Electrical schematic diagram related to seat belt warning is as follows:



Warning strategy is as follows
When ENGINE START STOP switch is in ON position:
If the driver wears the seat belt, the driver seat belt warning light goes off; If the seat belt is not fastened, the driver seat belt warning symbol flashes, and the buzzer will sound when vehicle speed is ⩾25 km/h, to remind the driver to wear the seat belt;
When ENGINE START STOP switch is in ON position:
The passenger seat belt buckle switch detection and passenger detection device operate together to confirm the logic of front passenger seat belt reminder warning light.
If there is an adult on the seat (signal of the detection device), and the seat belt is not fastened, the passenger seat belt warning symbol flashes, and the buzzer will sound when vehicle speed is 25 km/h or more, to remind the passenger to wear the seat belt. If the seat belt is fastened, the alarm will stop.
When seat belt warning is operating:
If the seat belt is fastened, the alarm will stop.
Shift to R position or warning for 100 seconds has finished, the buzzer stops sounding and indication warning continues.

■ Curtain Shield Airbag

Curtain shield airbag is mainly used to protect the head of passengers during side collision. The curtain shield airbag is installed in the inner side of roof and body quarter sheet metal, usually run through the front and rear, and it is controlled by the lateral acceleration sensor in the body. It will deploy when the lateral acceleration is greater than the calibrated threshold.

Resistance: 2.0 ± 0.3 Ω

■ Seat Belt

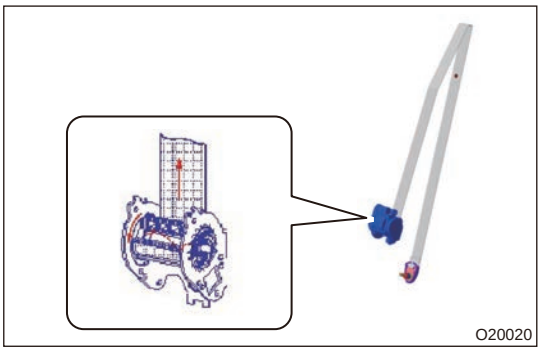
Following types of belts are equipped together with common emergency lock type seat belt:

(1) Emergency lock type belt

Reduce the pressure of belt on passengers, protect the occupants and prevent second collision.

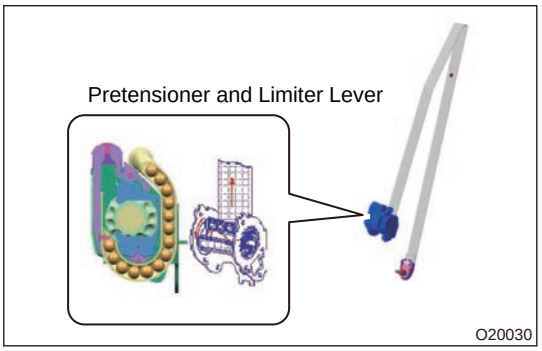
(2) Limiting type belt

Besides common emergency lock type belt, limiter lever is added. Reduce the pressure of belt on passengers, protect the occupants and prevent second collision.



(3) Limiting type belt with pretensioner

Besides common emergency lock type belt, pretensioner and limiter lever are added, which tightens the belt, reduces the pressure of belt on passengers, protects the occupants and prevents second collision during deployment.



2.4 Post-accident Repair and Inspection

(1) Post-accident components replacement of deployed airbag.

1) Airbag controller components should be replaced immediately in accordance with the provisions in this manual after the airbag is deployed in an accident.

(2) Post-accident components replacement of seat belt.

Hint:

After the collision, the seat belt replacement can be divided into the following two situations:

- The seat belt with pretensioner is determined to be activated or not depending on the form of the collision.
- Restraint and emergency locking are based on the presence or absence of an occupant.

1) Some seat belts need to be replaced or recommended to be replaced if airbag is deployed in an accident.

Seat Belt	Replace or Not
Used limiting type belt in the event of an accident	It is necessary to replace it
Seat belt with pretensioner that must be exploded or has been exploded	It is necessary to replace it
Used common emergency lock type belt in the event of an accident	It is necessary to replace it
Height adjuster (the seat belt had been used in the event of an accident)	It is necessary to replace it

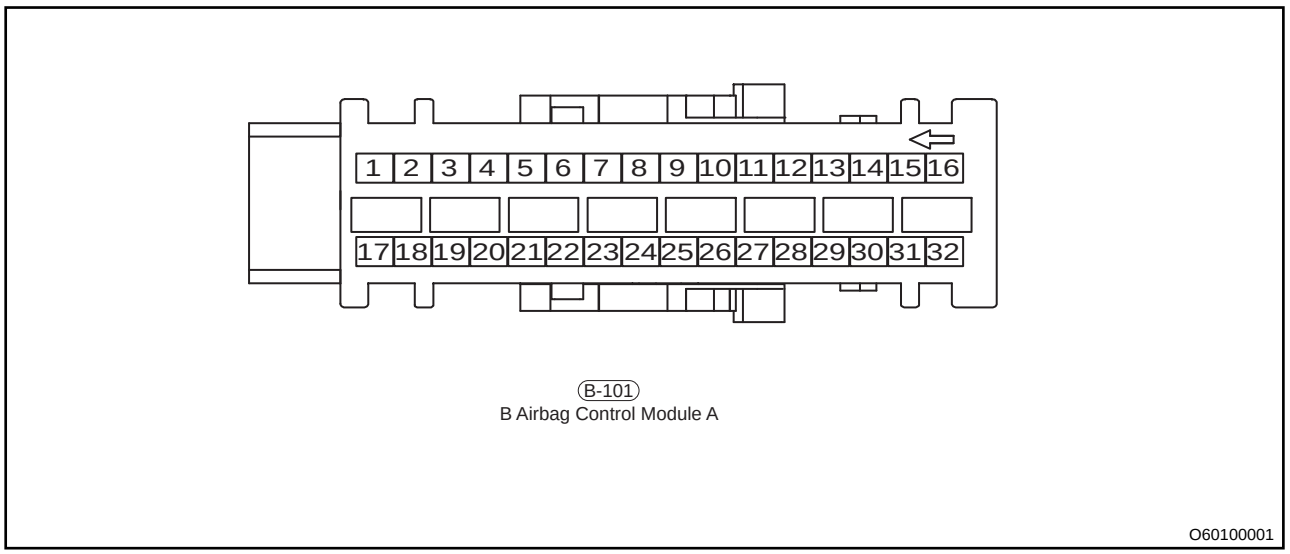
(3) Post-accident inspection of other components

1) No matter whether the airbag is deployed or not, specific inspection must be carried out after any collision. The steering column must be measured for dimension. Check the instrument panel and steering column cover for cracks or other damage, check the instrument panel support for deformation, bending, cracks or other damage and check the seat belt and installation fixing point.

3 System Circuit Diagram

3.1 Module Terminal Definition

■ Airbag Controller A

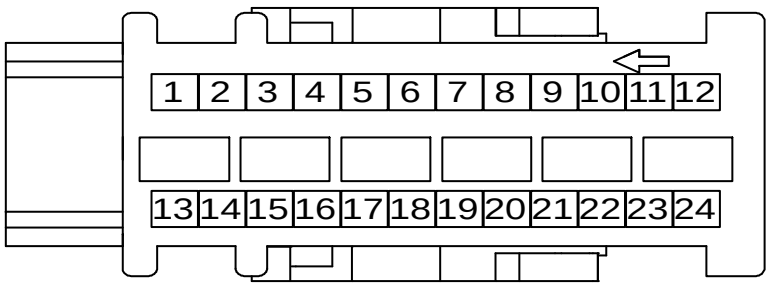


Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A1	/	Front Right Seat Side Airbag (+)	/	/
A2	/	Front Right Seat Side Airbag (-)	/	/
A3	/	Driver Airbag (-)	/	/
A4	/	Driver Airbag (+)	/	/
A5	/	Front Passenger Airbag (+)	/	/
A6	/	Front Passenger Airbag (-)	/	/
A7	/	Front Left Seat Side Airbag (-)	/	/
A8	/	Front Left Seat Side Airbag (+)	/	/
A9	/	Left Curtain Shield Airbag (+)	/	/
A10	/	Left Curtain Shield Airbag (-)	/	/
A11	/	Right Curtain Shield Airbag (-)	/	/
A12	/	Right Curtain Shield Airbag (+)	/	/

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A13	Body ground	Right Collision Sensor (+)	Power supply “ON”	7V
A14	Body ground	Right Collision Sensor (-)	Power supply “ON”	0V
A15	Body ground	Left Collision Sensor (-)	Power supply “ON”	0V
A16	Body ground	Left Collision Sensor (+)	Power supply “ON”	7V
A17	/	/	/	/
A18	/	/	/	/
A19	/	/	/	/
A20	/	/	/	/
A21	/	/	/	/
A22	Body ground	Second Row Right Seat Belt Buckle Switch	Power supply “ON”	0 V when not locked; 0.5 V when locked
A23	Body ground	Second Row Middle Seat Belt Buckle Switch	Power supply “ON”	0 V when not locked; 0.5 V when locked

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A24	Body ground	Second Row Middle Seat Belt Buckle Switch	Power supply “ON”	0 V when not locked; 0.5 V when locked
A25	Body ground	Front Passenger Weight Detection Sensor	Power supply “ON”	0V
A26	Body ground	Front Passenger Seat Belt Buckle Switch	Power supply “ON”	0V
A27	/	/	/	/
A28	/	/	/	/
A29	Body ground	Front Left Collision Sensor (+)	Power supply “ON”	7V
A30	Body ground	Front Left Collision Sensor (-)	Power supply “ON”	0V
A30	Body ground	Front Right Collision Sensor (-)	Power supply “ON”	0V
A32	Body ground	Front Right Collision Sensor (+)	Power supply “ON”	7V

■ **Airbag Controller B**



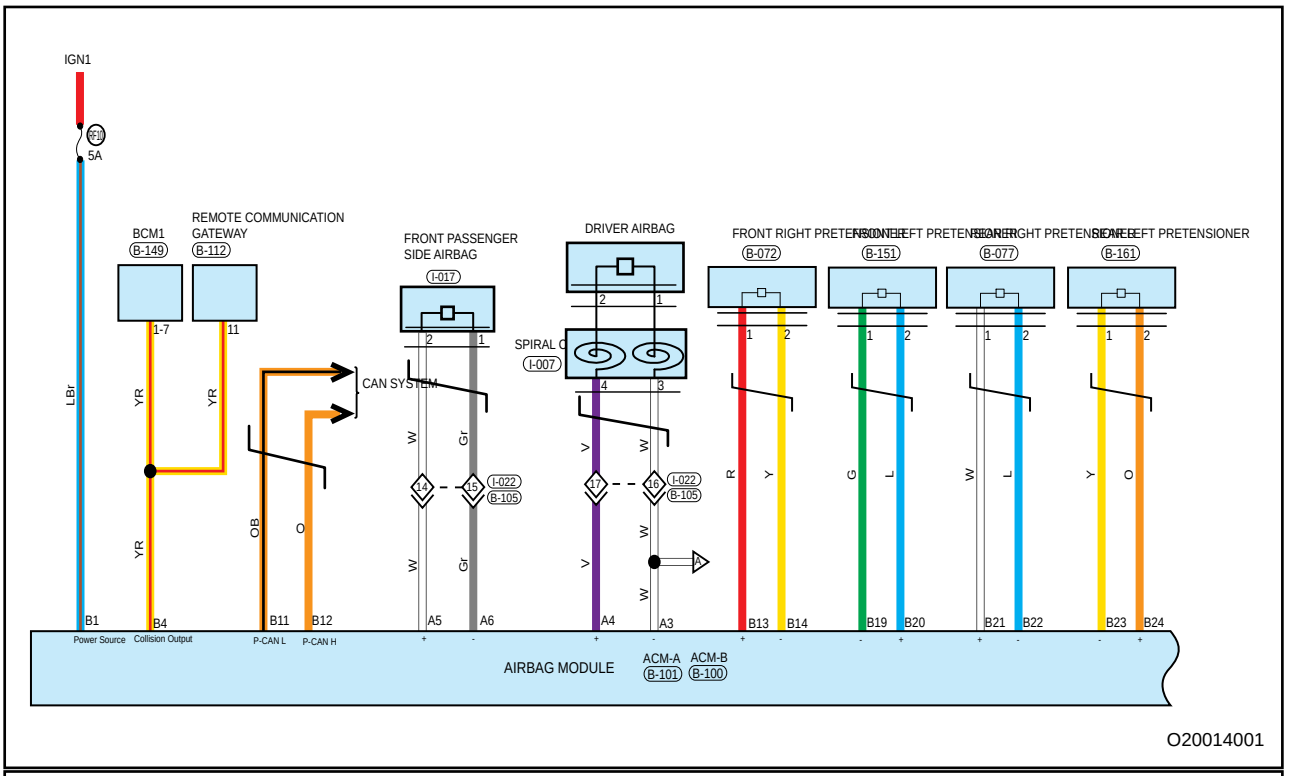
B-100
B Airbag Control Module B

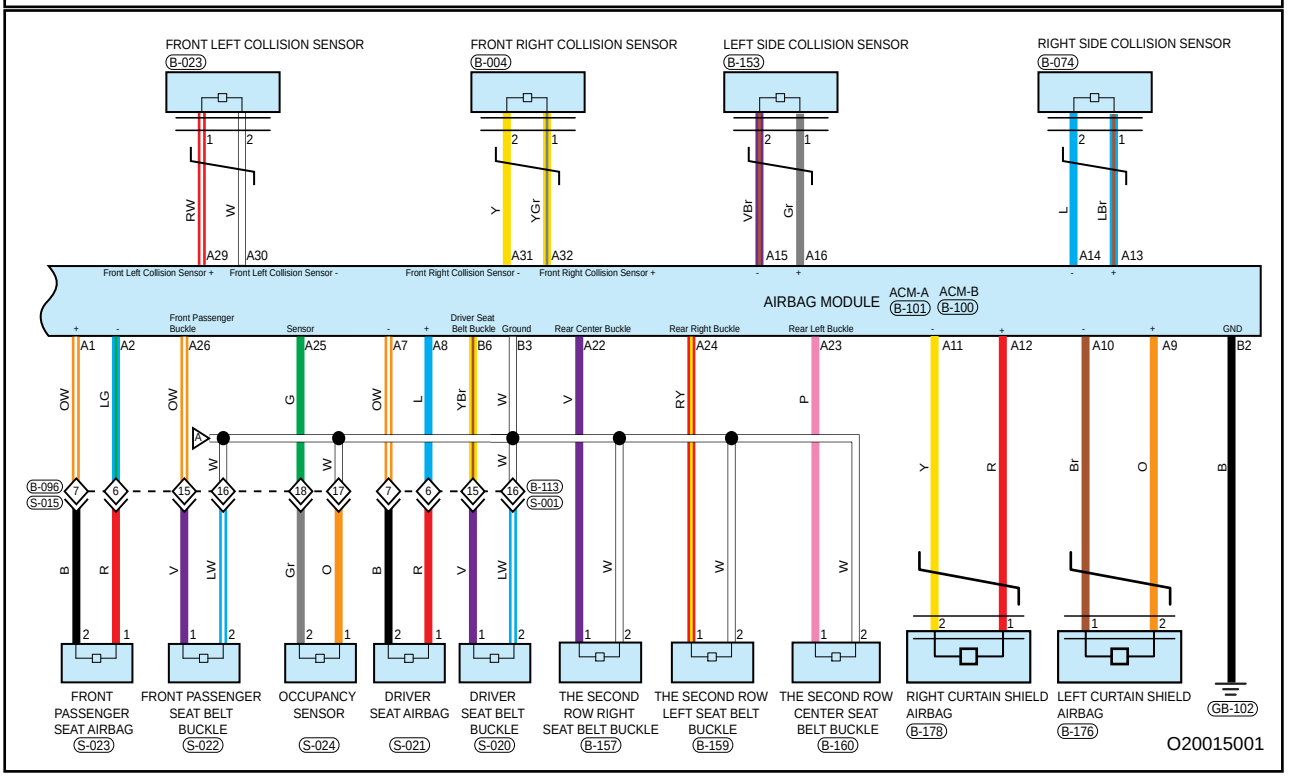
O60101001

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
B1	Body ground	IGN power supply	Power supply “ON”	12V
B2	Body ground	GND	Power supply “ON”	0V
B3	Body ground	GND (DCS GND)	Power supply “ON”	0V
B4	Body ground	Collision Output (ENS)	Power supply “ON”	8-9V
B5	/	/	/	/
B6	Body ground	Driver Seat Belt Buckle Switch	Power supply “ON”	0 V when not locked; 0.5 V when locked
B7	/	/	/	/
B8	/	/	/	/
B9	/	/	/	/
B10	/	/	/	/
B11	Body ground	CAN_L	Power supply “ON”	2.27V
B12	Body ground	CAN_H	Power supply “ON”	2.7V
B13	/	Front Right Seat Belt with Pretensioner (-Retractor) (+)	/	/
B14	/	Front Right Seat Belt with Pretensioner (-Retractor) (-)	/	/
B15	/	/	/	/

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
B16	/	/	/	/
B17	/	/	/	/
B18	/	/	/	/
B19	/	Front Left Seat Belt with Pretensioner (-Retractor) (-)	/	/
B20	/	Front Left Seat Belt with Pretensioner (-Retractor) (+)	/	/
B21	/	Second Row Right Seat Belt Pretensioner (+)	/	/
B22	/	Second Row Right Seat Belt Pretensioner (-)	/	/
B23	/	Second Row Left Seat Belt with Pretensioner (-)	/	/
B24	/	Second Row Left Seat Belt with Pretensioner (+)	/	/

3.2 Circuit Diagram





4 DIAGNOSIS & TEST

4.1

■ Diagnostic Tester Menu Function and Data Stream

Airbag system

(1) Enter “ACM (Airbag Control Module)”.

(2) Click “Version Information”.

(3) Click “Read Datastream”.

1) Click “IMU Off-line Calibration Status”.

2) Click “EOL Mode”.

3) Click “ACM Configuration Data”.

(4) Click “Special Operation”.

1) Click “IMU (Inertial Sensor) Calibration”.

2) Click “Write ACM Configuration Data”.

i. Click “Save the Paste (Transfer Configuration Data in Old Controller to New Controller Quickly)”.

- Click “Save Configuration Data in Old Controller”.
- Click “Write Configuration Data from Old Controller into New Controller”.

3) Click “Manual Writing”.

■ Diagnosis Contents

Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Airbag system indicator remains on	Battery voltage is too low or too high
	Airbag module internal fault
	Instrument cluster airbag indicator fault
	Poor contact in instrument cluster connector
	Airbag module power supply fuse open or poor contact
	Poor contact in airbag module connector
	Airbag circuit fault
Airbag assembly (resistance is too high or too low)	Airbag itself fault
	Connection fault between airbag and airbag module
	Airbag module fault

■ DTC Confirmation Procedure

Confirm that battery voltage is normal before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in supplemental restraint system.
- Turn the ENGINE START STOP switch to OFF and wait for several seconds.
- Turn ENGINE START STOP switch to “ON”, and then select read DTC.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

■ Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.

- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

■ Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

■ Preparations before Dealing with Airbag System Wire Harness Malfunction

(1) Read and record the system DTC.
(2) Turn ENGINE START STOP switch to OFF, disconnect the negative battery cable for at least 1 minute so that the airbag controller has enough time to discharge.
(3) Prevent electric static discharge, such as static-proof wrist strap.
(4) To prevent the ignition element from igniting accidentally during wire harness measurement, it is necessary to disengage all elements connected to wire harness, such as airbag, module, sensor etc. before measuring.

■ Airbag System Malfunction Repair Completion Inspection

(1) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable (if is the connected);
(2) Connect each wire harness connector of airbag system;
(3) Connect negative battery cable;
(4) Start the vehicle, operate the electrical system, turn on the electrical equipment as much as possible (-blower, rear defroster, headlight, audio, etc.). If all the following requirements are met, the airbag system is normal, otherwise it should be checked and repaired again:
    1) ENGINE START STOP switch is ON, system performs self-check, airbag warning light comes on. Warning light goes off when self-check is completed.
    2) Connect the diagnostic tester, read the DTC and observe the datastream. Use the simulation method if necessary. Test the vehicle in the malfunction conditions described by customer, check if the malfunction is no longer duplicate and no other DTCs are produced.
    3) If equipped with front passenger detection device, the front passenger seat belt warning light should operate normally; (Check method: A person sits on the front passenger seat and does not wear the seat belt, the light comes on and goes off after the seat belt is fastened.)
    4) Clear history DTC (if exists)

■ Disposal of Airbag

Airbag deploys (in vehicle).

(1) It is necessary to deploy the airbag before disposing. If the vehicle is scrapped and disassembled, the airbag may deploy in vehicle.

1) Preventive procedure of airbag deployment

⚠ Caution

To prevent injury when deploying the airbag in vehicle, please refer to following prevention methods:

- **Remove all movable objects or loose parts within airbag deployment range before the airbag is deployed.**
- **The airbag is deployed only in the reserved airbag deployment area with door closed and side window opened.**
- **The airbag is deployed only in the reserved airbag deployment area (site), the technicians must stand at least 10 meters in front of the vehicle.**
- **Do not load voltage before all preparations have been completed.**
- **Cool down the airbag at least 30 minutes before handling the deployed airbag.**
- **Please wear gloves and safety glasses during disposal process.**
- **If airbag deployment is failed, wait at least 5 minutes after disconnecting the voltage, and then you can approach the vehicle.**

2) Prevention methods of deployment procedure

i. Inside deployment prevention methods

- Disconnect the negative and positive battery cables and move the battery 10 meters away from the vehicle.
- Prepare two additional wire harnesses at least 10 meters long for each one and special connector for connecting the spiral cable (clock spring). Peel off the 13 mm insulation coat at the end of wire harness. Connect the connector at one end and another end to twist as shown in illustration.
- Place the twisted end next to the battery for airbag deployment, but do not connect it to battery at this time.
- Remove driver side lower instrument panel from steering column. When connecting the lower part of steering column to SRS wire harness connector of spiral cable, connect the connector in figure 10.
- Clean the site.
- Disengage the twisted end of the wire harness next to the battery for airbag deployment.
- One wire harness contacts with negative battery and another one contacts with positive battery, the airbag will deploy at this time.
- Deploy the passenger side airbag module using the same procedure.
- Handle the deployed airbag with correct prevention methods. Refer to “Handling Procedure for Deployed Airbag” in this manual.

ii. Outside deployment prevention methods

- Install the airbag set to the tire with rim with airbag front surface faced up, and the space for wire and connector is reserved to prevent the deployment from being destroyed.
- Prepare two additional wire harnesses at least 10 meters long for each one and special connector for connecting airbag set. Peel off the 13 mm insulation coat at the end of wire harness. Connect the connector at one end as shown in illustration.
- Place the twisted end next to the battery for airbag deployment, but do not connect it to battery at this time.
- Stack 4 old tires without rims on the wheel installed with airbag set, and secure all the tires in 4 different positions with rope.
- Clean the site.
- Disengage the twisted end of the wire harness next to the battery for airbag deployment.
- One wire harness contacts with negative battery and another one contacts with positive battery, the airbag will deploy at this time.
- Deploy the passenger side airbag module using the same procedure.
- Handle the deployed airbag with correct prevention methods. Refer to “Handling Procedure for Deployed Airbag Set” in this manual.

Handling procedure for deployed airbag set

(2) Place the deployed airbag in a solid plastic bag.

(3) Be sure to seal the plastic bag tightly.

(4) Wash both hands carefully after handling the deployed airbag.

(5) Although above protection measures are taken, if the irritant substance attaches to the eyes or skin, flush it with a large amount of water immediately.

⚠ Caution

- **There may be powder particles on airbag surface, which is primarily composed of chemical reaction product (used to lubricate bag when inflating).**
- **There may be substance which can irritate eyes or skin attached to the deployed airbag, so please wear gloves and safety glasses during disposal process.**
- **After the airbag deploys, the temperature on airbag module metal surface is very high. To avoid any injury or fire, please keep the deployed airbag module far away from any combustible materials,**
- **Do not pour water or oil on the airbag after the airbag deploys and handle it after cooling for 30 minutes.**

■ **Diagnosis Procedure**

Hint:
Use following procedures to troubleshoot the brake control system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Check if battery voltage is normal.
OK
Standard voltage: Not less than 12V.
Result

Result	Go to
OK	A
NG	B

B → **Replace battery**

A

3	**Customer problem analysis**

Next

4	**Read DTCs**

Result

Result	Go to
DTC occurs	A
No DTC	B

B → **Perform repair according to problem symptoms table**

A

5	Read DTCs (current DTC and history DTC)

Result

Result	Go to
Current DTC	A
History DTC	B

B → **Troubleshoot according to Intermittent DTC Fault Flow**

A

6	Repair according to Diagnostic Trouble Code (DTC) Chart

Next

7	Adjust, repair or replace

Next

8	Conduct test and confirm malfunction has been repaired

Next → **END**

4.2 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1271-16	ECU Supply Voltage Low	1. IG ON; 2. Initialization of components is completed.	Battery voltage; Wire harness connector; Module failure.	1. Check battery voltage; 2. Check wire harness; 3. Replace ECU.
B1270-17	ECU Supply Voltage High			
B0001-11	Driver/Left Front Airbag Squib Short to GND	Driver/front left airbag squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Airbag 3. Controller.	1. Check driver/front left airbag connector; 2. Check related wire harness of passenger frontal airbag; 3. Replace passenger frontal airbag; 4. Replace ECU.
B0001-12	Driver Frontal Airbag Deployment-Circuit Short To Battery	Driver/front left airbag squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0001-13	Driver/Left Front Airbag Squib High Resistance	Driver/front left airbag squib is short to GND for 4800 ms (400ms * 12); Resistance is more than 5.83Ω; gray area: 5.0~5.83Ω.		
B0001-19	Driver/Left Front Airbag Squib Cross-connect	Driver/front left airbag rear squib is cross-connected to another squib for 4800 ms (400ms * 12)/ Airbag pin is connected to another airbag pin in series.		
B0001-1A	Driver/Left Front Airbag Squib Low Resistance	Driver/front left airbag squib is short to GND for 4800 ms (400ms * 12); Resistance is less than 1.43 Ω; gray area: 1.43~1.7 Ω		
B0001-95	Driver/Left Front Airbag Squib Configured Fault	Not configured for driver/front left airbag/ airbag is only installed as hardware, but not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check driver/front left airbag connector; 2. Check related wire harness of passenger frontal airbag; 3. Check configuration; 4. Replace passenger frontal airbag; 5. Replace ECU.
B0020-11	Driver/Left Side Airbag Squib Short to GND	Driver side airbag squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Airbag 3. Controller.	1. Check driver/front left airbag connector; 2. Check related wire harness of driver side airbag; 3. Replace driver side airbag; 4. Replace ECU.
B0020-12	Driver/Left Side Airbag Squib Short to Power Line	Driver side airbag squib is short to power supply line for 4800 ms (400ms * 12); Resistances is less than 1 KΩ.		
B0020-13	Driver/Left Side Airbag Squib High Resistance	Driver side frontal airbag squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0020-19	Driver/Left Side Airbag Squib Cross-connect	Driver side frontal airbag rear squib is cross-connected to another squib for 4800 ms(400ms * 12)/ Airbag pin is connected to		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		another airbag pin in series.		
B0020-1A	Driver/Left Side Airbag Squib Low Resistance	Driver side frontal airbag rear squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0020-95	Driver/Left Side Airbag Squib Configured Fault	Not configured for driver side curtain shield airbag / airbag is only installed as hardware, but not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check driver/front left airbag connector; 2. Check related wire harness of driver side airbag; 3. Check configuration; 4. Replace driver side airbag; 5. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0021-11	Driver/Left Curtain Airbag Squib Short to GND	Driver side curtain shield airbag squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Airbag 3. Controller.	1. Check driver/front left airbag connector; 2. Check related wire harness of driver side curtain shield airbag; 3. Replace driver side curtain shield airbag; 4. Replace ECU.
B0021-12	Driver/Left Curtain Airbag Squib Short to Power Line	Driver side curtain shield airbag squib is short to power supply line for 4800 ms (400ms * 12); Resistances is less than 1 KΩ.		
B0021-13	Driver/Left Curtain Airbag Squib High Resistance	Driver side curtain shield airbag squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0021-19	Driver/Left Curtain Airbag Squib Cross-connect	Driver side curtain shield airbag rear squib is cross-connected to another squib for 4800 ms(400ms * 12)/ Airbag pin is connected to another airbag pin in series.		
B0021-1A	Driver/Left Curtain Airbag Squib Low Resistance	Driver side curtain shield airbag rear squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0021-95	Driver/Left Curtain Airbag Squib Configured Fault	Not configured for driver side frontal airbag/airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check driver side curtain shield airbag connector; 2. Check related wire harness of driver side curtain shield airbag; 3. Check configuration; 4. Replace driver side curtain shield airbag; 5. Replace ECU.
B0028-11	Passenger/Right Side Airbag Squib Short to GND	Passenger side airbag squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Airbag 3. Controller.	1. Check passenger side airbag connector; 2. Check related wire harness of passenger side airbag; 3. Replace passenger side airbag; 4. Replace ECU.
B0028-12	Passenger/Right Side Airbag Squib Short to Power Line	Passenger side airbag squib is short to power supply line for 4800 ms (400ms * 12); Resistances is less than 1 KΩ.		
B0028-13	Passenger/Right Side Airbag Squib High Resistance	Passenger side frontal airbag squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0028-19	Passenger/Right Side Airbag Squib Cross-connect Fault	Passenger side frontal airbag rear squib is cross-connected to another squib for 4800 ms(400ms * 12)/ Airbag pin is connected to another airbag pin in series.		
B0028-1A	Passenger/Right Side Airbag Squib Low Resistance	Passenger side frontal airbag rear squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0028-95	Passenger/Right Side Airbag Squib Configured Fault	Not configured for passenger side curtain shield airbag / airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check passenger side curtain shield airbag connector; 2. Check related wire harness of passenger side curtain shield airbag; 3. Check configuration; 4. Replace passenger side curtain shield airbag; 5. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0029-11	Passenger/Right Curtain Airbag Squib Short to GND	Passenger side curtain shield airbag squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Airbag 3. Controller.	1. Check passenger side curtain shield airbag connector; 2. Check related wire harness of passenger side curtain shield airbag; 3. Replace passenger side curtain shield airbag; 4. Replace ECU.
B0029-12	Passenger/Right Curtain Airbag Squib Short to Power Line	Passenger side curtain shield airbag squib is short to power supply line for 4800 ms (400ms * 12); Resistances is less than 1 KΩ.		
B0029-13	Passenger/Right Curtain Airbag Squib High Resistance	Passenger side frontal curtain shield airbag squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0029-19	Passenger/Right Curtain Airbag Squib Cross-connect	Passenger side frontal curtain shield airbag rear squib is cross-connected to another squib for 4800 ms (400ms * 12)/ Airbag pin is connected to another airbag pin in series.		
B0029-1A	Passenger/Right Curtain Airbag Squib Low Resistance	Passenger side frontal curtain shield airbag rear squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0029-95	Passenger/Right Curtain Airbag Squib Configured Fault	Not configured for passenger side frontal airbag/airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check passenger side curtain shield airbag connector; 2. Check related wire harness of passenger side curtain shield airbag; 3. Check configuration; 4. Replace passenger side curtain shield airbag; 5. Replace ECU.
B0050-11	Driver Seatbelt Buckle Short to Ground	Driver seat belt fixing buckle is short to ground for 6.2 seconds.	1. Wire harness connector; 2. Seat belt buckle is damaged; 3. Controller.	1. Check driver seat belt buckle switch connector; 2. Check related wire harness of driver seat belt buckle switch;

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0050-12	Driver Seatbelt Buckle Short to Power Line	Driver seat belt fixing buckle is short to power supply line for 6200 ms (100 ms * 62)/short to high voltage is circuit, voltage is more than 1.4 V.		3. Replace driver seat belt buckle switch; 4. Replace ECU.
B0050-13	Driver Seatbelt Buckle Open Circuit	Open in driver seat belt buckle circuit for 6.2 seconds.		
B0050-1D	Driver Seatbelt Buckle Meas High/Meas Low/ Bad Sensor	Driver seat belt buckle current high/low/sensor is damaged for 6.2 seconds.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0052-12	Front Passenger Seatbelt Buckle Short to Power Line	Short to high voltage in circuit is more than 1.4V.	1. Wire harness connector; 2. Seat belt buckle is damaged; 3. Controller.	1. Check corresponding seat belt buckle switch connector; 2. Check corresponding wire harness of driver seat belt buckle switch; 3. Replace corresponding seat belt buckle switch; 4. Replace ECU.
B0053-12	Second Row Left Seatbelt Sensor Short to Power Line			
B0054-12	Second Row Center Seatbelt Sensor Short to Power Line			
B0055-12	Second Row Right Seatbelt Sensor Short to Power Line			
B0070-11	Driver/Left Pretensioner Squib Short to GND	Driver seat belt pretensioner squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Seat belt pretensioner; 3. Controller.	1. Check driver seat belt pretensioner connector; 2. Check related wire harness of driver seat belt pretensioner; 3. Replace driver seat belt pretensioner; 4. Replace ECU.
B0070-12	Driver/Left Pretensioner Squib Short to Power Line	Driver seat belt pretensioner squib is short to GND and power supply line for 4800 ms (400ms * 12); Resistances is less than 1KΩ.		
B0070-13	Driver/Left Pretensioner Squib High Resistance	Driver seat belt pretensioner squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0070-19	Driver/Left Pretensioner Squib Cross-connect	Driver seat belt pretensioner squib is cross-connected to another squib for 4800 ms(400ms * 12)/ Driver seat belt pretensioner squib pin is connected to another airbag pin in series.		
B0070-1A	Driver/Left Pretensioner Squib Low Resistance	Driver seat belt pretensioner squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0070-95	Driver/Left Pretensioner Squib Configured Fault	Not configured for driver seat belt pretensioner / airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check driver seat belt pretensioner connector; 2. Check related wire harness of driver seat belt pretensioner; 3. Replace driver seat belt pretensioner; 4. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0072-11	Passenger/Right Pretensioner Squib Short to GND	Passenger seat belt pretensioner squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Seat belt pretensioner; 3. Controller.	1. Check passenger seat belt pretensioner connector; 2. Check related wire harness of passenger seat belt pretensioner; 3. Replace passenger seat belt pretensioner; 4. Replace ECU.
B0072-12	Passenger/Right Pretensioner Squib Short to Power Line	Passenger seat belt pretensioner squib is short to GND and power supply line for 4800 ms (400ms * 12); Resistances is less than 1KΩ.		
B0072-13	Passenger/Right Pretensioner Squib High Resistance	Passenger seat belt pretensioner squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0072-19	Passenger/Right Pretensioner Squib Cross-connect Fault	Passenger seat belt pretensioner squib is cross-connected to another squib for 4800 ms (400ms * 12)/ Driver seat belt pretensioner squib pin is connected to another airbag pin in series.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0072-1A	Passenger/Right Pretensioner Squib Low Resistance	Passenger seat belt pretensioner squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0072-95	Passenger/Right Pretensioner Squib Configured Fault	Not configured for Passenger seat belt pretensioner/airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check passenger seat belt pretensioner connector; 2. Check related wire harness of passenger seat belt pretensioner; 3. Replace passenger seat belt pretensioner; 4. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0073-11	Passenger/Right Pretensioner Squib Short to GND	Passenger seat belt pretensioner squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Seat belt pretensioner; 3. Controller.	1. Check passenger seat belt pretensioner connector; 2. Check related wire harness of passenger seat belt pretensioner; 3. Replace passenger seat belt pretensioner; 4. Replace ECU.
B0073-12	Passenger/Right Pretensioner Squib Short to Power Line	Passenger seat belt pretensioner squib is short to GND and power supply line for 4800 ms (400ms * 12); Resistances is less than 1KΩ.		
B0073-13	Passenger/Right Pretensioner Squib High Resistance	Passenger seat belt pretensioner squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0073-19	Passenger/Right Pretensioner Squib Cross-connect Fault	Passenger seat belt pretensioner squib is cross-connected to another squib for 4800 ms (400ms * 12)/ Driver seat belt pretensioner squib pin is connected to another airbag pin in series.		
B0073-1A	Passenger/Right Pretensioner Squib Low Resistance	Passenger seat belt pretensioner squib low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0073-95	Passenger/Right Pretensioner Squib Configured Fault	Not configured for Passenger seat belt pretensioner/airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check passenger seat belt pretensioner connector; 2. Check related wire harness of passenger seat belt pretensioner; 3. Replace passenger seat belt pretensioner; 4. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0075-11	Rear Right Pretensioner Squib Short to GND	Rear right seat belt pretensioner squib is short to GND for 4800 ms (400ms * 12); Resistances is less than 1KΩ.	1. Wire harness connector; 2. Seat belt pretensioner; 3. Controller.	1. Check passenger seat belt pretensioner connector; 2. Check related wire harness of passenger seat belt pretensioner; 3. Replace passenger seat belt pretensioner; 4. Replace ECU.
B0075-12	Rear Right Pretensioner	Rear right seat belt pretensioner squib is		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Squib Short to Power Line	short to GND and power supply line for 4800 ms (400ms * 12); Resistances is less than 1KΩ.		
B0075-13	Rear Right Seat Belt Pretensioner High Resistance	Rear right belt pretensioner squib high resistance for 4800 ms (400ms * 12); Resistances is more than 5.83 Ω; gray area: 5.0~5.83 Ω.		
B0075-19	Right Rear Pretensioner Squib Cross-connect Fault	Rear right seat belt pretensioner squib is cross-connected to another squib for 4800 ms(400ms * 12)/ Driver seat belt pretensioner squib pin is connected to another airbag pin in series.		
B0075-1A	Rear Right Pretensioner Low Resistance	Rear right seat belt pretensioner low resistance for 4800 ms (400ms * 12); Resistances is less than 1.43 Ω; gray area: 1.43~1.7 Ω.		
B0075-95	Rear Right Pretensioner Squib Configured Fault	Not configured for rear right seat belt pretensioner/airbag is only installed as hardware, not configured for software.	1. Wire harness connector; 2. Not configured; 3. Controller.	1. Check rear right seat belt pretensioner connector; 2. Check related wire harness of rear right seat belt pretensioner; 3. Check configuration; 4. Replace rear right seat belt pretensioner; 5. Replace ECU.
B0090-11	Front Left Sensor Short to GND	Front left collision sensor is short to ground for 2000ms (5ms * 400), output current from passage exceeds 130 mA.	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check front left collision sensor connector; 2. Check related wire harness of front left collision sensor; 3. Replace front left collision sensor; 4. Replace ECU.
B0090-13	Front Left Sensor Open	Open in front left collision sensor for 2000ms (5ms * 400).		
B0090-49	Front Left Sensor Internal Fault	Data in front left collision sensor exceeds range for 2000ms (5ms * 400).		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0090-55	Front Left Sensor Configured Fault	Configuration fault in front left collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Not configured or configuration fault; 3. Controller.	1. Check front left collision sensor connector; 2. Check related wire harness of front left collision sensor; 3. Check configuration; 4. Replace front left collision sensor; 5. Replace ECU.
B0090-87	Front Left Sensor Communication Fault	Communication in front left collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check front left collision sensor connector; 2 Check related wire harness of front left collision sensor; 3. Replace front left collision sensor; 4. Replace ECU.
B0091-11	Left B-pillar Sensor Short to GND	Left B-pillar collision sensor is short to ground for 2000ms (5ms * 400), output current from passage exceeds 130 mA.	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check left B-pillar collision sensor connector; 2. Check related wire harness of left B-pillar collision sensor; 3. Replace left B-pillar collision sensor; 4. Replace ECU.
B0091-13	Left B-pillar Sensor Open	Open in left B-pillar collision sensor for 2000ms (5ms * 400).		
B0091-49	Left B-pillar Sensor Internal Fault	Data in left B-pillar collision sensor exceeds range for 2000ms (5ms * 400).		
B0091-55	Left B-pillar Sensor Configured Fault	Configuration fault in front left collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Not configured or configuration fault; 3. Controller.	1. Check left B-pillar collision sensor connector; 2. Check related wire harness of left B-pillar collision sensor; 3. Check configuration; 4. Replace left B-pillar collision sensor; 5. Replace ECU.
B0091-87	Left B-pillar Sensor Communication Fault	Communication in front left collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check left B-pillar collision sensor connector; 2. Check related wire harness of left B-pillar collision sensor; 3. Replace left B-pillar collision sensor; 4. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0095-11	Front Right Sensor Short to GND	Front right collision sensor is short to ground for 2000ms (5ms * 400), output current from passage exceeds 130 mA.	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check front right collision sensor connector; 2. Check related wire harness of front right collision sensor; 3. Check front right collision sensor connector; 4. Replace ECU.
B0095-13	Front Right sensor Open	Open in front right collision sensor for 2000ms (5ms * 400).		
B0095-49	Front Right Sensor Internal Fault	Data in front right collision sensor exceeds range for 2000ms (5ms * 400).		
B0095-55	Front Right Sensor Configured Fault	Configuration fault in front right collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Not configured or configuration fault; 3. Controller.	1. Check front right collision sensor connector; 2. Check related wire harness of front right collision sensor; 3. Check configuration; 4. Replace front right collision sensor; 5. Replace ECU.
B0095-87	Front Right Sensor communication Fault	Communication in front right collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check front right collision sensor connector; 2 Check related wire harness of front right collision sensor; 3. Replace front right collision sensor; 4. Replace ECU.
B0096-11	Right B-pillar Sensor Short to GND	Right B-pillar collision sensor is short to ground for 2000ms (5ms * 400), output current from passage exceeds 130 mA.	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check right B-pillar collision sensor connector; 2. Check related wire harness of right B-pillar collision sensor; 3. Replace right B-pillar collision sensor; 4. Replace ECU.
B0096-13	Right B-pillar Sensor Open	Open in right B-pillar collision sensor for 2000ms (5ms * 400).		
B0096-49	Right B-pillar Sensor Internal Error	Data in right B-pillar collision sensor exceeds range for 2000ms (5ms * 400).		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B0096-55	Right B-pillar Sensor Configured Error	Configuration fault in front right collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Not configured or configuration fault; 3. Controller.	1. Check right B-pillar collision sensor connector; 2. Check related wire harness of right B-pillar collision sensor; 3. Check configuration; 4. Replace right B-pillar collision sensor; 5. Replace ECU.
B0096-87	Right B-pillar Sensor Communication Error	Communication in front right collision sensor for 2000ms (5ms * 400).	1. Wire harness connector; 2. Sensor failure; 3. Controller.	1. Check right B-pillar collision sensor connector; 2. Check related wire harness of right B-pillar collision sensor; 3. Replace right B-pillar collision sensor; 4. Replace ECU.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12E0-49	Internal Error	Internal malfunction occurs.	Controller internal fault occurs.	Replace ACM module.
B12E1-96	Airbag or Pretenioner Deployed When Front Crash Detect	Airbag or pretenioner deploys when front crash is detected.	1. Vehicle is involved in a collision. 2. Controller fault.	
B12E2-96	Airbag or Pretenioner Deployed When Rear Crash Detect	Airbag or pretenioner deploys when front crash is detected.		
B12E3-96	Airbag or Pretenioner Deployed When Rear Crash Detect	Airbag or pretenioner deploys when front crash is detected.		
B12E5-00	Disposal Command Record - Performed Scrap Deployment	Disposal command is received.	1. Disposal command is received; 2. Vehicle is involved in a collision. 3. Controller.	
B12E6-54	IMU EOL Calibration Missing	IMU calibration is not performed.	IMU calibration is not performed.	IMU calibration is performed.
B12E6-92	IMU EOL Calibration Fail	External IMU failed to be calibrated.	External IMU failed to be calibrated.	
B12E7-95	EOL Configuration Parameters Missing	EOL configuration fails.	EOL configuration fails.	EOL calibration is successfully completed.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B12E8-95	ACM in EOL Configuration Mode	ACM is in EOL mode.	ACM is in EOL mode.	

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U0100-87	Lost Communication with EMS	If EMS message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared.	1. Control module is damaged; 2. Wire harness is broken.	Refer to CAN network system for troubleshooting
U0101-87	Lost Communication with TCU	If TCU information is not received within 100 ms, this DTC will be generated, if this information is received for 3 consecutive times, DTC will be cleared		
U0122-87	Lost Communication with ESC	If ESC message is not received within 20 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared.		
U0140-87	Lost Communication with BCM	If BCM message is not received within 100 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared.		
U0155-87	Lost Communication with IPC	If IPC information is not received within 100 ms, this DTC will be generated, if this information is received for 3 consecutive times, DTC will be cleared		
U0212-87	Lost Communication with SCM	If SCM message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U0248-87	Lost Communication with PEPS	If PEPS message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U1272-88	CAN Bus Off	Vehicle CAN is short to ground, this DTC will be generated when disconnected; This DTC will be cleared after returning to normal.	1. Control module is damaged; 2. Wire harness is broken.	Refer to CAN network system for troubleshooting
U0401-86	Abnormal Data Length Received by EMS	If incorrect data is received from EMS, this DTC will occur, the DTC will be cleared after data is normal.		
U0401-81	Invalid Data Received from EMS			
U0402-86	Abnormal Data Length Received by TCU	If incorrect data is received from TCU, this DTC will be generated, the DTC will be cleared after data is normal.		
U0402-81	Invalid Data Received from TCU			
U0416-86	Abnormal Data Length Received by ESC	If incorrect data is received from ESC, this DTC will be generated, the DTC will be cleared after data is normal.		
U0416-81	Invalid Data Received from ESC			
U0422-86	Abnormal Data Length Received by BCM	If incorrect data is received from BCM, this DTC will be generated, the DTC will be cleared after data is normal.		
U0422-81	Invalid Data Received from BCM			
U0423-86	Abnormal Data Length Received by IPC	If incorrect data is received from IPC, this DTC will be generated, the DTC will be cleared after data is normal.		
U0423-81	Invalid Data Received from IPC			
U0426-86	Abnormal Data Length Received by PEPS	If incorrect data is received from PEPS, this DTC will be generated, the DTC		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U0426-81	Invalid Data Received from PEPS	will be cleared after data is normal.		
U0429-86	Abnormal Data Length Received by SCM	If incorrect data is received from SCM, this DTC will be generated, the DTC will be cleared after data is normal.		
U0429-81	Invalid Data Received from SCM			

■ **Controller Power Supply Fault**

DTC	DTC Definition
B1271-16	ECU Supply Voltage Low
B1270-17	ECU Supply Voltage High

- Possible cause for “High Voltage” malfunction: unstable power supply, sudden invalid load.
- Possible cause for “Low Voltage” malfunction: unstable power supply, poor contact;

⚠ Warning
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check system voltage

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Start engine, and use voltage band of multimeter to check if battery voltage is normal. (Rated voltage: Not less than 12 V).

Operating voltage

Multimeter Connection	Condition	Operating Voltage
Battery (+) - Battery (-)	ENGINE START STOP switch “ON”	Not less than 12 V

NG	Repair or replace battery/alternator

2	Check fuse

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Check for continuity of fuse RF10 in instrument panel fuse with a digital multimeter.

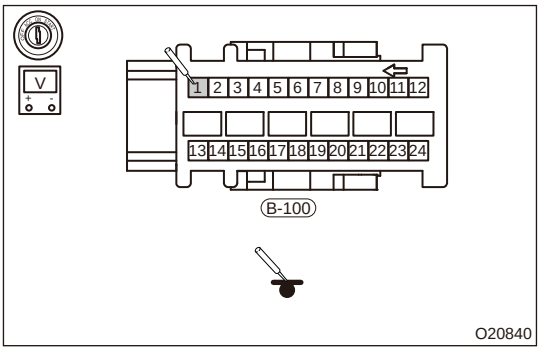
NG	Replace fuse.

3	Check airbag controller power supply

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF and connect the negative battery cable.

(b) Turn ENGINE START STOP switch to ON and use a digital multimeter to measure voltage of power supply. If the voltage is as required, make tests with 21W bulbs. Bright test lamp indicates that power supply is sufficient, and dim test lamp indicates that power supply is insufficient and poor contact of wire harness may occur.



Specified Condition

Multimeter Connection	Condition	Operating Voltage
B-100 (B1) - Ground	ENGINE START STOP switch "ON"	Not less than 12 V

NG	Replace fuse

4	Check airbag controller ground

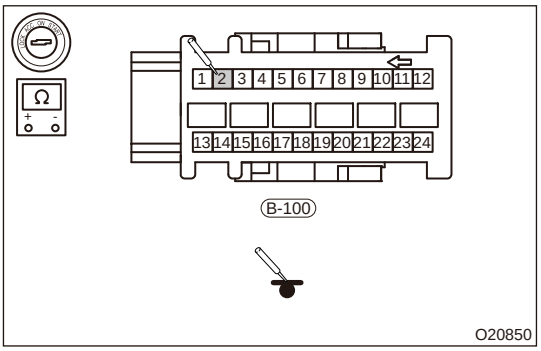
Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF and connect the negative battery cable.

(b) Disconnect the component connectors (measurement value is incorrect with power on, and power off is necessary).

(c) Use ohm band of digital multimeter to detect the continuity between B-100 (B2) and ground.

Specified Condition



Specified Condition

Multimeter Connection	Condition	Operating Voltage
B-100 (B1) - Ground	ENGINE START STOP switch "ON"	Not less than 12 V

OK	Replace module assembly.

NG	Check or repair module ground.

■ **Actuator Short Fault to Ground**

DTC	DTC Definition
B0001-11	Driver Frontal Airbag Deployment Control-Circuit Short To Ground
B0010-11	Passenger Airbag Deployment Control-Circuit Short To Ground
B0020-11	Driver/Left Side Airbag Squib Short to GND
B0021-11	Driver/Left Curtain Airbag Squib Short to GND
B0028-11	Passenger/Right Side Airbag Squib Short to GND
B0029-11	Passenger/Right Curtain Airbag Squib Short to GND
B0050-11	Driver Seatbelt Buckle Short to Ground
B0070-11	Driver/Left Pretensioner Squib Short to GND
B0072-11	Passenger/Right Pretensioner Squib Short to GND
B0073-11	Rear Left Pretensioner Squib Short to GND
B0075-11	Rear Right Pretensioner Squib Short to GND
B0090-11	Front Left Sensor Short to GND
B0091-11	Left B-pillar Sensor Short to GND
B0095-11	Front Right Sensor Short to GND
B0096-11	Right B-pillar Sensor Short to GND

⚠ Warning
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Hint:

- An activation prevention mechanism is built in airbag system connector. When connector is disconnected, this mechanism cuts off circuit by bringing short spring plate into contact with terminals, thus insulating the circuit from external power sources to prevent accidental airbag activation.
- To release activation prevention mechanism, insert a piece of paper with the same thickness as male terminal between terminals and short spring plate to disconnect the connection.

1	Check driver frontal airbag deployment control circuit shorted to ground malfunction

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

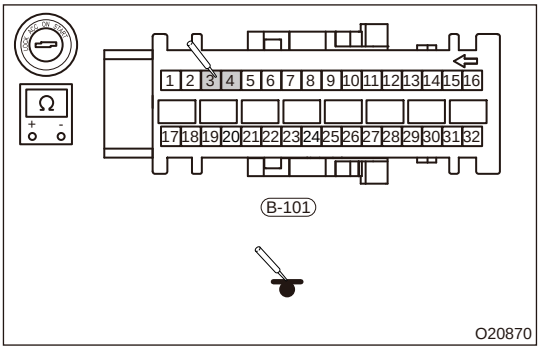
(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable and wait for at least 90 seconds.

(d) Disconnect airbag module connector B-101 and driver frontal airbag connector.

(e) Turn ENGINE START STOP switch to ON and make all accessories operate.

(f) Using ohm band of multimeter, detect B-101 (A3) to ground and B-101 (A4) to ground separately.



Operating Voltage

Multimeter Connection	Condition	Resistance
B-101 (A3) - Ground	ENGINE START STOP switch “OFF”	∞
B-101 (A4) - Ground	ENGINE START STOP switch “OFF”	∞

NG → **Repair or replace wire harness and connectors of driver frontal airbag deployment control circuit shorted to ground.**

OK → **Refer to “Airbag system malfunction repair completion inspection”.**

■ Actuator Short to Power Supply Fault

DTC	DTC Definition
B0001-12	Driver Frontal Airbag Deployment-Circuit Short To Power Supply
B0010-12	Passenger Airbag Deployment Control-Circuit Short To Power Supply
B0020-12	Driver/Left Side Airbag Squib Short to Power Line
B0021-12	Driver/Left Curtain Airbag Squib Short to Power Line
B0028-12	Passenger/Right Side Airbag Squib Short to Power Line
B0029-12	Passenger/Right Curtain Airbag Squib Short to Power Line
B0050-12	Driver Seatbelt Buckle Short to Power Line
B0052-12	Front Passenger Seatbelt Buckle Short to Power Line
B0053-12	Second Row Left Seatbelt Sensor Short to Power Line
B0054-12	Second Row Center Seatbelt Sensor Short to Power Line
B0055-12	Second Row Right Seatbelt Sensor Short to Power Line
B0070-12	Driver/Left Pretensioner Squib Short to Power Line
B0072-12	Passenger/Right Pretensioner Squib Short to Power Line

DTC	DTC Definition
B0073-12	Rear Left Pretensioner Squib Short to Power Line
B0075-12	Rear Right Pretensioner Squib Short to Power Line
B00C0-12	Front Passenger Occupant Sensor Short to Power Line

⚠ Warning
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Hint:

- An activation prevention mechanism is built in airbag system connector. When connector is disconnected, this mechanism cuts off circuit by bringing short spring plate into contact with terminals, thus insulating the circuit from external power sources to prevent accidental airbag activation.
- To release activation prevention mechanism, insert a piece of paper with the same thickness as male terminal between terminals and short spring plate to disconnect the connection.

1	Check driver frontal airbag deployment control circuit shorted to power supply malfunction

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

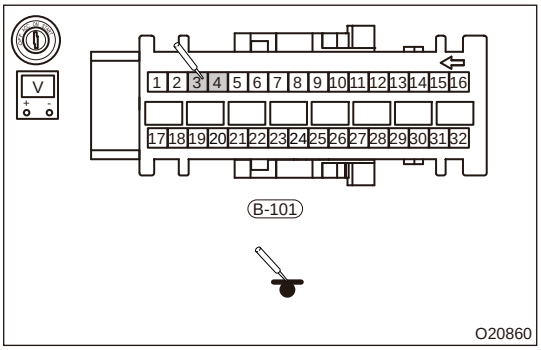
(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable and wait for at least 90 seconds.

(d) Disconnect airbag module connector B-101 and driver frontal airbag connector.

(e) Turn ENGINE START STOP switch to ON and make all accessories operate.

(f) Using ohm band of multimeter, detect B-101 (A3) to ground and B-101 (A4) to ground separately.



Operating Voltage

Multimeter Connection	Condition	Operating Voltage
B-101 (A3) - Ground	ENGINE START STOP switch “OFF”	0V
B-101 (A4) - Ground	ENGINE START STOP switch “OFF”	0V

NG	**Repair or replace wire harness and connectors of driver frontal airbag deployment control circuit shorted to ground.**
OK	**Refer to “Airbag system malfunction repair completion inspection”.**

■ **Front Left Sensor Fault**

DTC	DTC Definition
B0090-13	Front Left Sensor Open
B0091-13	Left B-pillar Sensor Open
B0095-13	Front Right sensor Open
B0096-13	Right B-pillar Sensor Open

⚠ Warning
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Hint:

- An activation prevention mechanism is built in airbag system connector. When connector is disconnected, this mechanism cuts off circuit by bringing short spring plate into contact with terminals, thus insulating the circuit from external power sources to prevent accidental airbag activation.
- To release activation prevention mechanism, insert a piece of paper with the same thickness as male terminal between terminals and short spring plate to disconnect the connection.

1	**Left side collision sensor circuit open**

Use circuit diagram as a guide to perform the following inspection procedures:

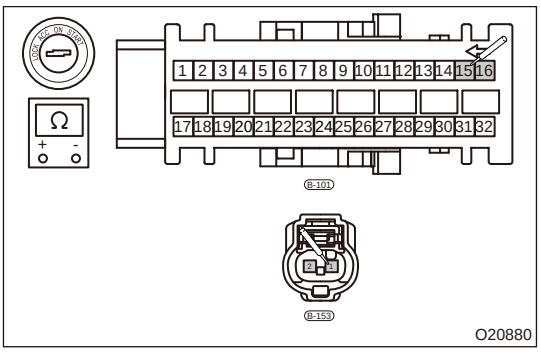
(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable and wait for at least 90 seconds.

(d) Disconnect airbag module connector B-101 and left side collision sensor connector B-153.

(e) Using ohm band of multimeter, detect continuity between B-101 (A16) and B-153 (1), B-101 (A15) and B-153 (2) separately.



Operating Voltage

Multimeter Connection	Condition	Resistance
B-101 (A16) - B-153(1)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
B-101 (A15) - B-153(2)	ENGINE START STOP switch “OFF”	⩽ 1 Ω

NG	**Repair or replace opened wire harness or connector.**
OK	**Inspection. Refer to “Airbag system malfunction repair completion inspection” and replace the sensor if wire harness is not malfunctioning**

■ **Airbag Low Resistance Fault**

DTC	DTC Definition
B0001-1A	Driver/Left Front Airbag Squib Low Resistance
B0010-1A	Passenger/Right Front Airbag Squib Low Resistance
B0020-1A	Driver/Left Side Airbag Squib Low Resistance
B0021-1A	Driver/Left Curtain Airbag Squib Low Resistance
B0028-1A	Passenger/Right Side Airbag Squib Low Resistance
B0029-1A	Passenger/Right Curtain Airbag Squib Low Resistance
B0070-1A	Driver/Left Pretensioner Squib Low Resistance
B0072-1A	Passenger/Right Pretensioner Squib Low Resistance
B0073-1A	Rear Left Seat Belt Pretensioner Low Resistance
B0075-1A	Rear Right Pretensioner Low Resistance

⚠ Warning
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Hint:

- An activation prevention mechanism is built in airbag system connector. When connector is disconnected, this mechanism cuts off circuit by bringing short spring plate into contact with terminals, thus insulating the circuit from external power sources to prevent accidental airbag activation.
- To release activation prevention mechanism, insert a piece of paper with the same thickness as male terminal between terminals and short spring plate to disconnect the connection.

1	**Left side collision sensor circuit open**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Use 2 Ω resistance to substitute airbag or tensioner indicated by DTC.

(b) Connect wire harness connector on the end of airbag module.

(c) Connect the battery and diagnostic tester and read the previous DTC.

NG	**Replace damaged airbag or tensioner.**
OK	**Inspection. Refer to “Airbag system malfunction repair completion inspection”.**

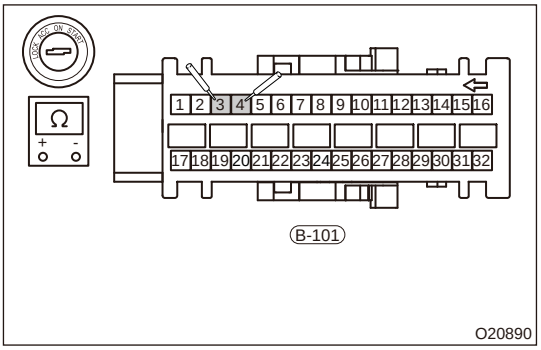
2	**Check for short circuit between 2 cables**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable and wait for at least 90 seconds.

(b) Disconnect the airbag module connector B-101.

(c) Using ohm band of multimeter, check for continuity between B-101 (A3) and I-023 (A4).



Standard Condition

Multimeter Connection	Condition	Resistance
B-101 (A3) - I-023 (A4)	ENGINE START STOP switch “OFF”	⩽ 1 Ω

NG → **Repair or replace opened wire harness or connector.**

OK → **Inspection. Refer to “Airbag system malfunction repair completion inspection”.**

■ **Airbag Low Resistance Fault**

DTC	DTC Definition
B0001-13	Driver/Left Front Airbag Squib High Resistance
B0010-13	Passenger/Right Front Airbag Squib High Resistance
B0020-13	Driver/Left Side Airbag Squib High Resistance
B0021-13	Driver/Left Curtain Airbag Squib High Resistance
B0028-13	Passenger/Right Side Airbag Squib High Resistance
B0029-13	Passenger/Right Curtain Airbag Squib High Resistance
B0070-13	Driver/Left Pretensioner Squib High Resistance
B0072-13	Passenger/Right Pretensioner Squib High Resistance
B0073-13	Rear Left Seat Belt Pretensioner High Resistance
B0075-13	Rear Right Seat Belt Pretensioner High Resistance

⚠ Warning

When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

Hint:

- An activation prevention mechanism is built in airbag system connector. When connector is disconnected, this mechanism cuts off circuit by bringing short spring plate into contact with terminals, thus insulating the circuit from external power sources to prevent accidental airbag activation.
- To release activation prevention mechanism, insert a piece of paper with the same thickness as male terminal between terminals and short spring plate to disconnect the connection.

1	**Check if ignition element is damaged**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Use 2 Ω resistance to substitute airbag or tensioner indicated by DTC.

(b) Connect wire harness connector on the end of airbag module.

(c) Connect the battery and diagnostic tester and read the previous DTC.

NG	**Replace damaged airbag or tensioner.**
OK	**Inspection. Refer to "Airbag system malfunction repair completion inspection".**

2	Check for short circuit between 2 cables

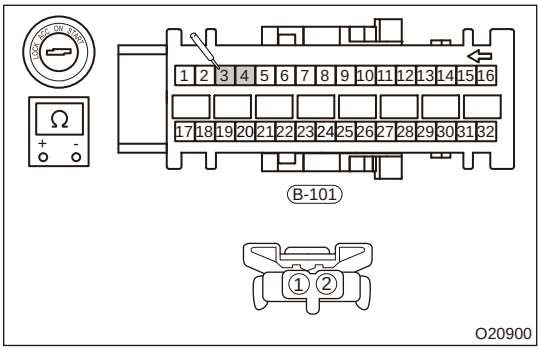
Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to "OFF", disconnect the negative battery cable and wait for at least 90 seconds.

(b) Replace front passenger frontal airbag with a new one, connect the negative battery cable, turn ENGINE START STOP switch to "ON", and use diagnostic tester to read DTCs to observe if DTC exists. If exists, it indicates that there is no problem in front passenger frontal airbag resistance, and a further inspection is needed.

(c) Disconnect airbag module connector B-101 and driver airbag connector.

(d) Using ohm band of multimeter, check the continuity between B-101 (A4) and driver airbag (2), B-101 (A3) and driver airbag (1) separately.



Standard Condition

Multimeter Connection	Condition	Resistance
B-101 (A4) - Driver airbag (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-101 (A3) - Driver airbag (1)	ENGINE START STOP switch "OFF"	⩽ 1 Ω

NG	**Repair or replace opened wire harness or connector.**
OK	**Inspection. Refer to "Airbag system malfunction repair completion inspection".**

■ Airbag Configured Fault

DTC	DTC Definition
B0001-95	Driver/Left Front Airbag Squib Configured Fault
B0010-95	Passenger/Right Front Airbag Squib Configured Fault
B0020-95	Driver/Left Side Airbag Squib Configured Fault
B0021-95	Driver/Left Curtain Airbag Squib Configured Fault
B0028-95	Passenger/Right Side Airbag Squib Configured Fault

DTC	DTC Definition
B0029-95	Passenger/Right Curtain Airbag Squib Configured Fault
B0070-95	Driver/Left Pretensioner Squib Configured Fault
B0072-95	Passenger/Right Pretensioner Squib Configured Fault
B0073-95	Rear Left Pretensioner Squib Configured Fault
B0075-95	Rear Right Pretensioner Squib Configured Fault
B0090-95	Front Left Sensor Configured Fault
B0091-55	Left B-pillar Sensor Configured Fault
B0095-55	Front Right Sensor Configured Fault
B0096-55	Front Right Sensor Configured Fault

1	Check front passenger load detection switch

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Replace it with seat belt buckle switch of correct function and type.

OK	Inspection. Refer to “Airbag system malfunction repair completion inspection”.

■ **Airbag Squib Cross-connect Problem**

DTC	DTC Definition
B0001-19	Driver/Left Front Airbag Squib Cross-connect
B0010-19	Passenger/Right Front Airbag Squib Cross-connect
B0020-19	Driver/Left Side Airbag Squib Cross-connect
B0021-19	Driver/Left Curtain Airbag Squib Cross-connect
B0028-19	Passenger/Right Side Airbag Squib Cross-connect Fault
B0029-19	Passenger/Right Curtain Airbag Squib Cross-connect
B0070-19	Driver/Left Pretensioner Squib Cross-connect
B0072-19	Passenger/Right Pretensioner Squib Cross-connect Fault
B0073-19	Rear Left Pretensioner Squib Cross-connect Fault
B0075-19	Rear Right Pretensioner Squib Cross-connect Fault

1	Check front passenger load detection switch

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Replace it with seat belt buckle switch of correct function and type.

OK	Inspection. Refer to “Airbag system malfunction repair completion inspection”.

■ **Sensor Internal Failure Problem**

DTC	DTC Definition
B0090-49	Front Left Sensor Internal Fault
B0091-49	Left B-pillar Sensor Internal Fault
B0095-49	Front Right Sensor Internal Fault
B0096-49	Right B-pillar Sensor Internal Error

Hint:
Trouble cause: Acceleration sensor type is wrong or the element is damaged.

1	Check side collision sensor

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Replace with side collision sensor of correct function and type.

OK → **Inspection. Refer to "Airbag system malfunction repair completion inspection".**

■ **Front Left Sensor & ACM Internal Fail**

DTC	DTC Definition
B0090-87	Front Left Sensor Communication Fault
B0091-87	Left B-pillar Sensor Communication Fault
B0095-87	Front Right Sensor Communication Fault
B0096-87	Right B-pillar Sensor Communication Error
B12E0-49	ACM Internal Error
B00D2-F0	ACM in Supplier Manufacturing Mode
B12E5-00	ACM Has Been Scrapped

Hint:
Trouble cause: Sensor usage incorrect or controller damaged.

1	Check controller

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Replace with side collision sensor or module of correct function and type.

OK → **Inspection. Refer to "Airbag system malfunction repair completion inspection".**

■ **CAN Network Fault**

DTC	DTC Definition
U0100-87	Lost Communication with EMS
U0101-87	Lost Communication with TCU
U0122-87	Lost Communication with ESC
U0140-87	Lost Communication with BCM
U0155-87	Lost Communication with IPC

DTC	DTC Definition
U0212-87	Lost Communication with SCM
U0248-87	Lost Communication with PEPS

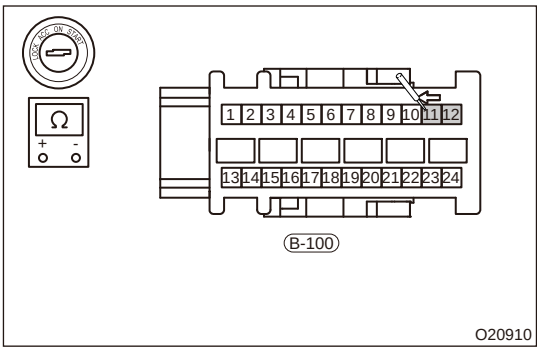
Hint:
Possible cause for malfunction: CAN bus malfunctions or controller indicated by DTC is faulty.

1	Check CAN network

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Disconnect the airbag module connector B-100.

(b) Use ohm band of multimeter to measure resistance between B-100 (B11) and B-100 (B12).



Standard Condition

Multimeter Connection	Condition	Resistance
B-100 (B11) - B-100 (B12)	ENGINE START STOP switch "OFF"	120 Ω

NG	**Repair or replace wire harness or connector.**
OK	**Check controller**

2	Check controller

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, disconnect the negative battery cable and wait for at least 90 seconds.

(b) Replace with controller of correct function and type.

⚠ Warning
Prevent electric static discharge, such as static-proof wrist strap.

OK	**Inspection. Refer to "Airbag system malfunction repair completion inspection".**

■ Airbag or pretenioner deploys when front crash is detected

DTC	DTC Definition
B12E1-96	Airbag or Pretenioner Deployed When Front Crash Detect
B12E2-96	Airbag or Pretenioner Deployed When Side Crash Detect
B12E3-96	Airbag or Pretenioner Deployed When Rear Crash Detect

Hint:
Possible cause for malfunction: Ignition circuit has been initiated and collision information is recorded.

1	Check controller and initiated ignition element

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Replace with front collision sensor or module of correct function and type.

OK > **Inspection. Refer to “Airbag system malfunction repair completion inspection”.**

■ **EOL calibration fault**

DTC	DTC Definition
B12E6-54	IMU EOL Calibration Missing
B12E6-92	MU EOL Calibration Fail
B12E7-95	EOL Configuration Parameters Missing
B12E8-95	ACM in EOL Configuration Mode

Hint:
Trouble cause: ACM is not configured with EOL or sample is error.

1	ACM is configured with EOL.

Use circuit diagram as a guide to perform the following inspection procedures:

NG > **Replace it with sample of correct function and type.**

OK > **Inspection. Refer to “Airbag system malfunction repair completion inspection”.**

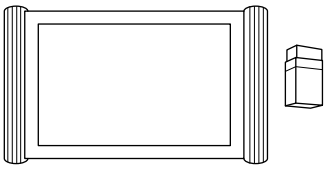
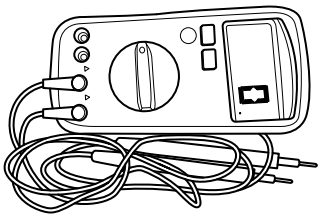
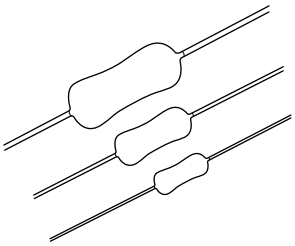
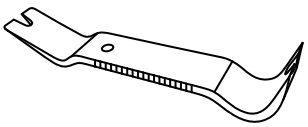
■ **PLG Communication Failure**

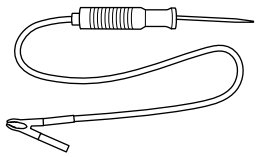
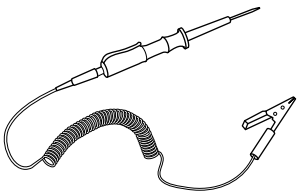
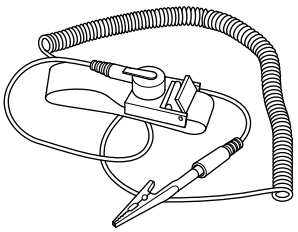
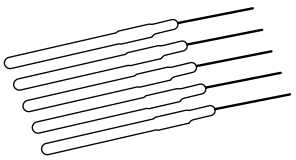
DTC	DTC Definition
U0401-86	Abnormal Data Length Received by EMS
U0401-81	Invalid Data Received from EMS
U0402-86	Abnormal Data Length Received by TCU
U0402-81	Invalid Data Received from TCU
U0416-86	Invalid Data Received from ESC
U0416-81	Invalid Data Received from ESC
U0422-86	Abnormal Data Length Received by BCM
U0422-81	Invalid Data Received from BCM
U0423-86	Abnormal Data Length Received by IPC
U0423-81	Invalid Data Received from IPC
U0426-86	Abnormal Data Length Received by PEPS
U0426-81	Invalid Data Received from PEPS
U0429-86	Abnormal Data Length Received by SCM
U0429-81	Invalid Data Received from SCM

1	Refer to “CAN Network System” for troubleshooting

5 On-vehicle Service

5.1 Tools

Tool Name	Tool Drawing
Diagnostic Tester	 S00001
Digital Multimeter	 S00002
Resistor (2 Ω)	 S00070
Interior & Exterior Remover	 S00020

Tool Name	Tool Drawing
Bulb Test Light	 S00071
Diode Test Light	 S00072
Static-proof Wrist Strap	 S00073
Wire Harness Terminal Service Tool	 S00074

5.2 Replacement of Airbag System Controller.(ACU)

■ Removal

⚠ Warning

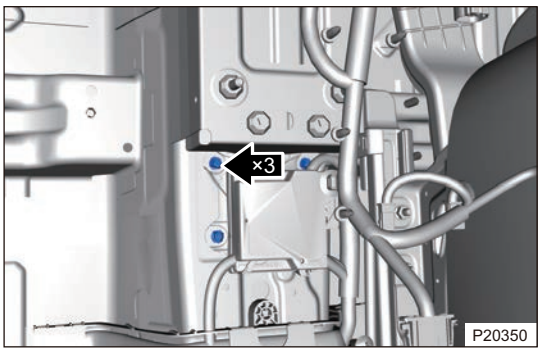
- **Be sure to follow correct procedures to remove and install airbag system controller.**
- **Inspect and confirm that part number in airbag control module label matches with configuration card part number in vehicle; parts surface should be free of chips and labels and bar codes should be intact and clear before assembly; Peel off one bar code after inspection and attach it to record card in vehicle;**
- **Handle airbag control module carefully and it’ s strictly forbidden to tap and crash it fiercely.**
- **There should be no other objects between airbag control module installation plane and ACU module, and ACU must be installed directly on body panel.**
- **Make sure that the ENGINE START STOP Switch in OFF state during installation and removal of ACU, and never install or remove it with power on.**
- **Reconfirm the installation direction of ACU after installation and make sure that label arrow direction is facing vehicle head. If fitted reversely, airbag controller assembly will not operate normally.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

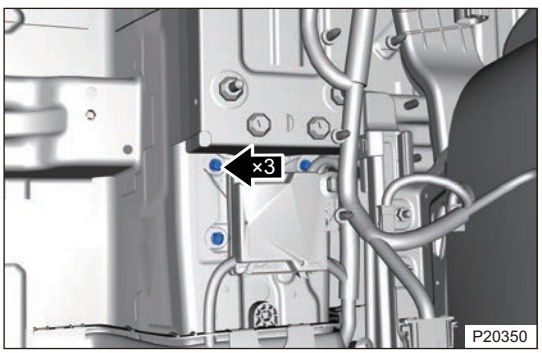
(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

(3) Remove the auxiliary fascia console assembly. (See page).

(4) Remove 3 fixing bolts (10# socket wrench) from airbag controller.



(5) Press lower limit clamp to separate it from wire harness connector and remove airbag controller assembly.



■ Inspection

(1) Check whether pins of airbag system controller are exposed and bent before assembly.

(2) Check whether there are cracks, burrs and other phenomena on airbag system controller.

■ **Installation**

⚠ Caution

- **Before installing tightening bolts, always make sure that airbag wire harness is not held down or stuck. Adjust if necessary and install it in place.**
- **Make sure to tighten fixing bolts to specified torque during installation.**
- **Always keep vehicle power off during installation. It is forbidden to install the airbag controller assembly with vehicle power on.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**

(1) Place ACU module on passage bottom panel in body with arrow direction in label facing vehicle head, install and tighten 3 fixing bolts (10# socket wrench).

Torque: 8 ± 1.2 N·m

(2) Install ACU connector, generally a “click” sound will be heard, which indicates that the clip has been clamped into place.

(3) Connect diagnostic tester, read and clear DTCs.

■ **Write VIN Code**

(1) Turn ENGINE START STOP switch to OFF.

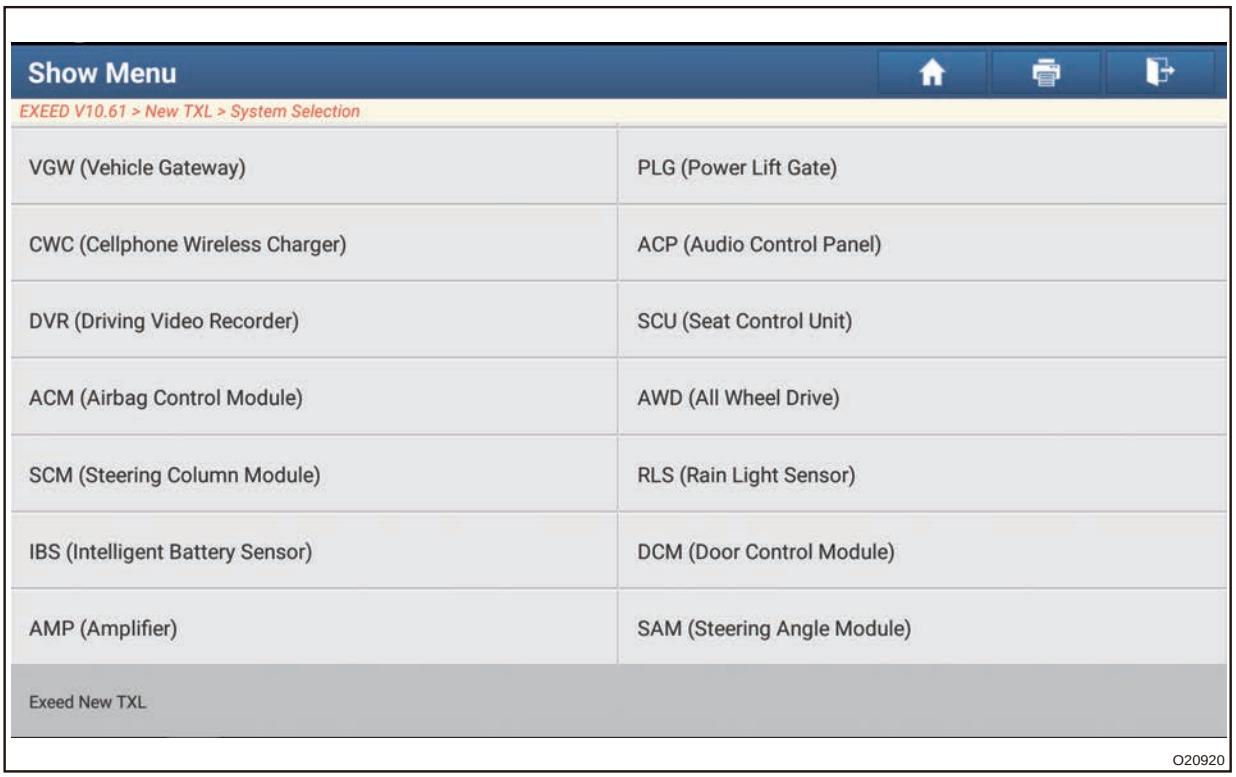
(2) Connect the diagnostic tester (the latest software).

(3) Turn ENGINE START STOP switch to ON.

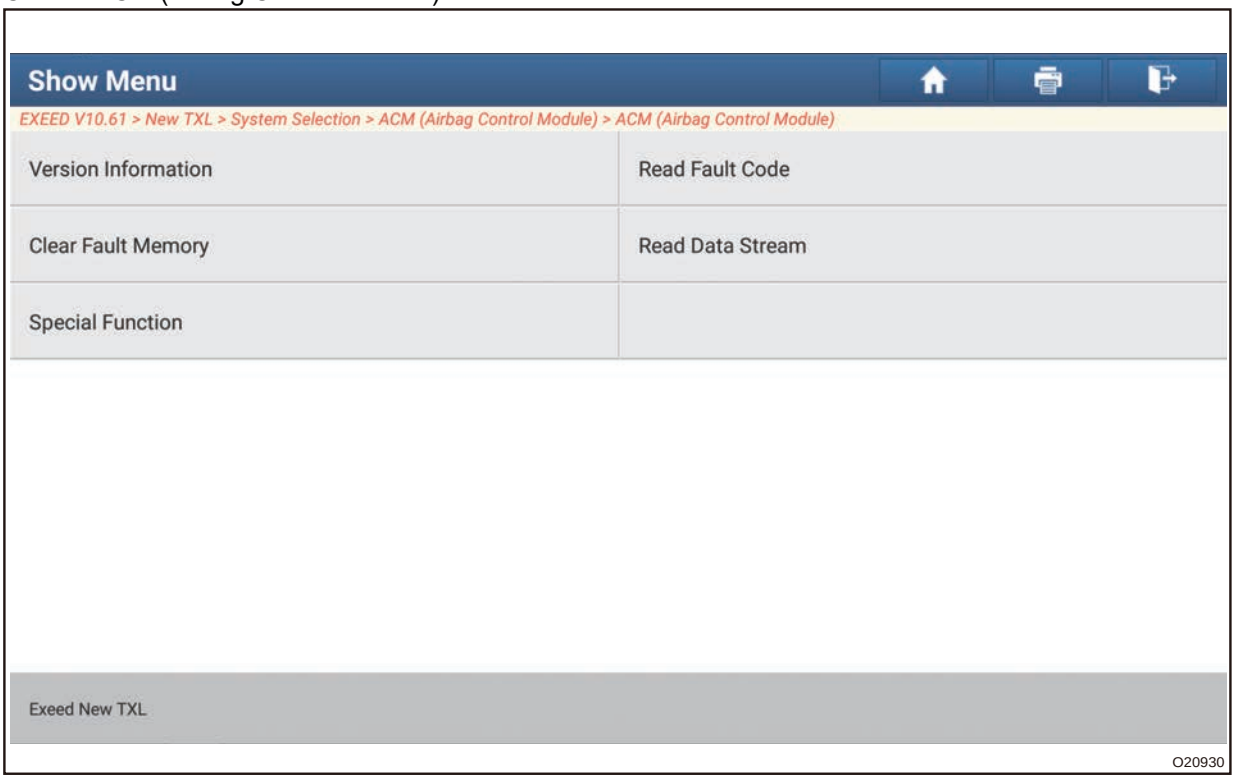
(4) Click “Traditional Diagnosis”.

(5) Click “EXCEED”.

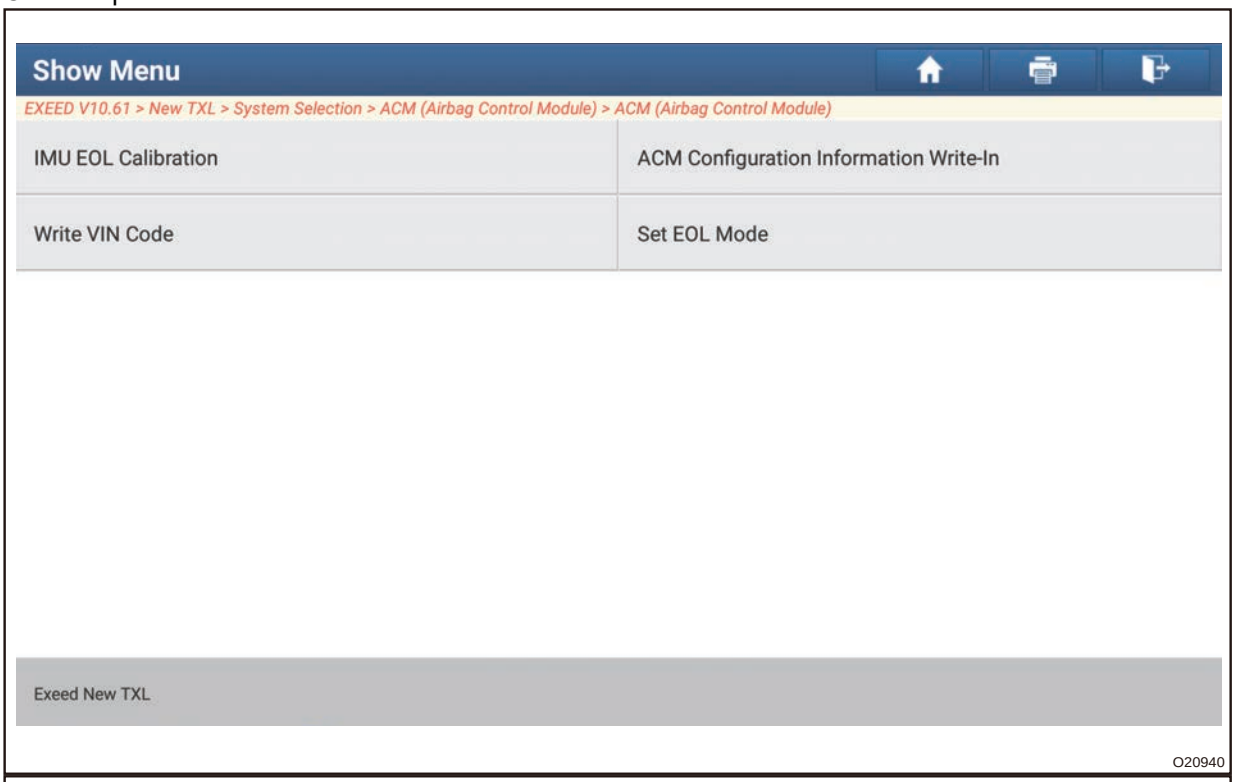
(6) Click “VX”.

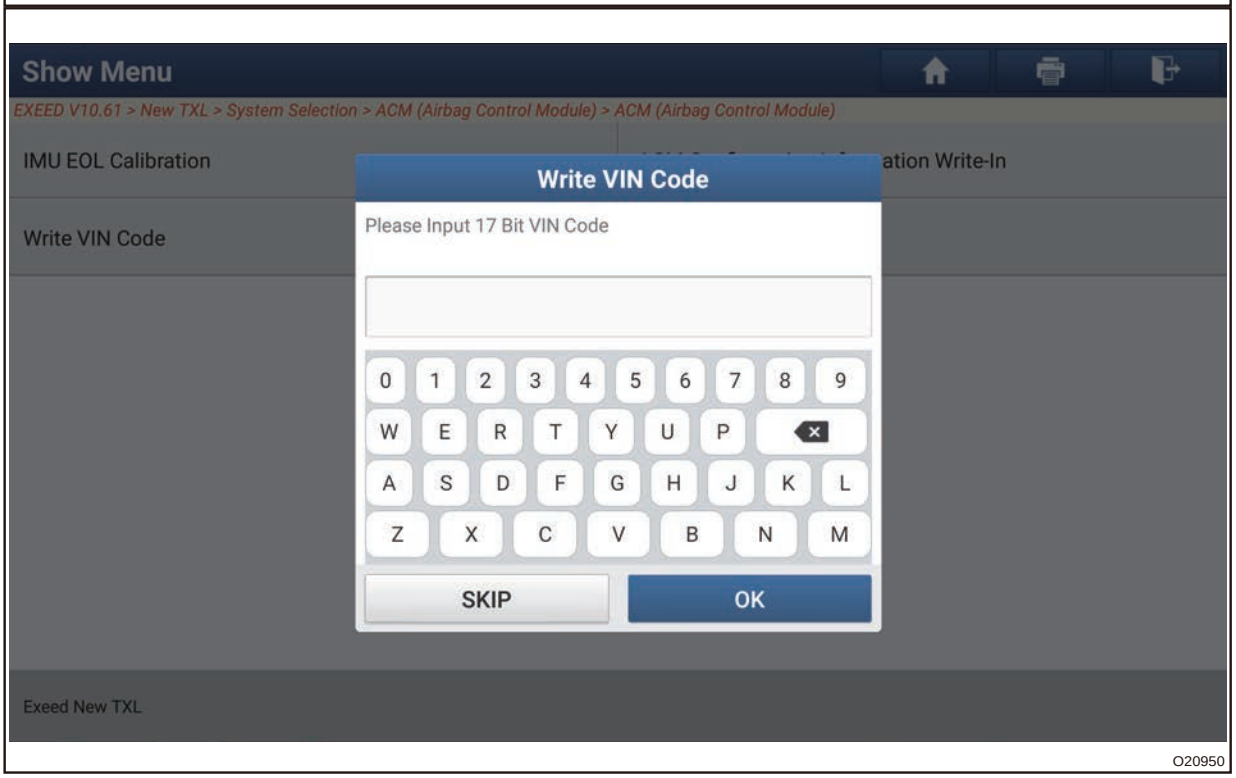


(7) Click “ACM (Airbag Control Module)”



(8) Click “Special Function”.





(9) Click “Write VIN code”.

■ IMU (Inertial Sensor) Calibration

(1) Turn ENGINE START STOP switch to OFF.

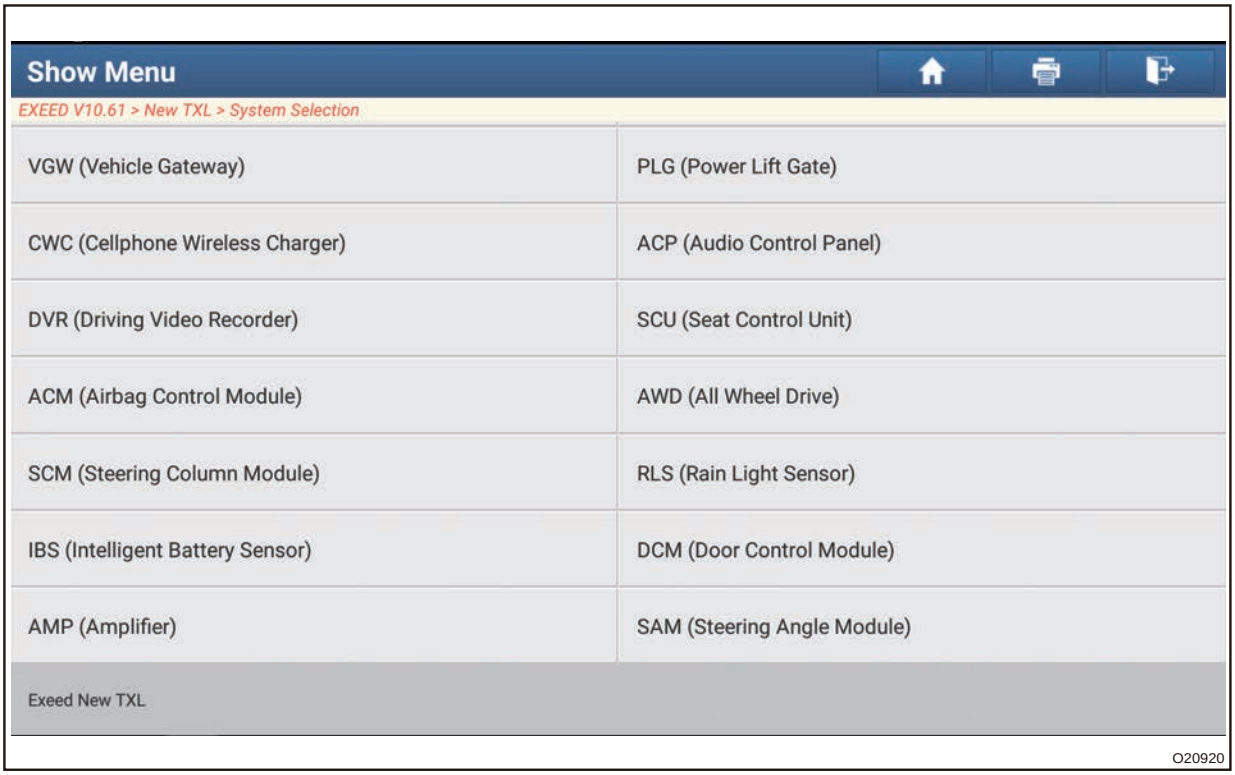
(2) Connect the diagnostic tester (the latest software).

(3) Turn ENGINE START STOP switch to ON.

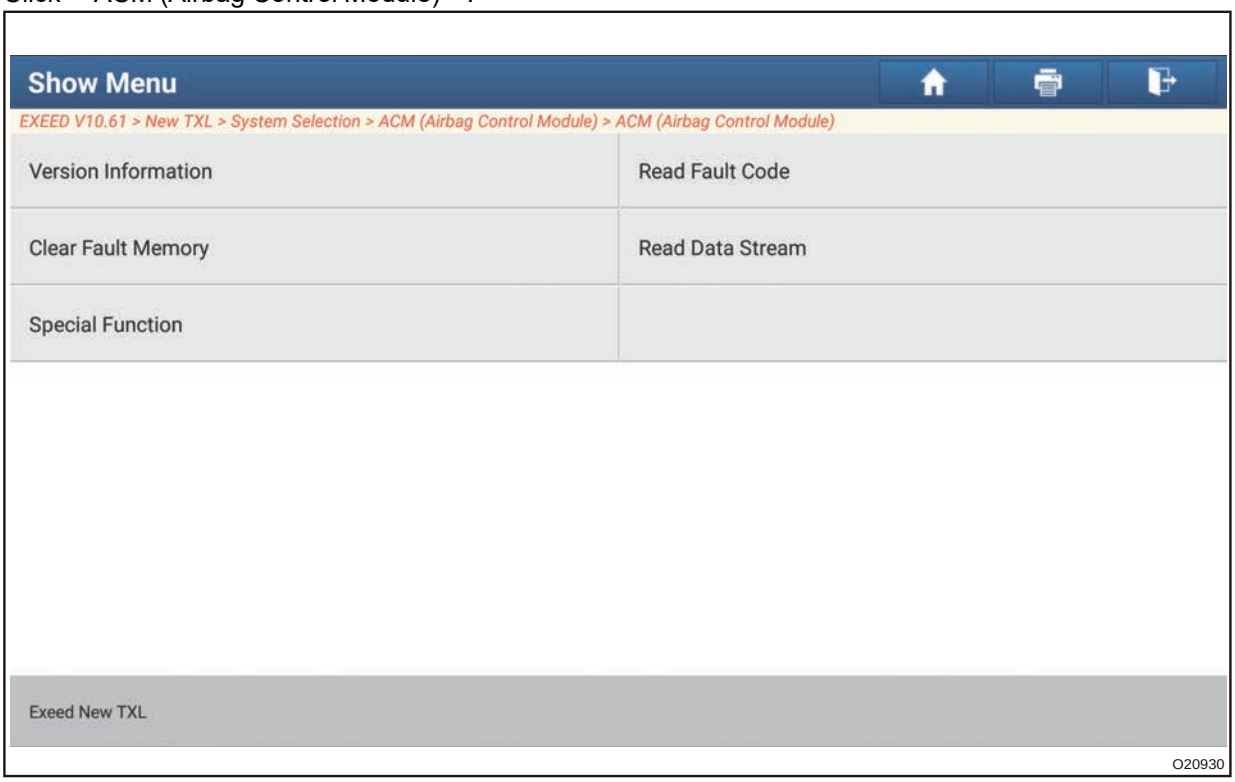
(4) Click “Traditional Diagnosis”.

(5) Click “EXCEED”.

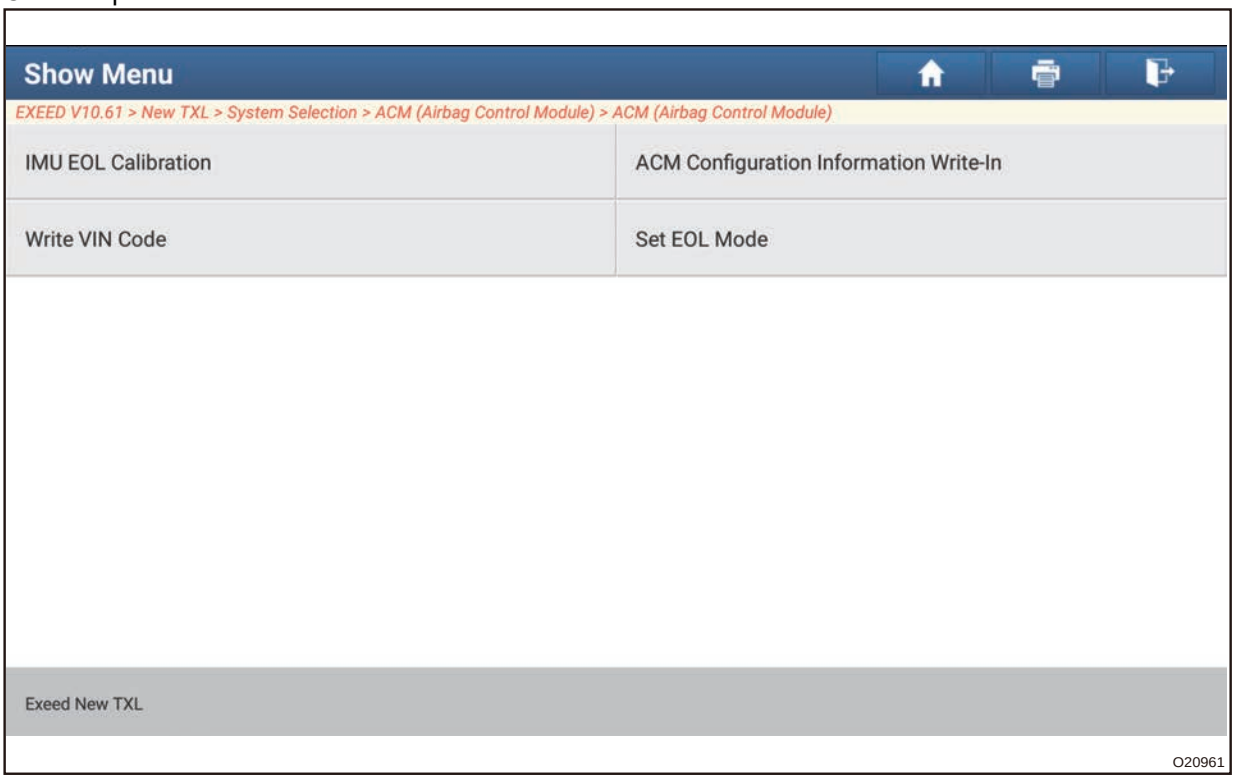
(6) Click “VX”.

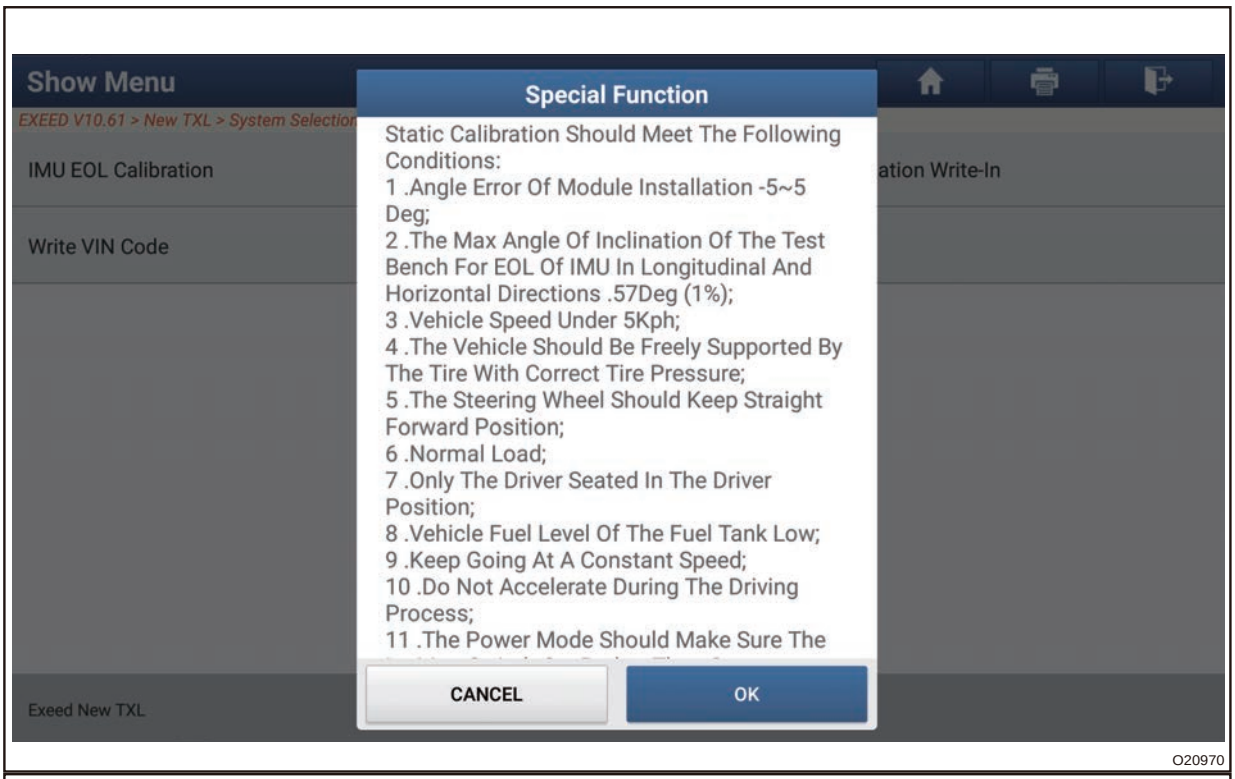


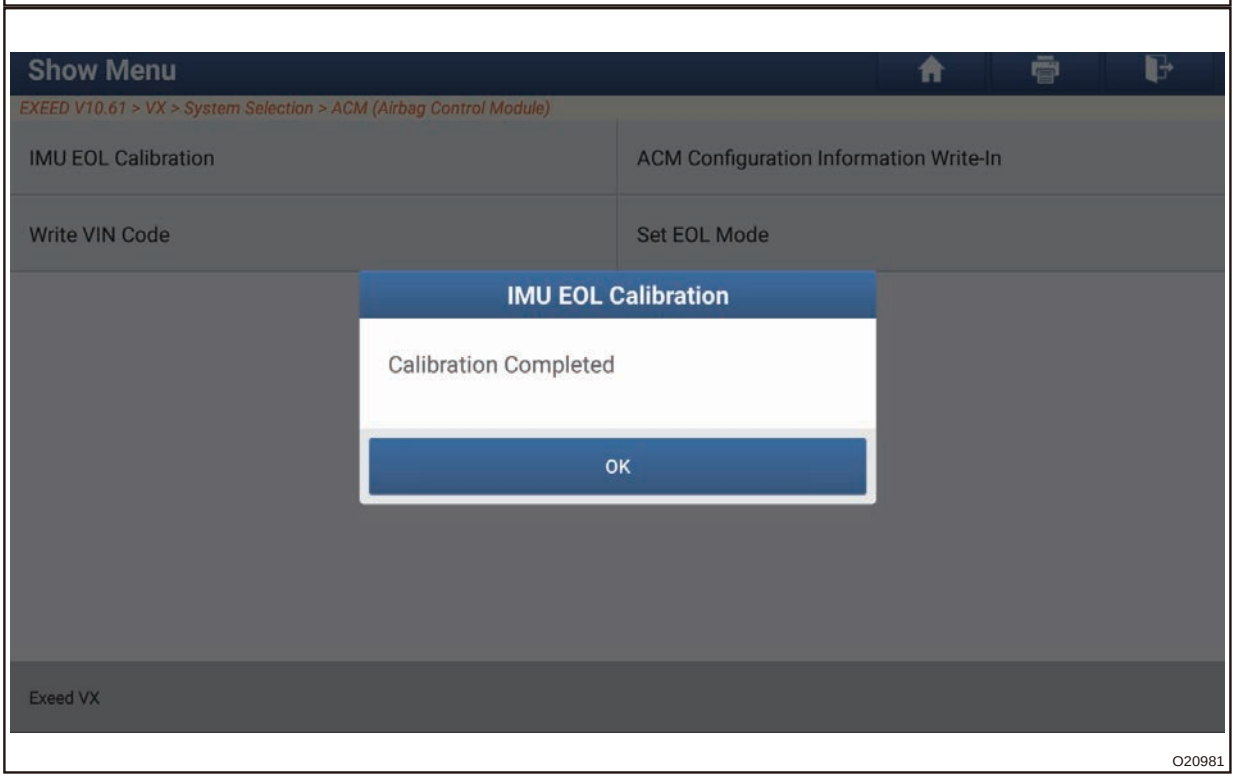
(7) Click “ACM (Airbag Control Module)”.



(8) Click “Special Function”.







(9) Click “IMU (Inertial Sensor) Calibration”.

■ Airbag Control Module (ACM) Configuration Data

(1) Turn ENGINE START STOP switch to OFF.

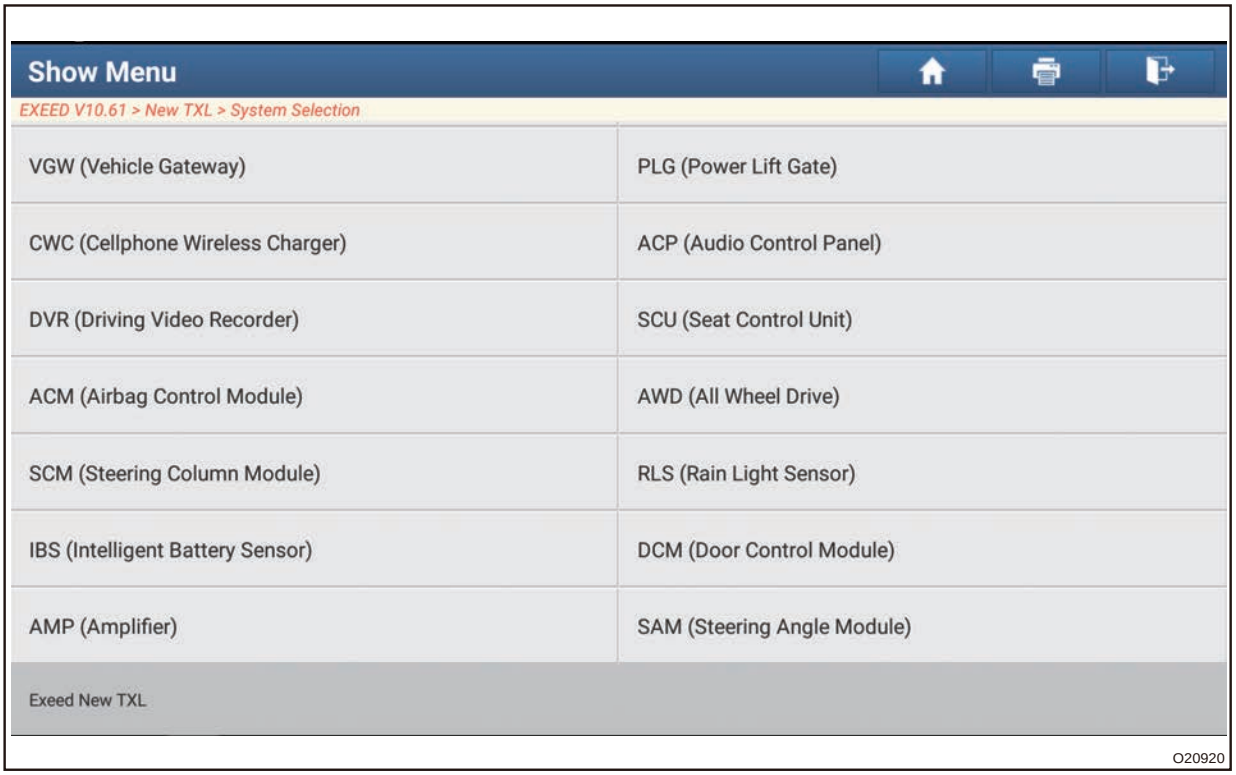
(2) Connect the diagnostic tester (the latest software).

(3) Turn ENGINE START STOP switch to ON.

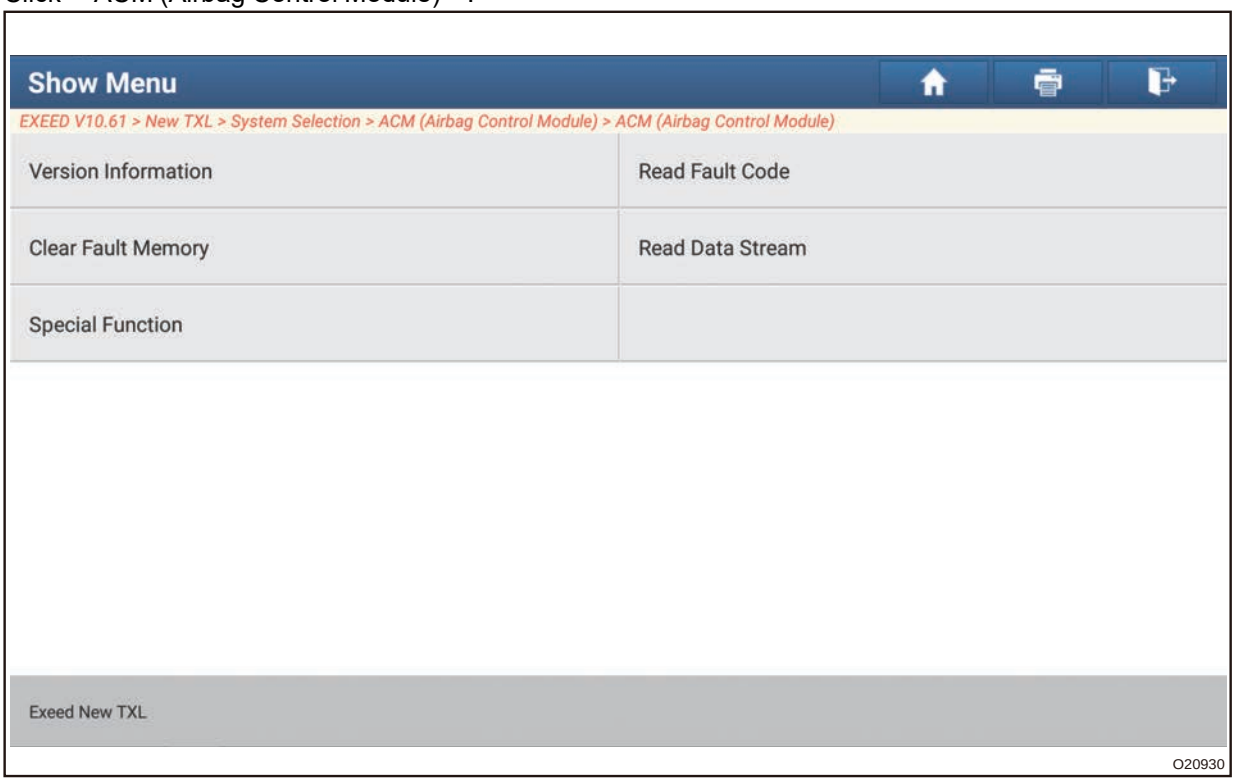
(4) Click “Traditional Diagnosis”.

(5) Click “EXCEED”.

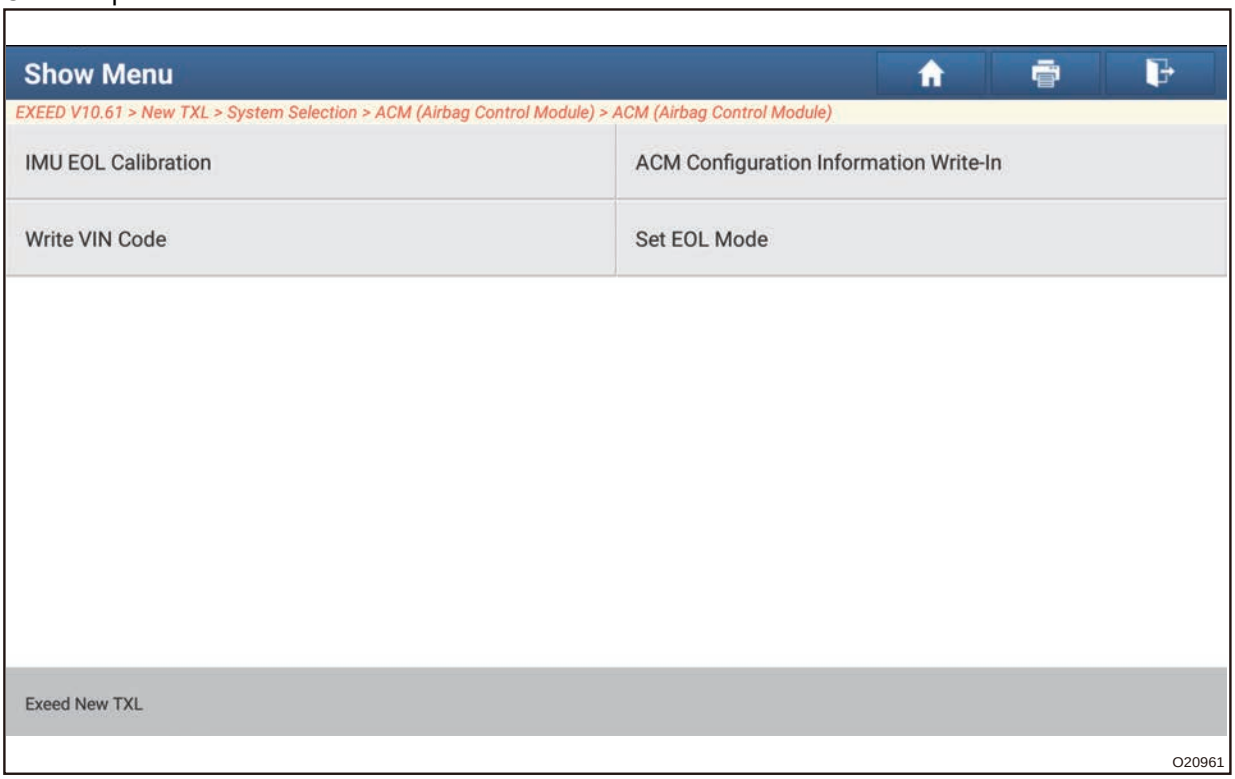
(6) Click “VX”.



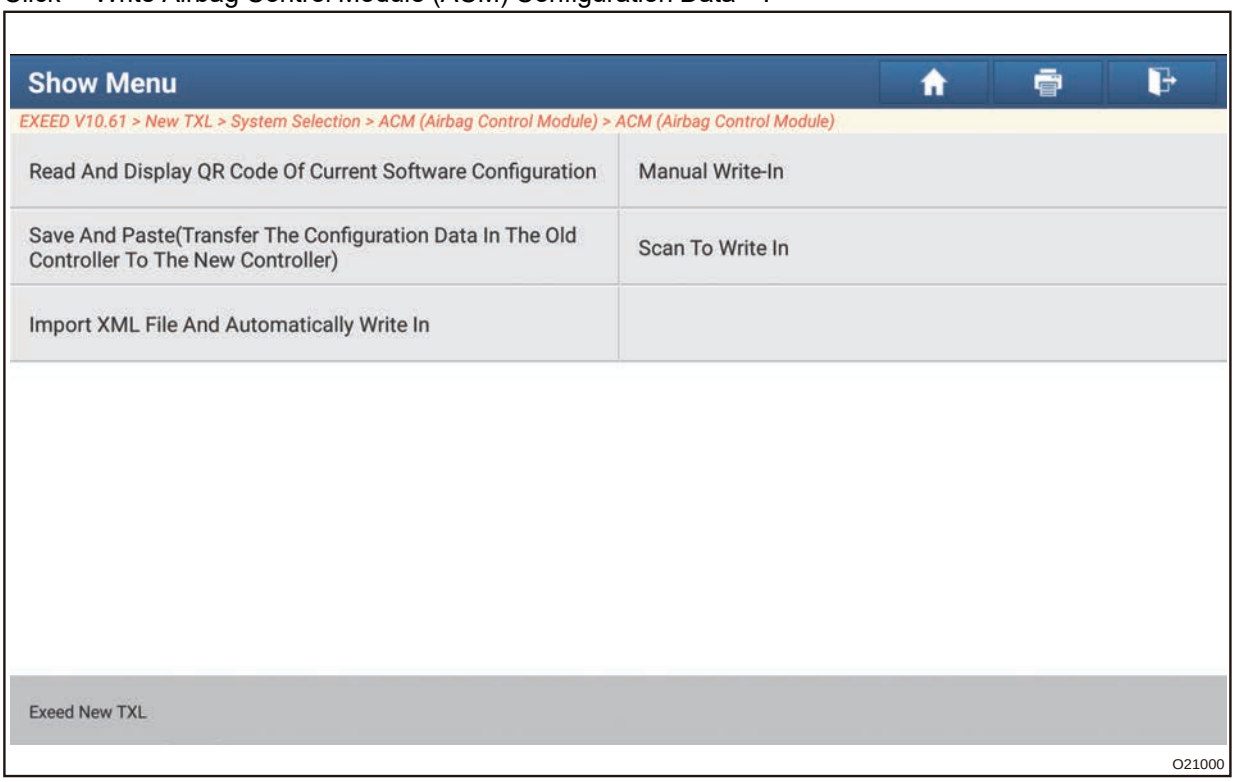
(7) Click “ACM (Airbag Control Module)”.



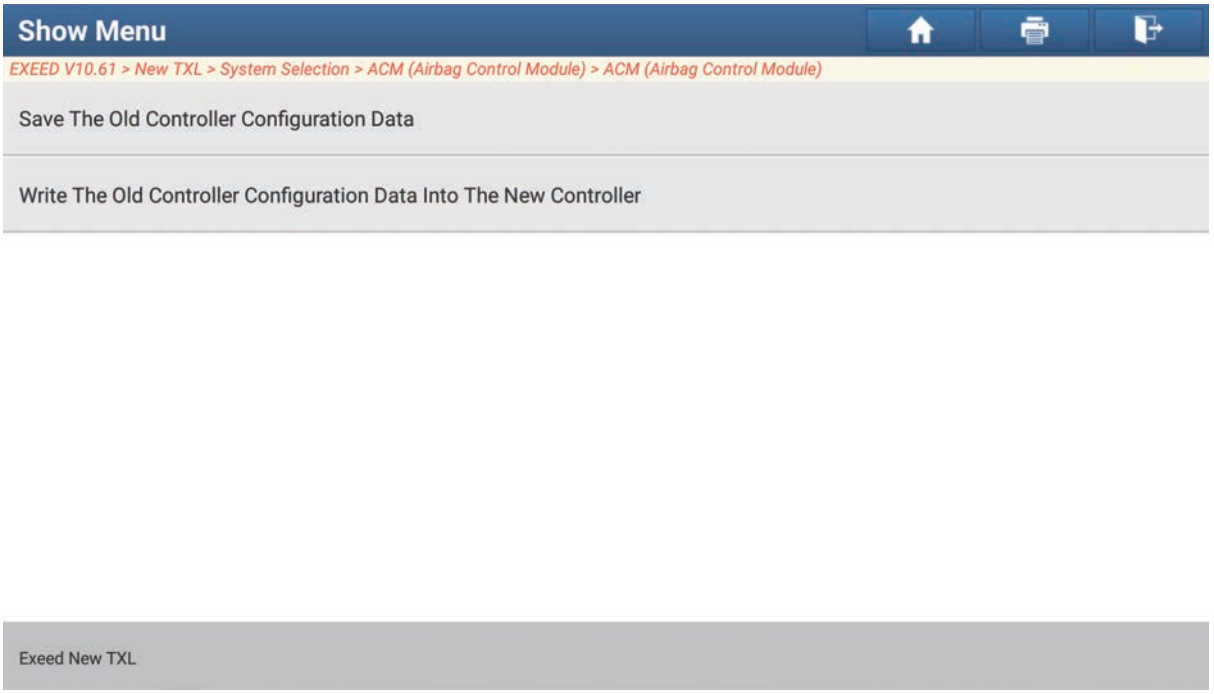
(8) Click “Special Function”.



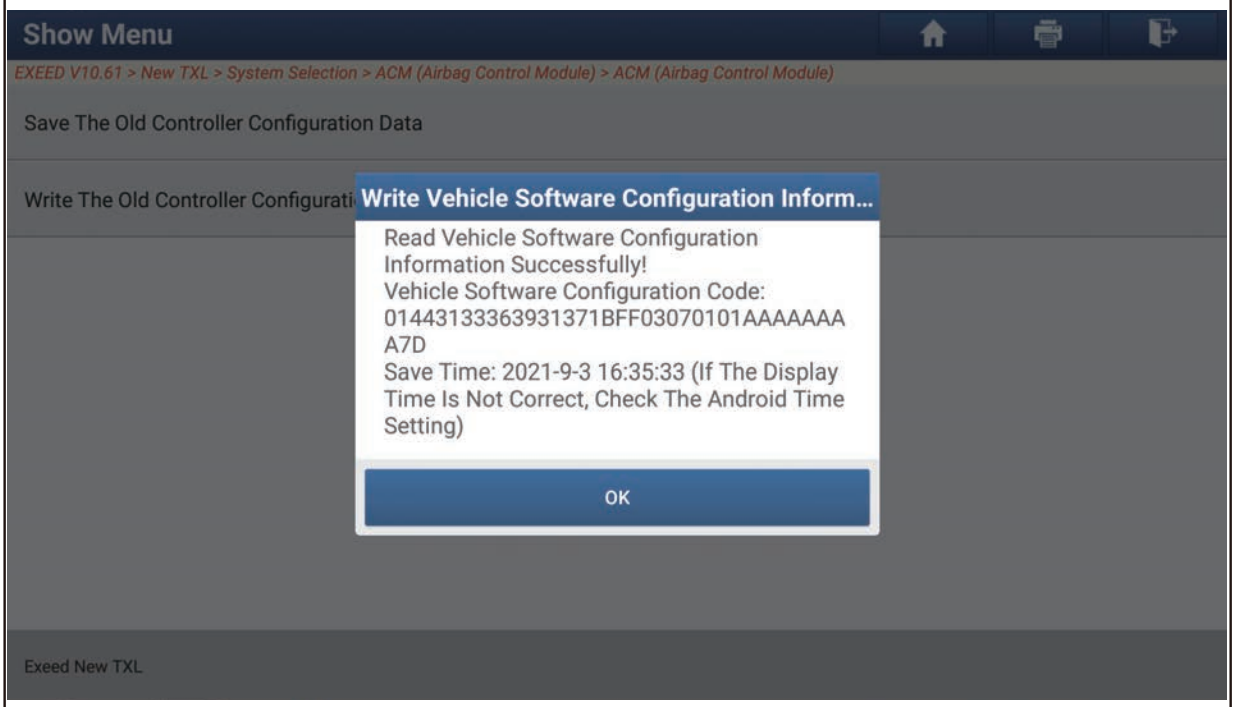
(9) Click “Write Airbag Control Module (ACM) Configuration Data”.



(10) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.

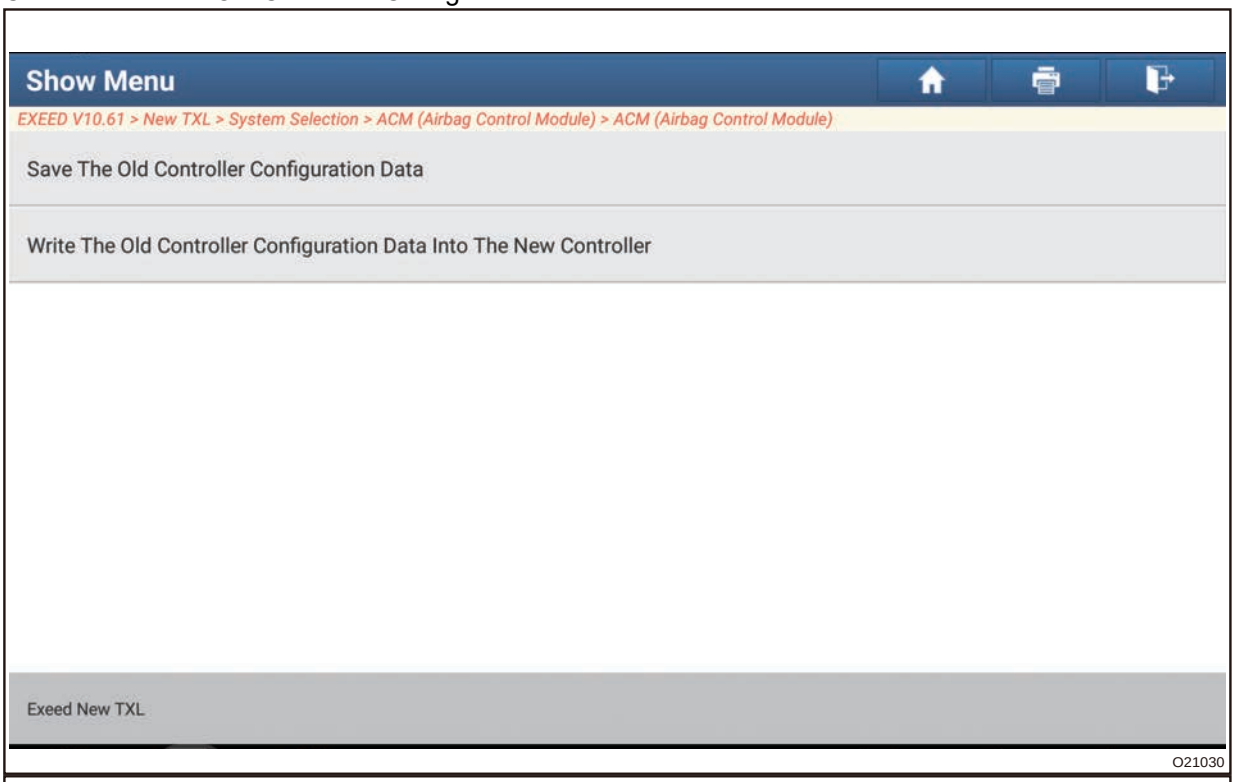


O21010

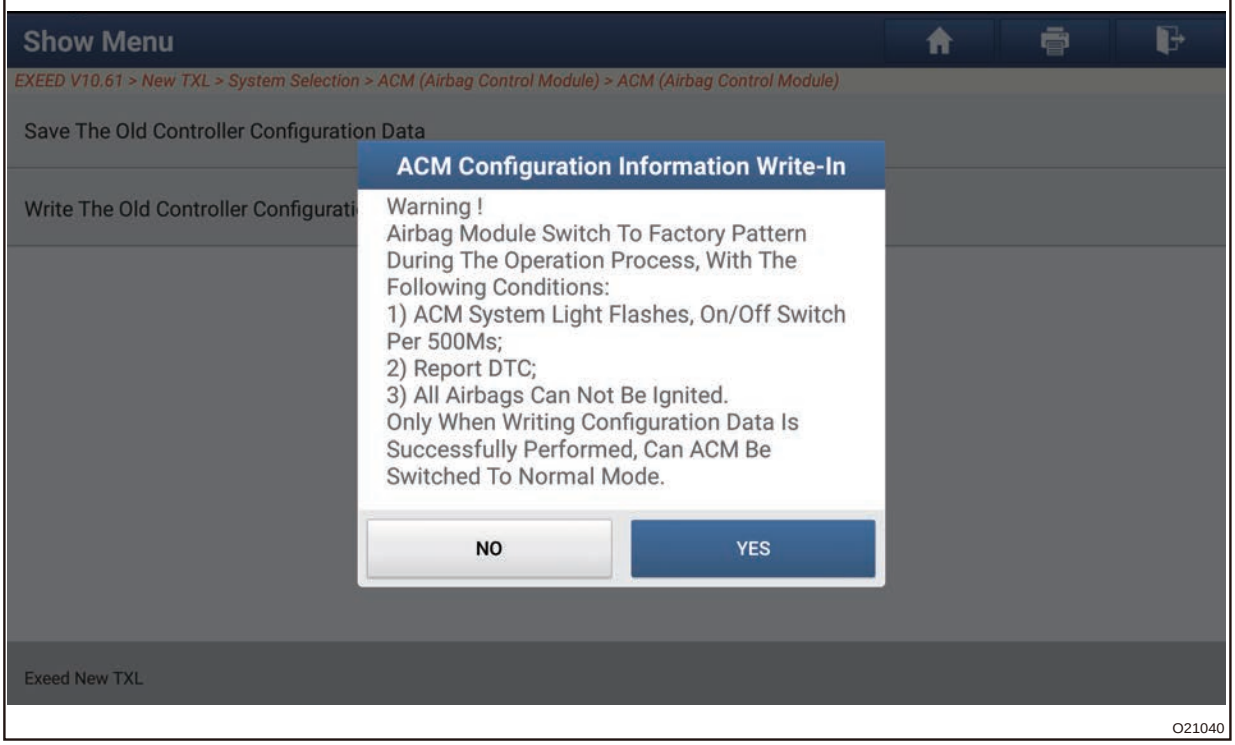


O21020

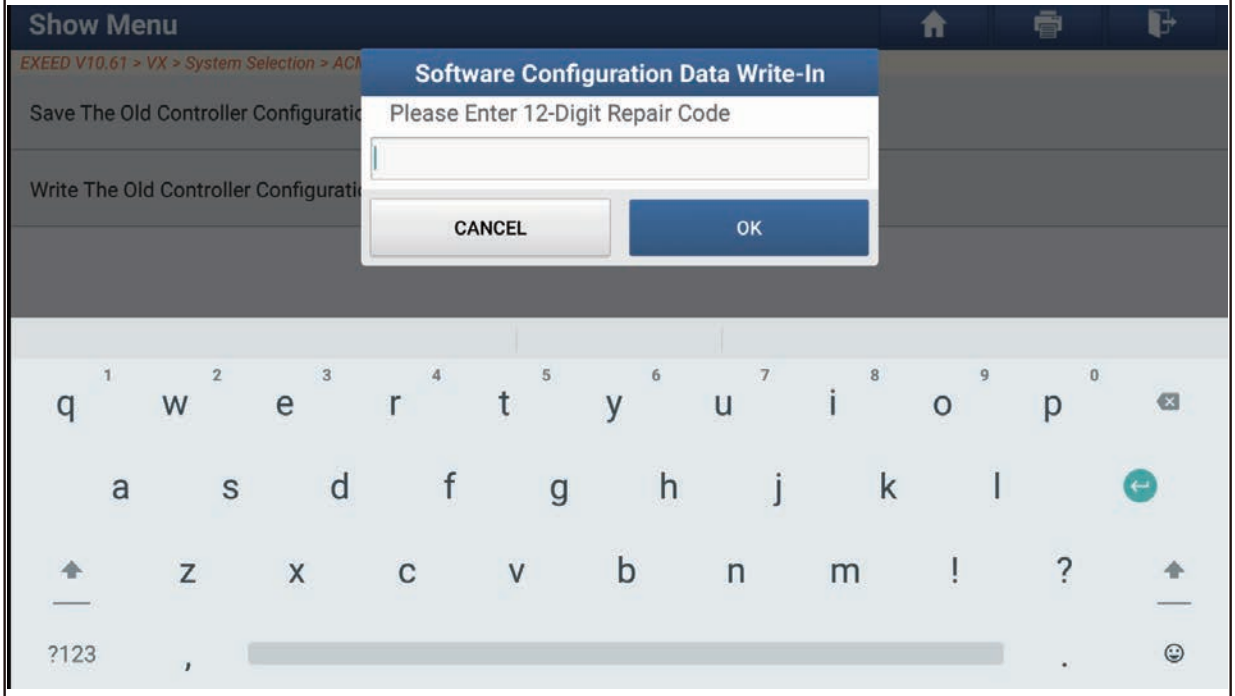
(11) Click “Save The Old Controller Configuration Data”.



O21030



O21040



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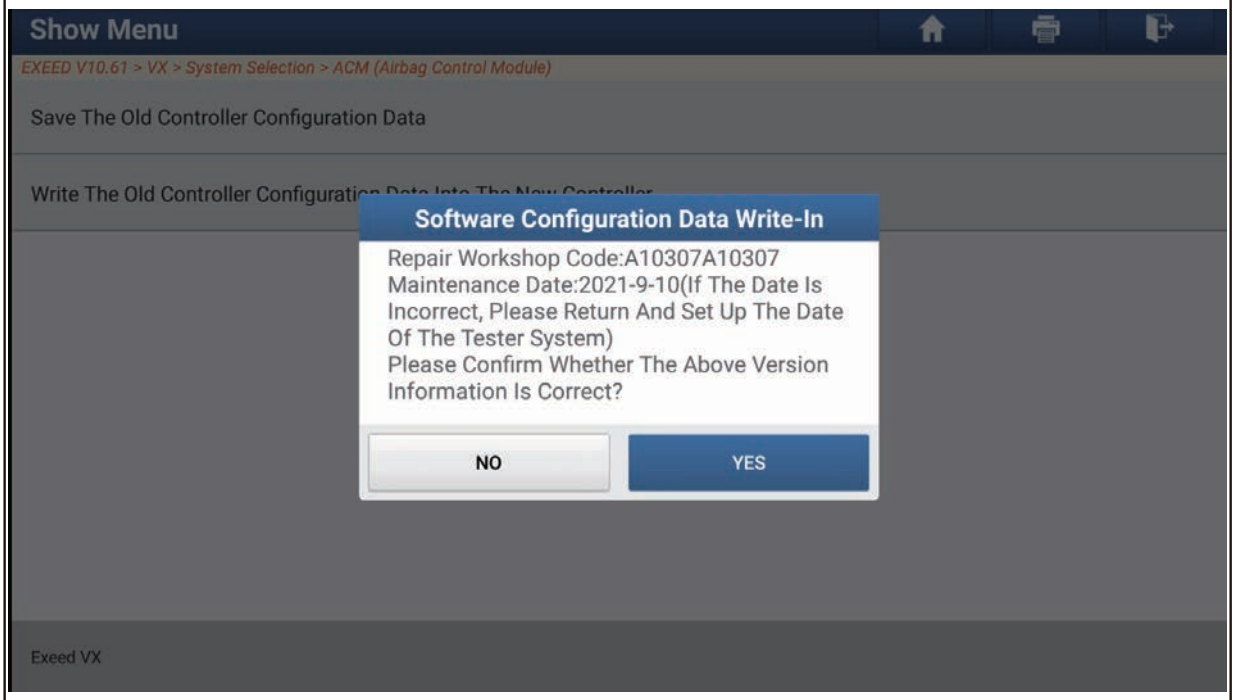
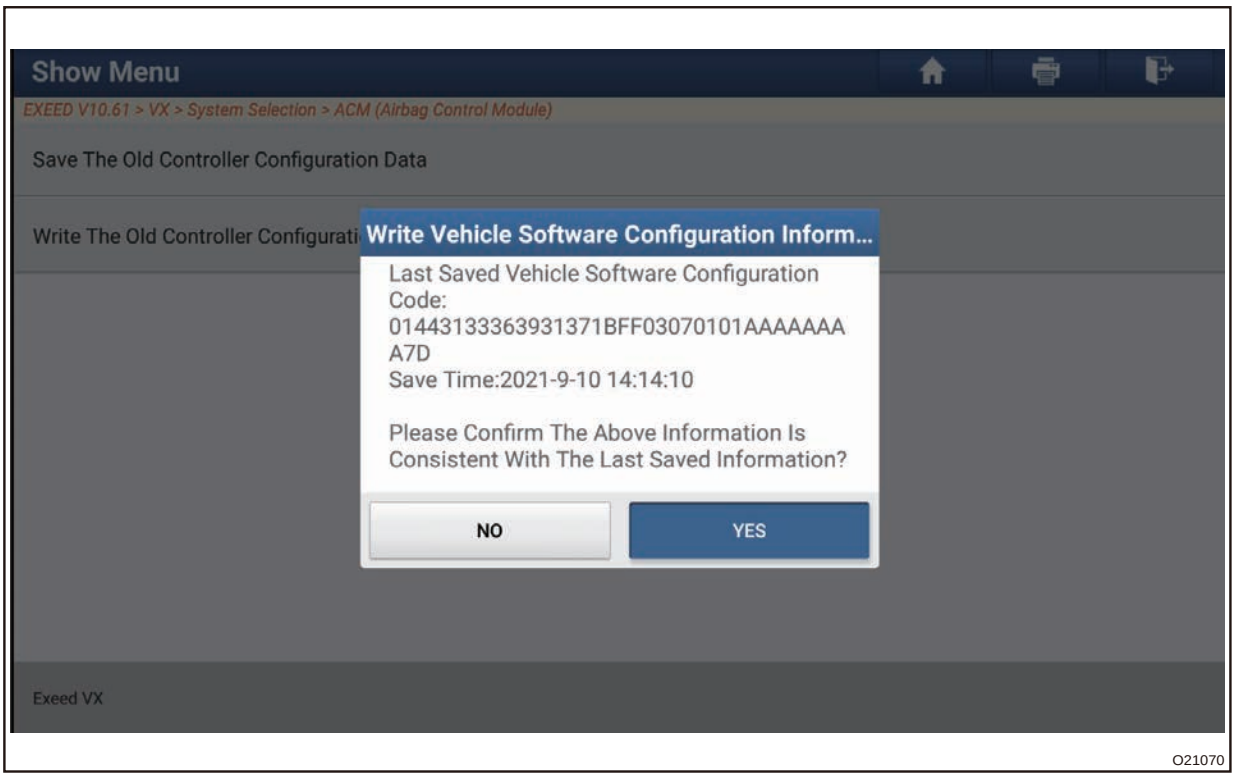
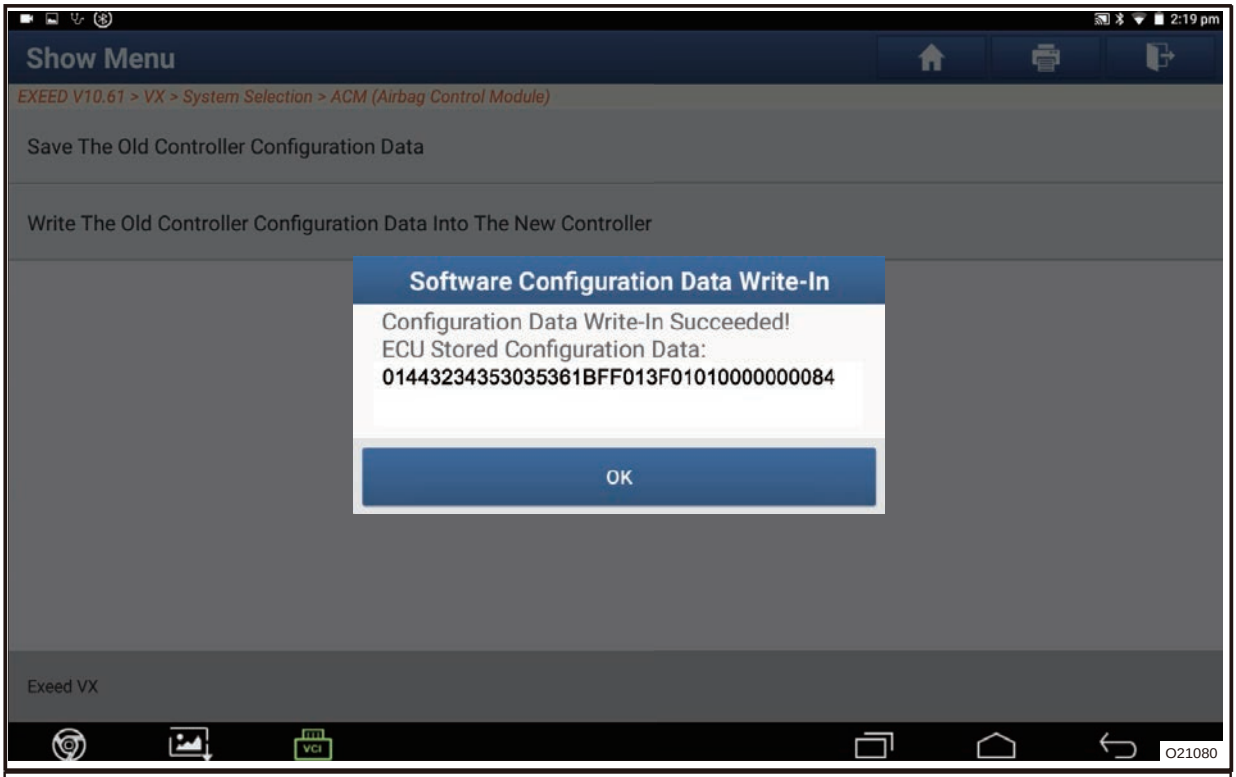
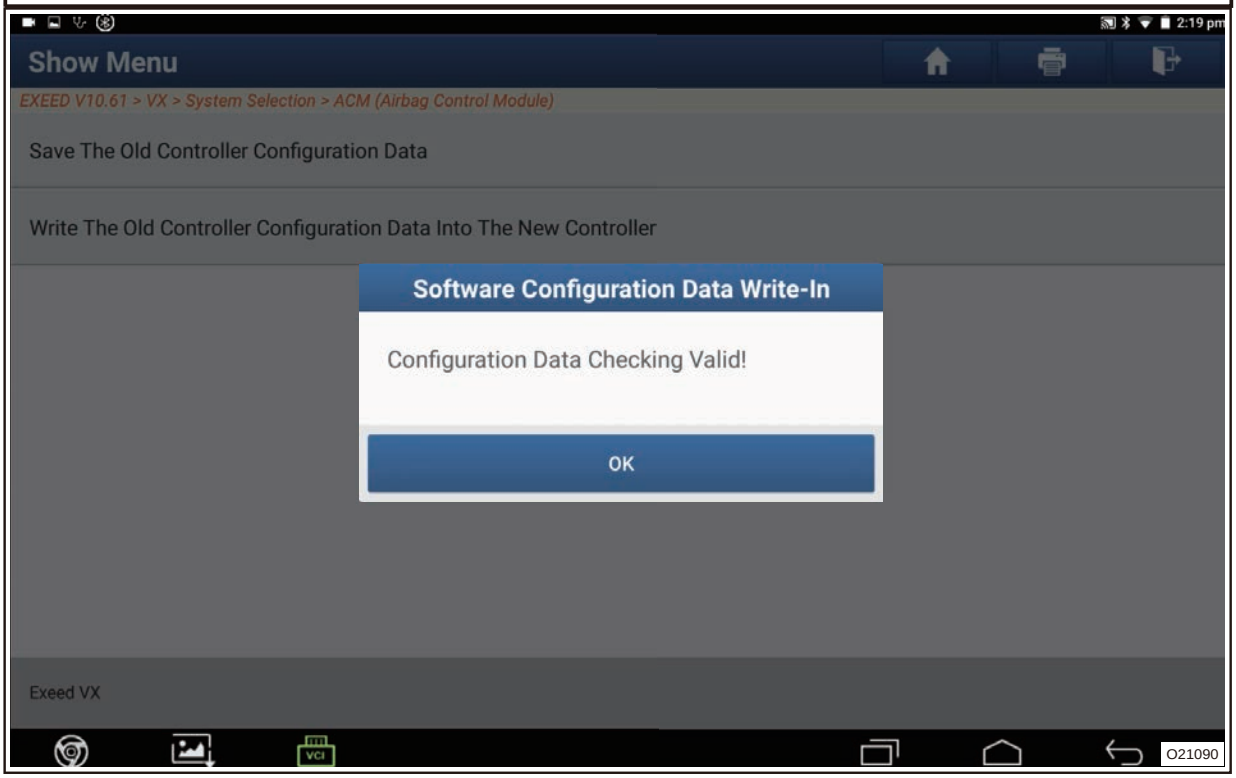


O21060


Show Menu
EXEED V10.61 > VX > System Selection > ACM (Airbag Control Module)
Save The Old Controller Configuration Data
Write The Old Controller Configurati
Write Vehicle Software Configuration Inform...
Last Saved Vehicle Software Configuration Code:
01443133363931371BFF03070101AAAAAAA A7D
Save Time:2021-9-10 14:14:10
Please Confirm The Above Information Is Consistent With The Last Saved Information?
NO
YES
Exeed VX
O21070





(12) Click “Write The Old Controller Configuration Data Into The New Controller”.

10.2 AIRBAG

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Wire harness assembly: Arrange the wire harness without any torsion and wrinkles, etc. Never make it with metal or non-metal sharp edge. It should be connected with ACU (Airbag Module), SIS and each airbag module firmly without any looseness.

(2) System power-on detection:

1) After powering-on, ACU sends airbag indicator light on signal via CAN, the lighting time should last for 3 seconds (When the controller has an Squib fault or undervoltage/overvoltage error, initialization time of malfunction indicator is extended to a maximum of 10 seconds). After self-check is completed, ACU sends airbag indicator off signal via CAN, the warning light goes off for (1±0.1) seconds, and then it will enter normal operation state;

2) After completion of (remains on for 3 seconds) and (goes off for 1±0.1 seconds) states, if there is no DTC in system that requires the indicator light to be turned on, the indicator light will go off. If the indicator light remains on, it indicates that there is a malfunction in ACU, it is necessary to clear the fault with a diagnostic tester. Check corresponding components and wire harness connection according to the fault display of diagnostic tester. If the malfunction is still not eliminated, you must complete the corresponding adjustment operation under the guidance of the quality department, design department and suppliers until the indicator goes off.

3) Diagnosis of airbag system should be completed at the follow-up station of four-wheel alignment. It is required to perform diagnosis when the vehicle is powered-on and airbag modules, etc. are fully fastened.

(3) The installation and repairing of all airbag parts must be performed with power off, and it’ s strictly forbidden to install, remove and rework on production line with power on. If the replacement or repairing of airbag parts is involved, you must cut off power supply. Because within 30 seconds of vehicle stalling or fuse removed (refer to Technology Instruction for Wire Harness System Assembly and Adjustment), sufficient power to deploy airbag is still remained inside airbag controller, so perform the repairing operation after 30 seconds of airbag controller and battery cut off.

(4) Be sure to clear all DTCs from ACU after vehicle assembly is complete.

(5) Store the airbag in a place with enough spare space to prevent accidental airbag deployment. If there is no airbag deployment space, accidental airbag deployment may injure human body or damage the vehicle.

(6) In order to avoid DTC, never energize airbag system before connecting all airbag system components and performing diagnostic inspection.

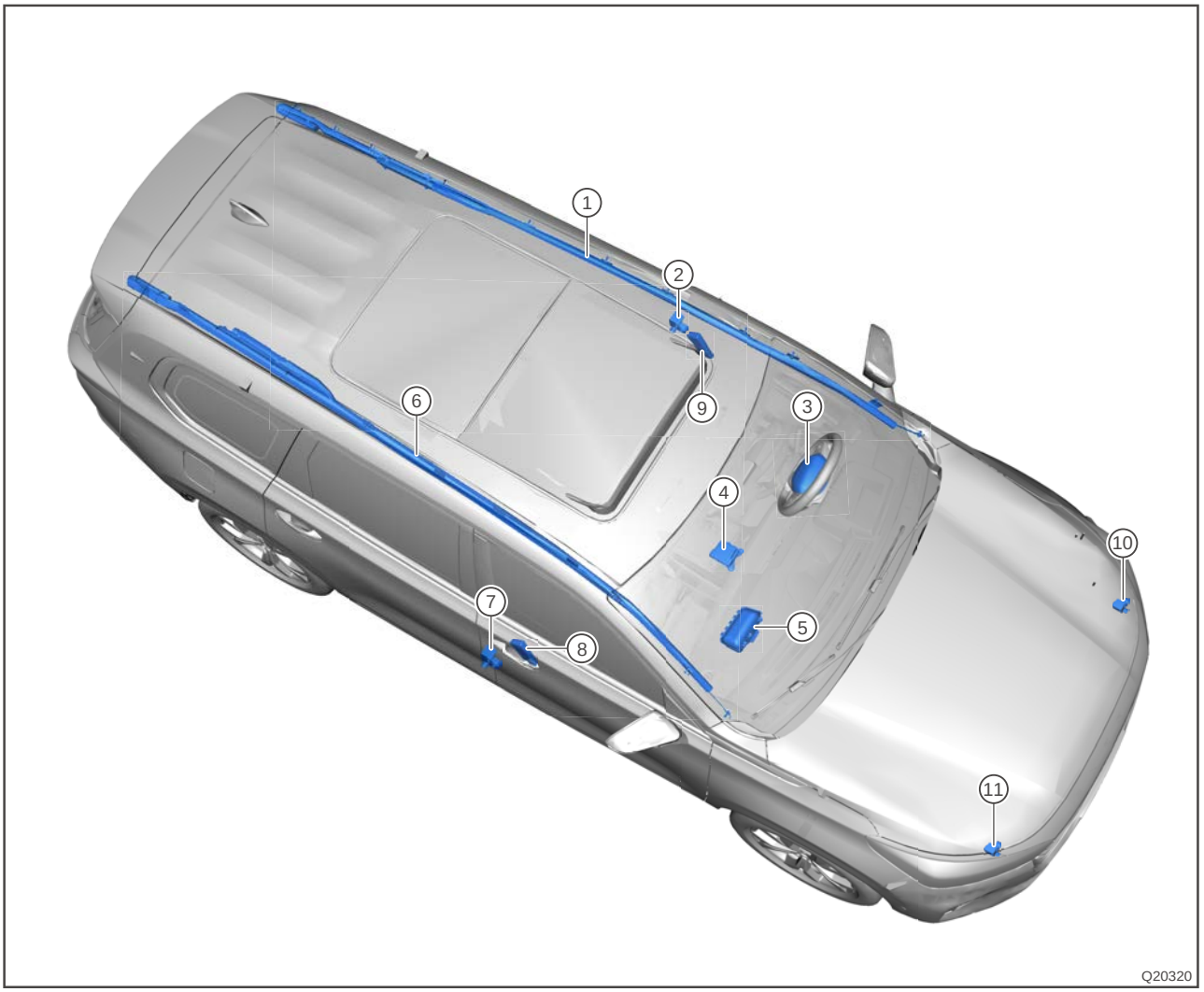
(7) If airbag and ACU had fallen down from a position higher than 1 m, please do not reuse it and insulate it.

(8) Handle airbag and ACU carefully, and never tap or strike it fiercely.

(9) Assembly, detection and removal of airbag system must meet relevant requirements and specifications, and never perform operation casually.

2 System Overview

2.1 System Components Diagram



1 - Left Curtain Shield Airbag Assembly	7 - Right Side Collision Sensor
2 - Left Side Collision Sensor	8 - Front Right Seat Side Airbag Assembly
3 - Driver Airbag Assembly	9 - Front Left Seat Side Airbag Assembly
4 - Airbag Module Assembly	10 - Left Frontal Collision Sensor
5 - Front Passenger Airbag Assembly	11 - Right Frontal Collision Sensor
6 - Right Curtain Shield Airbag Assembly	

Airbag: The controller controls ignition circuit and activates airbag (and belt pretensioner) reasonably to keep occupants at proper position in the cabin when accident occurs, thus protecting occupants.

3 Diagnostic Information and Steps

3.1 Diagnosis Procedure

■ Preparations before dealing with airbag system wire harness malfunction

- Read and record the system DTC.

- Turn ENGINE START STOP switch to OFF, disconnect the negative battery cable for at least 90 seconds so that the airbag controller has enough time to discharge.
- Prevent electric static discharge, such as static-proof wrist strap.
- To prevent the ignition element from igniting accidentally during wire harness measurement, it is necessary to disengage all elements connected to wire harness, such as airbag, module, sensor etc. before measuring.

■ Airbag system malfunction repair completion inspection

(1) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable (if it is connected).

(2) Connect each wire harness connector of airbag system.

(3) Connect negative battery cable.

(4) Start the vehicle, operate the electrical system, turn on the electrical equipment as much as possible (-blower, rear defroster, headlight, audio, etc.). If all the following requirements are met, the airbag system is normal, otherwise it should be checked and repaired again:

1) ENGINE START STOP switch is ON, system performs self-check, airbag warning light comes on. Warning light goes off when self-check is completed.

2) Connect the diagnostic tester, read the DTC and observe the datastream. Use the simulation method if necessary. Test the vehicle in the malfunction conditions described by customer, check if the malfunction is no longer duplicate and no other DTCs are produced.

3) If equipped with front passenger detection device, the front passenger seat belt warning light should operate normally; (Check method: A person sits on the front passenger seat and does not wear the seat belt, seat belt warning light comes on and goes off after the seat belt is fastened.)

4) Clear history DTC (If exists).

■ Handling procedure for deployed airbag set

(1) Place the deployed airbag in a solid plastic bag.

(2) Be sure to seal the plastic bag tightly.

(3) Wash both hands carefully after handling the deployed airbag.

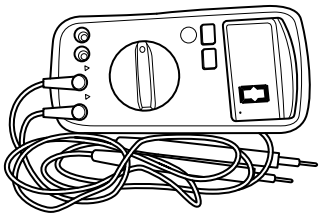
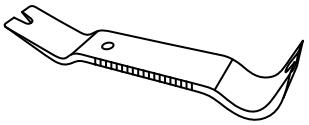
(4) Although above protection measures are taken, if the irritant substance attaches to the eyes or skin, flush it with a large amount of water immediately.

⚠ Warning

- **There may be powder particles on airbag surface, which is primarily composed of chemical reaction product (used to lubricate bag when inflating).**
- **There may be substance which can irritate eyes or skin attached to the deployed airbag, so please wear gloves and safety glasses during disposal process.**
- **After the airbag deploys, the temperature on airbag module metal surface is very high. To avoid any injury or fire, please keep the deployed airbag module far away from any combustible materials,**
- **Do not pour water or oil on the airbag after the airbag deploys and handle it after cooling for 30 minutes.**

4 On-Vehicle Service

4.1 Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Interior & Exterior Remover	 S00020

4.2 Replacement of Driver Airbag Assembly (DAB)

■ **Removal**

⚠ Warning

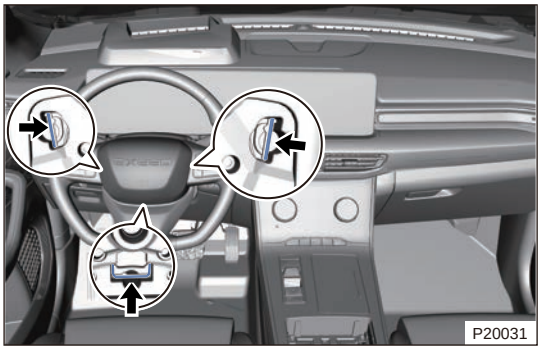
- **Be sure to follow correct procedures to remove and install airbag system controller.**
- **DAB installation and repairing must be performed with power off, and it's strictly forbidden to install, remove and rework DAB on any production line with power on. DAB replacement and repairing must be performed with power off. Within 30s of vehicle stalling or fused removed (refer to Technology Instruction for Wire Harness System Assembly), sufficient power to deploy airbag is still remained inside airbag controller, so it's necessary to perform repairing after 30s since the power of airbag controller is cut off.**
- **In order to avoid DTC, never energize airbag system before connecting all airbag system components (-including DAB) and performing diagnostic inspection;**
- **Keep space in area for storing DAB to prevent accidental deployment of DAB. If there is no deployment space, accidental deployment of DAB may injure human body or damage the vehicle.**
- **If DAB falls down from a position higher than 1 m, please do not reuse it and insulate it;**
- **Handle DAB carefully, and never tap or strike it fiercely.**
- **Assembly, detection and removal of DAB must meet relevant requirements and specifications, and never perform operation casually.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

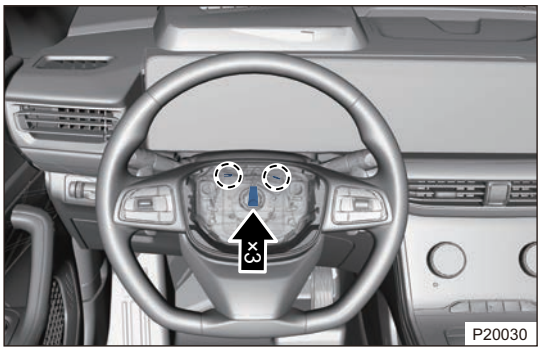
(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

(3) Position the front wheels straight ahead.

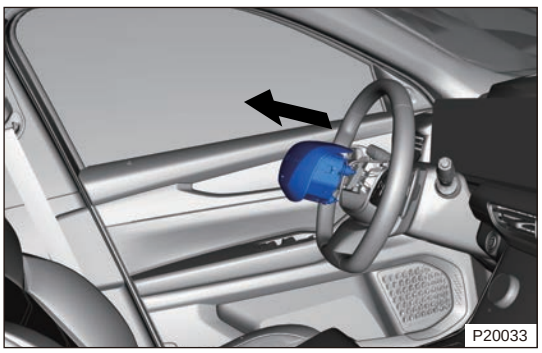
(4) Using a slotted screwdriver, remove driver airbag assembly in sequence through 3 removal holes in locations of 3 o’ clock, 9 o’ clock and 6 o’ clock on steering wheel. Insert the screwdriver into removal hole of 3 o’ clock position on steering wheel in removal direction and push it further lightly when reaching to snap spring until a “click” sound is heard, which means that the clip is detached, and the corresponding side of airbag will be bounced up. Then perform removal in 9 o’ clock direction with the same method as above. Finally perform removal in 6 o’ clock direction, and then take up the whole driver airbag assembly from steering wheel lightly with both hands.



(5) Removal of spiral cable and driver airbag assembly connector: While taking up driver airbag assembly with one hand, use 2 fingers of the other hand to press and hold lock clips of both sides in “pressing direction” as indicated in illustration and then remove driver airbag assembly connector in removal direction, and remove 2 connectors of horn ground wire.



(6) Remove the driver airbag assembly.



■ Inspection

(1) Before assembly, confirm that label part number in driver airbag assembly and configuration card part number in vehicle matches;

(2) Then check driver airbag assembly cover plate surface for trimming, residual, air vent, scratches, galling etc.; it’ s also forbidden for defects such as inclusion and dents etc. Peel off a bar code after inspection and attach it to record card in vehicle.

■ Installation

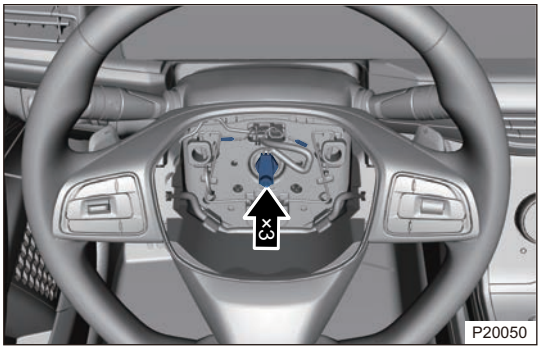
⚠ Warning

- **Install the driver airbag assembly after completing the steering wheel;**
- **Make sure that all connectors are securely connected and the wire harness is fixed in the set slot before pressing driver airbag assembly into steering wheel;**
- **After installing the driver airbag assembly, airbag light is normal after the power is turned on, ensure that the horn pressing function is normal;**
- **Press periphery and center part of driver airbag assembly cover with palms to make sure that the pressing operation is smooth without sluggish.**

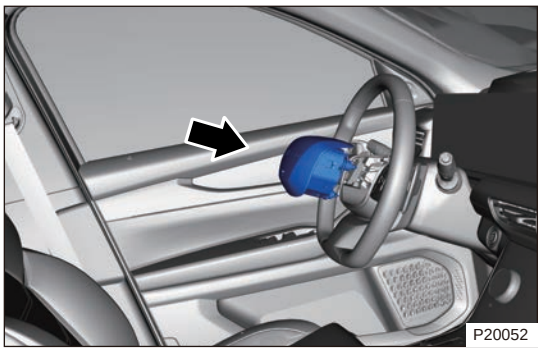
⚠ Caution

- **Press periphery and center part of DAB cover with palms to make sure that the pressing operation is smooth without sluggish after installation.**

(1) Insert horn connector on spiral cable side into horn metal plate on DAB side, insert airbag connector of spiral cable into generator of driver airbag assembly until a “click” sound is heard. The connector plane and generator port fitted flatly indicates that the connector is installed in place.


P20050

(2) DAB of M36T model adopts press-in mounting structure without any mounting tools. Put DAB into the steering wheel and ensure stability, press center part of airbag trim cover with palms of both hands until a “click” sound is heard, which means that the airbag and steering wheel have been fixed and installation is completed.


P20052

4.3 Replacement of Front Passenger Airbag Assembly (PAB)

■ Removal

⚠ Warning

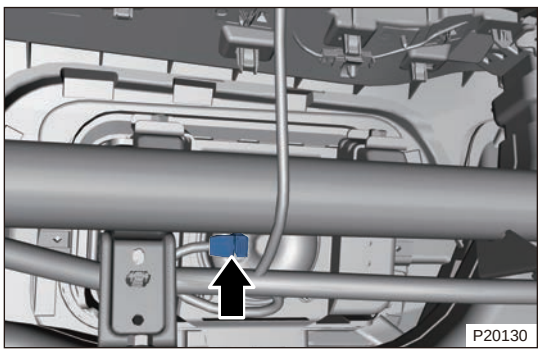
- **Handle airbag assembly carefully, and never tap or strike it fiercely.**
- **Removal, inspection and installation of airbag system must meet relevant requirements and specifications, and never perform operation casually.**
- **Removed airbag should be kept properly with face up. Store the airbag in a place with enough spare space to prevent accidental airbag deployment.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

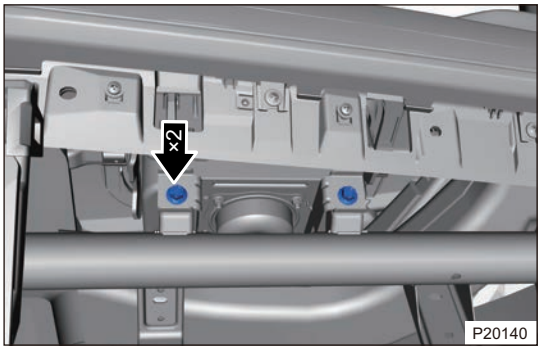
(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

(3) Remove the glove box assembly.

(4) Remove the front passenger airbag assembly wire harness connector assembly.

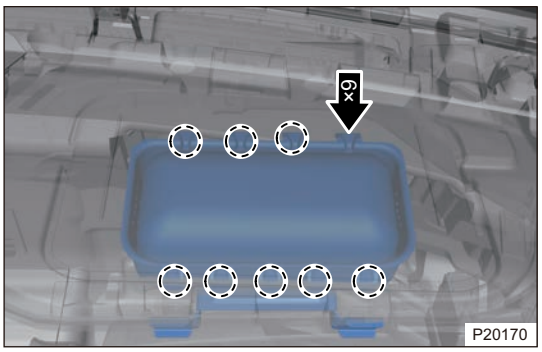

P20130

(5) Remove 2 coupling bolts (8# socket wrench) between front passenger airbag assembly and instrument panel crossmember assembly.



(6) Remove the instrument panel upper body assembly.

(7) Using an interior crow plate, pry off 9 fixing claws around front passenger airbag assembly mounting bracket to separate it from instrument panel body assembly.



■ Inspection

(1) Confirm that label part number in front passenger airbag assembly and configuration card part number in vehicle matches before assembly;

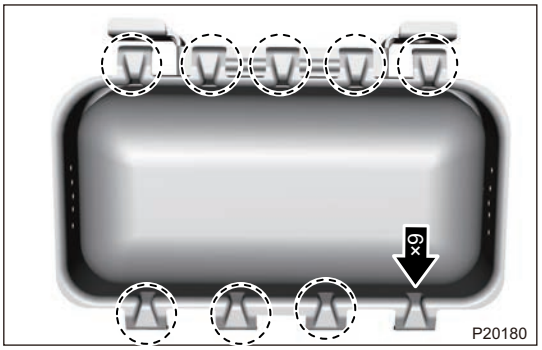
(2) Then check front passenger airbag assembly cover plate surface for trimming, residual, air vent, scratches, galling etc.; it' s also forbidden for defects such as inclusion and dents etc. Peel off a bar code after inspection and attach it to record card in vehicle.

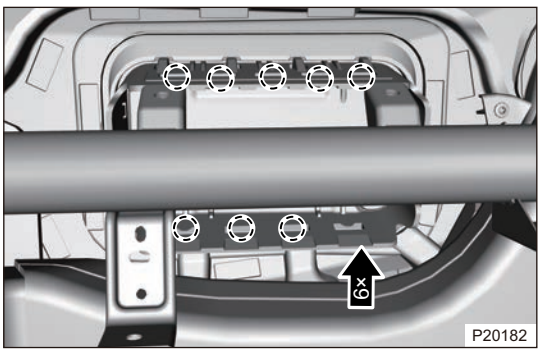
■ Installation

⚠ Warning

- **Inspect and confirm that parts surface should be free of chips and damages and labels and bar codes should be intact and clear before assembly; Peel off one bar code after inspection and attach it to record card in vehicle.**
- **Before installing tightening bolts, always make sure that airbag wire harness is not held down or stuck. Adjust if necessary and install it in place.**
- **Make sure to tighten fixing bolts to specified torque during installation.**
- **When installing front passenger airbag assembly, first slide the hook on one side into locating hole in airbag box, and then press in hook on the other side firmly, making sure that hooks on both sides enter the corresponding locating holes correctly.**
- **Always keep vehicle power off during installation. It is forbidden to install the front passenger airbag assembly with vehicle power on.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**

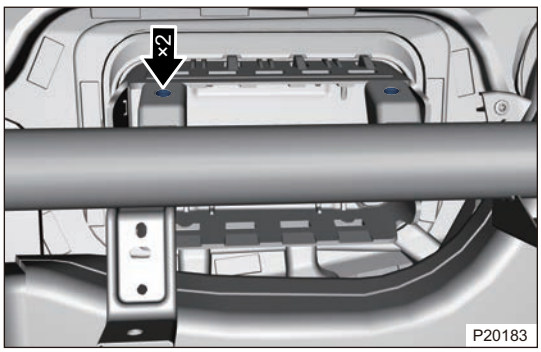
(1) PAB should be installed firstly to instrument panel upper body. Place PAB entirely into airbag bracket on back side of instrument panel upper body. First hang 4 hooks into fixing holes in airbag frame, then press 5 hooks on the other side firmly into bracket holes and make sure that hooks on both sides have been put into the corresponding fixing holes.



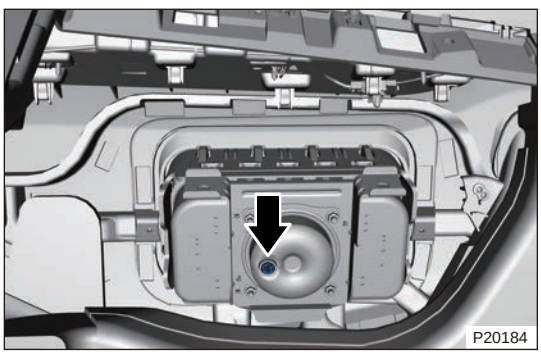


(2) Pre-tighten 2 bolts of PAB to CCB bracket in glove box port. Finally tightens bolts with installing tools according to set torque value.

23 ± 2 N m



(3) Insert instrument cluster wire harness connector into PAB generator port while keeping the connector fitting flatly with the generator. And press down short-circuit plate to keep its upper surface be flush with connector surface on wire harness end, which indicates that it is installed in place. PAB port has failure-proof function and it’ s forbidden to connect forcibly.



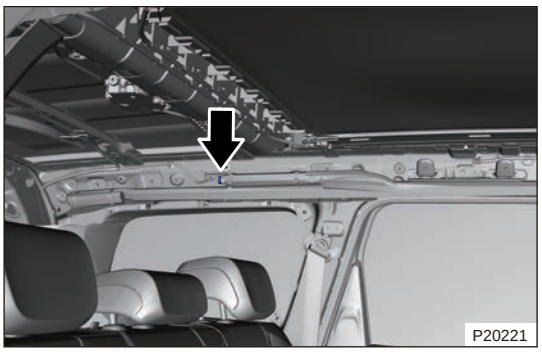
4.4 Replacement of Side Curtain Shield Airbag Assembly (CAB)

■ Removal

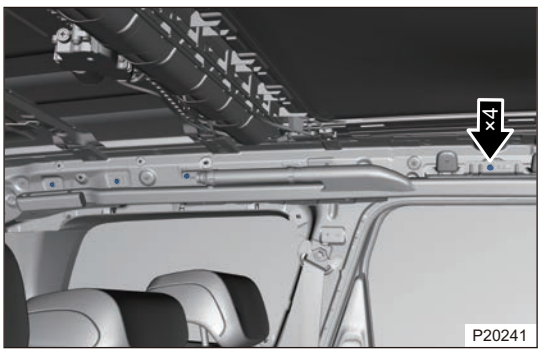
⚠ Warning

- **Handle airbag assembly carefully, and never tap or strike it fiercely.**
- **Removal, inspection and installation of airbag system must meet relevant requirements and specifications, and never perform operation casually.**
- **Removed airbag should be kept properly with face up. Store the airbag in a place with enough spare space to prevent accidental airbag deployment.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.
(3) Remove the roof assembly.
(4) Disconnect wire harness connector from side curtain shield airbag generator.



(5) Remove 4 fixing bolts from left curtain shield airbag. (10# socket wrench).



(6) Remove 6 fixing bolts from left curtain shield airbag. (10# socket wrench).
(7) Remove the left curtain shield airbag assembly.

■ Inspection

(1) Check that airbag components surface should be free of damages before assembly and labels and bar codes should be intact and clear; it's also necessary to check that CAB installation area on vehicle body should be free of rags, sharp corners, welding spatters etc.; peel off one bar code after the checking and attach it to record card in vehicle.

■ Installation

⚠ Caution

- **The installation of airbags can not be rotated and twisted. It is essential to check if protecting bag stitching of air bag is in lower part of air bag during assembly.**
- **Air bag on each armrest installation bracket should be in lower part of armrest bracket. If air bag covers armrest installation bracket, it's necessary to adjust air bag to lower part of the bracket with hands.**
- **If any of the above situation occurs, normal deployment of airbag will be affected when side collision occurs, it can not form effective protection for drivers and passengers; It is necessary to focus on control during assembly, and above problems are not allowed to occur.**

(1) Install generator mounting bracket to vehicle body with hooks (first hang hook into vehicle body groove, then hang hook beside bolt hole into vehicle body hole), and tighten it to vehicle body through bolt hole finally.

(2) Assemble tree screws from the center of the generator bracket assembly to both ends, and then assemble bolt assembly in order and tighten the bolts. Torque: 10 ± 1 N·m

(3) Assemble end of strap into sheet metal hole, first hang hook into vehicle body groove, and then tighten it to vehicle body through bolt hole. Torque: 10 ± 1 N·m

(4) Insert the connector on wire harness end into generator end and make sure that the connector is assembled into place.

4.5 Replacement of Front Seat Side Airbag

■ Removal

⚠ Warning

- **Front passenger side airbag is non-removable and must be removed together with seat assembly.**

Hint:
Removal method of right seat side airbag and left side is same.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

(3) Remove the front left seat assembly (installation position of front left seat side airbag).

(4)

■ Inspection

(1) Check the front seat for scratches and dirt before assembly.

(2) Check whether the front seat can adjust automatically before assembly.

■ Installation

⚠ Caution

- **Always install correctly according to specified operating instructions.**

(1) Install the front left seat assembly.

4.6 Replacement of Spiral Cable (Integrated in SCM Module)

■ Removal

⚠ Warning

- **An activation prevention mechanism is built in airbag system connector. When connector is disconnected, this mechanism cuts off circuit by bringing short spring plate into contact with terminals, thus insulating the circuit from external power sources to prevent accidental airbag activation.**
- **To release activation prevention mechanism, insert a piece of paper with the same thickness as male terminal between terminals and short spring plate to disconnect the connection.**

Hint:
When removing spiral cable, use the positioning pin to hold it in its original position.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

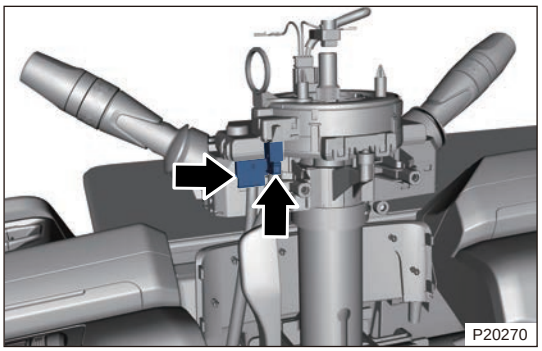
(3) Position the front wheels straight ahead.

(4) Remove the driver airbag.

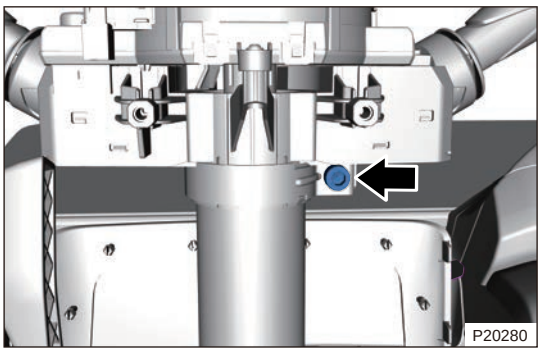
(5) Remove the steering wheel assembly.

(6) Remove the combination switch cover assembly.

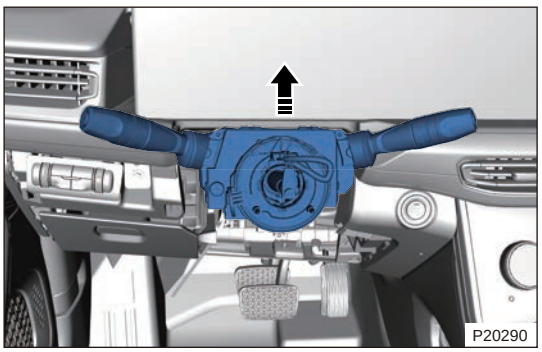
(7) Disconnect SCM module wire harness connector and angle sensor connector.



(8) Loose 1 fixing screw of SCM module. (6# inner hexagon wrench)



(9) Remove SCM module from steering column in direction of arrow.



■ Inspection

(1) Check whether any connector of spiral cable is damaged or exposed before assembly.

(2) Check whether there are cracks in plastic parts of spiral cable before assembly.

■ Installation

⚠ Caution

- **Always install correctly according to specified operating instructions.**
- **Check that horn operates normally after installation.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**

(1) Install SCM module with coil spring to steering column.

(2) Install and tighten fixing screw of coil spring.

Torque: 6 ± 0.5 N·m

(3) Connect spiral cable wire harness connector and angle sensor connector.

(4) Install the combination switch cover assembly.

⚠ Caution

Remove the positioning pins after the SCM module with spiral cable assembly is installed.

(5) Install the steering wheel assembly.

(6) Install the driver airbag.

4.7 Replacement of Side Collision Sensor Assembly

■ Removal

⚠ Warning

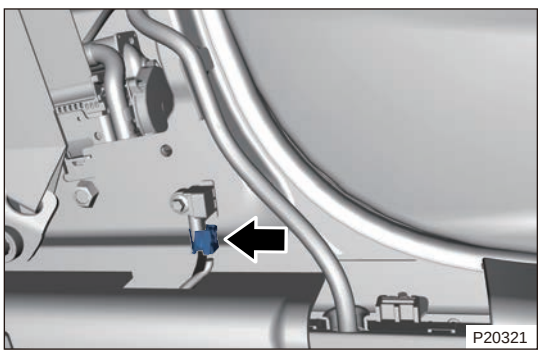
- **Before installing tightening bolts, always make sure that airbag wire harness is not held down or stuck. Adjust if necessary and install it in place.**
- **Make sure to tighten fixing bolts to specified torque during installation.**
- **Always keep vehicle power off during installation. It is forbidden to install the airbag controller assembly with vehicle power on.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**
- **During assembly, insert locating pin of the sensor into waist-shaped locating hole.**
- **Be sure to follow correct procedures to remove and install side collision sensor.**
- **Insert wire harness connector into side collision sensor port and generally a "click" sound will be heard after pushing into connector end to lock, which indicates that it is clamped into place; Connector port has failure-proof function. If it cannot be inserted, adjust and insert it again and do not insert it forcibly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

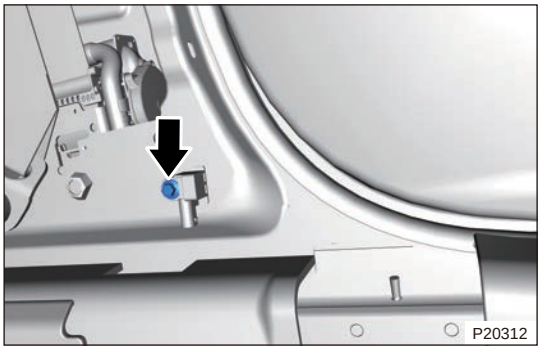
(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

(3) Remove the left B-pillar lower protector. (See page)

(4) Remove the wire harness connector.



(5) Remove 1 fixing bolt from side collision sensor assembly. (10# socket wrench).



■ **Inspection**

(1) Check whether pins of collision sensor are exposed and bent before assembly.

(2) Check collision sensor for cracks, burrs and creases before assembly.

■ **Installation**

⚠ Caution

- **Before installing tightening bolts, always make sure that airbag wire harness is not held down or stuck. Adjust if necessary and install it in place.**
- **Make sure to tighten fixing bolts to specified torque during installation.**
- **Always keep vehicle power off during installation. It is forbidden to install the airbag controller assembly with vehicle power on.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**

(1) Install waist-shaped pin of side collision sensor into waist-shaped hole of B-pillar reinforcing plate, install and tighten fixing bolts (10# socket wrench).

Torque: 9 ± 1 N·m

(2) Insert wire harness connector into side collision sensor port, lock after pushing into the end of connector.

4.8 Replacement of Frontal Collision Sensor Assembly

■ **Removal**

⚠ Warning

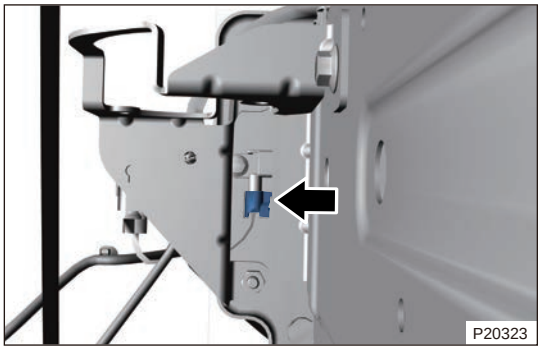
- **Before installing tightening bolts, always make sure that airbag wire harness is not held down or stuck. Adjust if necessary and install it in place.**
- **Make sure to tighten fixing bolts to specified torque during installation.**
- **Always keep vehicle power off during installation. It is forbidden to install the airbag controller assembly with vehicle power on.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**
- **During assembly, insert locating pin of the sensor into waist-shaped locating hole.**
- **Be sure to follow correct procedures to remove and install side collision sensor.**
- **Insert wire harness connector into side collision sensor port and generally a "click" sound will be heard after pushing into connector end to lock, which indicates that it is clamped into place; Connector port has failure-proof function. If it cannot be inserted, adjust and insert it again and do not insert it forcibly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

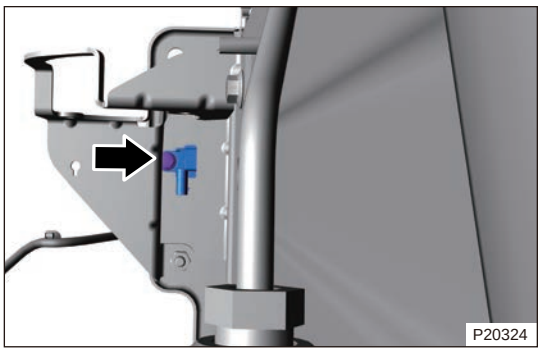
(2) Wait at least 90 seconds after disconnecting the negative battery cable to disable supplementary restraint system.

(3) Remove the front wheel house protector assembly. (See page)

(4) Disconnect the frontal collision sensor connector.



(5) Remove 1 fixing bolt from frontal collision sensor assembly (10# socket wrench).



■ **Inspection**

(1) Check whether pins of collision sensor are exposed and bent before assembly.

(2) Check collision sensor for cracks, burrs and creases before assembly.

■ **Installation**

⚠ Caution

- **Before installing tightening bolts, always make sure that airbag wire harness is not held down or stuck. Adjust if necessary and install it in place.**
- **Make sure to tighten fixing bolts to specified torque during installation.**
- **Always keep vehicle power off during installation. It is forbidden to install the airbag controller assembly with vehicle power on.**
- **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**

(1) Install waist-shaped pin of frontal collision sensor into waist-shaped hole of B-pillar reinforcing plate, install and tighten fixing bolts (10# socket wrench).

Torque: 9 ± 1 N·m

(2) Insert wire harness connector into side collision sensor port, lock after pushing into the end of connector.

4.9 Disposal of Airbag

■ **Airbag deploys (in vehicle)**

It is necessary to deploy the airbag before disposing. If the vehicle is scrapped and disassembled, the airbag may deploy in vehicle.

(1) Preventive procedure of airbag deployment.

⚠ Warning

To prevent injury when deploying the airbag in vehicle, please refer to following prevention methods:

- **Remove all movable objects or loose parts within airbag deployment range before the airbag is deployed;**
- **The airbag is deployed only in the reserved airbag deployment area with door closed and side window opened;**
- **The airbag is deployed only in the reserved airbag deployment area (site), the technicians must stand at least 10 meters in front of the vehicle;**
- **Do not load voltage before all preparations have been completed;**
- **Cool down the airbag at least 30 minutes before handling the deployed airbag;**
- **Please wear gloves and safety glasses during disposal process;**
- **If airbag deployment is failed, wait at least 5 minutes after disconnecting the voltage, and then you can approach the vehicle.**

(2) Prevention methods of deployment procedure.

1) Inside deployment prevention methods:

i. Disconnect the negative and positive battery cables and move the battery 10 meters away from the vehicle.

ii. Prepare two additional wire harnesses at least 10 meters long for each one and special connector for connecting the spiral cable. Peel off the 13 mm insulation coat at the end of wire harness. Connect the connector at one end and another end to twist.

iii. Place the twisted end next to the battery for airbag deployment, but do not connect it to battery at this time.

iv. Remove driver side lower instrument panel from steering column. Connect lower part of steering column to SRS wire harness connector of spiral cable.

v. Clean the site.

vi. Disengage the twisted end of the wire harness next to the battery for airbag deployment.

vii. One wire harness contacts with negative battery and another one contacts with positive battery, the airbag will deploy at this time.

viii. Deploy the passenger side airbag module using the same procedure.

ix. Handle the deployed airbag with correct prevention methods.

2) Outside deployment prevention methods:

i. Install the airbag set to the tire with rim with airbag front surface faced up, and the space for wire and connector is reserved to prevent the deployment from being destroyed.

ii. Prepare two additional wire harnesses at least 10 meters long for each one and special connector for connecting airbag set. Peel off the 13 mm insulation coat at the end of wire harness. Connect the connector at one end.

iii. Place the twisted end next to the battery for airbag deployment, but do not connect it to battery at this time.

iv. Stack 4 old tires without rims on the wheel installed with airbag set, and secure all the tires in 4 different positions with rope.

v. Clean the site.

vi. Disengage the twisted end of the wire harness next to the battery for airbag deployment.

vii. One wire harness contacts with negative battery and another one contacts with positive battery, the airbag will deploy at this time.

viii. Deploy the passenger side airbag module using the same procedure.

ix. Handle the deployed airbag with correct prevention methods.

10.3 SEAT BELT

1 Warnings and Precautions

1.1 Precautions

Seat belt assembly precautions

(1) Be sure to perform assembly of vehicle in accordance with BOM strictly. It is not allowed to replace the parts assembly without permission;

(2) During assembly of vehicle, tighten parts with specified torque in list strictly;

(3) It is not allowed to replace the components of parts assembly without permission, such as bolt, washer etc;

(4) If the parts assembly is accidentally dropped during handling and installation, please check the plastic parts of parts assembly (such as retractor) for cracks. If there is crack, insulate and dispose it after packaging and marking to prevent accidental injury;

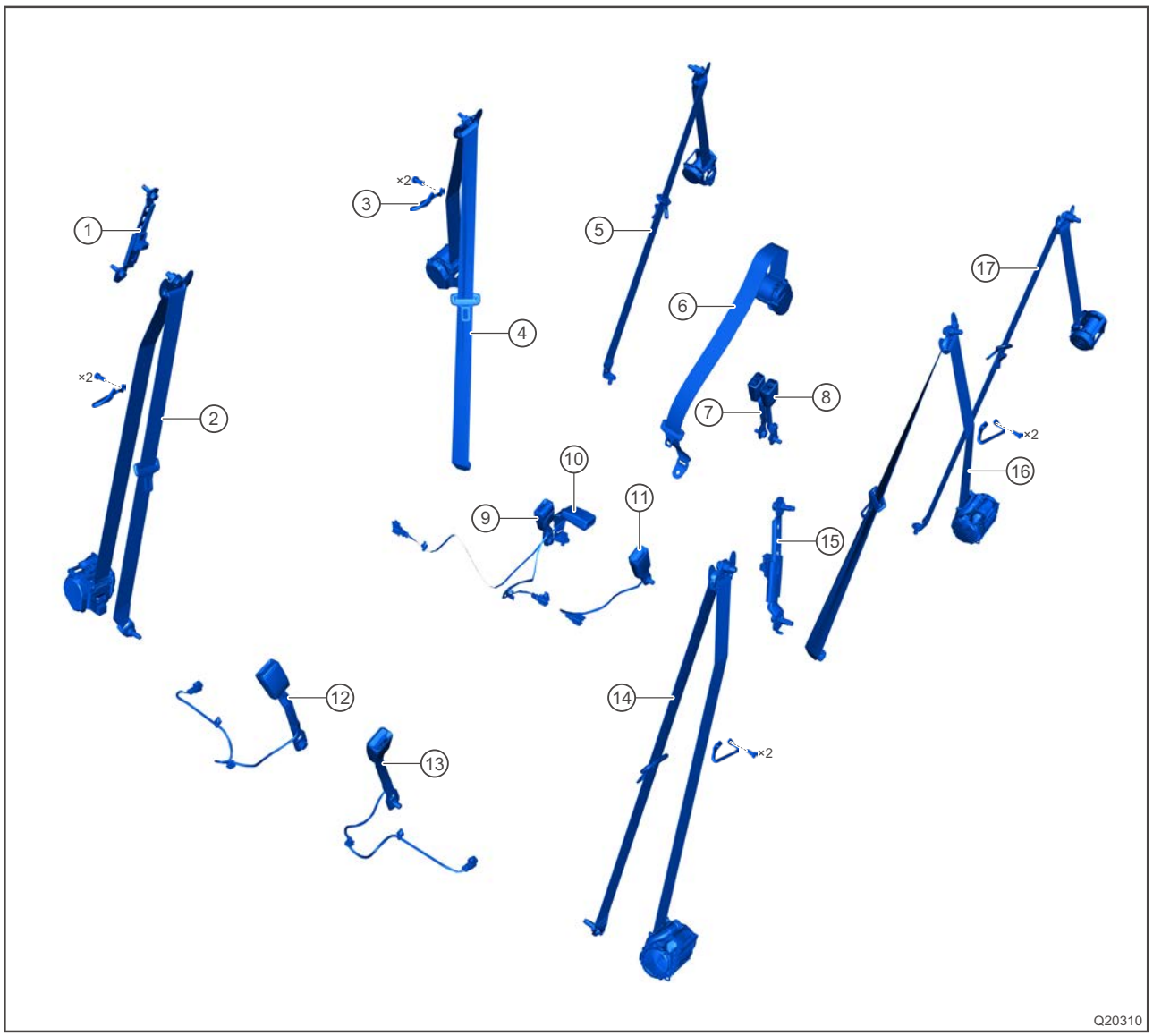
(5) It is necessary to check whether the seat belt is in good condition before installing it; Pull the webbing and lock the buckle after assembling to ensure that the webbing can be extended and retracted smoothly, the buckle can be locked and unlocked normally. Make sure that there are no objects (such as tools, etc) can scratch the webbing during assembly of seat belt;

(6) During overturn inspection of rear seat, never insert locking tab of rear center seat belt into big buckle;

(7) Never check the retracted function of the rear center seat belt when small buckle (rear seat small buckle lock assembly) is unlocked.

2 System Overview

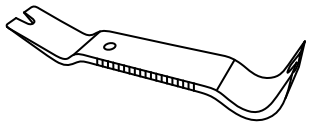
2.1 System Components Diagram



1 - Front Right Height Adjuster Assembly	10 - Second Row Middle Seat Belt Buckle
2 - Front Right Seat Belt Assembly	11 - Second Row Left Seat Belt Buckle
3 - Rear Right Fork Bracket	12 - Front Right Buckle Assembly
4 - Second Row Right Seat Belt Assembly	13 - Front Left Buckle Assembly
5 - Third Row Right Seat Belt Assembly	14 - Front Left Seat Belt Assembly
6 - Second Row Middle Seat Belt Assembly	15 - Front Left Height Adjuster Assembly
7 - Third Row Right Seat Belt Buckle	16 - Second Row Left Seat Belt Assembly
8 - Third Row Left Seat Belt Buckle	17 - Third Row Left Seat Belt Assembly
9 - Second Row Right Seat Belt Buckle	

3 On-Vehicle Service

3.1 Tool

Tool Name	Tool Drawing
Interior & Exterior Remover	 S00020

3.2 Replacement of Front Left Seat Belt Assembly

■ Removal

⚠ Caution

- **Removal method of right seat belt assembly and left side is same.**

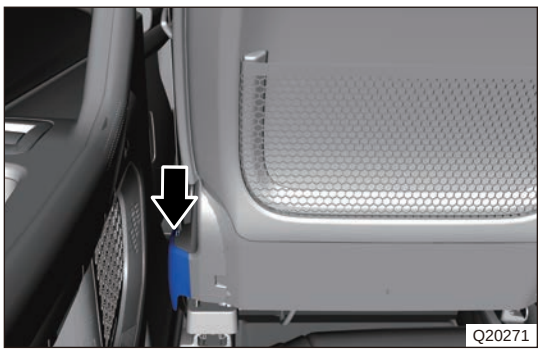
Hint:

- Be sure to wear safety equipment to prevent accidents, when removing front seat belt assembly.
- Appropriate force should be applied, when removing front seat belt assembly. Be careful not to operate roughly.
- DO NOT scratch interior when removing front seat belt assembly.

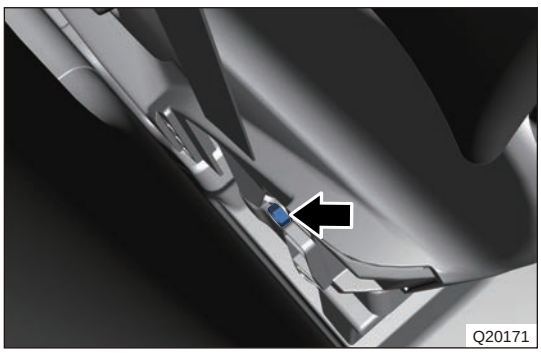
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Using an interior crow plate, pry off side panel trim cover carefully.


Q20271

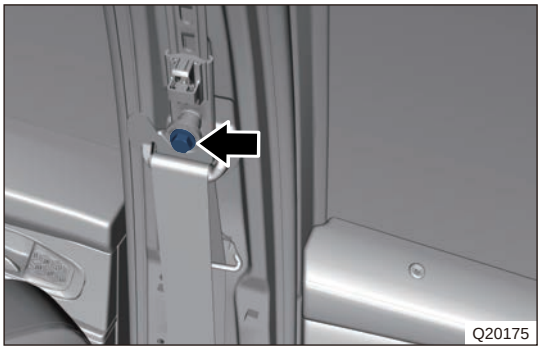
(4) Remove 1 fixing bolt from seat belt lower end plate (14# socket wrench).


Q20171

(5) Remove the left B-pillar lower protector assembly.

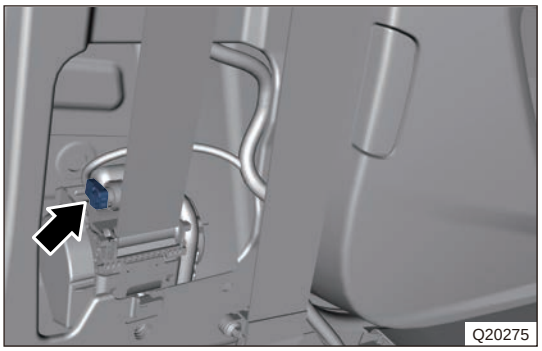
(6) Remove the left B-pillar upper protector assembly.

(7) Remove 1 fixing bolt from guide ring of front left seat belt assembly (17# socket wrench).

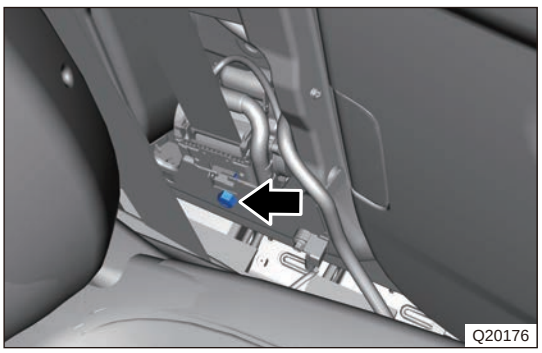


(8) Remove 2 fixing screws from seat belt assembly fork bracket.

(9) Disconnect the retractor connector.



(10) Remove 1 fixing bolt from front left seat belt retractor (14# socket wrench), and move front left seat belt retractor assembly away.



■ Inspection

(1) Check front left seat belt webbing for dirt, cuts, cracks or wear and replace it if necessary.

(2) Check whether the pins on the gas generator are broken or bent.

(3) Check whether retractor can freely rewind and release the webbing without sticking.

■ Installation

⚠ Warning

- **When connecting gas generator connector, if the pin inside of gas generator is deflective, please pack it properly and dispose it.**

⚠ Caution

- **If the connector wire harness is too long or interferes with the webbing, it is necessary to insert the wire harness into B-pillar to increase the gap between wire harness and webbing.**

(1) Take a front left seat belt assembly that is in good condition. First insert the seat belt pretensioner connector of interior wire harness into the gas generator connector of retractor and press the lock button, ensure that the connector is connected properly and clamped in place (connecting angle is 90).

(2) Using retractor tightening bolt, install the T-type hook of retractor to the retractor mounting board slot of B-pillar sheet metal, then install and tighten the retractor fixing bolt (14# socket wrench).

Torque: 50 ± 5 N·m

(3) Tighten the guide ring mounting bolt to the fixing nut of height adjuster assembly, install and tighten the bolt. (14# socket wrench).

Torque: 50 ± 5 N·m

(4) Take a fork bracket that is in good condition, pass the webbing through the fork bracket. The fork bracket mounting hole should be aligned with B-pillar sheet metal hole (pay attention to the mounting direction of fork bracket that the arrow marked on fork bracket should face toward the roof), tighten outer hexagon screw of guide ring.

Torque: 8 ± 1 N·m

(5) Install B-pillar lower protector assembly.

(6) Install B-pillar upper protector assembly.

(7) Install 1 fixing bolt of front left seat belt lower end plate (14# socket wrench).

Torque: 50 ± 5 N·m

(8) Install the side panel trim cover.

3.3 Replacement of Second Row Rear Seat Belt Assembly

■ Removal

⚠ Caution

- **Removal method of second row right seat belt assembly and left side is same.**

Hint:

- Be sure to wear safety equipment to prevent accidents, when removing the second row seat belt assembly.
- Appropriate force should be applied, when removing the second row seat belt assembly. Be careful not to operate roughly.
- DO NOT scratch interior when removing the second row seat belt assembly.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

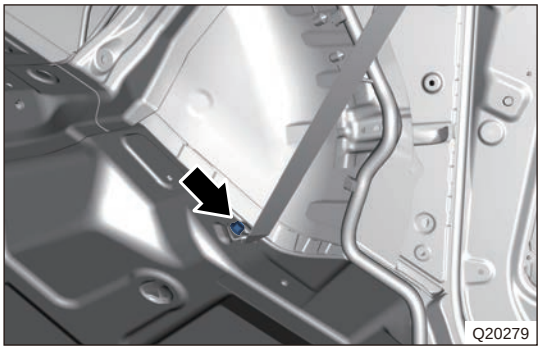
(2) Disconnect the negative battery cable.

(3) Remove the second row left seat assembly.

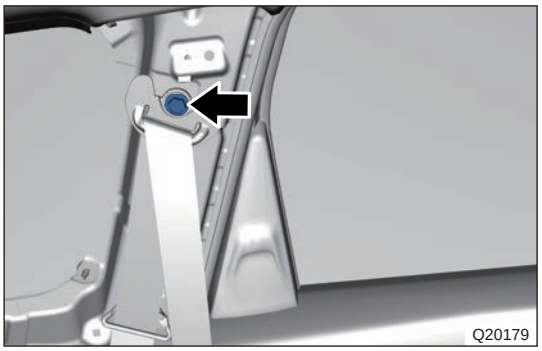
(4) Remove the left luggage compartment protector body assembly.

(5) Remove the left D-pillar upper protector assembly.

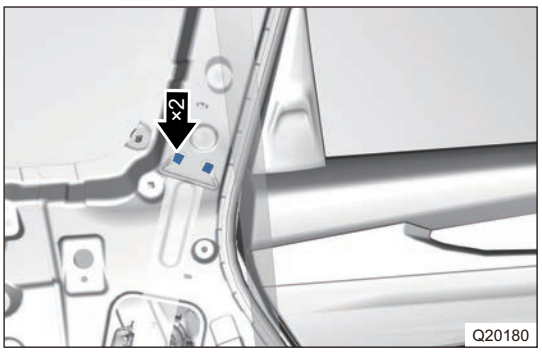
(6) Remove 1 fixing bolt from second row seat belt assembly lower end plate (14# socket wrench).



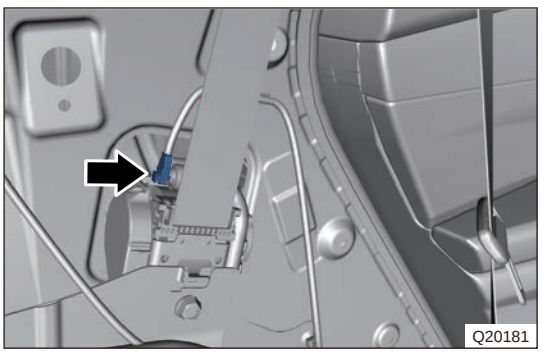
(7) Remove 1 fixing bolt from second row seat belt assembly guide ring (14# socket wrench).



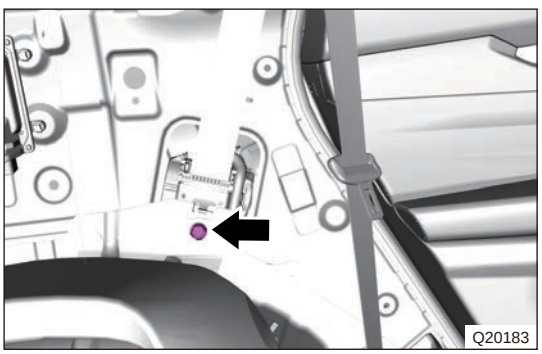
(8) Remove 2 fixing screws from seat belt assembly fork bracket.



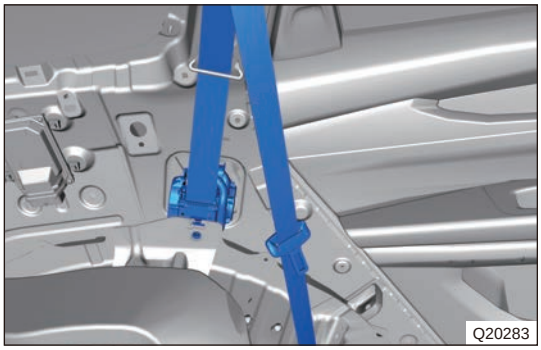
(9) Remove seat belt pretensioner connector of interior wire harness from gas generator connector of retractor (for high configuration).



(10) Remove 1 fixing bolt from retractor assembly and remove T-type hook of retractor assembly from mounting board (14# socket wrench).



(11) Remove the second row seat belt assembly.



■ **Inspection**

(1) Check front left seat belt webbing for dirt, cuts, cracks or wear and replace it if necessary.

(2) Check whether the pins on the gas generator are broken or bent.

(3) Check whether retractor can freely rewind and release the webbing without sticking.

■ **Installation**

Hint:

- The bar code on rear left seat belt assembly should be peeled off after installation and attach it to the corresponding position on record card in vehicle.

⚠ Warning

- **When connecting gas generator connector, if the pin inside of gas generator is deflective, please pack it properly and dispose it.**
- **If the second row seat belt assembly is preload limiting type belt, the resistance value is 2.15 ± 0.35 Ω, it's strictly forbidden to measure resistance with multimeter.**

⚠ Caution

- **The webbing between lower end plate and retractor should be smooth without any breakage and twist.**
- **If the webbings on both sides of rear seat cannot be pulled out, it is necessary to make a preliminary judgment on the seat belt. If the seat belt is locked due to the sensitivity function of seat belt.**
- **Judgment method: Slowly contract the webbing for 10-15 mm, and then pull out it slowly. If the seat belt can be pulled out normally and there are no other problems, the seat belt is normal. If the webbing can not be pulled out, further testing of seat belt is required.**

(1) Install second row seat belt assembly to a proper position.

(2) Insert the seat belt pretensioner connector of interior wire harness into the gas generator connector of retractor and press the lock button, ensure that the connector is connected properly and clamped in place (connecting angle is 45) (for high configuration).

(3) Install the T-type hook of retractor to the retractor mounting board slot of C-pillar sheet metal, then install and tighten the retractor fixing bolt (14# socket wrench).

Torque: 50 ± 5 N·m

(4) Take a fork bracket that is in good condition, pass the webbing of seat belt through the fork bracket. The fork bracket mounting hole should be aligned with C-pillar sheet metal hole, tighten hexagon head screw of assembly.

Torque: 8 ± 1 N·m

(5) Install 1 fixing bolt of second row seat belt assembly guide ring (14# socket wrench).

Torque: 50 ± 5 N·m

(6) Install D-pillar upper protector assembly, and pass the locking tab and webbing through the hole of D-pillar upper protector.

(7) Install the left luggage compartment protector body assembly.

(8) Install and tighten 1 fixing bolt of second row seat belt assembly lower end plate (14# socket wrench).

Torque: 50 ± 5 N·m

(9) Connect the negative battery cable.

3.4 Replacement of Third Row Seat Belt Assembly

■ Removal

⚠ Caution
• **Removal method of third row right seat belt assembly and left side is same.**

Hint:

- Be sure to wear safety equipment to prevent accidents, when removing the third row seat belt assembly.
- Appropriate force should be applied, when removing the third row seat belt assembly. Be careful not to operate roughly.
- DO NOT scratch interior when removing the third row seat belt assembly.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

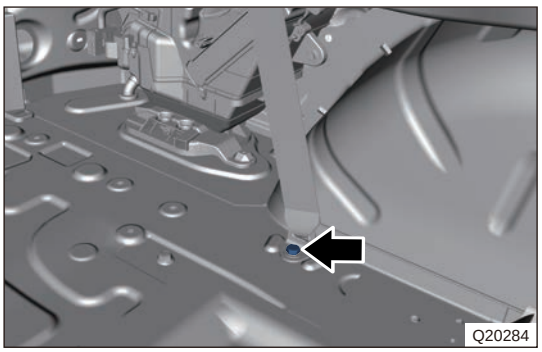
(2) Disconnect the negative battery cable.

(3) Remove the third row left seat assembly.

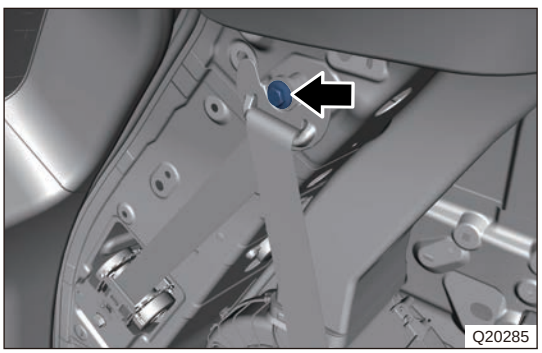
(4) Remove the left luggage compartment protector body assembly.

(5) Remove the left D-pillar upper protector assembly.

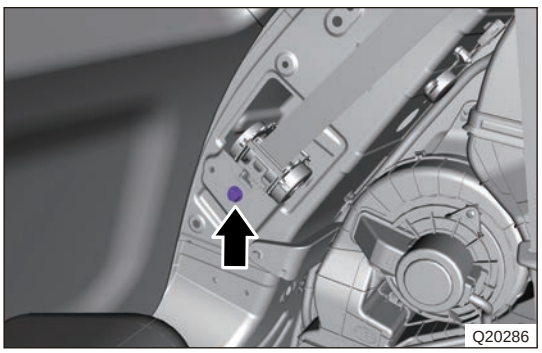
(6) Remove 1 fixing bolt from third row seat belt assembly lower end plate (14# socket wrench).



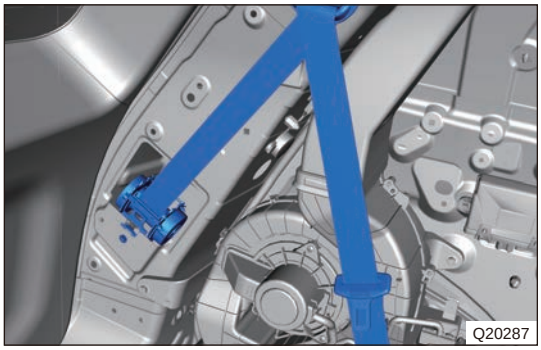
(7) Remove 1 fixing bolt from third row seat belt assembly guide ring (14# socket wrench).



(8) Remove 1 fixing bolt from retractor assembly and remove T-type hook of retractor assembly from mounting board (14# socket wrench).



(9) Remove the third row seat belt assembly.



■ **Inspection**

(1) Check front left seat belt webbing for dirt, cuts, cracks or wear and replace it if necessary.

(2) Check whether retractor can freely rewind and release the webbing without sticking.

■ **Installation**

Hint:

- The bar code on rear left seat belt assembly should be peeled off after installation and attach it to the corresponding position on record card in vehicle.

⚠ Caution

- **The webbing between lower end plate and retractor should be smooth without any breakage and twist.**
- **If the webbings on both sides of rear seat cannot be pulled out, it is necessary to make a preliminary judgment on the seat belt. If the seat belt is locked due to the sensitivity function of seat belt.**
- **Judgment method: Slowly contract the webbing for 10-15 mm, and then pull out it slowly. If the seat belt can be pulled out normally and there are no other problems, the seat belt is normal. If the webbing can not be pulled out, further testing of seat belt is required.**

(1) Install third row seat belt assembly to a proper position.

(2) Install the T-type hook of retractor to the retractor mounting board slot of D-pillar sheet metal, then install and tighten the retractor fixing bolt (14# socket wrench).

Torque: 50 ± 5 N·m

(3) Install 1 fixing bolt of third row seat belt assembly guide ring (14# socket wrench).

Torque: 50 ± 5 N·m

(4) Install D-pillar upper protector assembly, and pass the locking tab and webbing through the hole of D-pillar upper protector.

(5) Install the left luggage compartment protector body assembly.

(6) Install and tighten 1 fixing bolt of third row seat belt assembly lower end plate (14# socket wrench).

Torque: 50 ± 5 N·m

(7) Connect the negative battery cable.

3.5 Replacement of Second Row Middle Seat Belt Assembly

■ **Removal**

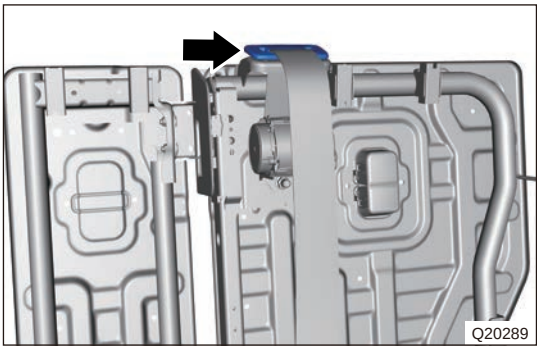
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

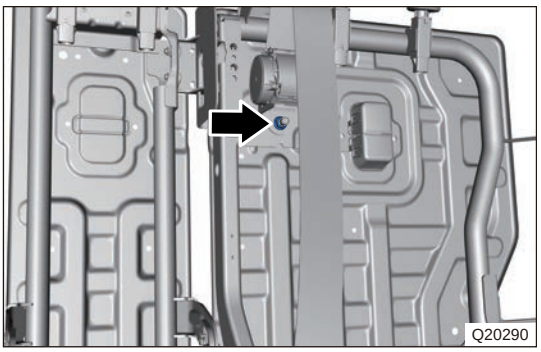
(3) Remove the second row left seat assembly.

(4) Disassemble the second row left seat assembly.

(5) Pass the webbing and locking tab of the second row middle seat belt assembly through the seat frame and web guide.



(6) Remove mounting nut of retractor, and remove seat belt retractor assembly.



■ Inspection

(1) Check front left seat belt webbing for dirt, cuts, cracks or wear and replace it if necessary.

(2) Check whether retractor can freely rewind and release the webbing without sticking.

■ Installation

(1) Take a second row middle seat belt assembly that is in good condition, hook the retractor mounting hole onto the seat frame mounting bolt, and align the retractor limit hole with seat frame limit hook, install and tighten the tightening bolt (14# socket wrench).

Torque: 50 ± 5 N·m

(2) After completing the above steps, pass the webbing and locking tab of the second row middle seat belt assembly through the seat frame and web guide (when the webbing is pulled out, make sure that seatback position is same as the normal usage position of real vehicle, otherwise the webbing cannot be pulled out; webbing from seat guide to retractor is required to be smooth, and there is no folding or twisting). Then clamp the webbing clip on the webbing, approximately more than 20mm (inside) away from the small snap fastener.

(3) Assemble the seat assembly (See page).

(4) Install the seat assembly (See page).

3.6 Replacement of Height Adjuster Assembly

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left B-pillar protector assembly.
(4) Remove the front left seat belt assembly.

(5) Remove 2 fixing bolts from height adjuster assembly.

(6) Remove the height adjuster assembly.

■ Inspection

(1) Check if height adjuster slides up and down properly.

(2) Check height adjustment bolt hole for wear.

■ Installation

Hint:

- It is necessary to press the unlock button all the time when height adjuster assembly of M36T seat belt is adjusted up and down. DO NOT push up directly or forcefully or quickly downward to unlock. Adjust the height adjuster to highest position after assembling.

(1) Install height adjuster to a proper position.

(2) Align the mounting bolts of height adjuster assembly with the upper and lower mounting nuts at fixing points of height adjuster for body B-pillar respectively and pre-tighten them. After that, the limit hook of height adjuster assembly should be engaged with the body limit hole; Tighten the mounting bolts.

Torque: 50 ± 5 N·m

(3) Install the front left seat belt assembly.

(4) Install the B-pillar protector assembly.

(5) Connect the negative battery cable.

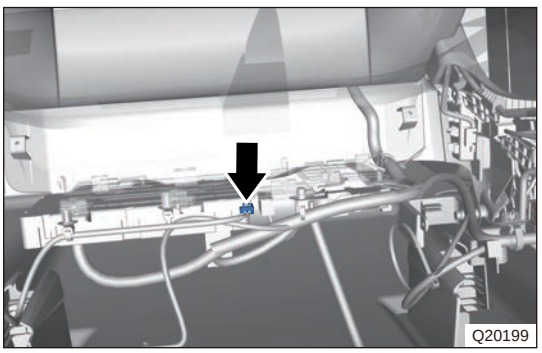
3.7 Replacement Front Left Buckle Assembly

■ Removal

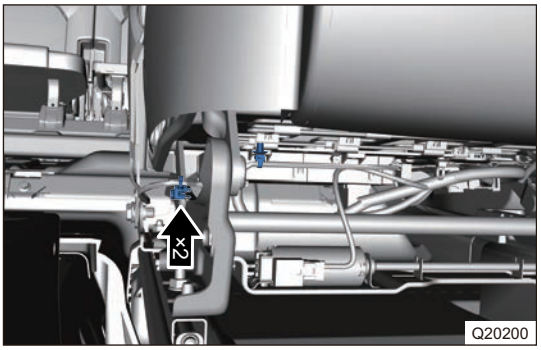
Hint:

- Removal and adjustment method of front right buckle assembly is similar to the front left buckle assembly.

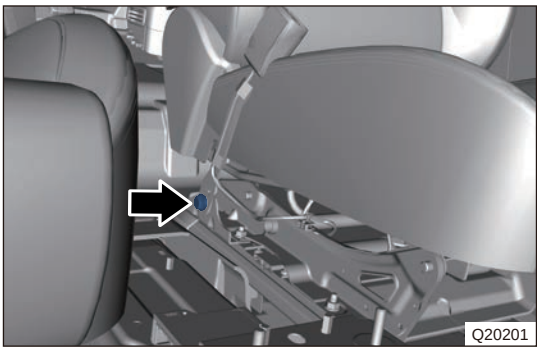
(1) Disconnect wire harness connector of front left buckle assembly and corresponding connector of instrument panel wire harness.



(2) Remove wire harness clips of front left seat assembly on the specified location of seat.



(3) Loosen front left buckle mounting bolt, and remove front left buckle assembly.



■ Inspection

(1) Check buckle connector pins for bending and breakage.

(2) Check if buckle can lock seat belt locking tab.

■ Installation

(1) Install a good front left buckle assembly, align buckle limit hole with limit hook of seat frame, install and tighten buckle mounting bolt.

Torque: 50 ± 5 N·m

(2) Secure the wire harness clips of front left buckle assembly to the specified location of seat.

(3) Connect wire harness connector of front left buckle assembly and corresponding connector of interior wire harness.

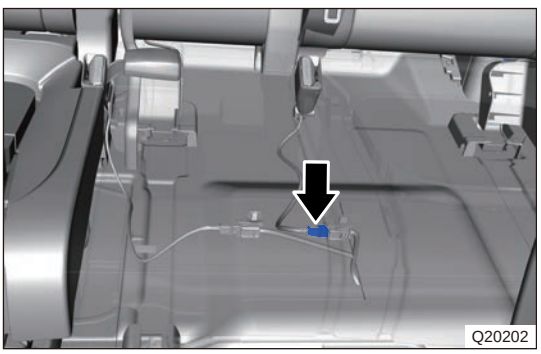
3.8 Replacement of Second Row Buckle Assembly

■ Removal

Hint:

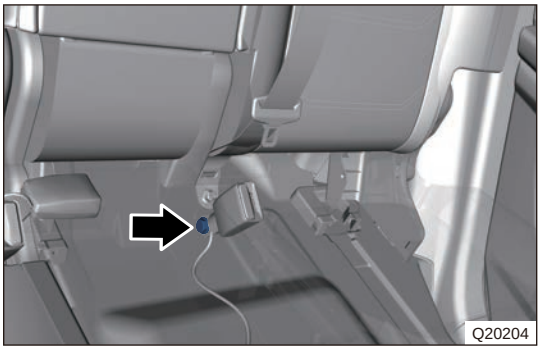
- Removal and adjustment method of second row right buckle assembly is similar to the second row left buckle assembly.

(1) Disconnect wire harness connector of second row left buckle assembly and corresponding connector of floor wire harness.



(2) Remove the second row left seat assembly.

(3) Loosen second row left buckle assembly mounting bolt, and remove front left buckle assembly.



■ **Inspection**

(1) Check buckle connector pins for bending and breakage.

(2) Check if buckle can lock seat belt locking tab.

■ **Installation**

⚠ **Caution**
• **Connect the wire harness connector with corresponding connector of interior wire harness and ensure that the connector is connected properly and clamped in place.**

(1) Install a second row left buckle assembly in good condition, align buckle limit hole with limit hook of seat frame, install and tighten buckle mounting bolt.

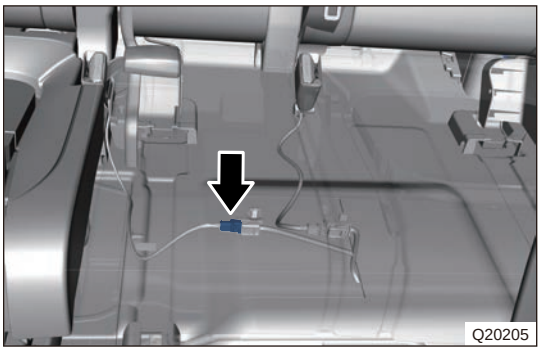
Torque: 50 ± 5 N·m

(2) Connect wire harness connector of second row left buckle assembly and corresponding connector of floor wire harness.

3.9 Replacement of Second Row Middle Buckle Assembly

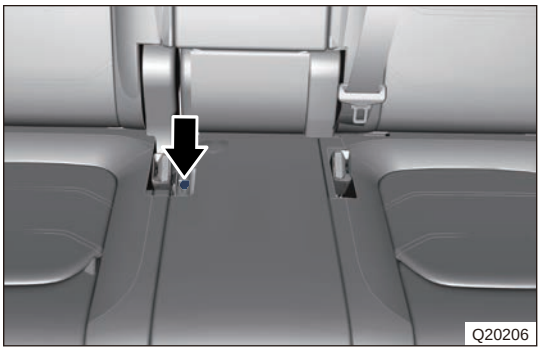
■ **Removal**

(1) Disconnect wire harness connector of second row middle buckle assembly and corresponding connector of floor wire harness.



(2) Remove the second row left seat assembly.

(3) Loosen second row middle buckle assembly mounting bolt, and remove front left buckle assembly.



■ **Inspection**

(1) Check buckle connector pins for bending and breakage.

(2) Check if buckle can lock seat belt locking tab.

■ **Installation**

⚠ Caution
• **Connect the wire harness connector with corresponding connector of interior wire harness and ensure that the connector is connected properly and clamped in place.**

(1) Install a second row middle buckle assembly in good condition, align buckle limit hole with limit hook of seat frame, install and tighten buckle mounting bolt.

Torque: 50 ± 5 N·m

(2) Connect wire harness connector of second row middle buckle assembly and corresponding connector of floor wire harness.

3.10 Replacement of Third Row Left Buckle Assembly

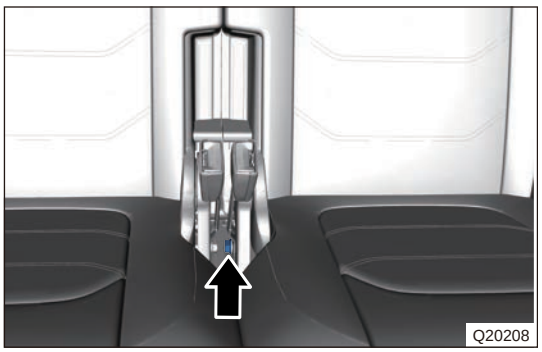
■ **Removal**

Hint:

• Removal and adjustment method of third row right buckle assembly is similar to the third row left buckle assembly.

(1) Remove the third row left seat assembly.

(2) Loosen third row left buckle assembly mounting bolt, and remove front left buckle assembly.



■ **Inspection**

(1) Check if buckle can lock seat belt locking tab.

■ **Installation**

(1) Install a third row middle buckle assembly that is in good condition, align buckle limit hole with limit hook of seat frame, install and tighten buckle mounting bolt.

(2) Connect wire harness connector of third row middle buckle assembly and corresponding connector of floor wire harness.

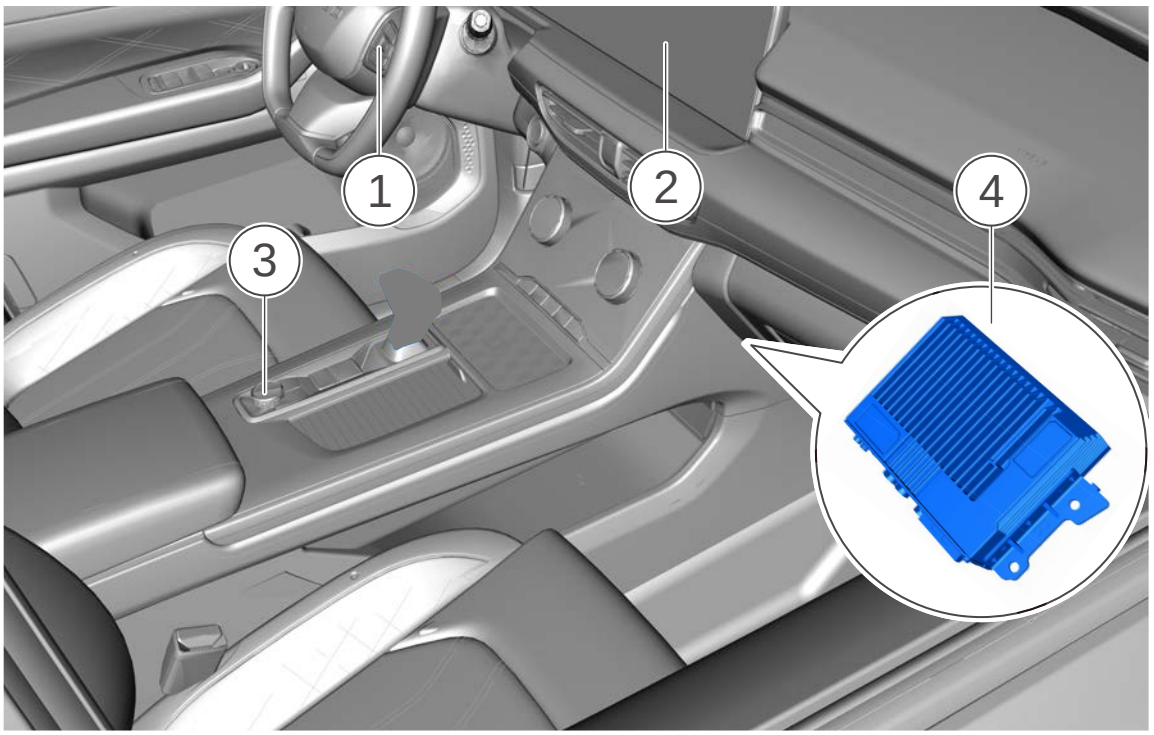
BODY ELECTRICAL

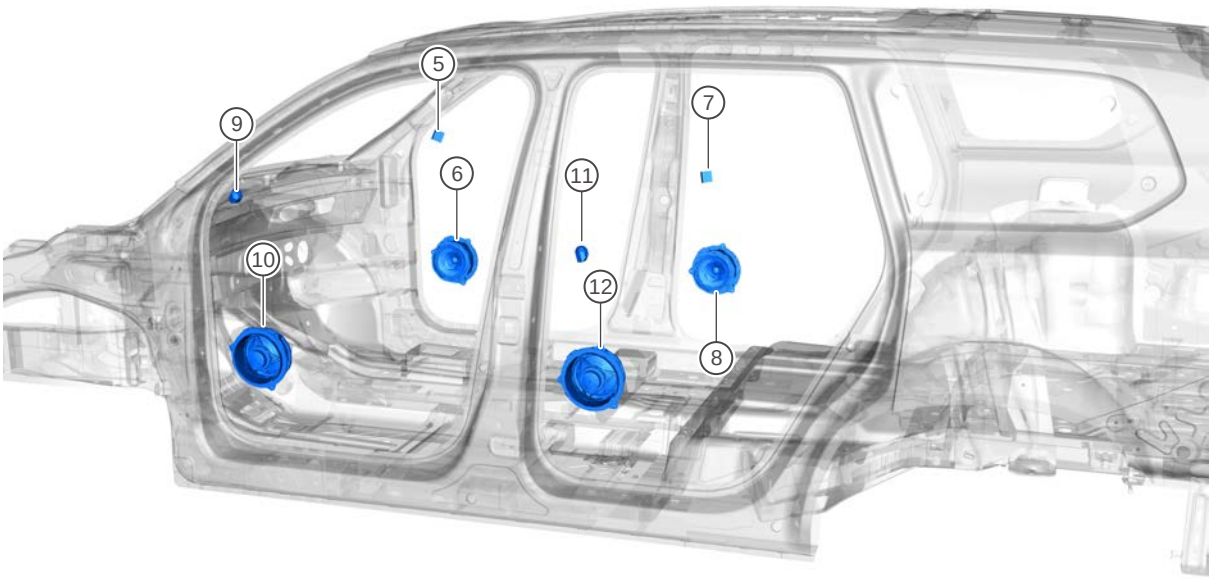
BODY ELECTRICAL

11.1 AUDIO/VISUAL SYSTEM

1 System Overview

1.1 System Components Diagram

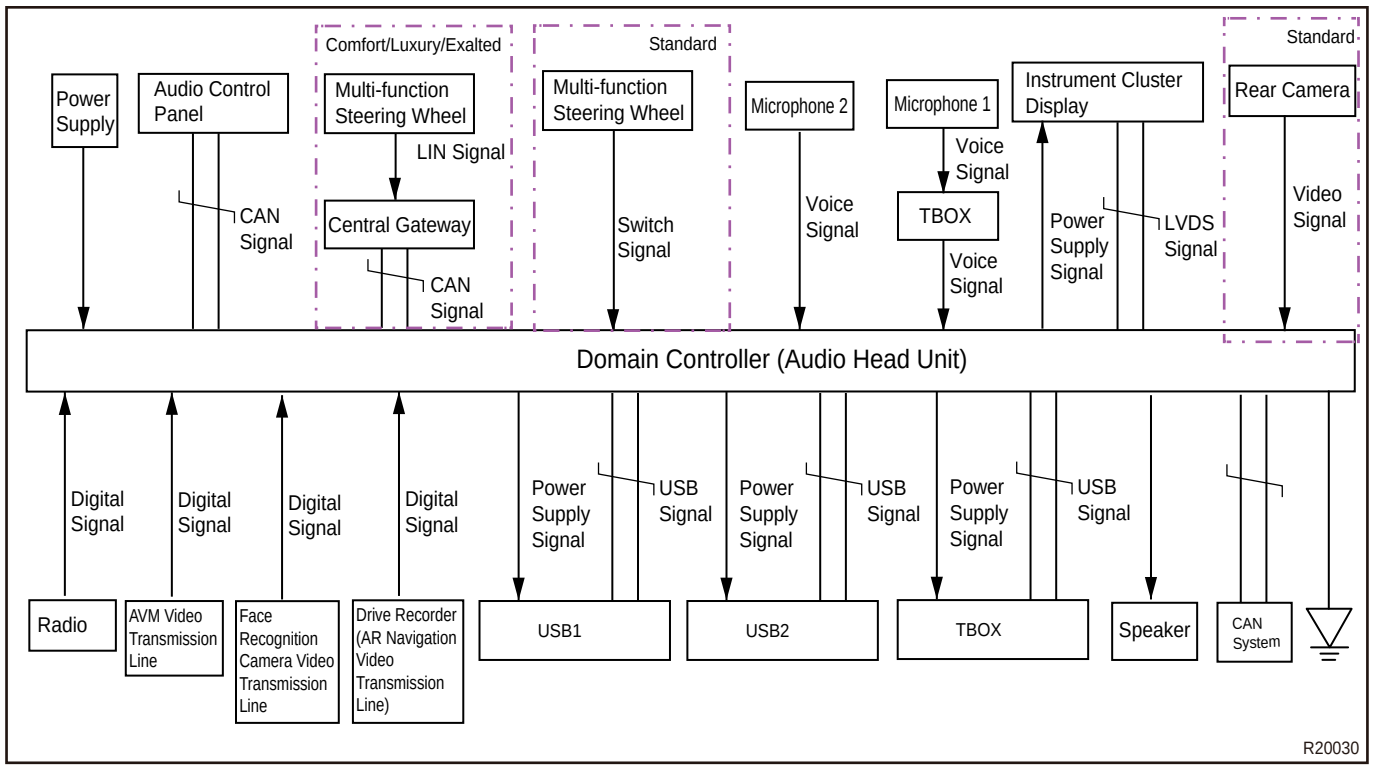




R20010

1	Steering Wheel Quick Button	7	Rear Right Tweeter
2	Hyperscreen	8	Rear Right Woofer
3	Volume Adjustment Knob	9	Front Right Tweeter
4	Domain Controller	10	Front Left Woofer
5	Front Right Tweeter	11	Rear Left Tweeter
6	Front Right Woofer	12	Rear Left Woofer

1.2 System Principle



- A domain controller refers to that at least one server is responsible for the verification of each computer and user connected to the network in "domain" mode, which is equivalent to the guard of a unit, called "-Domain Controller (abbreviated for DCM)". In VX model, domain controller integrates instrument cluster module (ICM) and audio head unit module (RRM) into one module.
  - Domain controller (audio head unit) part still maintains the traditional audio head unit function.
  - Multi-function steering wheel (comfort/luxury/exalted) controls domain controller (audio head unit) by transmitting signal to the central gateway module (CGW) via LIN line, and then transmitting information via CAN line network.
  - Multi-function steering wheel (standard) controls domain controller (audio head unit) by transmitting information directly via ordinary dedicated line.
  - Radio/AVM video/face recognition camera/AR navigation is transmitted to domain controller (audio head unit) via digital signal.
  - Data from domain controller (audio head unit) and USB1/USB2/TBOX is transmitted via universal serial bus (USB).
  - Data from domain controller (audio head unit) and instrument cluster display is transmitted to instrument cluster display via low voltage differential signal (LDVS).
  - Microphone 1 voice signal is transmitted to domain controller (audio head unit) through TBOX, microphone 2 voice signal is directly transmitted to domain controller (audio head unit).
  - The standard reversing view monitor transmits signal to domain controller (audio head unit) via a dedicated line by using a common camera.

- Audio control panel controls domain controller (audio head unit) by transmitting information via CAN line network.

2 Diagnosis & Testing

2.1 Module Terminal Definition

■ Domain Controller (Audio Unit A) Terminal Definition

Pin	Definition	Pin	Definition
1	Rear Right Speaker +	5	Rear Right Speaker -
2	Front Right Speaker +	6	Front Right Speaker -
3	Front Left Speaker +	7	Front Left Speaker -
4	Rear Left Speaker +	8	Rear Left Speaker -

■ Domain Controller (Audio Unit B) Terminal Definition

Pin	Definition	Pin	Definition
9	-	13	ACC
10	-	14	-
11	-	15	Power Supply
12	Ground	16	-

■ Domain Controller (Audio Unit C) Terminal Definition

Pin	Definition	Pin	Definition
1	Entertainment Information CAN H	7	Entertainment Information CAN L
2	Ignition Signal	8	Power Switch
3	Left MIC - Signal	9	Left MIC + Signal
4	Right MIC + Signal	10	Control Panel Ground
5	-	11	-
6	-	12	-

■ Domain Controller (Audio Unit D) Terminal Definition

Pin	Definition	Pin	Definition
1	T-BOX Audio Right Sound Channel	7	T-BOX Audio Left Sound Channel
2	T-BOX Audio Common Terminal Ground	8	-
3	T-BOX Mute Line Input	9	-
4	-	10	-
5	-	11	-
6	-	12	-

2.2 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace as necessary.

Current Status	Symptom	Possible Cause and Solution
General condition	Head unit operates, but has no sound or sound is very low	Turn up the volume. Check setting of front and rear, left and right balance for horn
	Navigation volume cannot be adjusted	Stop vehicle, and adjust navigation volume on navigation screen or volume setting screen
	Head unit screen cannot be operated	In some states, operations on screen are not available. End current state, long press the Power button for 10S to restart the system and try to operate the screen again. Or click [SET] button to restore factory setting in the system setting
	Some functions in air conditioning setting are not available	Some functions related to the vehicle are available only when ENGINE START STOP switch is in ON
Radio playback	Poor reception	Check if antenna is fully deployed, connection is correct (whether negative is grounded). The required radio signal is too weak, please use manual search
	Available station cannot be searched by automatic station searching	When there are several available stations in current range and favorite station is 0, only 40 stations with the strongest signal can be searched. If you have other favorite ones, please manually search and store them
USB file playback	There are unplayable files	The system can not support all formats files. There are many audio and video formats nowadays. Even file formats supported by audio video descriptions may not be supported due to the different encoding formats. Please refer to audio and video descriptions, download supported formats and try
	Volume fluctuates up and down during playback	Volume fluctuates up and down during playback, as there is no uniform standard, the volume cannot be handled uniformly, please adjust the volume knob by yourself.
	Knocking / noise	It may be caused when the original file is being recorded or caused by noise. Please confirm if it is a native problem with other players

Current Status	Symptom	Possible Cause and Solution
	USB audio, video, pictures can not be played normally and no prompt is given	Due to large number of USB manufacturers, the file system, supported protocols, etc. are very different, the system can not support all of them. Please try another USB.
Music playback	Bluetooth music name is showed as unknown	The model shows name in accordance with Bluetooth standard, if phone does not comply with the standard, it will be shown as unknown. Please change your phone and try again
Speech recognition	Inaccurate speech recognition	Say out voice command words provided by voice recognition system as much as possible and use Mandarin; Try to keep the vehicle quiet, and use voice recognition function in low noise surroundings; Microphone is in dome light position, so if noise is unavoidable, say command out as close to the microphone as possible

Hint:
If malfunction still cannot be eliminated, please drive vehicle to Chery Automobile authorized after-sales service center or 4S shop for inspection and repair. Do not remove head unit without authorization and repair it by yourself.

2.3 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

2.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.

- Refer to any Technical Bulletin that may apply to this malfunction.

2.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

2.6 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

Next

2	**Examine vehicle and check basic items**

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK

3	**Using a diagnostic tester, read related DTC and data stream information**

Result

Result	Go to
No DTC	A
DTC occurs	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and perform troubleshooting process again**

B

5	**According to malfunction repair completion inspection and delivery, confirm if malfunction is resolved**

Result

Result	Go to
Delivery inspection is not qualified	A
Delivery inspection is qualified	B

A → **Return to procedure 1 and perform troubleshooting process again**

B

6	**Finished**

2.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B1B0101	System Power Supply Voltage Low
B1B0201	System Power Supply Voltage High
B1B0301	Steering Wheel Button Fault
B1B0302	Steering Wheel Power Supply Voltage Abnormal
B1B0202	Speakers Connected Amplifier Failure
B1B0602	Tuner Antenna Abnormal
B1B0403	Amplifier R/W Failure
B1B0503	Tuner IC R/W Failure
B1B0703	Communication Failure Between MCU and Main Processor
B1B030A	MMI Over Temperature
B1B0129	USB1 Current Above Threshold

DTC	DTC Definition
B1B0229	USB2 Current Above Threshold
B1B0103	Communication Fault with IHU Display
B1B0203	Communication Fault with IPC Display
B1B0133	RVC Communication Fault
B1B0143	Communication Fault with AR/DVR Camera
B1B0243	Communication Fault with Face Recognition Camera
B1B0501	WiFi Function Fault
B1B0502	Inertial Navigation Function Fault
B1B0603	MIC Fault
B1B0401	Software Configuration Error
B1B0402	EEPROM Checksum Error
B1B60-16	Power Supply Circuit Voltage Below Threshold
B1B6017	Power Supply Circuit Voltage Above Threshold
U250088	CAN Bus Off
U014087	Lost Communication With BCM
U024587	Lost Communication With IHU
U042281	Invalid Data Received From BCM

2.8 DTC Diagnosis Procedure

DTC	B1B0101	System Power Supply Voltage Low
DTC	B1B0201	System Power Supply Voltage High

DTC	DTC Definition	Possible Causes
B1B0101	System Power Supply Voltage Low	• Fuse • Charging system • Wire harness connector • Domain controller
B1B0201	System Power Supply Voltage High	

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery voltage

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Start engine, and use voltage band of multimeter to check if battery voltage is normal. (Rated voltage: Not less than 12 V)

NG → **Check or replace charging system or battery.**

OK

2	Check fuse

(a) Turn off all electrical equipment and ENGINE START STOP switch.

(b) Disconnect the negative battery cable.

(c) Check for continuity of instrument panel fuses MF03 (125A), RF62 (20A), RF32 (5A) and RF41 (5A) with a digital multimeter.

NG → **Replace fuse**

OK

3	Check wire harness and connector

(a) Turn off all electrical equipment and ENGINE START STOP switch.

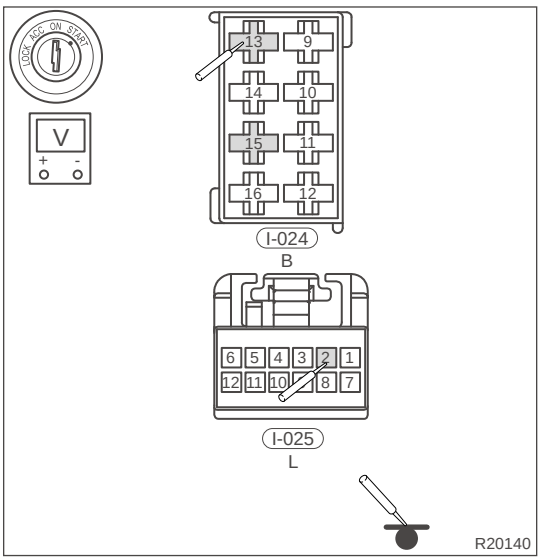
(b) Disconnect the negative battery cable.

(c) Disconnect domain controller connectors I-015 and I-017.

(d) Connect the negative battery cable.

(e) Turn ENGINE START STOP switch to ON.

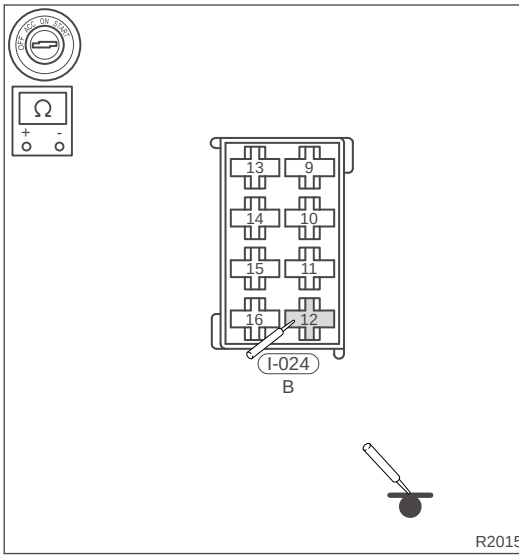
(f) Using a digital multimeter, measure voltage between domain controller connectors I-024 and I-025 and body, and detect it with a 21 W test lamp according to table below.



Multimeter Connection	Condition	Specified Condition
I-024 (B15) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
I-025 (C2) - Body ground		Not less than 12 V
I-024 (B13) - Body ground		Not less than 12 V

(g) Using a digital multimeter, measure resistance between domain controller connector I-024 and body ground according to table below.

Multimeter Connection	Condition	Specified Condition
I-024 (B12) - Body ground	Ignition switch OFF	Less than 1 Ω



NG → **Repair or replace wire harness or connector**

OK

4	Confirm DTCs again

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Use diagnostic tester to clear DTCs.
(d) Start the engine.
(e) Check if the same DTCs are still output.

OK → **Confirm that system is normal**

NG → **Replace domain controller**

DTC	B1B0202	Speakers Connected Amplifier Failure
DTC	B1B0403	Amplifier R/W Failure

DTC	Description	Possible Causes
B1B0202	Speakers Connected Amplifier Failure	• Speaker • Wire harness connector • Domain controller
B1B0403	Amplifier R/W Failure	

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check horn of vehicle

(a) Play music to check for speakers failing to operate on vehicle.

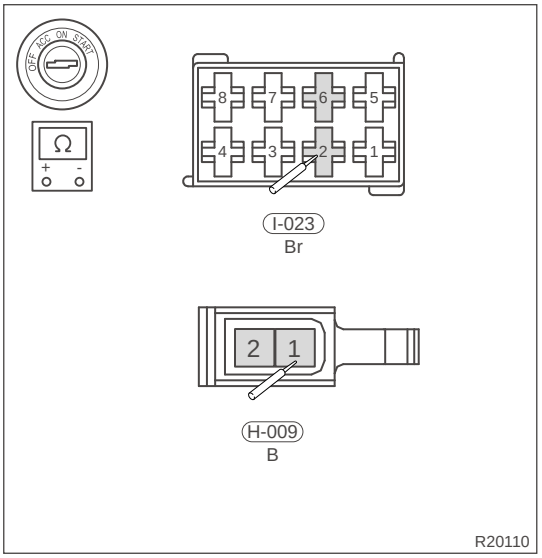
(b) Take the front right tweeter failing to operate as an example.

(c) Turn ignition switch to OFF and disconnect the negative battery cable.

(d) Disconnect front right tweeter connector H-009 and domain controller connector I-023.

(e) Check for continuity between front right tweeter connector H-009 and domain controller connector I-023.

Multimeter Connection	Condition	Specified Condition
H-009 (2) - I-023 (A6)	Ignition switch OFF	Less than 1 Ω
H-009 (1) - I-023 (A2)		

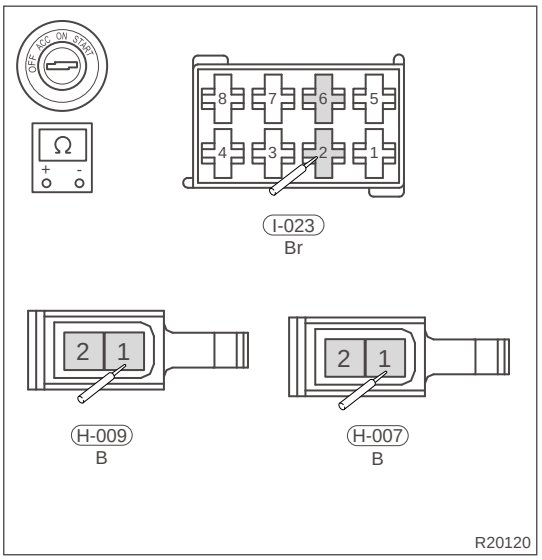


(f) Take front right tweeter and front right woofer failing to operate as an example.

(g) Disconnect front right tweeter connector H-009, front right woofer connector H-007 and domain controller connector I-023.

(h) Check for continuity between front right tweeter connector H-009, front right woofer connector H-007 and domain controller connector I-023.

Multimeter Connection	Condition	Specified Condition
H-009 (2) - I-023 (A6)	Ignition switch OFF	Less than 1 Ω
H-009 (1) - I-023 (A2)		
H-007 (2) - I-023 (A6)		
H-007 (1) - I-023 (A2)		



NG → **Repair or replace wire harness**

OK →

2	Check front right tweeter and woofer

(a) Using a replacement method, remove front left tweeter and woofer and install them to the front right position.

(b) Check if front right tweeter and woofer operate properly.

OK → **Replace tweeter and woofer**

NG → **Replace domain controller**

DTC	B1B0602	Tuner Antenna Abnormal
DTC	B1B0503	Tuner IC R/W Failure

DTC	DTC Definition	Possible Causes
B1B0602	Tuner Antenna Abnormal	• Radio antenna • Wire harness connector • Domain controller
B1B0503	Tuner IC R/W Failure	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check radio antenna

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Remove radio antenna from malfunctioning vehicle, then install it to a new vehicle and perform a test.

OK → **Replace radio antenna**

NG

2	Check wire harness connector of tuner antenna

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Disconnect the tuner antenna connectors B-093 and I-030.
(c) Check for continuity between tuner antenna connectors B-093 and I-030.

Multimeter Connection	Condition	Specified Condition
B-093 (1) - I-030 (1)	Ignition switch OFF	Less than 1 Ω

NG → **Repair or replace wire harness connector**

OK

3	Reconfirm DTCs

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Use diagnostic tester to clear DTCs.
(d) Start the engine.
(e) Check if the same DTCs are still output.

OK	Confirm that system is normal
NG	Replace domain controller

DTC	B1B0703	Communication Failure Between MCU and Main Processor
DTC	B1B030A	MMI Over Temperature
DTC	B1B0129	USB1 Current Above Threshold
DTC	B1B0229	USB2 Current Above Threshold

DTC	DTC Definition	Possible Causes
B1B0703	Communication Failure Between MCU and Main Processor	• Domain controller
B1B030A	MMI Over Temperature	
B1B0129	USB1 Current Above Threshold	
B1B0229	USB2 Current Above Threshold	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Domain controller

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Remove domain controller from malfunctioning vehicle, then install it to a new vehicle and perform a test.

(c) Check for system DTC.

OK	Replace domain controller
NG	System is normal

DTC	B1B0103	Communication Fault with IHU Display
DTC	B1B0203	Communication Fault with IPC Display

DTC	DTC Definition	Possible Causes
B1B0103	Communication Fault with IHU Display	• Wire harness connector • Domain controller
B1B0203	Communication Fault with IPC Display	

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.

- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Power off test**

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Wait for 2 minutes, and then connect the negative battery cable, turn ignition switch to ON to check if the fault occurs again.

OK → **System is normal**

NG

2	**Check hyperscreen and connecting wire harness between hyperscreen and domain controller**

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Remove hyperscreen and connecting wire harness between hyperscreen and domain controller from malfunctioning vehicle, then install it to a new vehicle and perform a test.

OK → **Repair or replace hyperscreen and connecting wire harness**

NG

3	**Confirm DTCs again**

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Use diagnostic tester to clear DTCs.
(d) Start the engine.
(e) Check if the same DTCs are still output.

OK → **Confirm that system is normal**

NG → **Replace domain controller**

DTC	B1B0143	Communication Fault with AR/DVR Camera

DTC	DTC Definition	Possible Causes
B1B0143	Communication Fault with AR/DVR Camera	• AR/DVR damaged • LVDS line failure • Head unit failure

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).

- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Power off test

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Wait for 2 minutes, and then connect the negative battery cable, turn ignition switch to ON to check if the fault occurs again.

OK → **System is normal**

NG

2	Check face recognition camera

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Remove rear camera from malfunctioning vehicle, then install it to a new vehicle and perform a test.

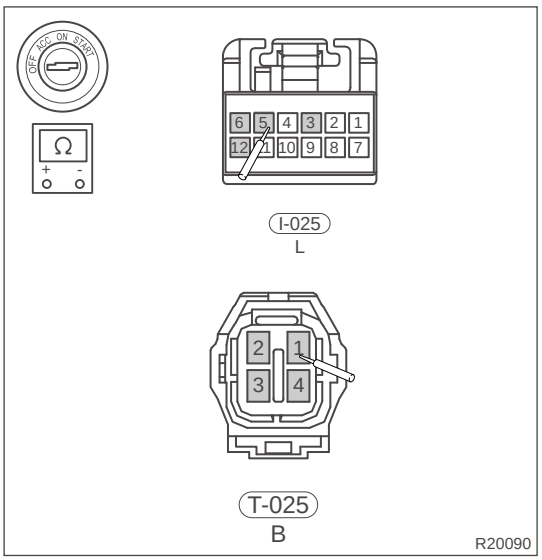
OK → **Repair or replace rear camera**

NG

3	Check wire harness connector

(a) Turn ignition switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the rear camera connector T-025.
(d) Disconnect the domain controller connector I-025.
(e) Check for continuity between rear camera connector T-025 and domain controller connector I-025.

Multimeter Connection	Condition	Resistance
T-025 (2) - I-025 (C12)	ENGINE START STOP switch "OFF"	< 1 Ω
I-025 (4) - I-025 (C6)		
T-025 (1) - I-025 (C5)		
T-025 (3) - I-025 (C11)		



OK → **Replace domain controller**

NG

4	Confirm DTCs again

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Use diagnostic tester to clear DTCs.
(d) Start the engine.
(e) Check if the same DTCs are still output.

OK	Confirm that system is normal
NG	Replace domain controller

DTC	B1B0243	Communication Fault with Face Recognition Camera

DTC	DTC Definition	Possible Causes
B1B0243	Communication Fault with Face Recognition Camera	• Face recognition camera • Wire harness connector • Domain controller

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Power off test

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Wait for 2 minutes, and then connect the negative battery cable, turn ignition switch to ON to check if the fault occurs again.

OK	System is normal

NG

2	Check face recognition camera

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Remove face recognition camera from malfunctioning vehicle, then install it to a new vehicle and perform a test.

OK	Replace face recognition camera

NG

3	Check domain controller

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Remove domain controller from malfunctioning vehicle, then install it to a new vehicle and perform a test.

OK	**Replace domain controller**

NG

4	**Confirm DTCs again**

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Use diagnostic tester to clear DTCs.
(d) Start the engine.
(e) Check if the same DTCs are still output.

OK	**Confirm that system is normal**
NG	**Replace or repair instrument panel wire harness**

DTC	**B1B0401**	**Software Configuration Error**

DTC	Description	Possible Causes
B1B0401	Software Configuration Error	Software not configured

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Reconfiguration**

DTC	**B1B0501**	**WiFi Function Fault**
DTC	**B1B0502**	**Inertial Navigation Function Fault**
DTC	**B1B0603**	**MIC Fault**

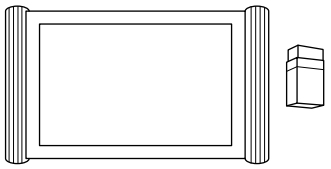
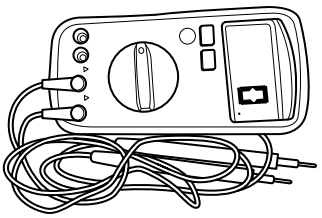
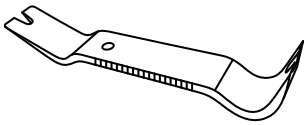
DTC	Description	Possible Causes
B1B0501	WiFi Function Fault	Audio head unit failure
B1B0502	Inertial Navigation Function Fault	
B1B0603	MIC Fault	

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Replace audio head unit assembly**

3 On-vehicle Service

3.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006
Interior Crow Plate	 RCH002506

3.2 Domain Controller

■ Removal

Hint:

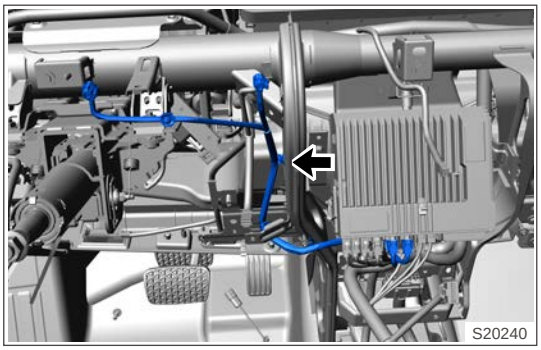
- Be sure to wear safety equipment to prevent accidents, when removing domain controller.
- Appropriate force should be applied when removing domain controller. Be careful not to operate roughly.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

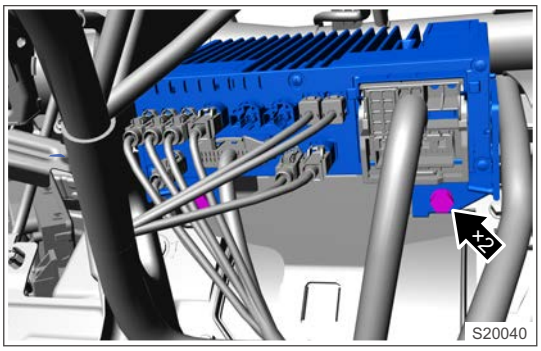
(2) Disconnect the negative battery cable.

(3) Remove the instrument panel assembly.

(4) Disconnect connecting wire harness from domain controller display.



(5) Disconnect domain controller connector, and remove 2 fixing bolts from domain controller.



■ **Installation**

Caution
• **Tighten fixing bolts to specified torque, when installing domain controller.** • **Connect connectors in place, when installing domain controller.** • **Check audio system for proper operation, after installing domain controller.**

(1) Connect the domain controller connector.

(2) Install 2 fixing bolts to domain controller.

Torque: 5 ± 1 N•m

(3) Connect diagnostic tester, read and clear DTCs.

3.3 Front Left Tweeter

■ **Removal**

Hint:
Use same procedures for right and left sides (take left side as an example).

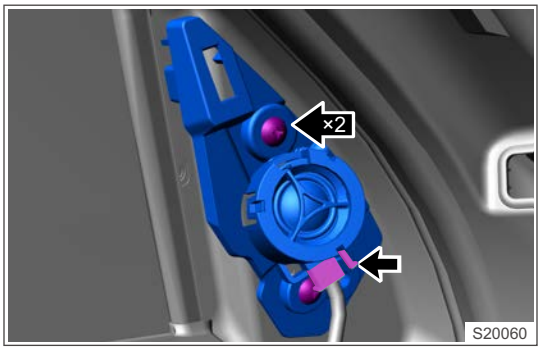
Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front left tweeter.** • **Appropriate force should be applied when removing front left tweeter. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the front left door protector assembly.

(4) Disconnect connector from front left tweeter, remove 2 fixing screws from front left tweeter, detach clip from front left tweeter to remove tweeter.



■ **Installation**

Caution
• **Be sure to tighten fixing bolts to specified torque, when installing front left tweeter.** • **Check front left tweeter for proper operation, after installing front left tweeter.**

(1) Install 2 fixing screws to front left tweeter.

Torque: 1.5 ± 0.5 N•m

(2) Install the front left door protector assembly.

3.4 Front Left Woofer

■ **Removal**

Hint:
Use same procedures for right and left sides (take left side as an example).

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front left woofer.** • **Appropriate force should be applied when removing front left woofer. Be careful not to operate roughly.**

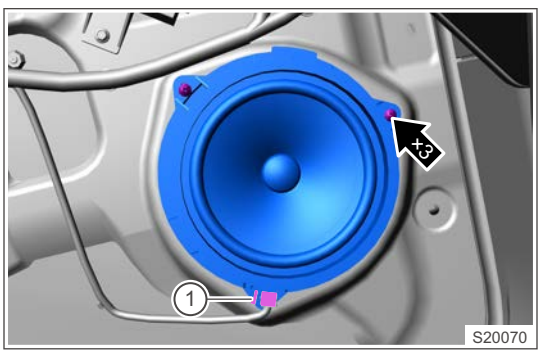
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the front left door protector.

(4) Disconnect front left woofer (1), remove 3 fixing screws from front left tweeter, and remove front left woofer.

Tightening torque:
1.5 ± 0.5 N m



■ **Installation**

Caution
• **Be sure to tighten fixing bolts to specified torque, when installing front left woofer.** • **Check front left woofer for proper operation, after installing front left woofer.**

(1) Install the front left woofer.

Torque: 1.5 ± 0.5 N•m

(2) Install the front left door protector.

3.5 Rear Left Tweeter

■ **Removal**

Hint:
Use same procedures for right and left sides (take left side as an example).

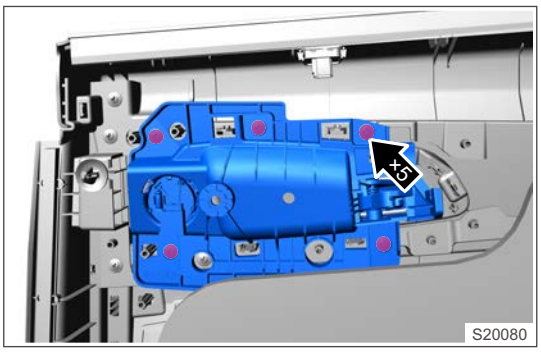
Caution
• **Be sure to wear safety equipment to prevent accidents, when removing rear left tweeter.** • **Appropriate force should be applied when removing rear left tweeter. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear left door inner trim panel assembly.

(4) Remove 5 fixing screws of rear left door inside handle assembly from rear left door protector and detach 3 fixing clips from rear left tweeter to remove tweeter.



■ **Installation**

Caution
• **Be sure to tighten fixing bolts to specified torque, when installing rear left tweeter.** • **Check rear left tweeter for proper operation, after installing rear left tweeter.**

(1) Install rear left tweeter and rear left door inside handle assembly.

Torque: 1.5 ± 0.5 N•m

(2) Install the rear left door protector.

3.6 Rear Left Woofer

■ **Removal**

Hint:
Use same procedures for right and left sides (take left side as an example).

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing rear left woofer.** • **Appropriate force should be applied when removing rear left woofer. Be careful not to operate roughly.**

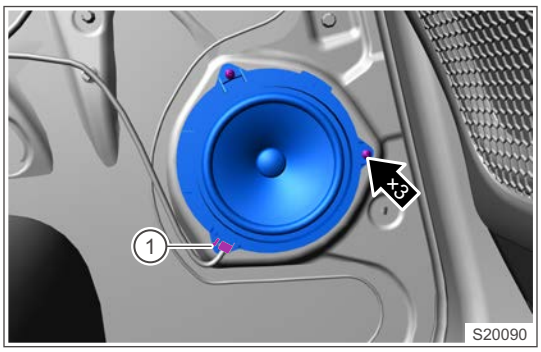
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear left door protector assembly.

(4) Disconnect rear left woofer connector (1), remove 3 fixing screws from rear left woofer to remove rear left woofer.

Tightening torque:
1.5 ± 0.5 N m



■ Installation

Caution
• **Be sure to tighten fixing bolts to specified torque, when installing rear left tweeter.** • **Check rear left tweeter for proper operation, after installing rear left tweeter.**

(1) Install the rear left tweeter.

Torque: 1.5 ± 0.5 N•m

(2) Install the rear left door protector.

3.7 Face Recognition Camera

■ Removal

Caution
• **Be sure to wear necessary safety equipment to prevent accidents, when removing face recognition camera.** • **Appropriate force should be applied when removing face recognition camera. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the left A-pillar upper protector assembly.

(4) Remove face recognition camera from left A-pillar upper protector.

■ Installation

Caution
Tighten fixing screws to specified torque, when installing face recognition camera.

(1) Install face recognition camera to left A-pillar upper protector.
(2) Install the left A-pillar upper protector.

3.8 Combined Antenna

■ Removal

Hint:

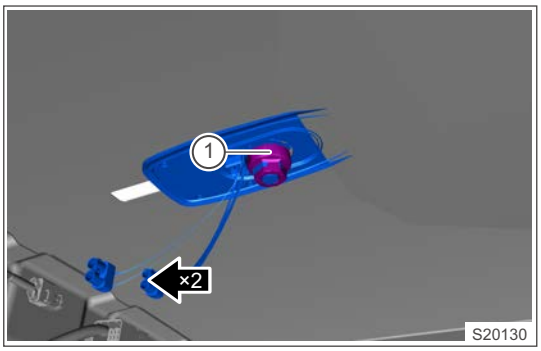
- Be sure to wear safety equipment to prevent accidents, when removing combined antenna.
- Appropriate force should be applied when removing combined antenna. Be careful not to operate roughly.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear part of interior ceiling.

(4) Disconnect combined antenna connector, and remove fixing nut (1) from combined antenna.



■ Installation

(1) Connect combined antenna connector, and install fixing nut to combined antenna.
Torque: 5 ± 1 N•m

(2) Install the rear part of roof.

11.2 INSTRUMENT CLUSTER SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Try to prevent interior and body paint from being scratched, when removing instrument cluster.

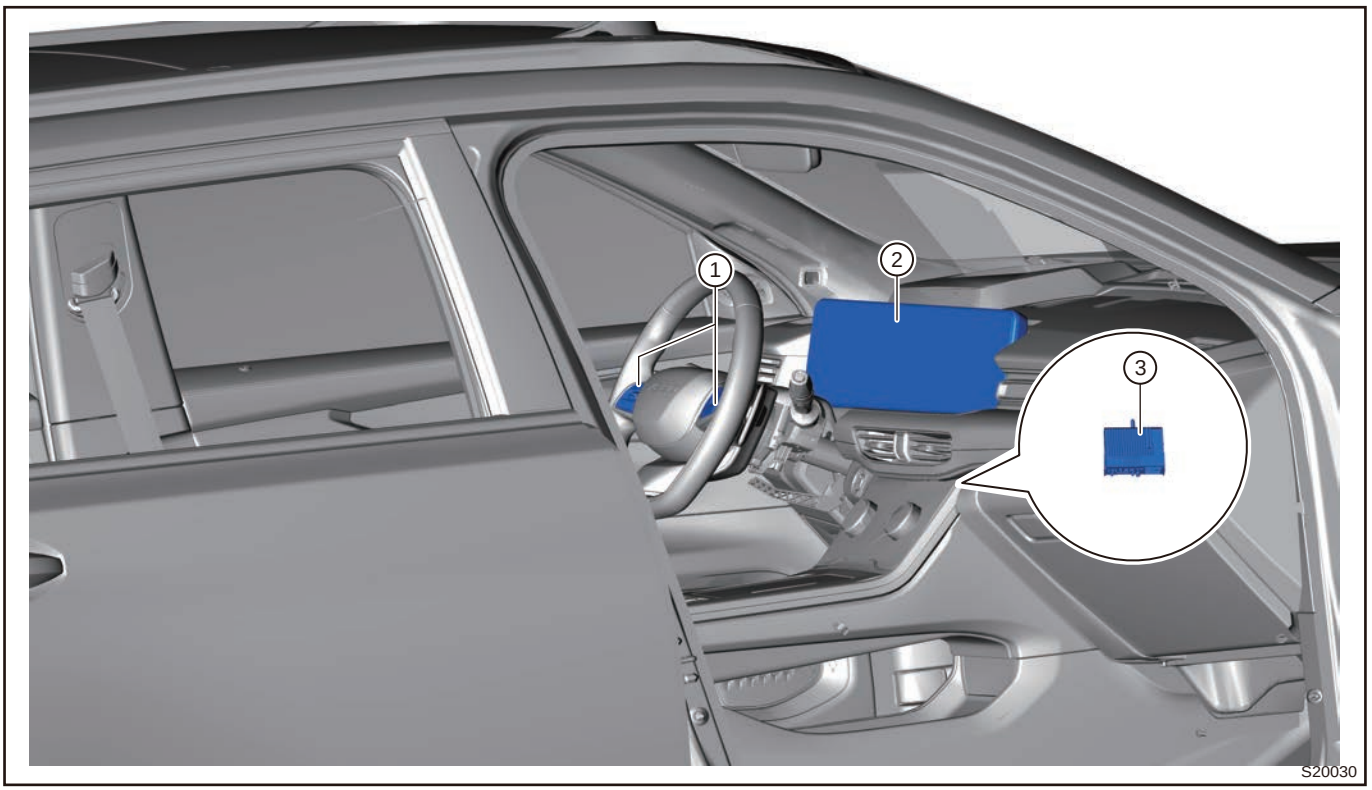
(2) Be sure to wear necessary safety equipment to prevent accidents, when removing instrument cluster.

(3) Appropriate force should be applied, when removing instrument cluster. Be careful not to operate roughly.

(4) When removing instrument cluster, handle it with care, so as to avoid meter needle and dial from deviating from initial position or becoming looseness caused by collisions.

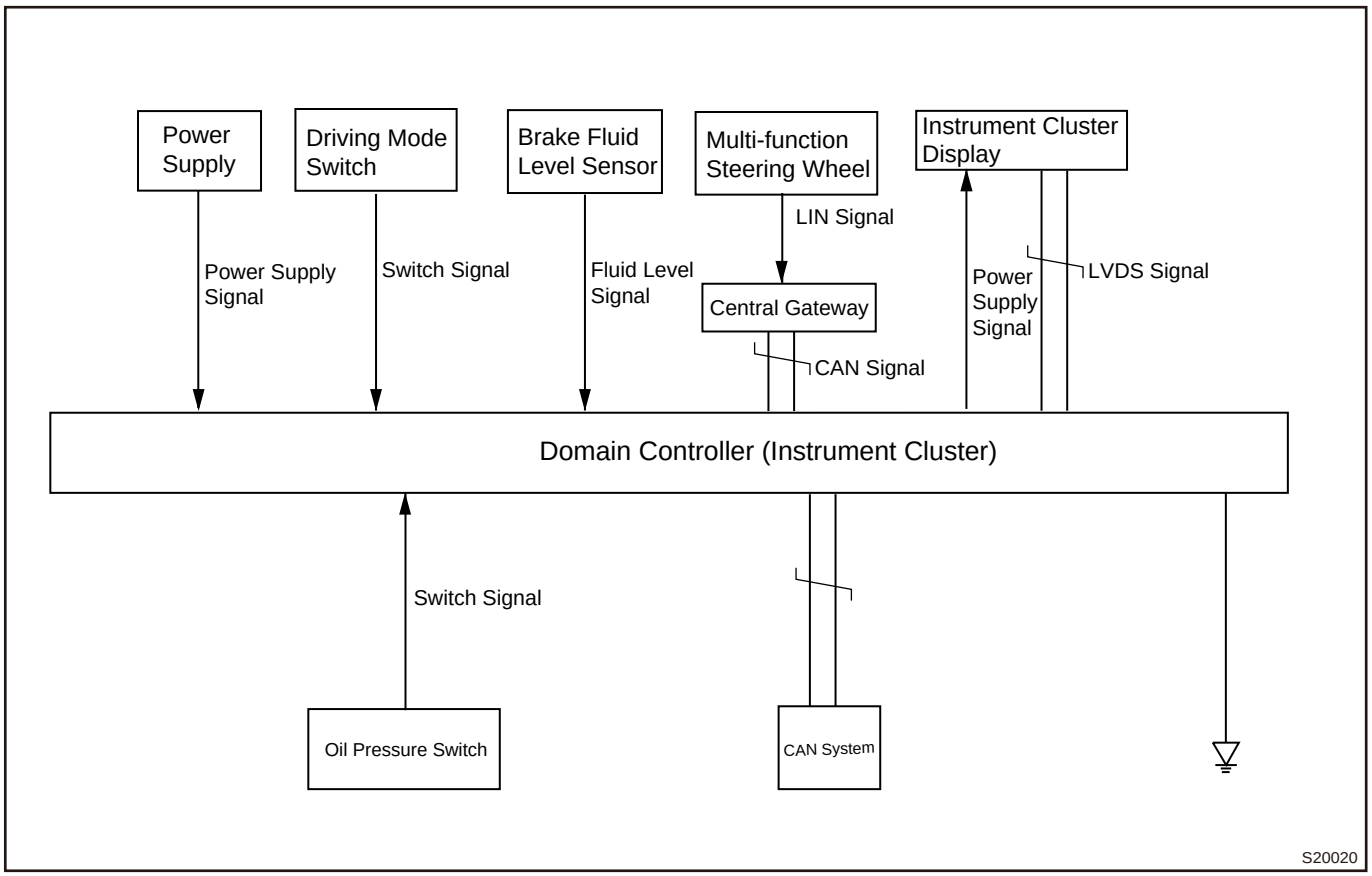
2 System Overview

2.1 Instrument Cluster



1	Steering Wheel Quick Button	2	Hyperscreen
3	Domain Controller		

2.2 System Principle



(1) A domain controller indicates that at least one server is responsible for the verification of each computer and user connected to the network in "domain" mode, which is equivalent to the guard of a unit, called "-Domain Controller (abbreviated for DCM)". In T1D model, domain controller integrates instrument cluster module (ICM) and audio head unit module (RRM) into one module, but both the modules still operate independently by their independent ECU.

(2) Domain controller (instrument cluster) part still maintains the traditional instrument cluster function.

(3) ESP function has a setting item on instrument cluster. Customer can set it to ON or OFF by themselves. The instrument cluster sends out the state set by customer, and ESP module receives the state and sends out the actual state signal. The setting item of instrument cluster is displayed according to the feedback signal of ESP module.

(4) Data between domain controller (instrument cluster) and instrument cluster display is transmitted via low voltage differential signal (LDVS).

(5) Multi-function steering wheel controls the domain controller (instrument cluster) by transmitting signal to the central gateway module (CGW) via LIN line, and then transmitting information via CAN line network.

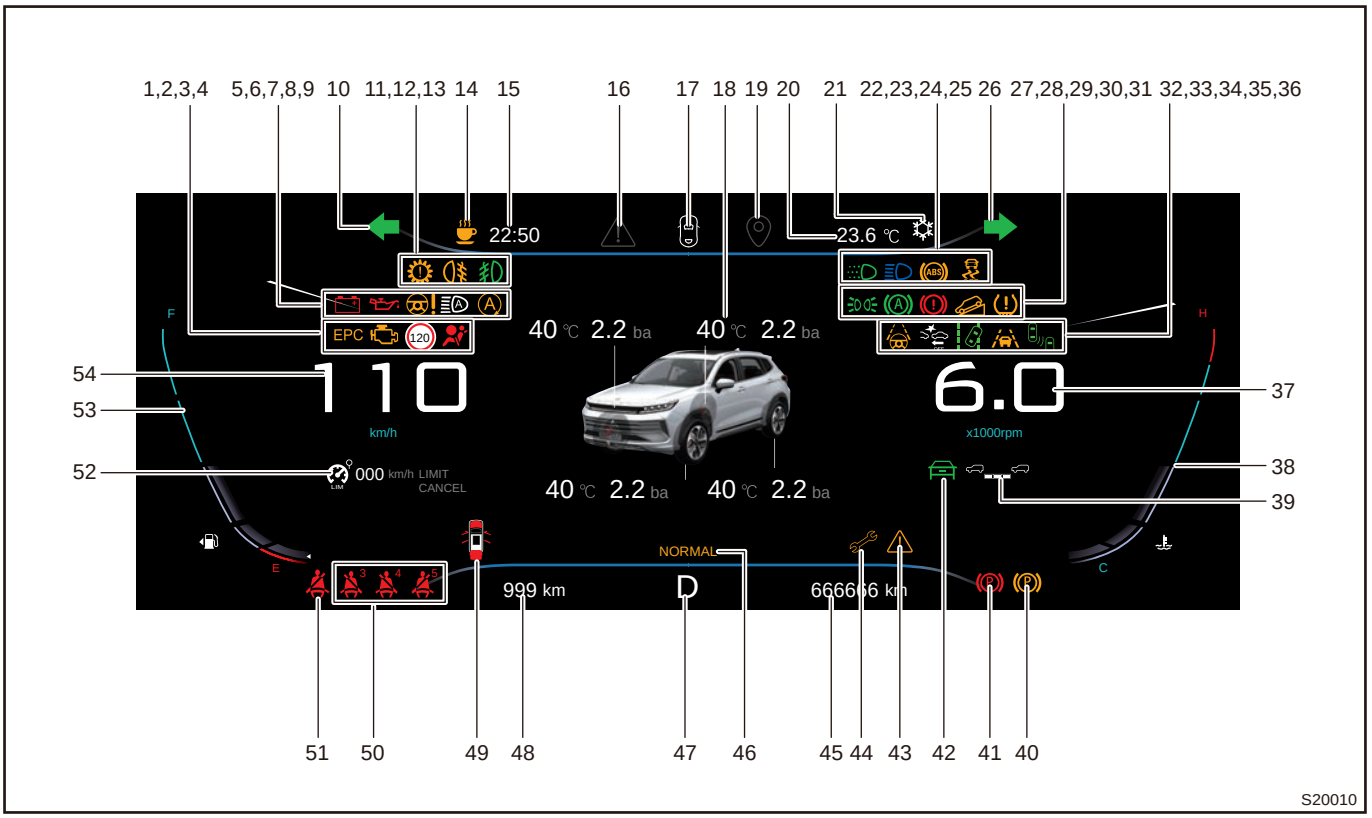
(6) Multi-function steering wheel (standard) controls domain controller (instrument cluster) by transmitting information directly via ordinary dedicated line.

(7) Oil pressure switch/driver seat belt switch/fuel pump and sensor/brake fluid level are transmitted to the domain controller (instrument cluster) via ordinary dedicated line.

(8) Central console switch (driving mode) transmits signal to domain controller (instrument cluster) via ordinary dedicated line.

(9) Central console switch (audio power supply switch (standard and comfort models)/LDW/LKA (luxury and exalted models) transmits signal to domain controller (instrument cluster) via ordinary dedicated line.

2.3 System Indicators



1	EPC Malfunction Indicator	2	Engine Malfunction Indicator
3	Traffic Speed Limit Sign Indicator + Overspeed Alarm	4	Airbag Malfunction Indicator
5	Charging System Warning Indicator	6	Low Engine Oil Pressure Warning Indicator
7	Electric Steering System Malfunction Indicator	8	Automatic Headlight Operating Indicator
9	Start and Stop System Indicator	10	Left Turn Signal Indicator
11	Transmission Malfunction Indicator	12	Rear Fog Indicator
13	Front Fog Indicator	14	Fatigue Driving
15	Time Display	16	Malfunction Information
17	Driving Information	18	Tire Temperature
19	Navigation	20	Outside Temperature
21	Road Ice Indicator	22	Daytime Running Indicator
23	High Beam Indicator	24	ABS Malfunction Indicator
25	ESP Malfunction Indicator	26	Right Turn Signal Indicator
27	Position Indicator	28	Automatic Parking Indicator

29	Brake System Malfunction Indicator	30	HDC Indicator
31	Tire Pressure Malfunction Indicator	32	Traffic Jam Assist System Indicator
33	Active Collision Avoidance System Indicator	34	Lane Departure
35	Lane Keeping	36	Blind Spot Detection
37	Speed Display	38	Coolant Temperature Gauge
39	ACC Distance Level	40	EPB Malfunction Indicator
41	Parking Brake Indicator	42	ACC Indicator
43	Malfunction Information Indicator	44	Maintenance Indicator
45	Odometer	46	Standard Mode
47	Gear Position Indicator	48	Driving Mileage
49	Door Opening Indicator	50	Rear Seat Belt Reminder
51	Front Seat Belt Indicator	52	Cruise Indicator
53	Fuel Gauge	54	Speedometer

Instrument cluster equipped with hyperscreen is located above the upper left of instrument panel assembly, which is used to monitor and display the operation status of each system and component in vehicle. Instrument cluster equipped with hyperscreen receives signals from each sensor and switch, and displays the operation status of each system through meters, multi-information display, indicators and warning lights. It also reminds and warns driver by flashing lights and sounding buzzer. As a result, it will be helpful for driver to eliminate possible troubles in time, thus avoiding malfunctions or accidents efficiently.

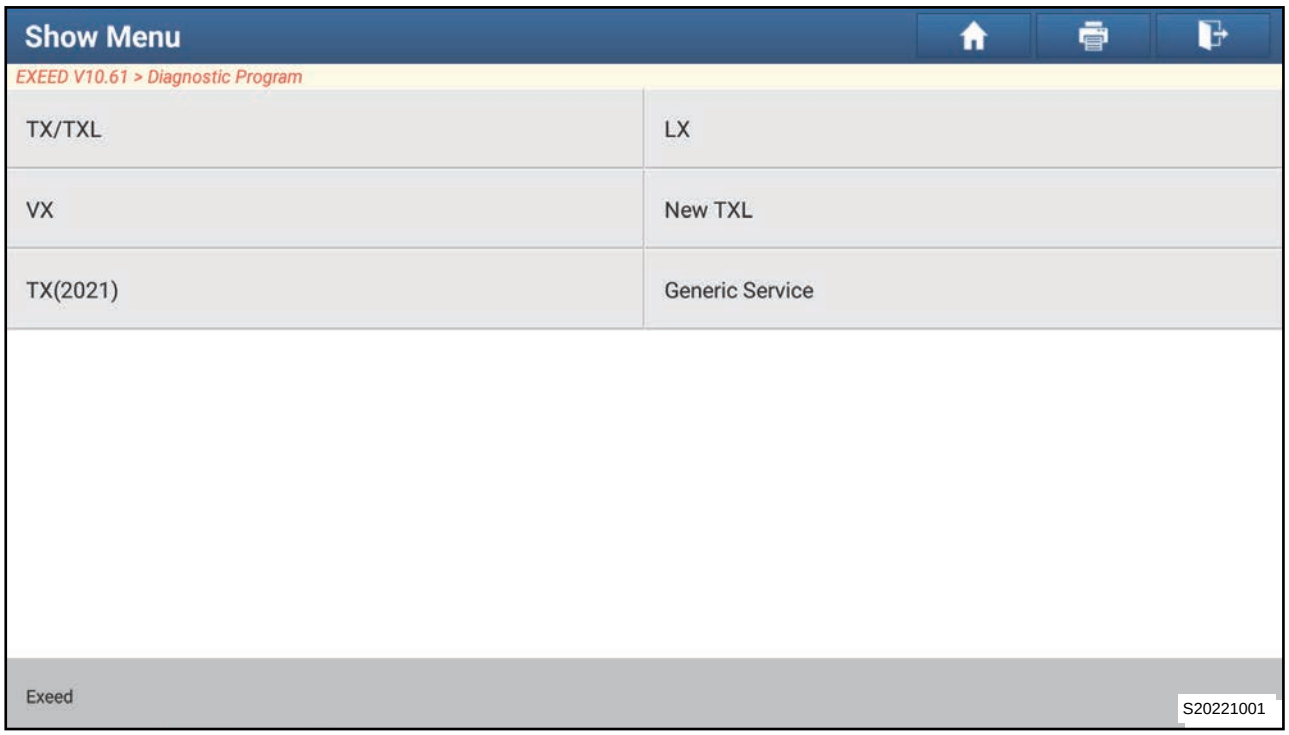
2.4 Maintenance Indicator Clearing

■ Manual clearing

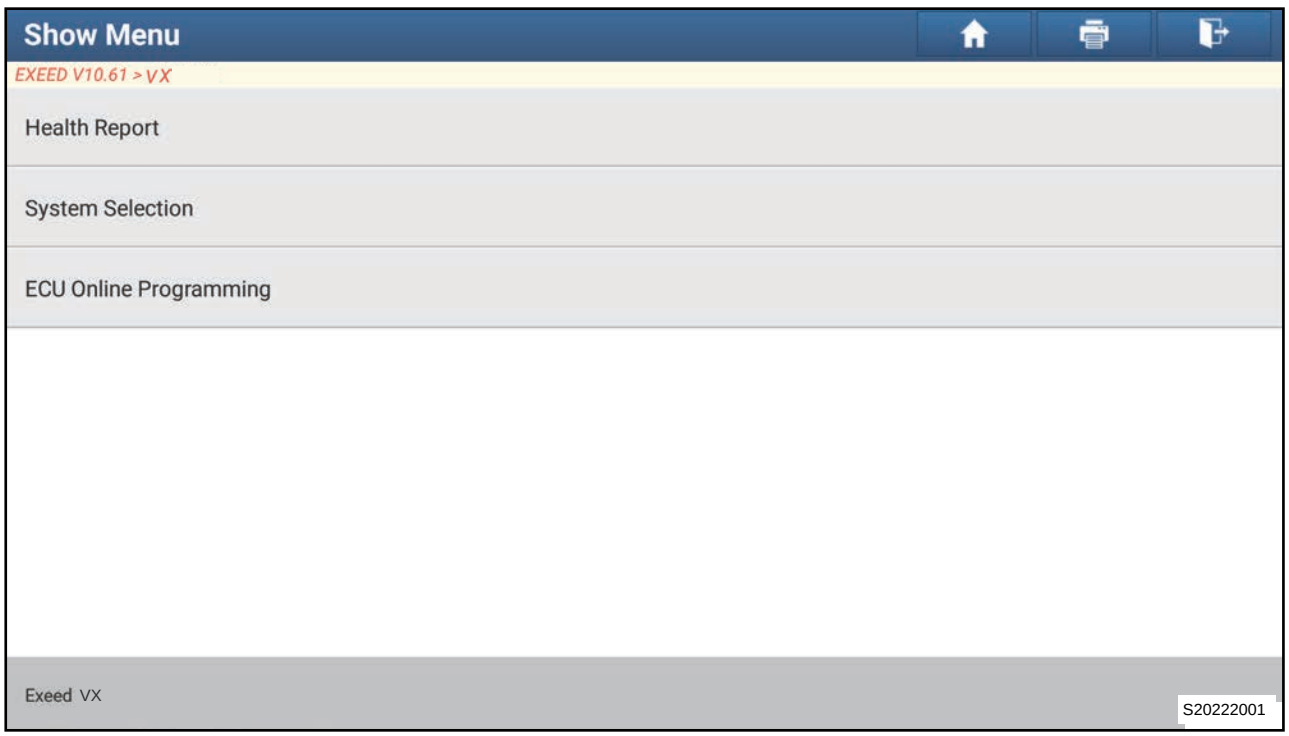
(1) Manual clearing method: In OFF state, press and hold [OK] button, and then turn ignition switch to ON, that is, when instrument cluster is in ON state, press and hold [OK] button for 5 seconds, and maintenance mileage can be cleared.

■ Diagnostic tester clearing

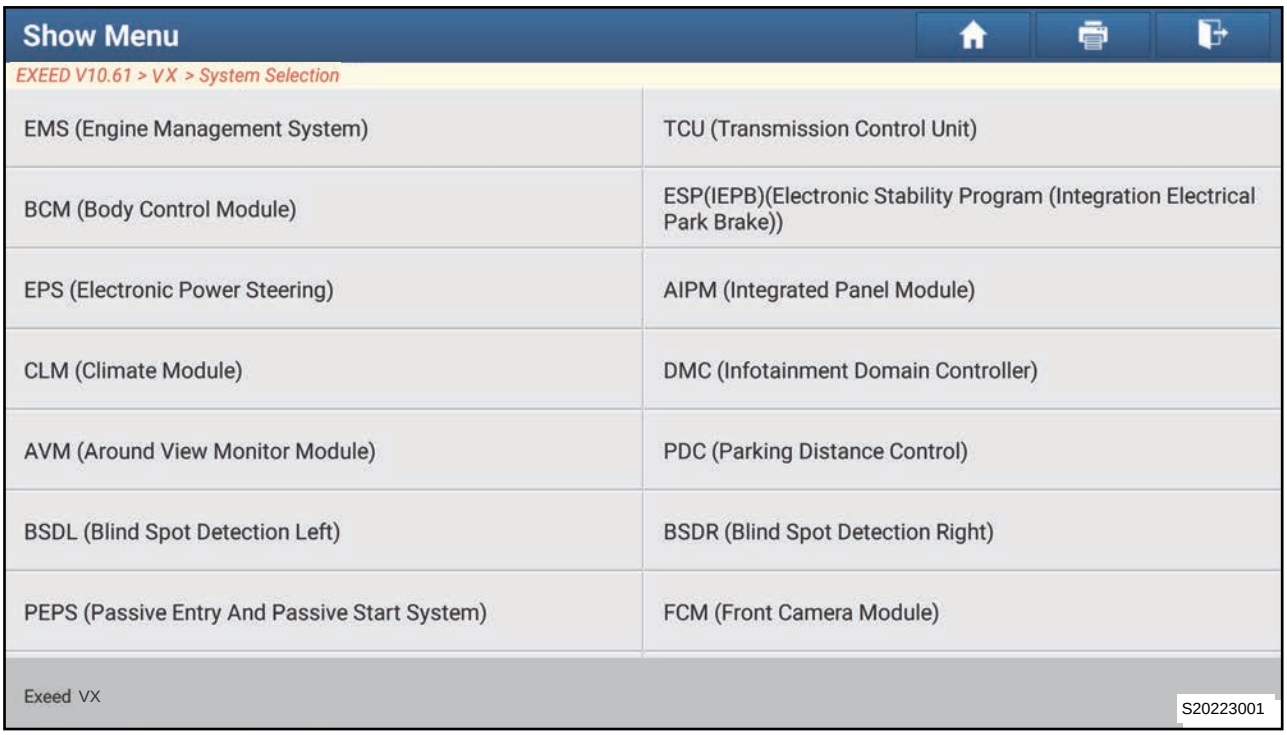
(1) Click "VX" to enter "Show Menu".



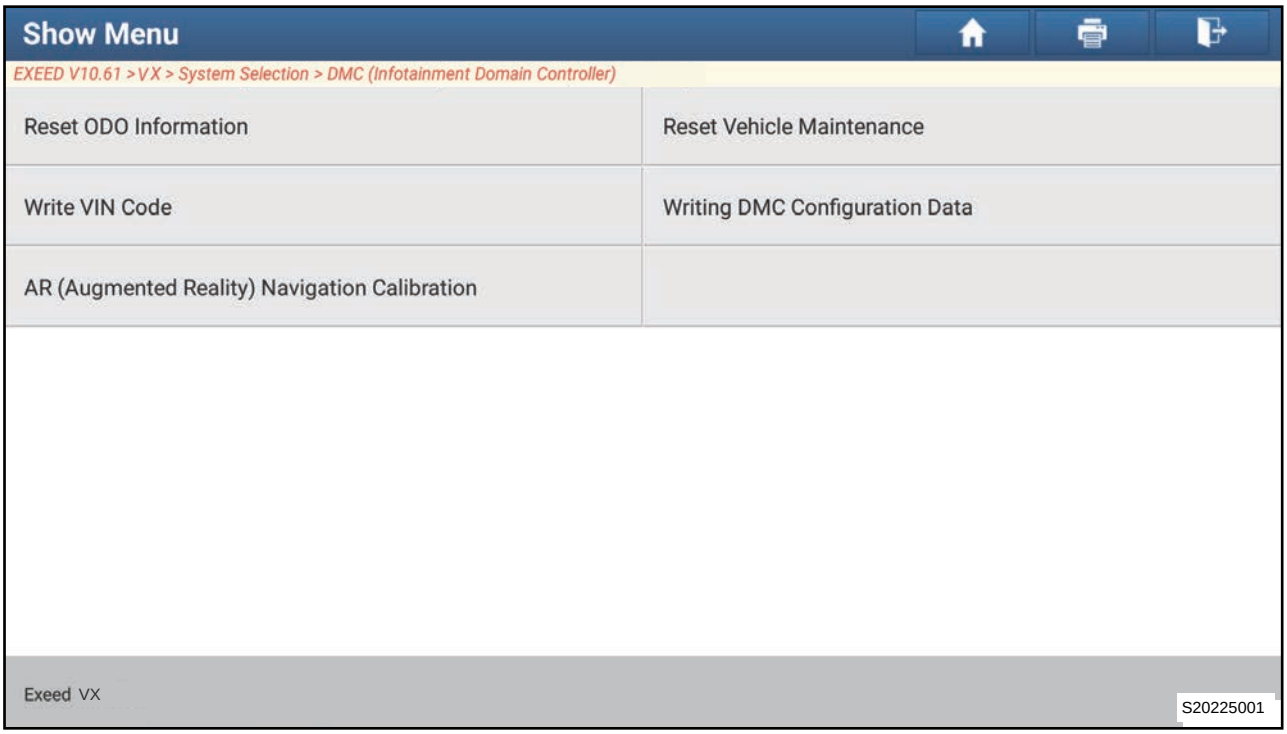
(2) Click “System Selection”.



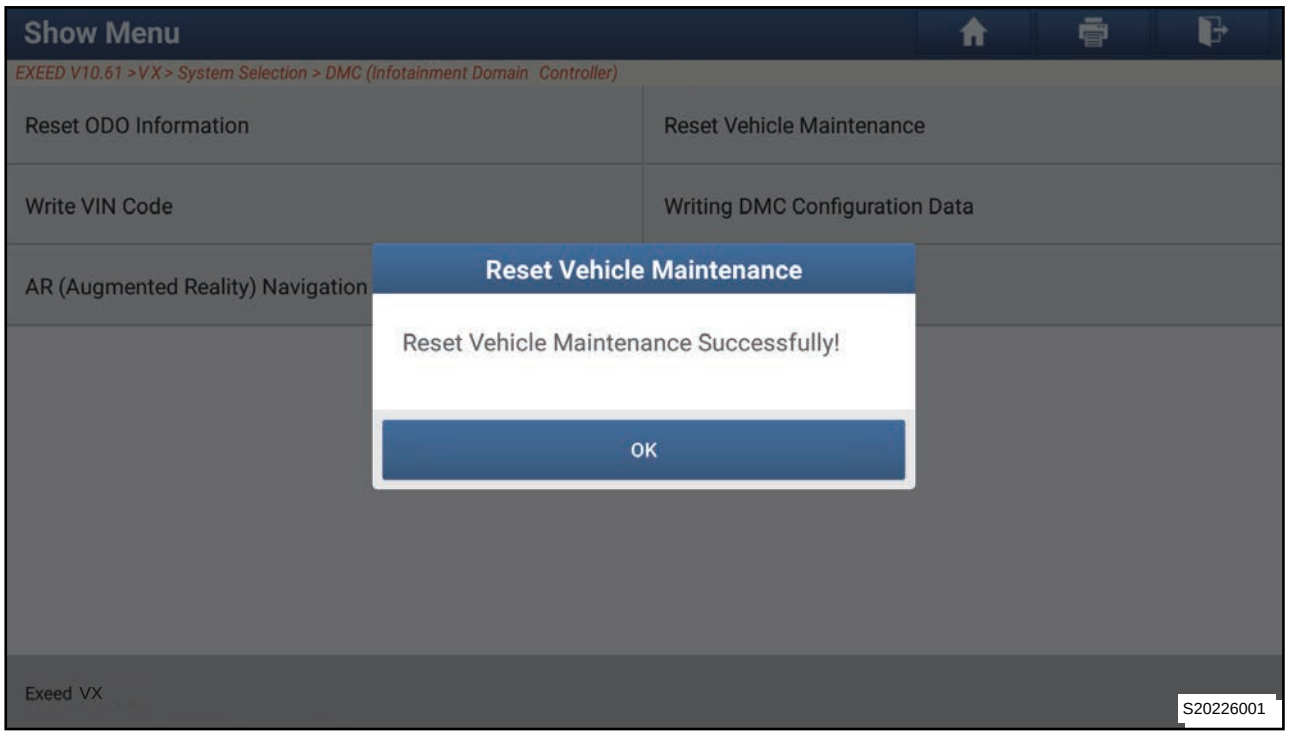
(3) Click “DMC (Infotainment Domain Controller)”



(4) Click “Reset Vehicle Maintenance”

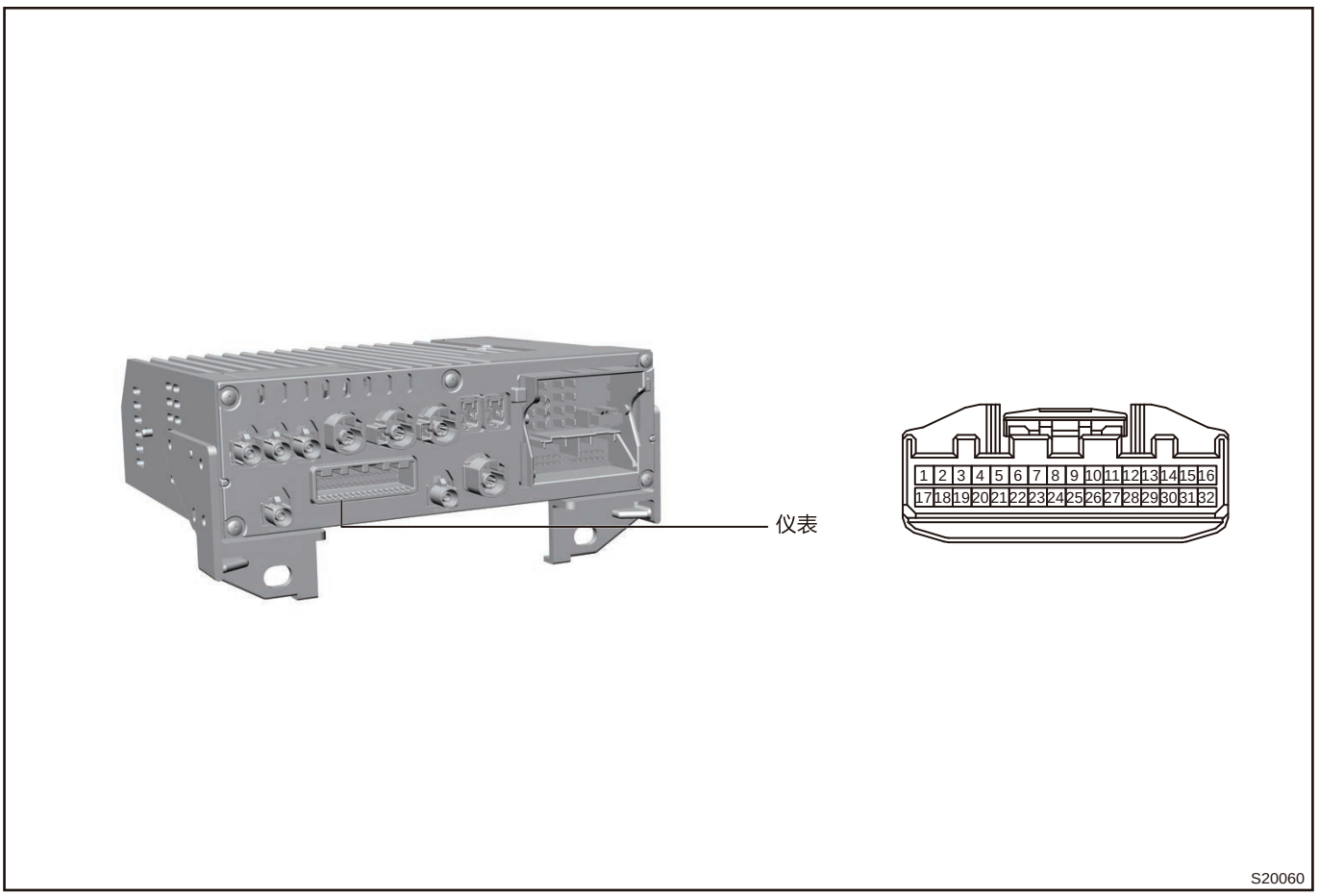


(5) Reset Vehicle Maintenance Successfully



3 Diagnosis & Testing

3.1



Pin	Definition	Pin	Definition
1	-	17	-
2	-	18	-
3	-	19	-
4	Driving Mode Signal	20	-
5	-	21	-
6	-	22	-
7	-	23	-
8	-	24	-
9	Oil Pressure Signal	25	-
10	-	26	Brake Fluid Level Signal
11	-	27	-
12	-	28	-
13	-	29	CAN-L
14	-	30	CAN-H
15	-	31	-
16	-	32	-

3.2 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace as necessary.

Symptom	Suspected Area
Entire instrument cluster does not operate	Fuse
	Domain controller
	Wire harness or connector
Vehicle speed displays abnormally	Wheel speed sensor
	Wire harness or connector
	Domain controller
Tachometer is abnormal	Engine speed sensor
	Domain controller
	Wire harness or connector
	Engine Control Module (ECM)
Fuel gauge is abnormal	Fuel level sensor
	Domain controller
	Wire harness or connector
Position indicator is abnormal	Position light switch (combination light switch assembly)
	Wire harness or connector

Symptom	Suspected Area
	Domain controller
	Body Control Module (BCM)
Turn signal indicator is abnormal	Turn signal light switch (combination light switch assembly)
	Body Control Module (BCM)
	Domain controller
	Wire harness or connector
High beam indicator is abnormal	High beam switch (combination light switch assembly)
	Body Control Module (BCM)
	Domain controller
	Wire harness or connector
Rear fog indicator is abnormal	Rear fog light switch (combination light switch assembly)
	Body Control Module (BCM)
	Domain controller
	Wire harness or connector
Charging system warning light is abnormal	Alternator
	Domain controller
	Wire harness or connector
Low engine oil pressure warning light is abnormal	Engine oil level
	Engine oil pressure switch
	Wire harness or connector
	Domain controller
ABS warning light is abnormal	ABS control unit assembly
	CAN line or connector
	Domain controller
Coolant temperature warning light is abnormal	Coolant level
	Extremely high engine coolant temperature
	Coolant temperature sensor
	Wire harness or connector
	Domain controller
	Body Control Module (BCM)
Engine malfunction warning light is abnormal	CAN line or connector
	Engine Control Module (ECM)
	Domain controller

Symptom	Suspected Area
SRS warning light is abnormal	CAN line or connector
	Airbag control module (SRS)
	Domain controller
Driver seat belt reminder light is abnormal	Driver seat belt buckle switch
	Wire harness or connector
	Domain controller
Front passenger seat belt reminder light is abnormal (If equipped)	Front passenger seat belt buckle switch
	Wire harness or connector
	Domain controller
Brake system warning light is abnormal	Low brake fluid level
	Parking brake switch
	Domain controller
Cruise indicator is abnormal	Cruise switch (multi-function switch)
	Wire harness or connector
	Domain controller
Transmission malfunction warning light is abnormal	Transmission Control Unit (TCU)
	CAN line or connector
	Domain controller
Low tire pressure warning light is abnormal	Low or high tire pressure (tire pressure is not within specified range)
	Domain controller

3.3 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.

- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B1104-41	Instrument Cluster EEPROM Data Checksum Error
U0073-88	BD CAN Busoff
U1010-88	IFT CAN Busoff
U0140-87	Lost Communication with Body Control Module
U0214-87	Lost Communication with Passive Entry Passive Start (PEPS)
U0164-87	Lost Communication with A/C Control Unit
U0141-87	Lost Communication with Reversing Radar
U0142-87	Lost Communication with Around View Monitor Module
U0230-87	Lost Communication with PLG-Missing Message
U0100-87	Lost Communication with Engine Control System Module
U0129-87	Lost Communication With Brake System Control Module -Missing Message
U0101-87	Lost Communication with TCU
U0151-87	Lost Communication with Airbag Control Unit
U1157-87	Lost Communication with Blind Spot Detection
U0131-87	Lost Communication with Electronic Power Steering Module
U1162-87	Lost Communication with Front Camera Module
U1163-87	Lost Communication with FRM-Missing Message

DTC	DTC Definition
U1193-87	Lost Communication with Electric Shifting Controller
U1189-87	Lost Communication with MFS-Missing Message
U0126-87	Lost Communication with SAM
U1300-55	Software Configuration Error

3.7 DTC Diagnosis Procedure

DTC	B1104-41	Instrument Cluster EEPROM Data Checksum Error

DTC	DTC Definition	Possible Causes
B1104-41	Instrument Cluster EEPROM Data Checksum Error	Instrument panel internal fault

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Power off test

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable and wait for 3 minutes to check if it recovers.

NG → **Clear DTCs**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace domain controller**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	U0073-88	BD CAN Busoff
DTC	U1010-88	IFT CAN Busoff
DTC	U0140-87	Lost Communication with Body Control Module
DTC	U0214-87	Lost Communication with Passive Entry Passive Start (PEPS)

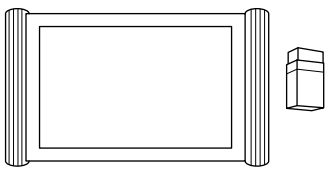
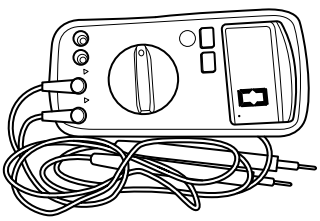
DTC	U0164-87	Lost Communication with A/C Control Unit
DTC	U0141-87	Lost Communication with Reversing Radar
DTC	U0142-87	Lost Communication with Around View Monitor Module
DTC	U0230-87	Lost Communication with PLG-Missing Message
DTC	U0100-87	Lost Communication with Engine Control System Module
DTC	U0129-87	Lost Communication With Brake System Control Module -Missing Message
DTC	U0101-87	Lost Communication with TCU
DTC	U0151-87	Lost Communication with Airbag Control Unit
DTC	U1157-87	Lost Communication with Blind Spot Detection
DTC	U0131-87	Lost Communication with Electronic Power Steering Module
DTC	U1162-87	Lost Communication with Front Camera Module
DTC	U1163-87	Lost Communication with FRM-Missing Message
DTC	U1193-87	Lost Communication with Electric Shifting Controller
DTC	U1189-87	Lost Communication with MFS-Missing Message
DTC	U0126-87	Lost Communication with SAM
DTC	U1300-55	Software Configuration Error

■ **DTC Confirmation Procedure**

Refer to CAN communication system

4 ON-VEHICLE SERVICE

4.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006

4.2 Dual LCD

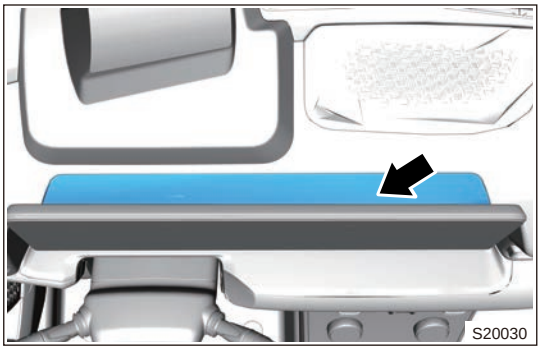
■ Removal

Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing instrument cluster.** • **Appropriate force should be applied, when removing instrument cluster. Be careful not to operate roughly.** • **When removing instrument cluster, handle it with care, so as to avoid meter needle and dial from deviating from initial position or becoming looseness caused by collisions.**

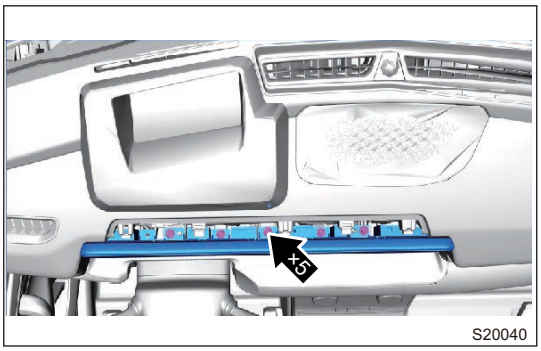
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

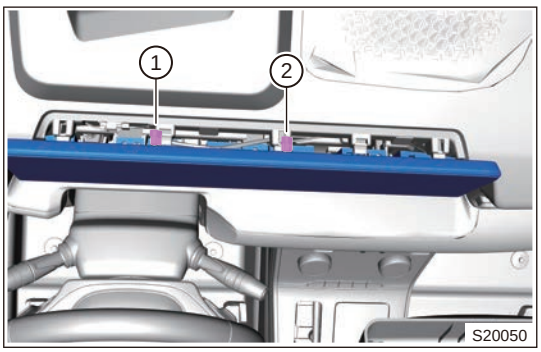
(3) Using an interior crow plate, pry off screw block cover.



(4) Remove 5 fixing bolts from dual LCD.



(5) Disconnect DVD connector from instrument cluster equipped with dual LCD, and remove dual LCD.



■ **Installation**

Caution
• **Tighten fixing nut to specified torque, when installing dual LCD.** • **Install connector into place when installing dual LCD.** • **Check audio system for proper operation, after installing dual LCD.**

(1) Connect 2 connectors to dual LCD.
(2) Install 5 fixing bolts to dual LCD.
(3) Install the screw block cover.

11.3 DRIVING ASSIST SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to wear necessary safety equipment to prevent accidents, when removing multi-function front camera.

(2) Appropriate force should be applied when removing multi-function front camera. Be careful not to operate roughly.

(3) Remove multi-function front camera to perform matching calibration.

(4) Be sure to tighten fixing screws to specified torques when installing multi-function front camera.

(5) Be sure to wear necessary safety equipment to prevent accidents, when removing front bumper assembly.

(6) Appropriate force should be applied, when removing front bumper assembly. Be careful not to operate roughly.

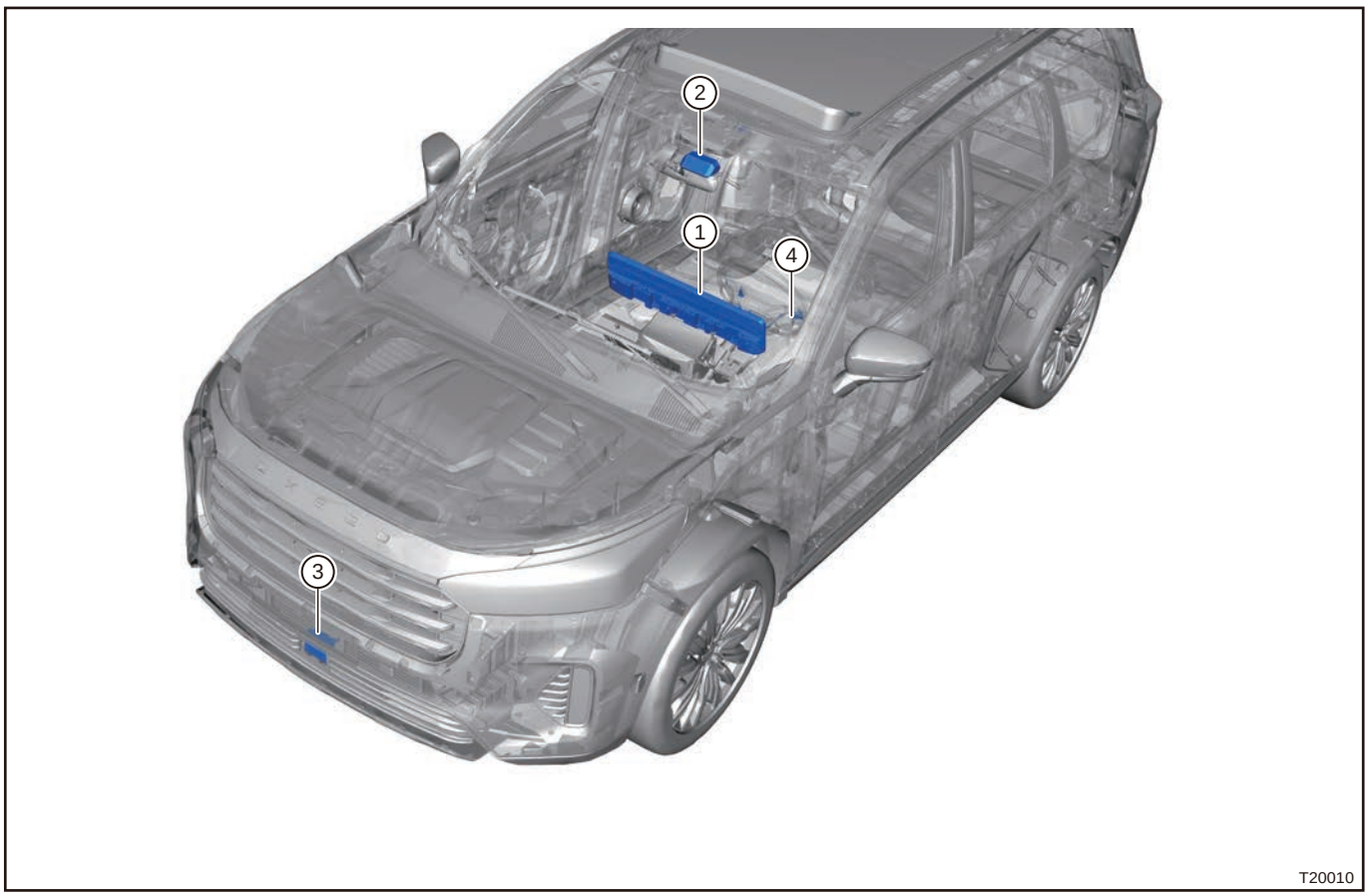
(7) Try to prevent body paint surface from being scratched, when removing front bumper assembly.

(8) Avoid breaking claws, when disassembling front bumper assembly.

(9) Avoid damage when detaching fixing clip of microwave radar.

2 System Overview

2.1 System Components Diagram

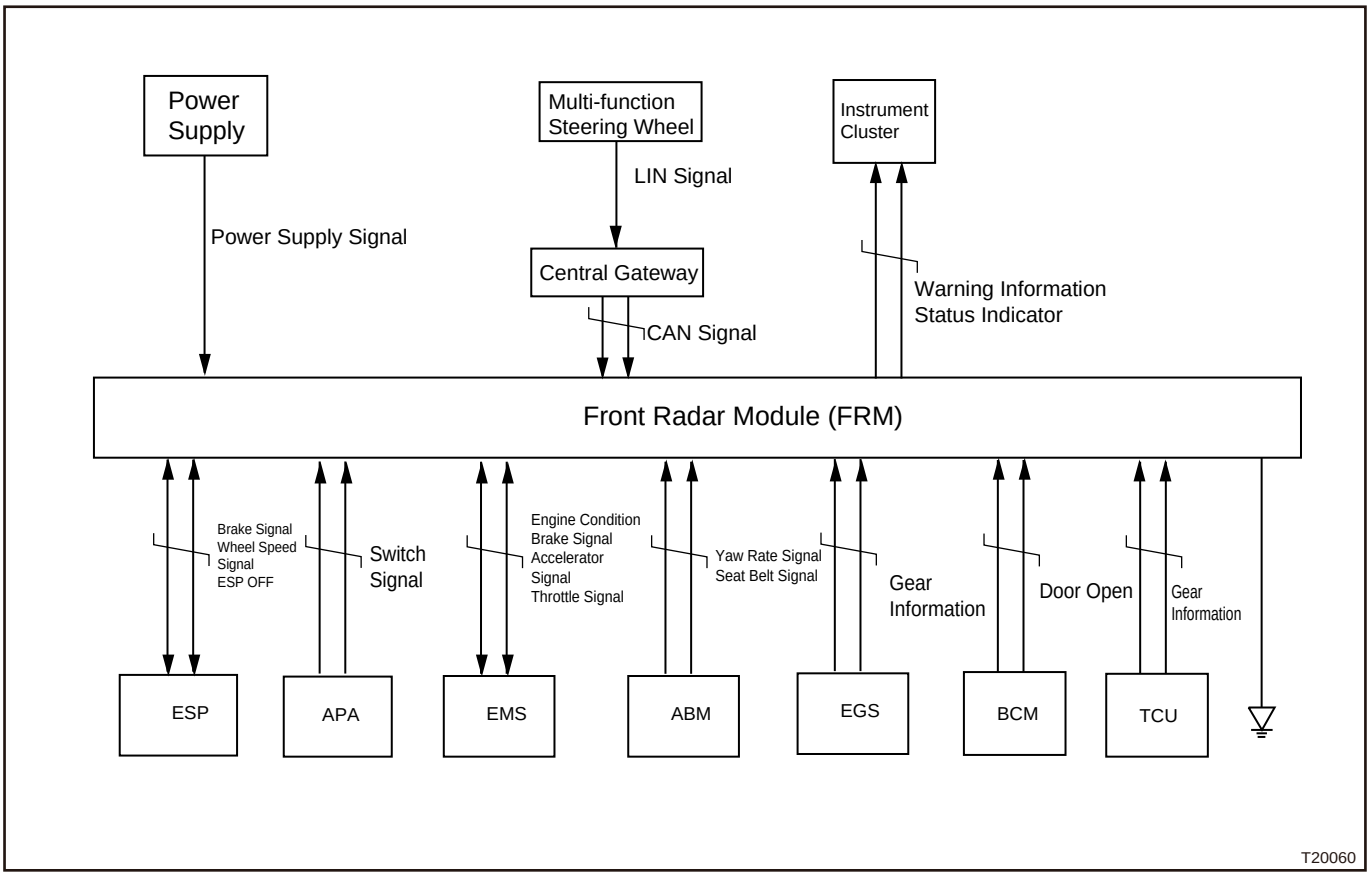


1	Hyperscreen	2	Multi-function Front Camera
3	Microwave Radar Module	4	Multi-function Steering Wheel Button

2.2 System Introduction

■ Adaptive cruise

Introduction



Adaptive cruise system is a comfort function which assists driver to keep certain distance between own vehicle and preceding vehicle according to the set speed while driving. Adaptive cruise system uses microwave radar and front camera to detect relative speed and angle with preceding vehicle. Vehicle will be controlled at target speed set by driver while no vehicle is in the front. Follow the vehicle at the set distance if there is a vehicle in front, and stop automatically while preceding vehicle stops. If preceding vehicle starts to drive within 3s, your own car will also start automatically, however, you need to start the automatic following function manually if preceding vehicle starts to drive after 3s. It automatically reduces vehicle to a responding speed according to condition of curve when the vehicle enters curve. By deeply depressing acceleration pedal, driver can operate vehicle to a speed more than target speed while ACC is active. The set target speed will be restored automatically after acceleration pedal is released.

ACC function ON/OFF/function setting

Function	Operation
ACC Function ON	Enable ACC function by pressing ACC main switch button on steering wheel when ACC is OFF.
ACC Function ON	Set the current speed to target vehicle speed by pressing set button on steering wheel when target speed has not been set or ACC is ON. If current speed is less than 30 km/h, it will set 30km/h as target speed (-target speed set range: 30km/h～150km/h).

Function	Operation
Increase Target Speed	When ACC function is active, short press RES button on steering wheel once to increase target speed by 1 km/h, and long press RES button to increase it by 5 km/h.
Decrease Target Speed	When ACC function is active, short press SET button on steering wheel once to decrease target speed by 1 km/h, and long press SET button to decrease it by 5 km/h.
Following Distance Setting	When ACC function is ON, short press distance adjusting button on steering wheel to set the distance from the preceding vehicle to far, middle and near in cycle.The default is the middle distance.
Cancel ACC Function	Press ACC Cancel button on steering wheel to cancel ACC function; ACC function can also be canceled by depressing the brake pedal or by restraint condition.
Resume ACC Function	When ACC is standby or canceled, ACC function can be resumed by pressing RES button, and set speed will be used as target speed (If ACC has not been activated before standby, it will not resume by pressing RES).
ACC Function OFF	ACC function can be disabled by pressing ACC main switch button on steering wheel when ACC is ON.

ACC system function control

Speed Control:

- When there is no vehicle ahead, ACC controls the vehicle to drive at the speed set by driver; When preceding vehicle is detected, ACC controls the vehicle to follow the preceding vehicle at the set following distance. If preceding vehicle stops, the vehicle will also stop automatically. If preceding vehicle starts off within 3 seconds, the vehicle will also start off automatically; After stopping for 3 seconds, the driver can press Res button or depress accelerator pedal to reactivate ACC function.
- If engine start and stop system has been turned on, the engine will stop automatically 3 seconds after ACC controls the vehicle to stop when preceding vehicle is stopping, the driver can press Res button or depress accelerator pedal to reactivate ACC function and start the engine.

Curved road driving:

- When ACC detects that the vehicle is driving on curved road, it will reduce certain vehicle speed, so that the vehicle can drive on curved road steadily.

Active overtaking by driver:

- When ACC controls driving, the driver can depress accelerator pedal deeply to temporarily drive the vehicle at a speed higher than set speed. After releasing the accelerator pedal, the vehicle will return to set speed.

ACC preceding vehicle reminder:

- When ACC is standby or activated, it will detect whether there is vehicle ahead. If there is vehicle ahead, preceding vehicle will be displayed on instrument cluster.

ACC preceding vehicle driving away reminder:

- The driver can select central screen - setting - driving away reminder to enable driving away reminder function. With driving away reminder selected, when the vehicle following vehicle ahead to stop automatically, if preceding vehicle is leaving about more than 1.5 s, meter will send prompt by text and sound.

Take-over reminder:

- When braking force of ACC is not enough to avoid a collision, it will send image and sound alarm to remind driver to take over the vehicle actively.

Alarm hint:

- When radar is covered by external dirt, the system will remind to clean the front radar module.

ACC system state meter display
ACC state displays:

ACC OFF	No icon
ACC standby	Grey white ACC icon is displayed
ACC activated	Green ACC icon is displayed
ACC system invalid or failure	Yellow ACC icon is displayed

ACC target speed setting:

ACC OFF	Target speed is not displayed
ACC standby	Target speed is displayed in grey white
ACC activated	Target speed is displayed in white
ACC system invalid or failure	Target speed is not displayed

ACC Following Distance Setting

- There are three levels can be selected for ACC following distance: Far, medium, near; Default is medium. The distance can be changed through distance button. Once the distance button is depressed, it displays medium - near - far - medium in cycle.
- ACC function will display approximate distance to vehicle ahead on instrument cluster; The distance is not displayed when there is no vehicle ahead.

  Take-over reminder: When ACC asks the driver to take over control of the vehicle, meter will display red vehicle icon with text and sound prompt to remind the driver to take over the vehicle.

  ACC preceding vehicle driving away reminder: After driving away reminder is turned on, if preceding vehicle drives away, meter will display the preceding vehicle driving away icon, and reminds the driver to operate RES or depress accelerator pedal to enable ACC function.

ACC driving away reminder setting
The driver can turn on or off preceding vehicle driving away reminder in meter setting options on the meter. With driving away reminder selected, if preceding vehicle drives away, meter will send prompt; If driving away reminder is turned off, meter will not send prompt when preceding vehicle drives away.

ACC limitations
ACC function is driving assist system, it is necessary for driver to monitor driving state of vehicle in real-time and intervene as needed.Do not use adaptive cruise control in any of the following situations. Failure to do so may result in loss of vehicle control and could cause an accident, resulting in death or serious injury.

- In heavy traffic;
- On roads with sharp bends;
- On winding roads;
- On slippery roads, such as roads covered with rain, ice or snow;
- Vehicle speed may exceed set speed when driving down a steep hill;
- During emergency traction.

Limitations or termination conditions:

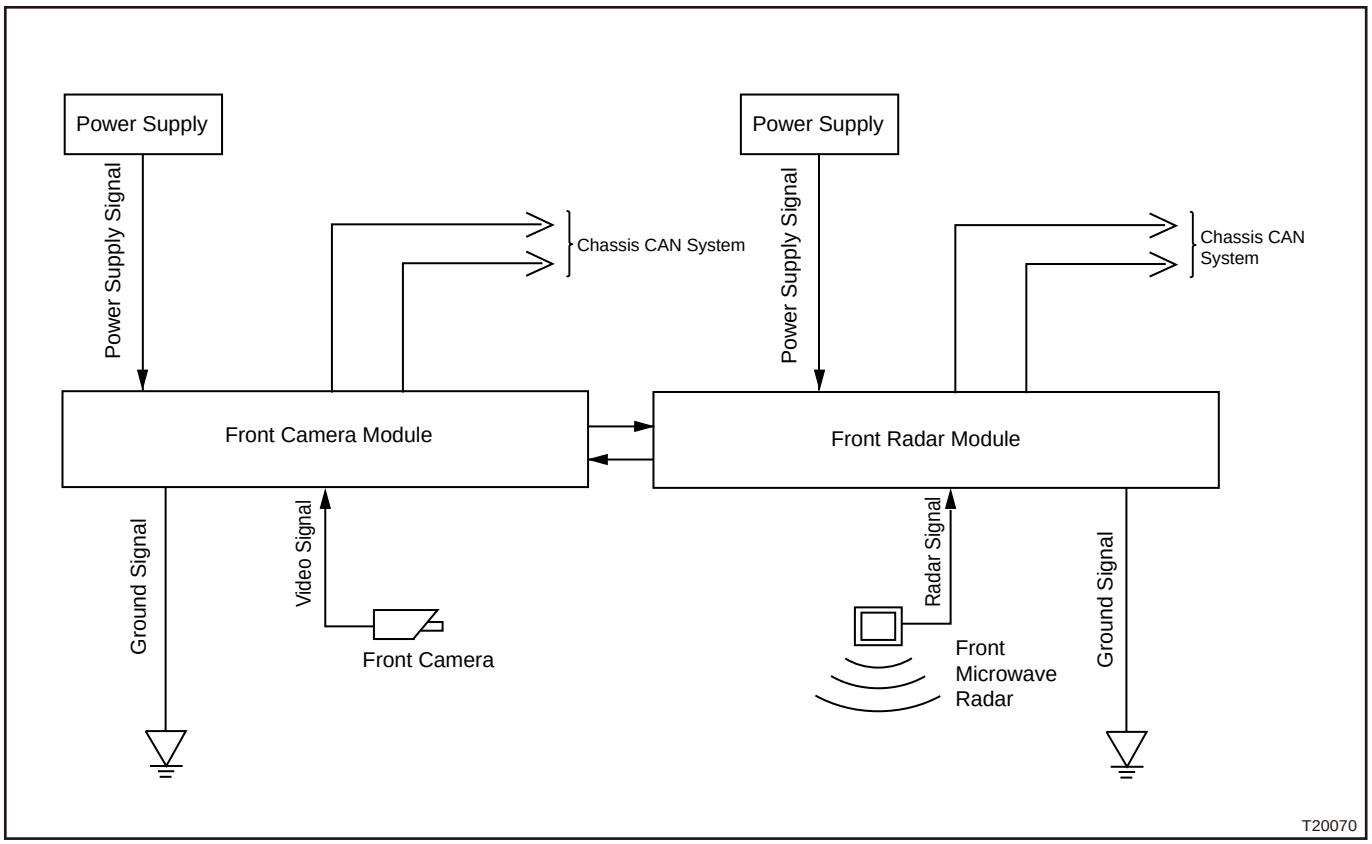
ACC function will be deactivated under the following conditions:

- Transmission is not in D position;
- Brake system failure;
- Power system failure;
- EPB activation leads to deceleration;
- Radar system failure or shielded;
- Any of four doors, back door or engine hood is opened;
- Engine is OFF;
- ESC is OFF;
- Vehicle stability system is activated;

- Downhill assist system is activated;
- Automatic emergency braking system is activated.

■ Automatic Emergency Braking (AEB) System and Forward Collision Warning (FCW) System

Brief introduction



FCW		Forward collision warning system consists of pre-alarm (image + sound alarm) + emergency alarm (emergency braking) + safety distance alarm.
EBA		Warning and brake assist based on driver braking input
AEB	AEB-P	To reduce automatic emergency brake occurred when vehicle speed is reduced to mitigate a collision, its purpose is to reduce relative speed as much as possible.
/	AEB-M	An automatic emergency brake triggered when the warning is invalid and the system determines that a large uncomfortable brake is needed to avoid collision. Its purpose is to reduce the relative speed as much as possible.
PEBS		Predictive emergency brake system is collective term for FCW, EBA and AEB.

Front collision warning and automatic emergency braking system is an emergency collision assist function, not designed to avoid collisions. Do not relay on automatic emergency braking system to brake the vehicle. Front automatic braking system will not brake when its operation speed is out of range, and it only makes response to the detected vehicle. Driver has to always concentrate all his attention while driving and be ready to take measures and apply brake and/or turn the vehicle at any time to avoid a collision.

- Meter may prompts “Automatic emergency braking system can not be enabled temporarily” in the following conditions, which indicates that the system function is restricted, and system function will return to normal after the current condition or when dirty on radar surface is removed.

- Front radar surface is covered or dirty;
- Front radar is overheated;
- Voltage is not stable/network is unstable at the moment of starting;
- On the curved road or mountain road.

- Forward collision warning and automatic emergency braking may not operate under the following conditions:
  - Preceding vehicle is detected while driving on curved road or mountain road;
  - All vehicles detected, especially vehicles with trailers, tractors, mud trucks, etc.;
  - Vehicles or pedestrians are detected when visibility is influenced by whether, such as fog, rain and snow;
  - When preceding vehicle is partially obscured by pedestrian or other objects.

WARNING

- **Automatic emergency braking system will not react to animals, oncoming vehicles and crossing vehicles.**
- **The view of camera and radar is limited. In some cases, time for system to detect vehicle or pedestrian will be delayed than expected or no person or objects will be detected at all.**
- **Automatic emergency braking system only provides assistance to the driver, and cannot operate normally under all driving conditions, weather conditions, traffic or road conditions.**
- **During the whole operation, you are responsible for controlling vehicle, monitoring and managing system, and intervening as necessary.**

- If any of the followings occur, AEB function stops:
  - AEB function is turned off through central console;
  - System failure;
  - ESC electronic stability is turned off or malfunctioning;
  - ESC function is activated;
  - Overtaking operations such as deeply depressing accelerator pedal or operating turn signal lights;
  - Reach the maximum allowable reduced speed;
  - The time for function activation is overtime;
  - Excessive steering operation;
  - Driver side door is opened or seat belt is unfastened;
  - Own vehicle speed is lower than target speed;
  - System initialization;
  - Engine shuts down or power off;
  - Radar unavailable;
  - Gear position is changed to N, P, R;
  - AEB-P function has just been activated (the time interval is about 20s);
  - Actively brake by driver.

CAUTION

- **PEBS function can assist the driver under extremely dangerous condition, however, driver should not rely entirely on this system. The driver is responsible for how to drive and how to avoid dangerous situations.**
- **Protections from system is still limited to its physical constraints. This system only supplies driver assist functions. The driver still needs to take operation at anytime and brakes at the optimal time. Do not trap yourself in dangerous conditions due to this supplemental safety system, otherwise it may lead to traffic accidents.**
- **The driver should not rely entirely on system functions, otherwise it may be used for incorrect purpose. (For example, automatic emergency braking function is used for parking assist). Due to inherent limitations of the system, false triggering is inevitable and may occur.**
- **Please note that the sensor cannot detect dangerous obstacles ahead under all conditions.**
- **Severe weather conditions, such as heavy rain and snow, will cause the system function to decline. In this case, the relevant targets will not be detected by the system or detected too late.**
- **Some objects will affect and weaken the detection of radar, such as highway fences, tunnel entrances, heavy rain or snow, and then affect the related functions of PEBS.**
- **The PEBS function usually operates in the background and will not be noticed by the driver. Therefore, if the related target is detected by the system, it will not be displayed to the driver.**
- **Some PEBS functions will operate with informations from sensor around the vehicle body. All sensors need to detect objects to achieve the best performance. When the system performance drops, the driver will not know that.**
- **The initial design of PEBS function is to respond to moving target in the same lane with same direction under normal traffic conditions. When certain conditions and speed ranges are met, the PEBS system can also respond to stationary target in the same lane.**
- **The system will not respond to animals, oncoming vehicles and crossing vehicles.**
- **For security reasons, ESP system support is required to enable PEBS function.**
- **PEBS responds to related target only when the target is recognized within detection range of radar sensor. PEBS performance will be greatly limited to the shifted target, target detected after the vehicle changes the lane, and the target in the sharp curve.**
- **The calibration of radar will be affected when subjected to strong vibration or slight impact, which will reduce the system performance or increase the false trigger rate. The installation position of radar needs to be checked or recalibrated.**
- **The radar system needs special performance to detect related targets. The detection will be interfered or performance will be dropped when the radar is affected by the environment. For example, under electromagnetic field interference or caused by target's own reasons.**
- **Radar system is installed in the front of vehicle, and any obstacles are not allowed to be placed within detection range of radar sensor.**
- **In such installation position, the radar will be affected by dust and snow, and the system may shut down when the radar is completely covered by dust or snow. Functions will be restrained under the following conditions:**
- **The target cannot be detected until it appears within the detection range of the sensor.**
- **When the target changes lanes or cuts in too close, function that detects front target is restrained.**
- **Motor (such as motorcycle), pedestrian crossing the road, and vehicles with high chassis are often identified too late or cannot be identified.**

AEB and FCW function ON/OFF

AEB and FCW are both turned on by default after every cycle of power on. The driver can turn on / off AEB or FCW through settings on central screen.

FCW sensitivity setting

FCW sensitivity can be set through settings on central screen. Sensitivity setting of high, medium and low are available. High sensitivity FCW warning will be more active and low sensitivity FCW warning will be a bit delayed.

Forward collision warning and automatic emergency braking activation conditions

Function	Sub Function	Vehicle Speed Condition		Description	Note
		For Front Moving Or Stopping Target	For Front Static Target		
Vehicle AEB	Safety distance warning	65 - 150 km/h	Invalid	If the vehicle is too close to the front vehicle (- approximately 1 second) and the vehicle speed meets the conditions, the system will give a visual alarm to remind the driver.	/
	Image + sound alarm	30 - 150 km/h	30 - 85 km/h	If you continue to drive at the current speed and the vehicle speed meets the conditions, the system will give an audible and visual reminder to the driver when it may collide with the front vehicle.	Meter and head unit prompt images and sounds respectively.
	Short braking alarm	30 - 150 km/h	30 - 85 km/h	When in emergency and the vehicle speed meets the conditions, system will perform short braking to alarm the driver.	The maximum speed reduced by short braking does not exceed 5 km/h
	Emergency Brake Assist (EBA)	4 - 150 km/h	4 - 85 km/h	When in emergency and the vehicle speed meets the conditions, if the driver depresses the brake pedal suddenly, the system will supply more supplemental brake force.	/
	Automatic emergency braking - partly interference AEB-P	30 - 150 km/h	Invalid	If the driver does not respond after the alarm, the system will automatically perform comfort braking partly	Vehicle speed can be decreased by up to 45 km/h

Function	Sub Function	Vehicle Speed Condition		Description	Note
		For Front Moving Or Stopping Target	For Front Static Target		
				interference when the vehicle speed meets the conditions.	
	Automatic emergency braking - completely interference AEB-M	4 - 85 km/h	4 - 48 km/h	If the driver does not respond after the alarm, the system will automatically perform completely braking interference when the vehicle speed meets the conditions in an emergency.	Vehicle speed can be decreased by up to 45 km/h
Pedestrian protection	Image + sound alarm	5 - 64 km/h	Invalid	When a pedestrian in front is detected and the vehicle speed meets the conditions, if there is a possibility of a collision with a pedestrian, the system will alarm to remind the driver.	Pedestrian protection function is aimed to avoid or reduce collision between the vehicle and the pedestrian who is crossing the lane. Specific requirements are as follows: • Pedestrian is identified by camera; • Pedestrian is detected in actual cycle; • Longitudinal speed of pedestrian is less than 0.3 km/h; • Pedestrian is moving within vehicle forward route; • An alarm will sound when distance between pedestrian and vehicle front is 4.2 m
Bicycle protection	Automatic Emergency Braking (AEB)	4 - 64 km/h	Invalid	It detects that the pedestrian is crossing the road and the speed of own vehicle is 4 to 64, if there is a possibility of a collision with a pedestrian, the system will automatically perform complete braking.	

Function	Sub Function	Vehicle Speed Condition		Description	Note
		For Front Moving Or Stopping Target	For Front Static Target		
					to 1.32 m, and brake will be applied directly when the distance between them is 0 to 1.32 m. • Pedestrian is in the longitudinal range of 40 m - 5 m from vehicle front; • AEB function is enabled after being confirmed by camera; • Vehicle speed can be decreased by up to 40 km/h (own vehicle speed <= 40 km/h) or 25 km/h (own vehicle speed > 40km/h). The function of AEB is to reduce the number of collisions with pedestrians and reduce injuries. Not 100%.
	Automatic partly braking	4 - 64 km/h	Invalid	When own vehicle speed is between 4 and 43 km/h, own vehicle speed will be reduced by 30 km/h; When own vehicle speed is between 44 and 64 km/h, own vehicle speed will be reduced by 25 km/h.	/

Function	Sub Function	Vehicle Speed Condition		Description	Note
		For Front Moving Or Stopping Target	For Front Static Target		
	Automatic completely braking	4 - 64 km/h	Invalid	When own vehicle speed is between 4 and 43 km/h, the own vehicle speed will decelerate to a stop; When own vehicle speed is between 44 and 64 km/h, the own vehicle speed will be reduced by 25 km/h.	/

The stopped target indicates that the target has moved within the radar's detection range and has now stopped. The static target indicates that the target has not moved within the radar's detection range.

■ Lane keep system (LKS)

Introduction
The lane keep system assists the driver to control the vehicle to drive in the center of the lane during high speed driving, reducing the driving intensity of driver and improving driving safety. When LKS operates, the driver can operate steering wheel to control the vehicle in active.
Lane keep function ON / OFF
Press the button on steering wheel to allow lane keep system to turn on or off lane keep function.
Driver take over prompt
When the driver moves his hands off the steering wheel for over 15 s, meter will alarm the driver to take over the steering wheel through text and sound. Lane assist system function will be restricted after 5 s.
LKS system state meter display
Lane keep system main screen display:

Function	Indicator Icon
Lane assist system standby	
Lane assist system activated	
System malfunction	
Front camera covered	

Lane departure warning system main screen detailed display:

Lane Line Detection		Lane Departure		Steering Interference		Main Screen Display	Sound
Left	Right	Left	Right	Left	Right		
No	No	No	No	No	No		No
YES	No	No	No	No	No		No
No	YES	No	No	No	No		No
YES	YES	No	No	No	No		No
YES	No	No	No	YES	No		No
No	YES	No	No	No	YES		No
YES	YES	No	No	No	YES		No
YES	YES	No	No	YES	No		No
YES	YES	No	No	YES	YES		No
YES	YES	YES	No	No	No		YES
YES	YES	No	YES	No	No		YES

Lane Line Detection		Lane Departure		Steering Interference		Main Screen Display	Sound
Left	Right	Left	Right	Left	Right		
YES	No	YES	No	No	No		YES
No	YES	No	YES	No	No		YES

LKS function restrained condition
Function restrained conditions:

- This system operates only when vehicle speed is above 60 km/h.
- The marking line that can be identified by the camera: White solid line, white dashed line, yellow solid line, yellow dashed line, double solid line, etc.
- In cold or bad weather, system may not operate. Rain, snow, fog or intensive illumination can affect the sensor.
- Lane assist system only operates on the road with two clear lane lines.
- Lane assist system may not operate on the cement road.
- Lane assist system may not operate in the road construction area.
- Lane assist system may not operate on the water-logged or muddy road.
- Lane assist system may not operate at sharp curve or narrow road.
- When only one lane line is detected, the alarm stability of the system decreases.
- If the sensor is interfered, the system will not function.
- Sensor may be misled by temporary construction markings line on the road, etc., resulting in false and incorrect alarms.
- If suspension components of the vehicle are not approval by us, the lane assist system may not operate normally.

CAUTION
When the camera fails, it will prompt that the camera is faulty or unavailable, and related system functions are unavailable.

■ Lane departure warning system (LDW)

Introduction
Lane departure warning system can help drivers reduce traffic accidents caused by lane departure and improve driving safety.
Lane departure warning function ON / OFF
The driver can turn on or off the lane departure warning function through the central screen setting item.
Lane departure sensitivity setting
Sensitivity of lane departure warning can be set in central setting item, high and low sensitivity can be selected. When high sensitivity is selected, lane departure alarms earlier; When low sensitivity is selected, lane departure alarms later; The driver can select different sensitivity levels accordingly.
Lane departure warning type selection
Lane departure warning type can be set by central setting item, sound alarm and steering wheel vibration alarm can be selected. When the sound alarm is selected, if vehicle is driving off the lane, the meter will prompt an image with sound alarm; When the steering wheel vibration alarm is selected, if vehicle is driving off the lane, the meter will prompt an image with steering wheel vibration.
Driver take over prompt
When the driver moves his hands off the steering wheel for over 15 s, meter will alarm the driver to take over the steering wheel through text and sound. Lane assist system function will be restricted after 5 s.
LDW function restrained condition
Function restrained conditions:

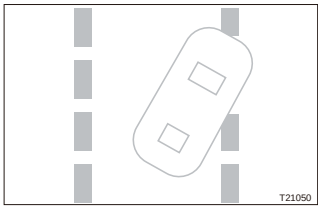
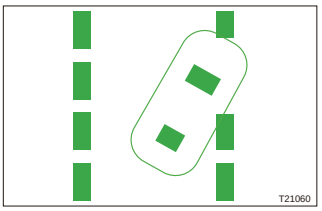
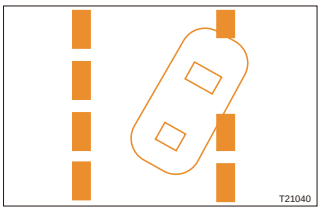
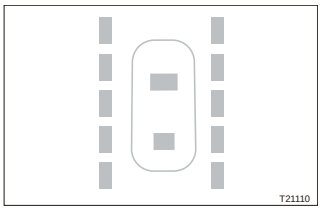
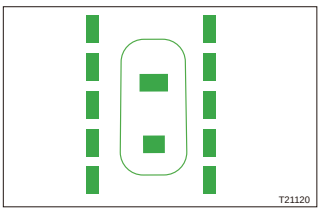
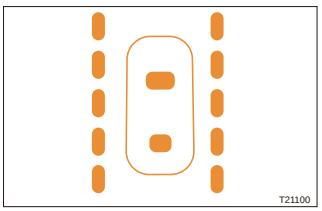
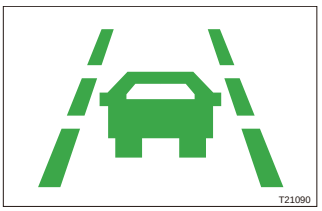
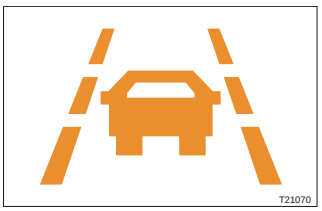
- This system operates only when vehicle speed is above 60 km/h.

- The marking line that can be identified by the camera: White solid line, white dashed line, yellow solid line, yellow dashed line, double solid line, etc.
- In cold or bad weather, system may not operate. Rain, snow, fog or intensive illumination can affect the sensor.
- When there is only one lane line, LDW can operate normally on the lane line side.
- LDW may not operate on the cement road.
- LDW may not operate in the road construction area.
- LDW may not operate on the water-logged or muddy road.
- LDW may not operate at sharp curve or narrow road.
- When only one lane line is detected, the alarm stability of the system decreases.
- If the sensor is interfered, the system will not function.
- Sensor may be misled by temporary construction markings line on the road, etc., resulting in false and incorrect alarms.
- If suspension components of the vehicle are not approval by us, the lane assist system may not operate normally.

CAUTION
When the camera fails, it will prompt that the camera is faulty or unavailable, and related system functions are unavailable.

■ Lane departure intervention system RDP

Introduction
Lane departure intervention system performs steering intervention while vehicle is about to driving off the lane. So that vehicle returns to the driving lane to prevent vehicle from driving off the lane. It is a system that reduces traffic accidents caused by lane departure and improve driving safety.
Lane departure warning function ON / OFF
The lane departure intervention function can be turned on or off through the central screen setting item.
Driver take over prompt
When the driver moves his hands off the steering wheel for over 15 s, meter will alarm the driver to take over the steering wheel through text and sound. The lane departure intervention function will be restricted after 5 s.
RDP system state meter display
Lane departure interference system indicator:

Indicator	To be activated	Activated	Problem
LDW Indicator	Grey indicator comes on 	Green indicator comes on 	Yellow indicator comes on 
RDP Indicator	Grey indicator comes on 	Green indicator comes on 	Yellow indicator comes on 
LKA Indicator	Grey indicator comes on 	Green indicator comes on 	Yellow indicator comes on 

RDP function restrained condition
Function restrained conditions:

- This system operates only when vehicle speed is above 60 km/h.
- The marking line that can be identified by the camera: White solid line, white dashed line, yellow solid line, yellow dashed line, double solid line, etc.
- In cold or bad weather, system may not operate. Rain, snow, fog or intensive illumination can affect the sensor.
- When only one lane line is detected, lane assist system only can operate on the lane line side.
- Lane assist system may not operate on the cement road.
- Lane assist system may not operate in the road construction area.
- Lane assist system may not operate on the water-logged or muddy road.
- Lane assist system may not operate at sharp curve or narrow road.
- When only one lane line is detected, the alarm stability of the system decreases.
- If the sensor is interfered, the system will not function.
- Sensor may be misled by temporary construction markings line on the road, etc., resulting in false and incorrect alarms.
- If suspension components of the vehicle are not approval by us, the lane assist system may not operate normally.

CAUTION
When the camera fails, it will prompt that the camera is faulty or unavailable, and related system functions are unavailable.

■ Speed limit marking recognition function

Introduction
Speed limit marking recognition function detects speed limit traffic mark on the road and displays the detected speed limit value on the instrument cluster. The displayed sign will disappear after driving for a certain distance or time. If a new sign is detected when it displays, the speed limit value displayed on the instrument

cluster will be updated. If current speed is more than displayed value, instrument cluster will zoom in the icon or make a sound alarm.

TSR function ON / OFF

TSR function can be turned on and off in the instrument setting menu. After function is turned on, user can select options between visual warning and visual warning + audio warning. Vehicle will record setting value in the previous ignition cycle.

TSR system state meter display

When the setting is image display only, if the speed limit sign is detected, the instrument cluster will display correspondingly. The displayed speed limit sign will disappear after driving for a period of time or distance. If there is a new speed limit sign, the display will be updated. When the vehicle speed is greater than the detected vehicle speed by 5 km/h, instrument cluster will zoom in the icon to alert the driver that vehicle is over speed. When the setting is imagine display + audio alert, if the speed limit sign is detected, the instrument cluster will display correspondingly. The displayed speed limit sign will disappear after driving for a period of time or distance. If there is a new speed limit sign, the display will be updated. When the vehicle speed is greater than the detected vehicle speed by 5 km/h, instrument cluster zoom in the icon to alert the driver that vehicle is over speed.

TSR recognizable traffic sign categories

Icons of recognizable speed limit sign:

Operation figure	Operation description
Condition Ⅰ: Common speed limit sign  T20500	System can detect common speed limit sign and send speed limit command to driver;
Condition Ⅱ: Variable speed limit sign  T20510	System can detect variable speed limit sign and send speed limit command to driver;
Condition Ⅲ: Area speed limit sign  T20520	System can detect area speed limit sign and send speed limit command to driver;
Condition Ⅳ: Divided lane speed limit	The system should only correspond to the speed limit sign of the lane;

Operation figure	Operation description
 T20530	
Condition Ⅴ: Divided model speed limit  T20540	The system should only display the highest limit speed among multiple speed limits;
Condition Ⅵ：Ramp  T20550	When vehicle has not driven into the ramp, vehicle should display original speed limit information instead of the freeway off-ramp speed limit information; When vehicle drives into the ramp, system should display freeway off-ramp speed limit information; When navigation has route plan, ramp information will be sent 100 m before vehicle enters the ramp until it drives to ramp exit. After vehicle drives into ramp, it sends speed limit alarm and speed limit information;
Condition Ⅶ: Deactivating speed limit sign  T20560	System can detect speed limit deactivating sign and send speed limit deactivating command to driver;
Condition Ⅷ: Deactivating speed limit sign and speed limit sign are shown at the same time	When deactivating speed limit sign and speed limit sign are shown at the same time, speed limit information has a higher priority than deactivating speed limit information, camera will recognize speed limit information and send it to the driver;

Operation figure	Operation description
 T20570	
Condition ⅨX: Height limit, width limit, weight limit sign  T20580	Height limit, width limit and weight limit signs are not allowed to be recognized by mistake. If the sign is recognized by mistake due to coverage, correct the speed limit information after coverage is removed;
Condition X: Deactivating no overtaking sign  T20590	Deactivating no overtaking sign is not allowed to be recognized as deactivating speed limit information.

■ Traffic Jam Assist (TJA) and Integrated Cruise Assist (ICA)

Function description

Traffic jam assist function can provide longitudinal and horizontal control in a congested traffic environment to help driver guide the vehicle. This function is available for vehicle speed range from 0 to 60 km/h. Integrated cruise assist function can provide longitudinal and horizontal control in high way or suburb expressway to help driver guide the vehicle. This function is available for vehicle speed over 60 km/h.

Functional requirements

TJA/ICA ON / OFF

- When the adaptive cruise system and lane keep system are turned on, the TJA/ICA function automatically turns on.
- When either adaptive cruise system or lane keep system is turned off, the TJA/ICA function turns off.

TJA/ICA lateral guide

- Lateral guide provides lateral control logic for TJA/ICA function based on relative position relationship between own driving track and target driving track, and calculates the steering wheel torque to ensure that the vehicle travels along the center of target driving track.
- In integrated cruise assist mode, the lane of own vehicle detected by the camera is considered as target driving track, so the lane following function is performed.
- In traffic jam assist mode, lane following function is not available if vehicle speed is lower than 60 km/h with heavy traffic. Therefore, target driving track will be identified by radar based on TIPL road model. If preceding vehicle is driving as a guide, own vehicle will perform lateral control according to the preceding vehicle. Otherwise, TJA remains the lane following function (on the condition that lane can be identified).

- Except for the control logic, limited events of the system should always be monitored. If the function activation conditions are not met, the system will not control the steering of own vehicle.
- The target steering torque signal will be sent to the electronic power steering system via CAN bus to perform steering intervention.

Lateral guide limited condition
When TJA/ICA is on and none of following limited conditions is met, TJA/ICA function is enabled.

- Limited conditions at low speed:
  - Limitation is deactivated when vehicle speed on meter is not lower than 0 km/h;
  - Limitation is activated when vehicle speed on meter is lower than 0 km/h;
  - Limited condition is entered immediately when limited conditions are met;
  - Limitation is deactivated immediately when deactivated conditions are met.
- Limited conditions at high speed:
  - Limitation is deactivated when vehicle speed on meter is lower than 172 km/h;
  - Limitation is activated when vehicle speed on meter is higher than 180 km/h;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated immediately when deactivated conditions are met.
- Limited conditions at high yaw:
  - When yaw rate is lower than 0.20 rad/s, limitation is deactivated;
  - When yaw rate is higher than 0.25 rad/s, limitation is activated;
  - Limitation is activated after 5 seconds when limited conditions are met;
  - Limitation is deactivated after 1 second when deactivated conditions are met.
- Limited conditions when lane is too wide:
  - Limitation is deactivated when lane width is lower than 5.2 km;
  - Limitation is activated when lane width is higher than 5.5 km;
  - Limitation is activated after 3 seconds when limited conditions are met;
  - Limitation is deactivated after 1 second when deactivated conditions are met.
- Limited conditions when lane is too narrow:
  - Limitation is deactivated when lane width is higher than 2.6 km;
  - Limitation is activated when lane width is lower than 2.5 km;
  - Limitation is activated after 3 seconds when limited conditions are met;
  - Limitation is deactivated after 1 second when deactivated conditions are met.
- Limited conditions when lane curvature is too high:
  - Limitation is deactivated when lane curvature is lower than 0.0033/ m;
  - Limitation is activated when lane curvature is higher than 0.004/ m;
  - Limitation is activated after 2 seconds when limited conditions are met;
  - Limitation is deactivated after 4 seconds when deactivated conditions are met.
- Limited conditions when lane line is lost:
  - When both lane lines are detected, limitation is deactivated;
  - When lane line on one side is lost, limitation is activated;
  - Limitation is activated after 3 seconds when limited conditions are met;
  - Limitation is deactivated after 3 seconds when deactivated conditions are met.
- Limited conditions when vehicle is changing lanes:
  - Limitation is deactivated when no vehicle is detected to change the lane;
  - Limitation is activated when lane change is detected;
  - Limitation is activated after 0.5 seconds when limited conditions are met;
  - Limitation is deactivated after 3 seconds when deactivated conditions are met.
- ABS and ESP intervention limited conditions:
  - When ABS and EPS are not activated, limitation is deactivated;

- When ABS or EPS function is activated, limitation is activated;
- Limitation is activated immediately when limited conditions are met;
- Limitation is deactivated after 1 second when deactivated conditions are met.

- Off-hand driving limited conditions:
  - Limitation is deactivated when steering link torque is higher than 0.4 N•m;
  - Limitation is activated when steering link torque is lower than 0.3 N•m;
  - Limitation is activated after 20 seconds when limited conditions are met;
  - Limitation is deactivated after 3 seconds when deactivated conditions are met.
- Limitation is deactivated when vertical control state is any of following state:
  - Adaptive cruise function is activated;
  - When adaptive cruise is driving vehicle actively;
  - When adaptive cruise only supports the brake;
  - When adaptive cruise is activated but stopped;
  - When adaptive cruise stops waiting.
- Limitation is activated when vertical control state is not any of following state:
  - Adaptive cruise function is activated;
  - When adaptive cruise is driving vehicle actively;
  - When adaptive cruise only supports the brake;
  - When adaptive cruise is activated but stopped;
  - When adaptive cruise stops waiting.
- Parking assist system limitation activated condition:
  - When parking assist system turns off, limitation is deactivated;
  - When parking assist system turns on, limitation is activated.
- Turn signal light limited conditions:
  - When turn signal light turns off, limitation is deactivated;
  - When turn signal light turns on, limitation is activated;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated after 5 seconds when deactivated conditions are met.
- Brake limited conditions:
  - Limitation is deactivated when brake pressure is lower than 3bar;
  - Limitation is activated when brake pressure is higher than 10bar;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated after 4 seconds when deactivated conditions are met.
- High steering angle rate limited conditions:
  - Limitation is deactivated when steering angle speed is small;
  - Limitation is activated when steering angle speed is too big;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated after 4 seconds when deactivated conditions are met.
- Accelerator pedal excessive speed limited conditions:
  - When accelerator pedal speed is lower than 30%/s, limitation is deactivated;
  - When accelerator pedal speed is higher than 70%/s, limitation is activated;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated after 4 seconds when deactivated conditions are met.
- Electronic power steering system limited conditions:
  - When electronic power steering operates normally, limitation is deactivated;
  - When electronic power steering is unavailable, limitation is activated;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated immediately when deactivated conditions are met.

- Hazard warning light limited conditions:
  - When hazard warning light turns off, limitation is deactivated;
  - When hazard warning light turns on, limitation is activated;
  - Limitation is activated immediately when limited conditions are met;
  - Limitation is deactivated after 5 seconds when deactivated conditions are met.

Horizontal control intervention

- When intervention conditions are met:
  - Function is in activated state;
  - As for low sensitivity setting of curve, the lane boundary of curve will be virtually moved toward the inner curve, and the maximum lateral movement is up to 20 cm;
  - As for low sensitivity setting of narrow lane, the width of curve will be virtually extended, and the maximum lateral movement is up to 20 cm;

System malfunction detection

- System can detect the following malfunctions:
  - Permanent system hardware malfunction;
  - Temporary system hardware malfunction;
  - Camera permanent lighting malfunction;
  - Camera is under protection mode due to high temperature;
  - Camera is under protection mode due to high voltage;
  - Hot restart;
  - Communication error;
  - Signal error.

System malfunction output

- Front camera sends system malfunction condition information
  - System is malfunctioning or camera is covered.

Display
There is no specific icon, and the status of TJA/ICA function is judged by ACC and LKS icons.

■ Intelligent Headlight System (IHC)

Introduction
Intelligent headlight function can turn on and off high beam light automatically. When driving at night, high beam lights will turn on automatically if there are no preceding vehicles are detected in the opposite or same direction, and related external environment and traffic conditions are met; If preceding vehicles driving in the opposite or same direction or on the urban roads are detected, high beam lights will turn off automatically, this provide convenience to driver while preventing abuse of high beam lights. Meanwhile, the driver can turn on/off high beam lights forcefully by manual operation.

IHC function owner setting
The driver can turn on and off the intelligent headlight function in the central screen setting interface. The function is turned on by default when vehicle rolls from the line. After the power is turned on again, the function will record the setting status of the previous ignition cycle; After this function is turned on, the driver can turn on the intelligent high beam function by operating the high beam lever. If the intelligent headlight is turned off through the central screen setting interface, move the high beam lever forward to turn on the high beam lights, and move the high beam lever backward to operate the flashing function.

IHC function activation and deactivation
After intelligent headlight function is set to ON via central screen, IHC function is activated when following conditions are met:

- Power mode is ON;
- Light position is in AUTO and low beam light comes on;
- Move the high beam lever upward once.

IHC white indicator on the meter comes on after IHC is activated, and high beam lights will automatically turn on or off according to the environment. The meter will turn on the high beam indicator icon if high beam lights turn on. When intelligent headlight function is activated, move the high beam lever upward to forcibly turn on the high beam lights. When the high beam lights turn on, move the high beam lever upward to activate intelligent headlight function again. When the intelligent headlight function is activated, if the high beam lights

turn on, move the high beam lever downward to turn off high beam lights and turn off intelligent headlight function. If high beam lights turn off when intelligent headlight function is activated, move the high beam lever downward to enter the flashing mode. After the lever is released, intelligent headlight remains activated. The camera will be affected by dirt, so keep the front camera lens clean. The function will be limited if lens is covered. When the function is malfunctioning, the function will automatically turn off the high beam lights. At this time, the driver can manually turn on or off the high beam lights. IHC is an assist function that requires the driver to check the lights at any time and manually control the lights according to the driving environment. In the following situations, manual intervention by the driver is required:

- In bad weather, such as fog and snow.
- When pedestrians or bicycles are poorly illuminated.
- When driving on a curve or uphill / downhill.
- Urban road with poor illumination.
- When strong light is reflected.

IHC lighting control
After IHC function is activated, when either of following conditions occurs, high beam lights will turn off automatically:

- When a vehicle driving in the opposite direction or in the same direction is detected;
- In the night with dense fogs;
- In a heavy rain;
- When 3 or more street lights are detected;
- Vehicle speed is lower than 30 km/h;
- Ambient brightness is too intensive.

When none of above conditions occurs and following conditions are met, high beam lights will turn on automatically:

- Vehicle speed is higher than 40 km/h.

When ABS or ESP is activated, IHC will not control lighting automatically.In the following conditions, IHC only can turns off high beam lights automatically and can not turn on it automatically:

- When turn signal light or hazard warning light turns on;
- When vehicle is not stable;
- When vehicle speed is between 30 km/h and 40 km/h.

IHC function state meter display
When the intelligent headlight function is activated, the meter will display a white indicator icon. When IHC function is turned off, the indicator on the meter will turn off. When the intelligent headlight function is malfunctioning, the meter will display a red indicator icon.

3 DIAGNOSIS & TESTING

3.1 Problem symptoms table

■ Constant speed cruise/adaptive cruise

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Vehicle speed can not be set (Meter indicator does not illuminate)	Wire harness or connector
	Instrument cluster
	Engine Control Module (ECM)
Vehicle speed can not be set (Meter indicator comes on normally)	Constant speed cruise control switch
	Brake switch
	ESP and EPB

Symptom	Suspected Area
	Wire harness or connector
	Body Control Module (BCM)
	Engine Control Module (ECM)

3.2 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.

(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.

(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.

(4) Only use a digital multimeter to measure voltage of electronic system.

(5) Refer to any Technical Bulletin that may apply to this malfunction.

(6) Visually check related wire harness and connector.

(7) Check and clean all system grounds related to the latest DTCs.

(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.3 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.4 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.5 Front Camera Module (FCM) DTC Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C235016	Circuit Voltage Below Threshold	System internal power supply voltage is too low within 5 monitoring cycle.	1. System power supply voltage is too low; 2. Wiring harness connector malfunction; 3. Module malfunction.	1. Reset module and clear DTCs; 2. Check module power supply voltage; 3. Check wire harness connector; 4. Check module.
C235017	Circuit Voltage Above Threshold	System internal power supply voltage is too high within 5 monitoring cycle.		
C236016	Supply Voltage Error - Low Voltage	Power supply voltage is low (Ubat <= 8.5 V) for 90 seconds.	1. System power supply voltage is too low; 2. Wiring harness connector malfunction; 3. Module malfunction.	1. Check module power supply voltage; 2. Check wire harness connector; 3. Check module.
C236017	Supply Voltage Error - High Voltage	Power supply voltage is high (-Ubat>= 16.5V) for 90 seconds.		
C235144	Parameter Error - Dataset Error	Dataset error / CRC error / missed	Module data is lost.	Please download camera calibration data again.
C235246	Parameter Error - Initial Calibration Data Out Of Range	Initial calibration result out of range	Calibration is unsuccessful.	Use static or initial online method to recalibrate front camera again.
C235254	Parameter Error - Initial Calibration Data is lost	No initial calibration data	No calibration	
C235294	Process Error - Initial Calibration Timeout	Due to any of following conditions, timeout occurs in initial calibration: (1) Static calibration - inspection failure by manufacture. (2) Online calibration - within available period (Default value is 10 minutes) calibration is not completed successfully.	Calibration procedure is unsuccessful.	1) When performing static calibration: a) Check calibration panel; b) Check distance between calibration panel and ECU; c) Recalibrate camera. 2) For online calibration - Confirm road condition and whether condition meets calibration requirements, and recalibrate camera.
C235346	Parameter Error - Online Calibration Data Out Of Range	Compared with initial calibration result, online calibration result is out of range.	Module installation location is incorrect.	1) Check module installation location; 2) If necessary, use “static” or “initial online” method to perform initial calibration.
C23544B	Temperature Error - Controller	1. System temperature is too	Camera temperature is too high.	Please cool down the camera.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Temperature Out Of Range	high (system operation temperature > 100 ˚C) for 2 seconds; 2. Image-forming device temperature is too high or too low to operate normally (When image-forming device temperature is out of range: > 108C or < -48 C) for 150 ms.		
C235509	Electronic Error - Internal Electronic Failure Permanent	For specified identification method, observe internal electronic hardware permanent malfunction.	1. Intermittent fault; 2. Internal module fault.	1. Vehicle is powered off and clear DTCs; 2. Inspect and repair module.
C235549	Electronic Error - Internal Electronic Failure Temporary	Any malfunctions related to internal electronic hardware and peripheral devices (For example, ECU temperature sensor driver error, image-forming device sensor driver error, DMA, RAM, ROM, UART, CAN buffer zone malfunction, parity check malfunction, watchdog).		
C235597	Electronic Error - Camera Blindness	Image losses for 2700 seconds	1. Camera is covered. 2. System accidental malfunction.	Check if camera is covered.
C235635	Configuration Error - Calibration Parameter Mismatch	/	Configuration error.	Perform module configuration again.
C235646	Configuration Error - Configuration Coding Invalid	Module coding character string DID 0xFD00 contains CRC error. Module coding character string DID 0xFD00 contains CRC error (or) invalid value.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C235655	Configuration error - Not coded	1) ECU coding repair shop code - DID 0xF19A is not stored. ECU coding repair shop code contains all 0x00. 2) ECU enters “Not Coded” state - writing in DID 0xF19A ECU coding repair shop code	Configuration sequence error.	

3.6 DTC Diagnosis Procedure

DTC	**C235016**	**Circuit Voltage Below Threshold**
DTC	**C235017**	**Circuit Voltage Above Threshold**
DTC	**C236016**	**Supply Voltage Error - Low Voltage**
DTC	**C236017**	**Supply Voltage Error - High Voltage**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check fuse**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Check if instrument panel fuse box RF08 (5A) fuse is blown.

NG → **Replace fuse**

OK

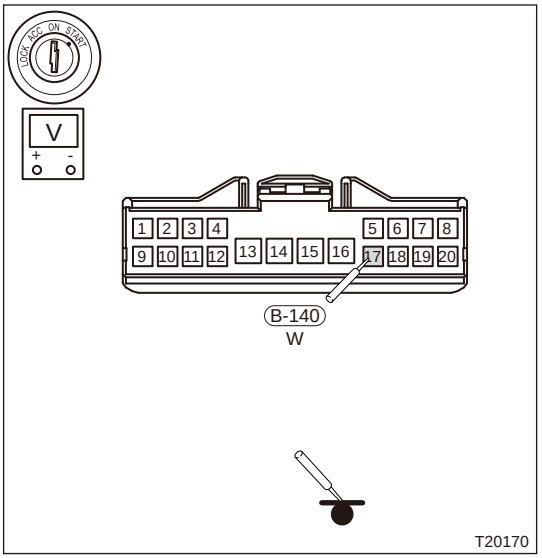
2	**Check instrument panel fuse box output voltage**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to ON.

(b) Check voltage between terminal 17 of instrument panel fuse box B-140 and ground. (When using digital multimeter)

Multimeter Connection	Condition	Specified Condition
B-140(17)- Body ground	ON	9-16V



NG → **Replace the instrument panel fuse box assembly**

OK →

3	Check wire harness for open

Use circuit diagram as a guide to perform the following inspection procedures:

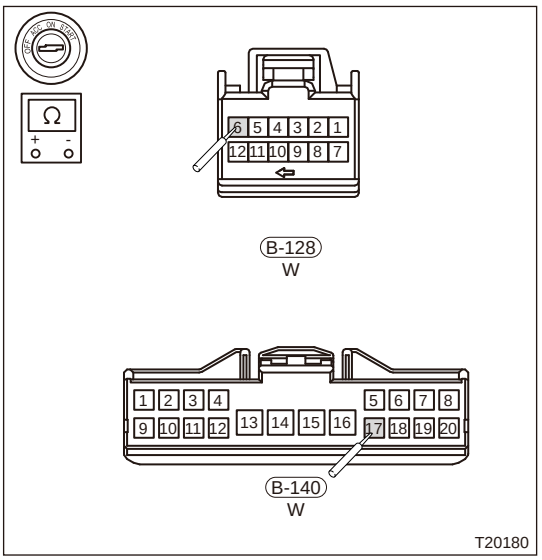
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect front camera module connector B-128 and instrument panel fuse box connector B-140.

(d) Using ohm band of digital multimeter, measure if resistance between connector B-140 (17) and connector B-128 (6) is normal to check wire harness for open.

Multimeter Connection	Condition	Specified Condition
B-140 (17) - B- 128 (6)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



NG → **Handle and repair related wire harness**

OK → **Replace front camera module assembly**

DTC	C235509	Electronic Error - Internal Electronic Failure Permanent
DTC	C235549	Electronic Error - Internal Electronic Failure Temporary
DTC	C235597	Electronic Error - Camera Blindness

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check for DTCs**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Using diagnostic tester, clear DTCs and read front camera control system DTCs again.

(b) Check if DTCs occur again.

OK → **System is normal**

NG

2	**Check if front camera operates normally**

NG → **Replace front camera module assembly**

OK → **Turn off vehicle power supply (disconnect the negative battery cable), then clear DTCs again**

DTC	**C23544B**	**Temperature Error - Controller Temperature Out Of Range**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Clear DTC to relieve overheat protection**

DTC	**C235144**	**Parameter Error - Dataset Error**
DTC	**C235246**	**Parameter Error - Initial Calibration Data Out Of Range**
DTC	**C235254**	**Parameter Error - Initial Calibration Data Missing**
DTC	**C235294**	**Process Error - Initial Calibration Timeout**
DTC	**C235346**	**Parameter Error - Online Calibration Data Out Of Range**

Hint:
Possible cause of malfunction: Front camera calibration is not performed or corresponding calibration conditions are not met.

1	**Refer to front camera calibration method and perform calibration again**

DTC	**C235635**	**Configuration Error - Calibration Parameter Mismatch**
DTC	**C235646**	**Configuration Error - Configuration Coding Invalid**
DTC	**C235655**	**Configuration Error - Not Coded**

Hint:
Possible cause of malfunction: Configuration data is not written into module.

1	**Rewrite configuration data**

3.7 Front Radar Module (FRM) DTC Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C106017	Supply Voltage Too High	Local measured voltage is higher than threshold of 18 V, confirm immediately.	1. System power supply voltage is too high; 2. Wire harness connector malfunction.	1. Check if battery voltage, power supply system, ground circuit and IGN circuit are normal; 2. Check if wire harness and connector are normal. Caution: Do not replace the millimeter wave radar.
C106016	Supply Voltage Too Low	Local measured voltage is lower than under voltage threshold of 6 V, confirm immediately.		
C106409	Drive Test Active	When ECU setting operates under drive test mode, this DTC will be detected. This driver test mode was run at BOSCH factory for quality inspection, then the sensor is delivered to OEM. Ideally, this mode should never be detected at the OEM's site.	Module is set to test mode.	Module returns to factory.
C106504	ECU Hardware Error	When some important hardware malfunctions are detected in at least 3 of 40 ignition cycles, it will detect DTC.	Module is damaged.	
C106601	ASIC Controller Voltage Failure	Battery voltage is out of normal radar operation range and this function can not be enabled. Under voltage and over voltage threshold depend on hardware specifications. Under voltage: Mature condition - Local measured battery voltage is lower than radar functional	1. Battery voltage is not stable. 2. Charging system malfunction. 3. Ground circuit malfunction. 4. Ignition circuit malfunction. 5. Wire harness malfunction. 6. Intermittent malfunction.	1. Check battery voltage. 2. Check charging system. 3. Check ground circuit. 4. Check ignition operation circuit. 5. Check wire harness for obvious sign of damage. Repeat the following steps for 3 times. - Perform the DTC clearing service. -

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		threshold (7.0 V) for 100 ms. Over voltage: Mature condition - When certain voltage clamp in power supply voltage range of 19 V to 25 V is detected by RADAR ECU, the incorrect detection time is 40 ms.		Perform the ignition cycle - Check if this DTC is still in active state. Replace the radar sensor if malfunction is still exists after repeating above steps for 3 times.
C106705	Radar Application Software Mismatch	If following errors are found, this DTC will be set: - The sensor data version flashed to the BOSCH factory sensor does not match the expected version of current application software - The antenna image version flashed on the sensor of BOSCH factory does not match the expected version of current application software - The Radar ASIC data version stored in flash memory of BOSCH factory sensor does not match the expected version of current application.	1. Accidental failure; 2. Radar sensor malfunction.	1. Perform DTC clearing service - perform an ignition cycle - check whether DTC still exists; 2. If this DTC is still in active state, please replace the radar sensor.
C106802	Front Radar (Disturbed)	If all the standard deviation of absolute signal amplitude or the noise in specific modulation slope measured through channels are not within the specified range of platform, DTC will be detected.	1. Radar is interfered by other possible device; 2. Radar sensor malfunction.	1. Confirm there is no vehicle or turn off vehicle that may interfere with the radar. 2. Clear DTC and perform an ignition cycle. If this malfunction still exists, replace the radar sensor.
C106A4B	Front Radar Module (Over Temperature)	1. Temperature of power supply PCB is out of range from -50 ˚C to 127 ˚C; 2. Microcontroller operation temperature is not	1. Environment temperature of sensor / vehicle is too high; 2. Radar sensor malfunction.	1. Place sensor / vehicle in a cooler environment. 2. Clear DTC and perform an ignition cycle. If this malfunction still

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		within range of - 40 ˚C to 150 ˚C.		exists, replace the radar sensor.
C106B09	Control Unit Failure	When the measured transmit power is lower than specified threshold and malfunction time continues for 300 ms, DTC will be detected, resulting in a decrease of detection range.	1. Environment temperature of sensor / vehicle is too high; 2. Radar sensor malfunction.	1. If temperature is high, please wait for ECU to cool down; 2. If external temperature is high, please place sensor in a cool environment; 3. Clear DTC and perform an ignition cycle, if the malfunction still exists, please replace the radar sensor.
C106C05	Critical Functionality Unavailable Failure	If important input data can not be received in certain quality, especially for the yaw rate quality, DTC will be detected. Unavailable conditions: 1. When the input signal used for yaw rate calculation is invalid for more than 10 s. 2. After "ECU", when all wheel speeds are equal to zero and difference between input filtering yaw velocity and the current estimated deviation value is not less than 2°/s, and this condition continues for more than 200 ms. When the longitudinal reference speed can not be guaranteed by FRM as required, DTC will also be detected. It can not be used as true under the following conditions: 1. More than one wheel speed have not been updated with valid value for at least 120 ms in the past; 2. The differences between average of	1. Wire harness connector; 2. Wheel speed and yaw rate information is incorrect; 3. Module malfunction.	Check if wheel speed and yaw rate information sent by ECU is transmitting correct values.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		all valid wheel speeds and uncalibrated reference speeds are not less than 0.3 m/s.		
C106E78	Uncalibrated	SDA routine or active alignment routine is in active state. After SDA / active / passive alignment routine is completed, the deviation angle is not within the specified range.	Module is not calibrated.	Complete module calibration.
C107055	Not Coded	When the software is loaded on sensor, this DTC will be set by default, which indicates ECU configuration is required.	Configuration writing is not performed.	ECU configuration learning is completed successfully according to the specified configuration sequence.
C107191	Incorrect Configuration Data	Due to ECU configuration is not performed successfully, the result of routine "-Check coding status" is incorrect, this DTC will be set: - 0xF19A: If content of DID 0xF19A is 0x00 (HEX), ECU configuration of repair shop code is invalid -0xF19B: If the contents of DID 0xF19B are all 0x00 (HEX), the ECU configuration date is invalid -0xFD00: If Short-VIN is compared with DID 0xF190 (the last 7 bytes), the configuration string is invalid and inconsistent, or the CRC of configuration string has error, or the trim level is not equal to 3/4/5. “	Configuration has error.	
C107253	Production Mode is Active	1. When the software is loaded on sensor, it will be	1. Production mode is enabled by mistake through	Use diagnostic tester to turn off production mode.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		production mode by default; 2. Use the diagnostic tester to set the production mode to "ON" through the write service (DID 4F80). Production mode will disable all functions to ensure that no false activation will occur on the assembly line.	diagnostic tester. 2. After sensor is refreshed.	
C107300	Calibration Parameter XML Mismatch	/	1. Calibration data is lost. 2. System is not calibrated.	Recalibration.
C1111FB	Radar Sensor Interference - Blind Spot	/	1. Covered by dirt; 2. Signal interference.	1. Check whether the sensor is dirty, clean the surface of module, and make sure that no reflective objects are placed directly in front of the sensor.
C1112FA	Radar System interference - No Field	/		1. Check whether the module is dirty; 2. Check that no reflective objects are placed directly in front of sensor.
C1112FB	Radar System Interference - Blind Spot	/		1. Check whether the sensor is dirty; 2. Clean the surface of module, and make sure that no reflective objects are placed directly in front of sensor.
C130204	Reference Speed Unavailable	/	1. Communication of module reference speed is incorrect. 2. Wire harness connector malfunction.	Check for reference wheel speed provided by ESP.
C130478	Horizontal Angle Deviation	/	1. The position in horizontal direction is deviated; 2. Horizontal calibration is not performed.	1. Check bracket for proper installation. 2. Perform horizontal calibration of module.
C130578	Vertically Angle Deviation	/	1. Module bracket is damaged; 2. There is deviation in sensor fixed position; 3.	1. Check bracket for proper installation. 2. Check sensor in fixed bracket for

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
			Module is damaged; 4. Horizontal calibration is not performed.	proper installation. 3. Check for broken debris and replace the radar sensor only when damage is obvious. If the vehicle has an accident due to frontal damage, replace the bracket and sensor assembly. 4. Perform horizontal calibration of module.
C130678	Target Not Updated	/	1. Intermittent malfunction; 2. Management malfunction in other module.	Clear DTC through diagnostic tester and reset the module. If DTC still exists, please check for other DTC.
C130964	Hardware Reliability Inspection	/	1. Intermittent malfunction; 2. Module power circuit malfunction.	1. Check external power for proper connection; 2. Turn off ignition switch again and restart the system.
C131210	Lens Heating Malfunction	/	Lens heating malfunction	1. Check whether the lens heating operates properly (- Check with diagnostic tester).
C134504	System Interference	/	1. Vehicle is in the interference area; 2. Module is interfered; 3. Module has malfunction.	1. Drive the vehicle away from interference area; 2. Remove the interference source. 3. Reset the module.
C134604	External Sensor Invalid due to Interference	/	1. Module dirty; 2. Module is covered.	1. Check whether the sensor is dirty, clean the surface of module; 2. Check front view of module and make sure that no reflective objects are placed directly in front of sensor.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
C2F9809	CAN Controller Malfunction	/	1. Intermittent malfunction; 2. Module malfunction.	1. Clear DTC and reset module. 2. If malfunction still exists, module may need to be replaced.
C106207	Tire Size Incorrect	When the estimated factor between speed determined by evaluating wheel speed and average speed of standing object exceeds the 10.5% threshold, DTC will be detected. Incorrect detection time is equal to 2 minutes. This is an estimated average value and depends on driving conditions.	Wheel speed is abnormal	1. Check whether the tire size of vehicle is correct; 2. Check whether the wheel speed transmitted by ECU is correct.

3.8 DTC Diagnosis Procedure

DTC	C106017	Supply Voltage Too High
DTC	C106016	Supply Voltage Too Low
DTC	C106601	ASIC Controller Voltage Failure

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuse

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Check if fuse RF29 5A is blown.

NG → Replace fuse

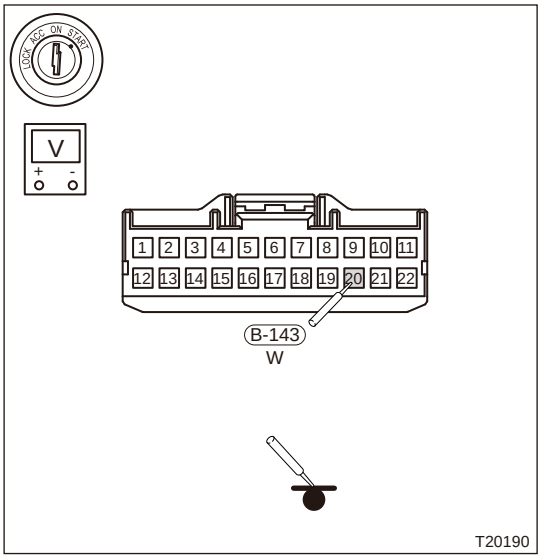
OK

2	Check instrument panel fuse box output voltage

(a) Turn ENGINE START STOP switch to ON.

(b) Check voltage between terminal 20 of instrument panel fuse box B-143 and ground. (When using digital multimeter)

Multimeter Connection	Condition	Specified Condition
B-143 (20) - Body ground	ON	9-16 V



NG → **Replace the instrument panel fuse box assembly**

OK

3	Check wire harness for open

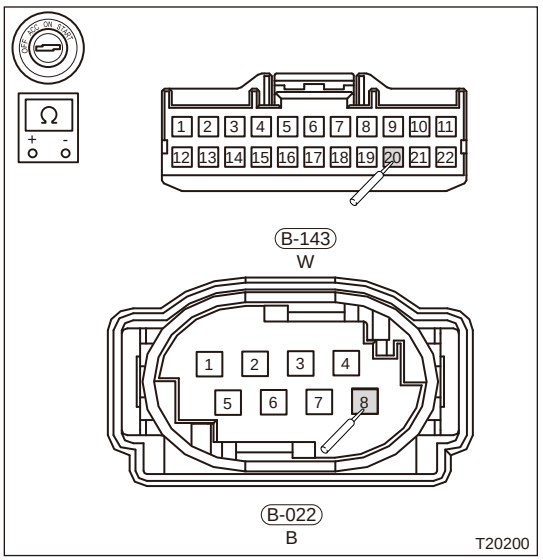
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect microwave radar module connector B-022 and instrument panel fuse box connector B-143.

(d) Using ohm band of digital multimeter, measure if resistance between terminal (20) of connector B-143 and terminal (8) of connector B-22 is normal to check wire harness for open.

Multimeter Connection	Condition	Specified Condition
B-143 (20) - B- 22 (8)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



NG → **Handle and repair related wire harness**

OK → **Replace microwave radar module assembly**

DTC	C106409	Drive Test Active

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.

- If DTC is not detected, malfunction is intermittent.

Hint:
Module is set to test mode.

1	**Replace microwave radar module assembly**

DTC	**C106504**	**ECU Hardware Error-Internal Electronic Failure**
DTC	**C106705**	**Radar Application Software Mismatch**
DTC	**C106B09**	**Control Unit Failure**
DTC	**C106C05**	**Critical Functionality Unavailable Failure**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check for DTCs**

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.

(b) Check if DTCs occur again.

OK → **System is normal**

NG

2	**Check if microwave radar module on the vehicle operates normally**

NG → **Replace microwave radar module assembly**

OK → **Turn off vehicle power supply (disconnect the negative battery cable), then clear DTCs again**

DTC	**C130204**	**Reference Speed Unavailable**
DTC	**C130478**	**Horizontal Angle Deviation**
DTC	**C130578**	**Vertically Angle Deviation**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check for DTCs

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.

(b) Check if DTCs occur again.

OK → System is normal

NG

2	Check steering angle position

NG → Calibrate the steering angle position of steering system.

OK → Turn off vehicle power supply (disconnect the negative battery cable), then clear DTCs again

DTC	C106207	Tire Size Incorrect

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check for DTCs

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.

(b) Check if DTCs occur again.

OK → System is normal

NG

2	Check if the tire size is the same as original tire size

NG → Replace tire of same type.

OK → Turn off vehicle power supply (disconnect the negative battery cable), then clear DTCs again

DTC	C2F9809	CAN Controller Malfunction
DTC	C130964	Hardware Reliability Inspection
DTC	C130678	Target Not Updated

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check for DTCs**

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.

(b) Check if DTCs occur again.

OK → **System is normal**

NG

2	**Check if microwave radar module on the vehicle operates normally**

NG → **Replace the microwave radar module**

OK → **Turn off vehicle power supply (disconnect the negative battery cable), then clear DTCs again**

DTC	**C134604**	**External Sensor Invalid due to Interference**
DTC	**C134504**	**System Interference**
DTC	**C1112FB**	**Radar System Interference - Blind Spot**
DTC	**C1112FA**	**Radar System interference - No Field**
DTC	**C1111FB**	**Radar Sensor Interference - Blind Spot**
DTC	**C106802**	**Front Radar (Disturbed)**

1	**Check for DTCs**

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.

(b) Check if DTCs occur again.

OK → **System is normal**

NG

2	**Check if microwave radar module is covered by foreign matters and clean dirt on the surface of microwave radar module**

OK → **Turn off vehicle power supply (disconnect negative battery cable), then clear DTCs again.**

NG

3	Check if the vehicle is equipped with other interference components

OK → System is normal

NG → Remove add-on components and test function

DTC	C106705	Radar Application Software Mismatch

Hint:
Possible cause of malfunction: Front radar calibration is not performed or corresponding calibration conditions are not met.

1	Check for DTCs

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.

(b) Check if DTCs occur again.

OK → System is normal

NG

2	Replace radar sensor and perform running test

OK → System is normal

DTC	C106A4B	Uncalibrated
DTC	C107300	Calibration Parameter XML Mismatch

CAUTION
Possible cause of malfunction: Front radar calibration is not performed or corresponding calibration conditions are not met.

1	Refer to front radar calibration method and perform calibration again

DTC	C107055	Not Coded
DTC	C107191	Incorrect Configuration Data

CAUTION
Possible cause of malfunction: Configuration data is not written into module.

1	Rewrite configuration data

DTC	C107253	Production Mode is Active

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.

- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Turn production mode off**

(a) Use diagnostic tester, enter system “Special Operation” to turn off production mode.

OK	**Perform running test after clearing DTCs**

DTC	**C131210**	**Lens Heating Malfunction**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check for DTCs**

(a) Using diagnostic tester, clear DTCs and read front radar control system DTCs again.
(b) Check if DTCs occur again.

OK	**System is normal**

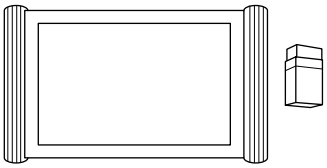
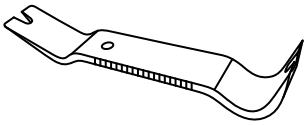
NG

2	**Check if front radar operates normally**

OK	**Turn off vehicle power supply (disconnect the negative battery cable), then clear DTC again**
NG	**Replace the front microwave radar module.**

4 ON-VEHICLE SERVICE

4.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 S00001
Interior Crow Plate	 S00020

4.2 Microwave Radar

■ Removal

WARNING

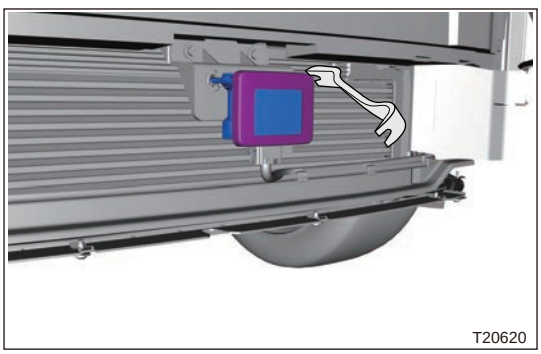
- **Be sure to wear necessary safety equipment to prevent accidents, when removing front bumper assembly.**
- **Appropriate force should be applied, when removing front bumper assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing front bumper assembly.**
- **Avoid breaking claws, when disassembling front bumper assembly.**
- **Avoid damage when detaching fixing clip of microwave radar.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

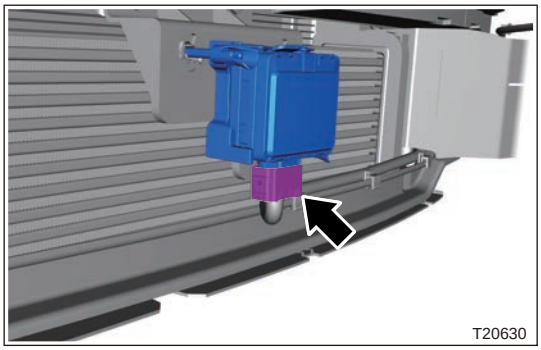
(2) Disconnect the negative battery cable.

(3) Remove the front bumper assembly.

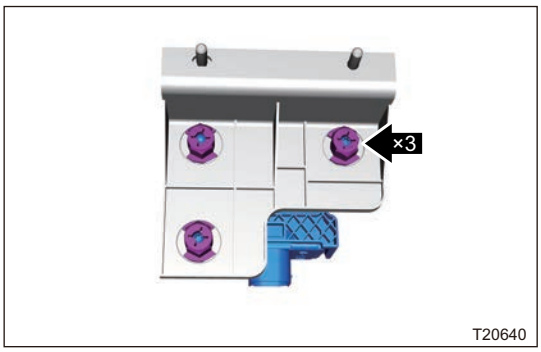
(4) Using an interior crow plate, pry off microwave radar cover.


T20620

(5) Disconnect the microwave radar connector.



(6) Detach 3 fixing clips from top and bottom sides of microwave radar.



(7) Remove the microwave radar module.

■ Installation

CAUTION

- **Try to prevent body paint surface from being scratched, when installing front bumper assembly.**
- **Make sure that front bumper is installed correctly and fitting clearance between front bumper and body is appropriate, when installing front bumper assembly.**

(1) Install the microwave radar.

(2) Install 3 fixing clips between microwave radar and bracket.

(3) Connect the microwave radar connector.

(4) Install the microwave radar cover.

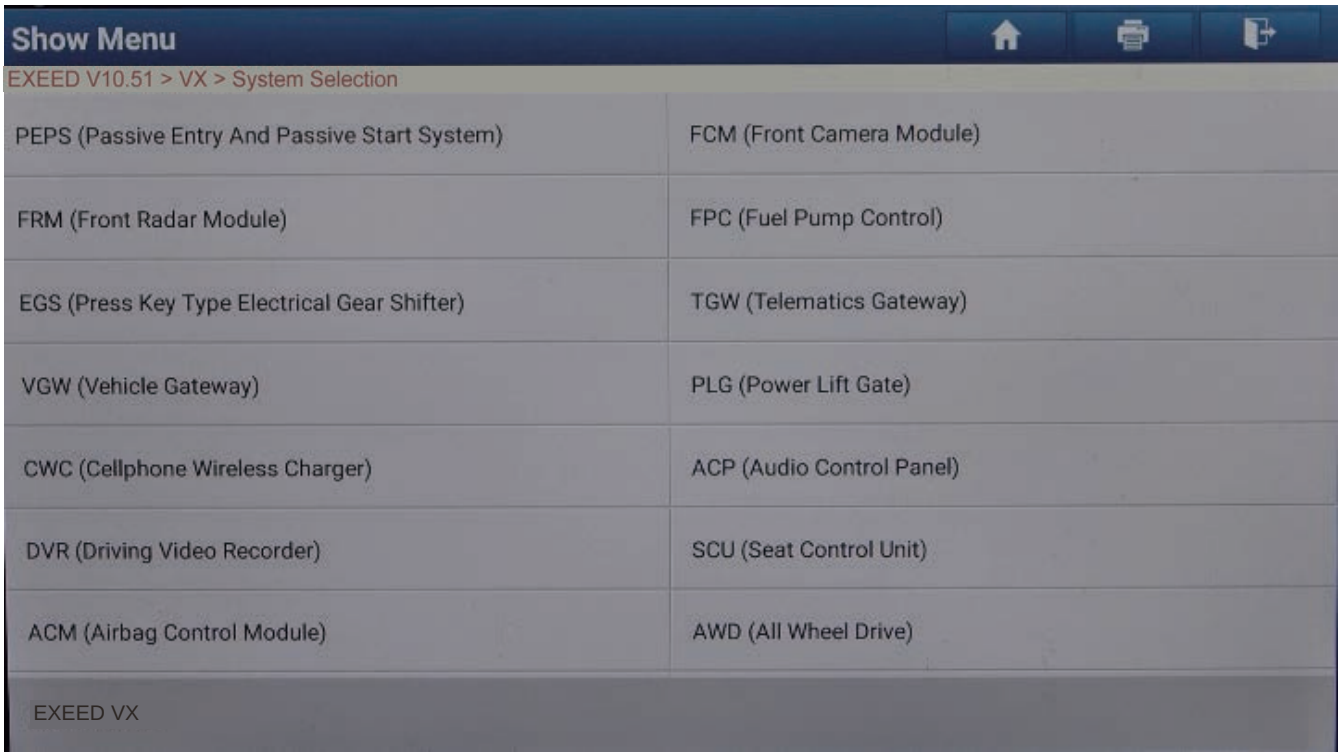
(5) Install the front bumper assembly.

(6) Connect the negative battery cable.

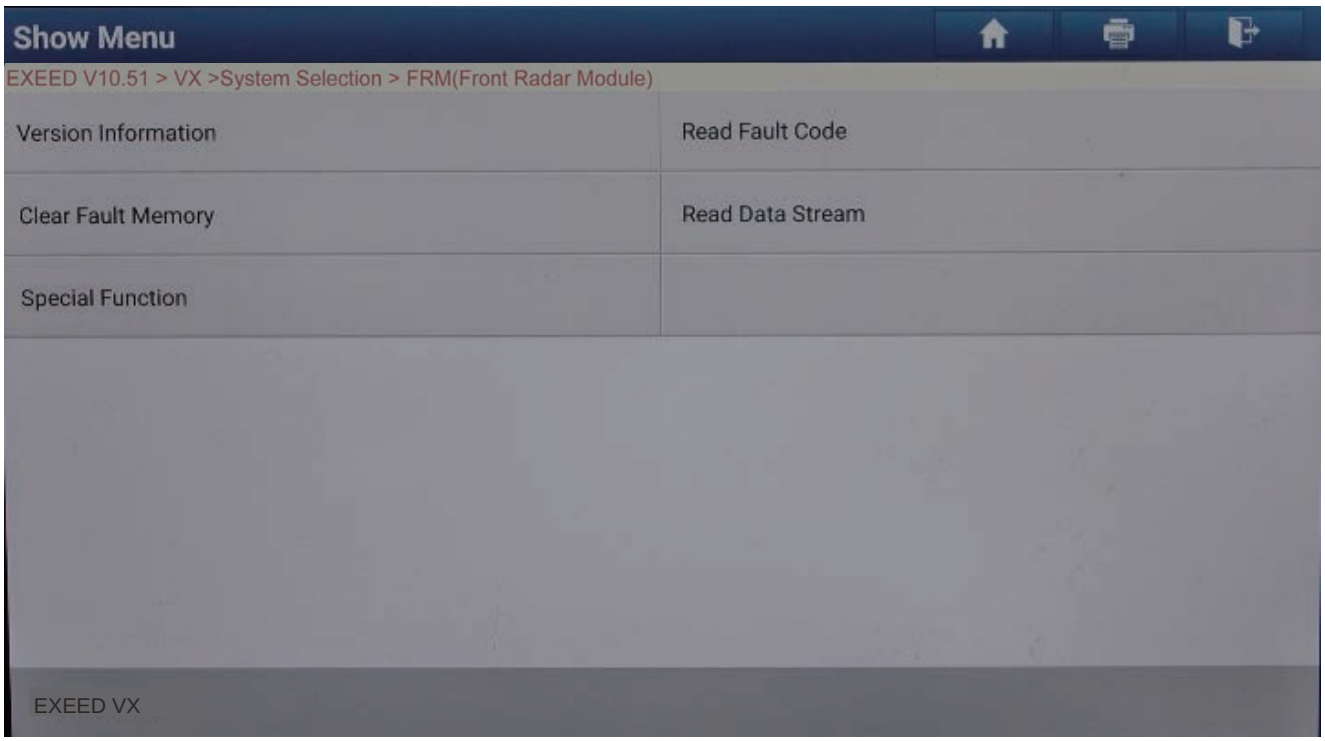
■ Matching Learning

■ Writing VIN code

(1) Connect diagnostic tester, enter the system, select model and click special operation.

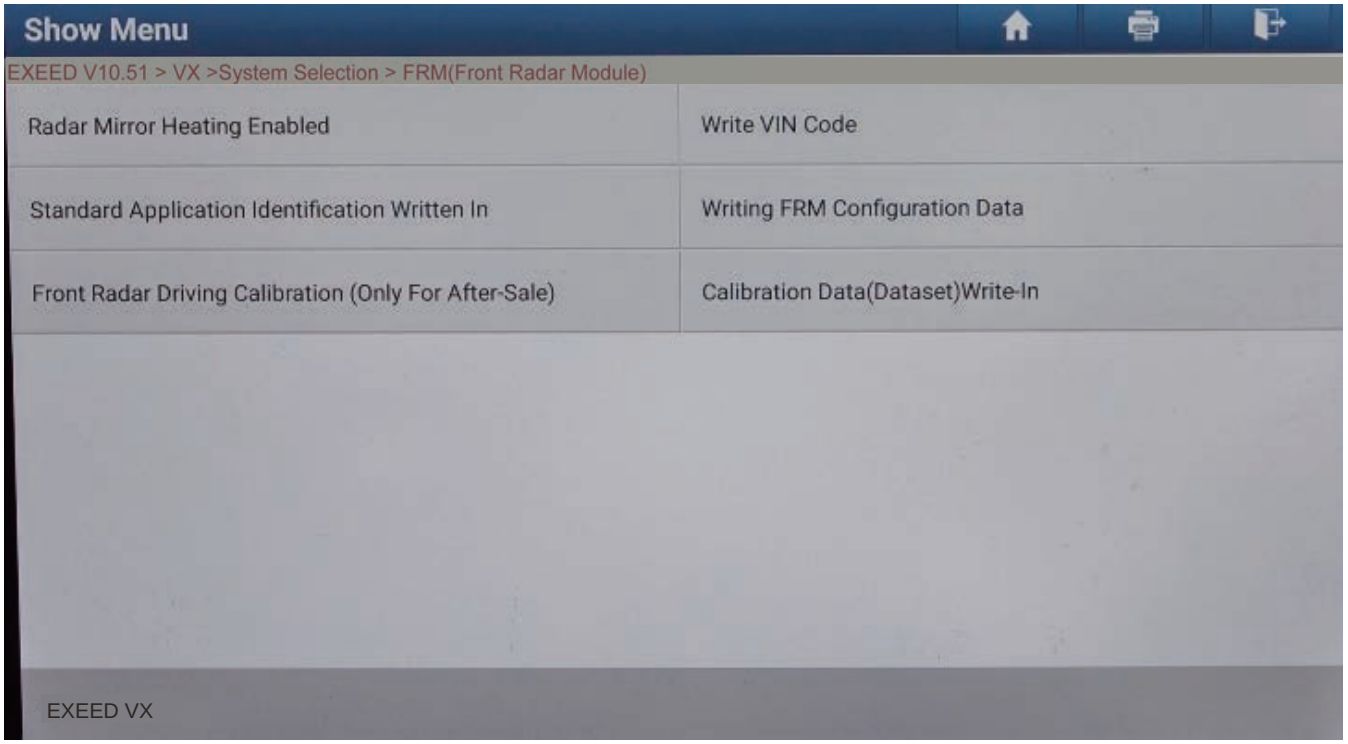


T20660



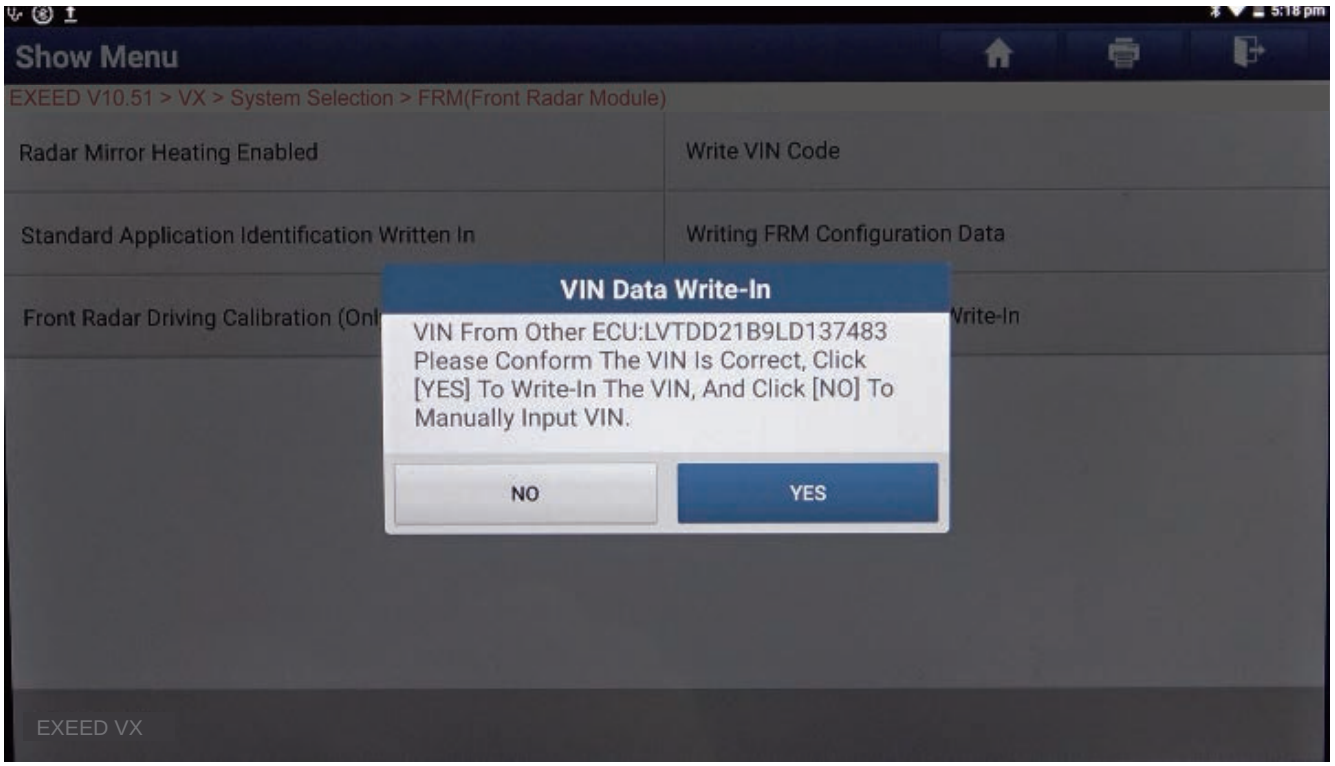
T20670

(2) Click “Write VIN Code”.



T20680

(3) Compare VIN code displayed on screen with vehicle. If the code is same, click “Yes”, otherwise click “No” and input it manually.



T20690

(4) Input corresponding VIN code and click “OK”.

■ Front radar after-sales driving calibration

Use a spirit level to calibrate the vertical direction of radar. The requirements for calibration are as follows:

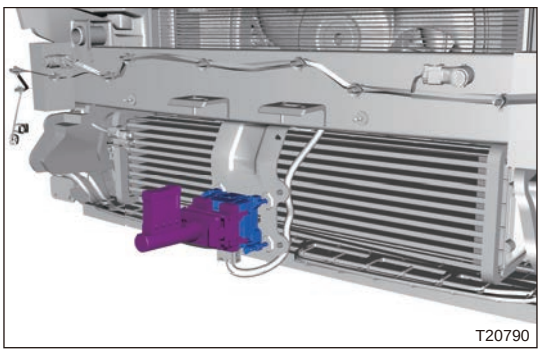
- Calibration site for parking vehicle must be horizontal, with an inclination of -0.3 - 0.3°, or inclination of calibration site can be measured.
- Keep the radar surface clean, especially ensure the positioning accuracy of three installation positioning points of the spirit level.
- Use SDA to calibrate the horizontal direction of radar. Environmental requirements for calibration are as follows:
  - Keep the radar surface clean and free of snow, soil and other objects.
  - Avoid calibration in rainy and snowy weather.
  - There should be stationary metal targets on both sides of road, such as lampposts, signboards, etc. Highway or elevated road with metal railings are recommended. When driving calibration is started, the vehicle must drive under certain conditions to gradually increase the progress bar of driving calibration to 100% and complete the driving calibration process. The driving conditions of calibration are as follows:

Limitations	Threshold	Out of Limit Hint
Minimum speed	40 km/h	Speed is too low
Maximum speed	120 km/h	Speed is too high
Minimum longitudinal acceleration	-0.5 m/s2	Longitudinal acceleration is too low
Maximum longitudinal acceleration	1.0 m/s2	Longitudinal acceleration is too high
Maximum lateral acceleration	2.0 m/s2	Lateral acceleration is too high
Maximum steering qulv	0.001 /m	Curvature is too large
ABS, ASR, ESP, MSR trigger		Vehicle dynamic condition interference (ABS, ASR, ESP, MSR, etc. trigger)

After sales calibration of medium distance radar is performed by combining level calibration and driving calibration. Use a spirit level to calibrate the vertical direction firstly, then use driving calibration service to calibrate the horizontal direction, and finally make the deviation between driving axis and radar axis within a certain range. Radar calibration is required when:

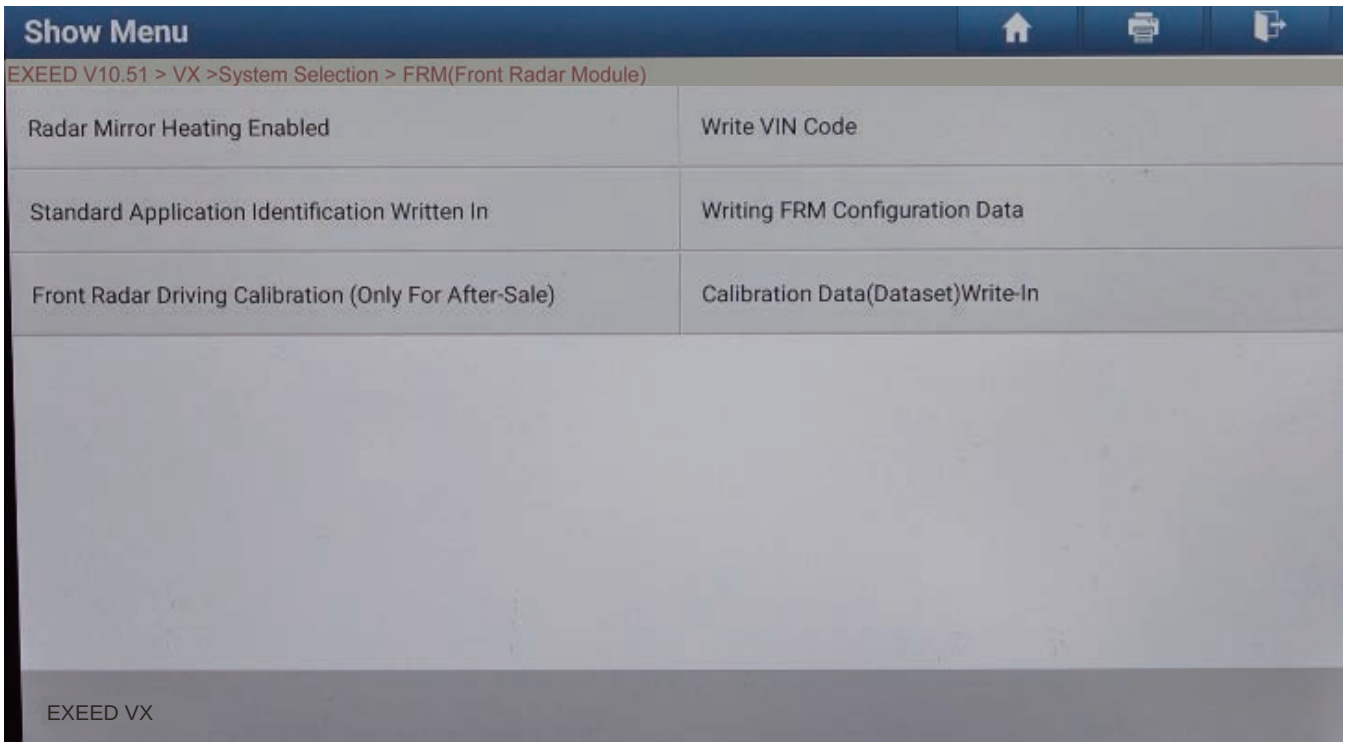
- When replacing radar assembly with a new one, for example, replace radar or radar bracket.
- When the driving axis of the vehicle changes, for example, four-wheel alignment was performed again, etc.
- When the radar reports an error and reads the error code as "Front Radar not Calibrated" by diagnostic equipment.

(1) Park the vehicle in a horizontal area, remove components around radar, front bumper and front radar cover, install front collision warning tool correctly, observe data showed on display of front collision warning tool. Adjust calibration bolt (right lower bolt) vertically so that data showed on display is close to 0°.


T20790

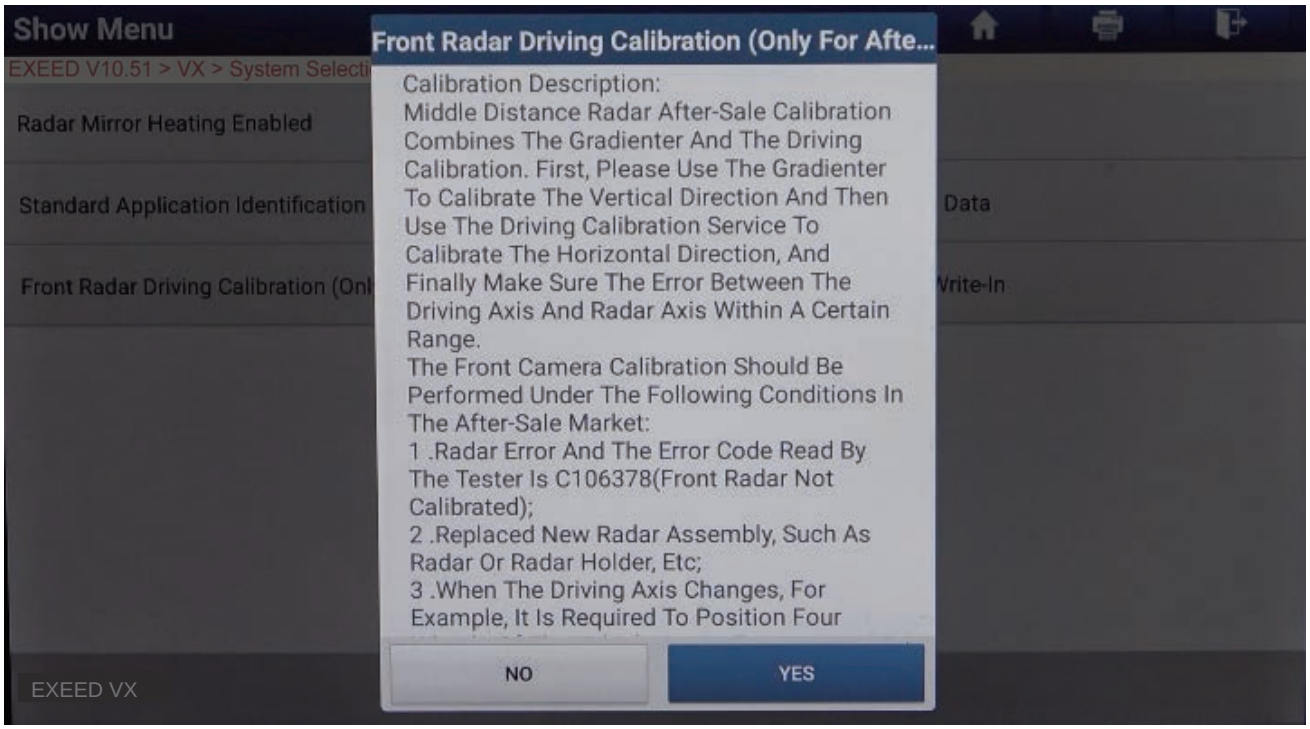
WARNING
Turn off factory mode before calibrating.

(1) Click “Front Radar After-sales Driving Calibration”.



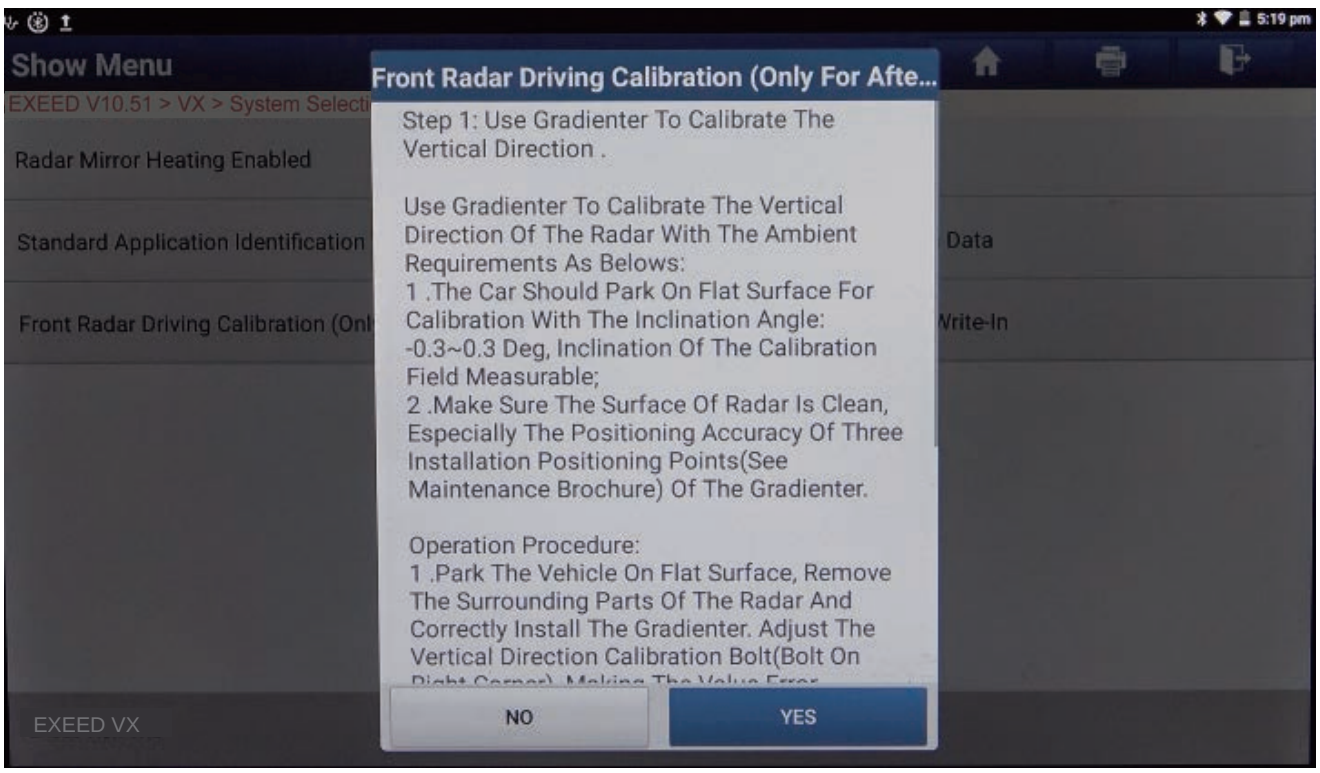
(2) Turn off factory mode before calibration.

(3) Read precautions, confirm and click “Yes”.



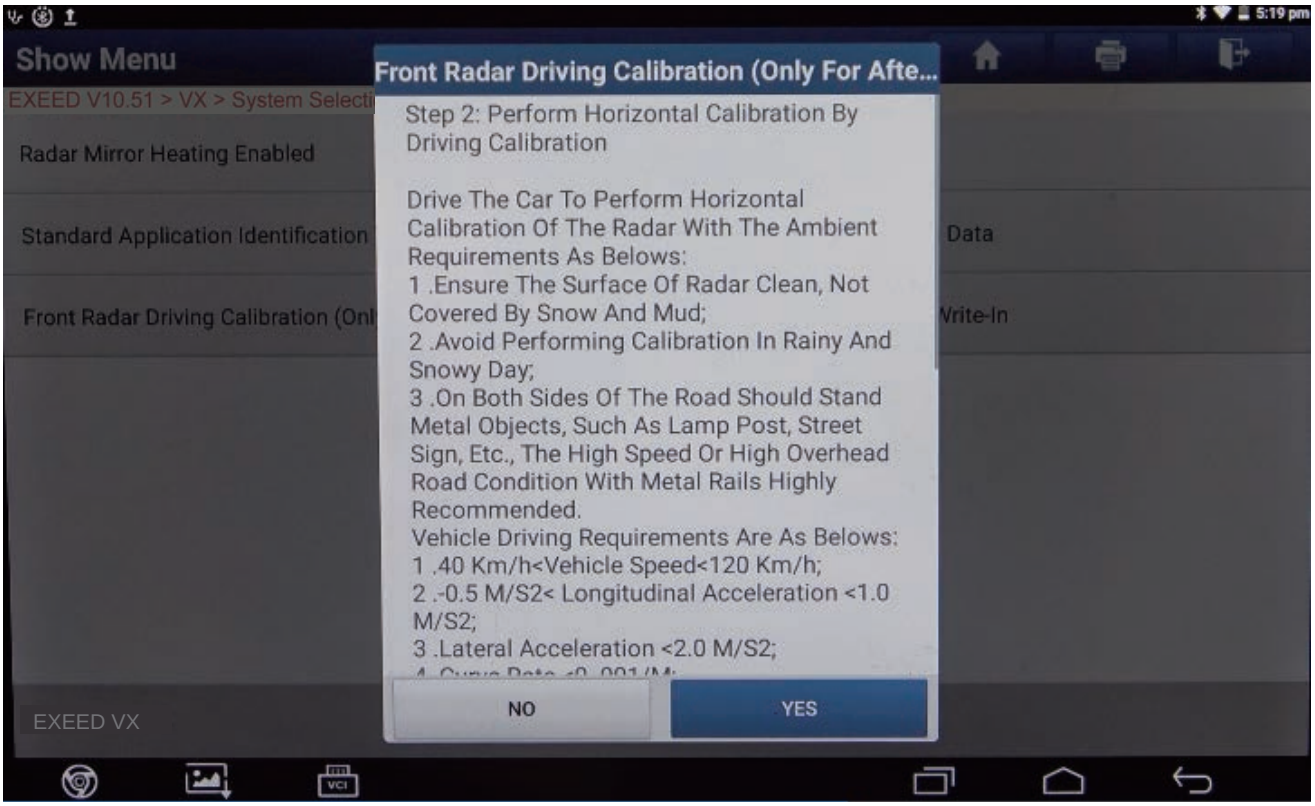
T20700

(4) Use front collision warning tool to calibrate vertical direction, and click "Yes" after completing items prompted by diagnostic tester.



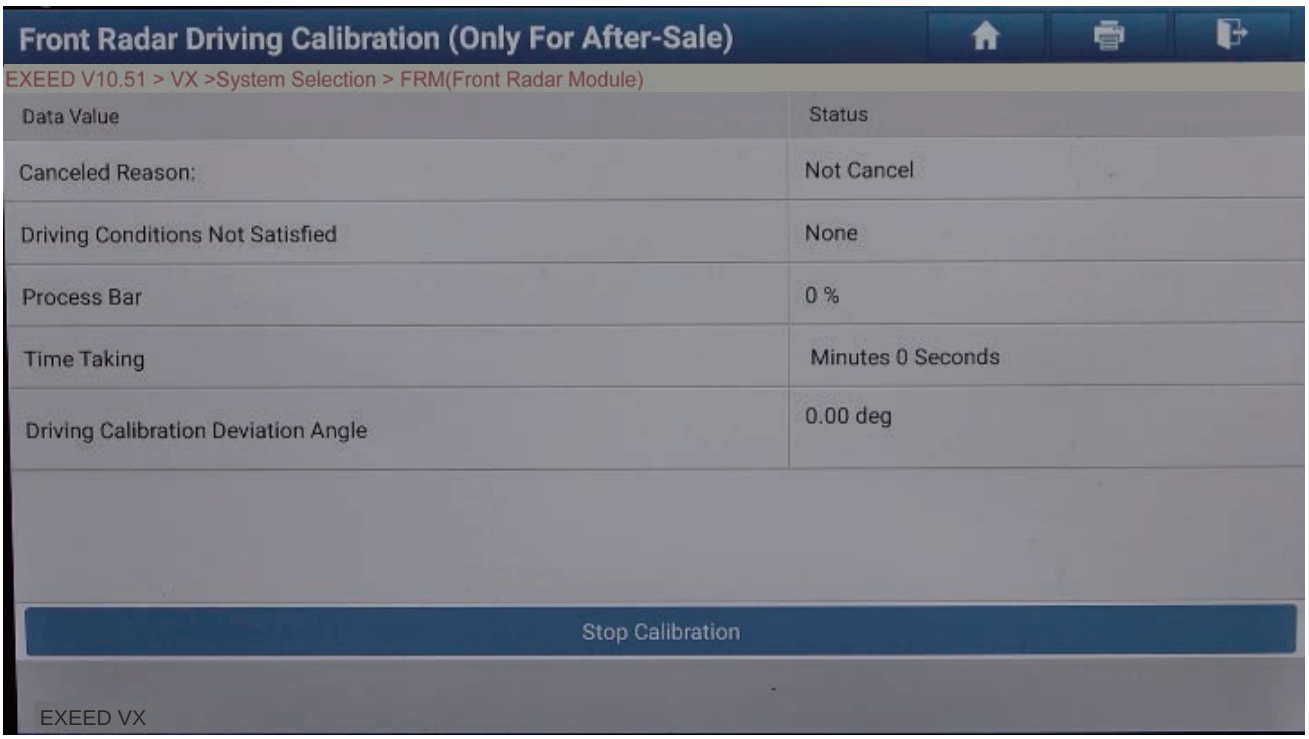
T20710

(5) Calibrate horizontal direction with driving calibration, and click “Yes”.



T20720

(6) Start driving calibration and drive according to driving conditions until the calibration progress bar reaches 100%.



T20730

WARNING

- **The calibration progress bar of 100% usually takes less than 20 minutes, which depends on road conditions and target quantity.**
- **If calibration still is not completed after more than 45 minutes, it is necessary to check whether calibration environment, driving conditions, installation position etc. are correct, and whether the driving calibration requirements are followed; after confirmation, repeat the above steps.**

HINT

Adjust horizontal calibration bolt according to requirements of calibration result; If the result exceeds threshold once, after adjusting calibration bolt, perform driving calibration again to ensure the calibration is completed.

CAUTION

Calibration may fail if following conditions occur:

- **Driving conditions always do not meet requirements: Surrounding references, road conditions.**
- **Communication between diagnostic tester and body is interrupted during calibration.**
- **Installation deviation of radar is too large.**

4.3 Multi-function Front Camera

WARNING

- **Be sure to wear necessary safety equipment to prevent accidents, when removing multi-function front camera.**
- **Appropriate force should be applied when removing multi-function front camera. Be careful not to operate roughly.**
- **Remove multi-function front camera to perform matching calibration.**

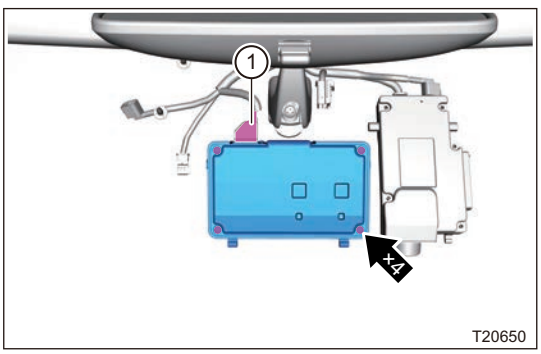
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the inside rear view mirror right protective cover.

(4) Remove the inside rear view mirror left protective cover.

(5) Disconnect multi-function front camera connector (1) and remove 4 fixing screws from multi-function front camera.



■ **Installation**

CAUTION
• **Be sure to tighten fixing screws to specified torques when installing multi-function front camera.**

(1) Install multi-function front camera.

(2) Install multi-function front camera connector and 4 fixing screws.

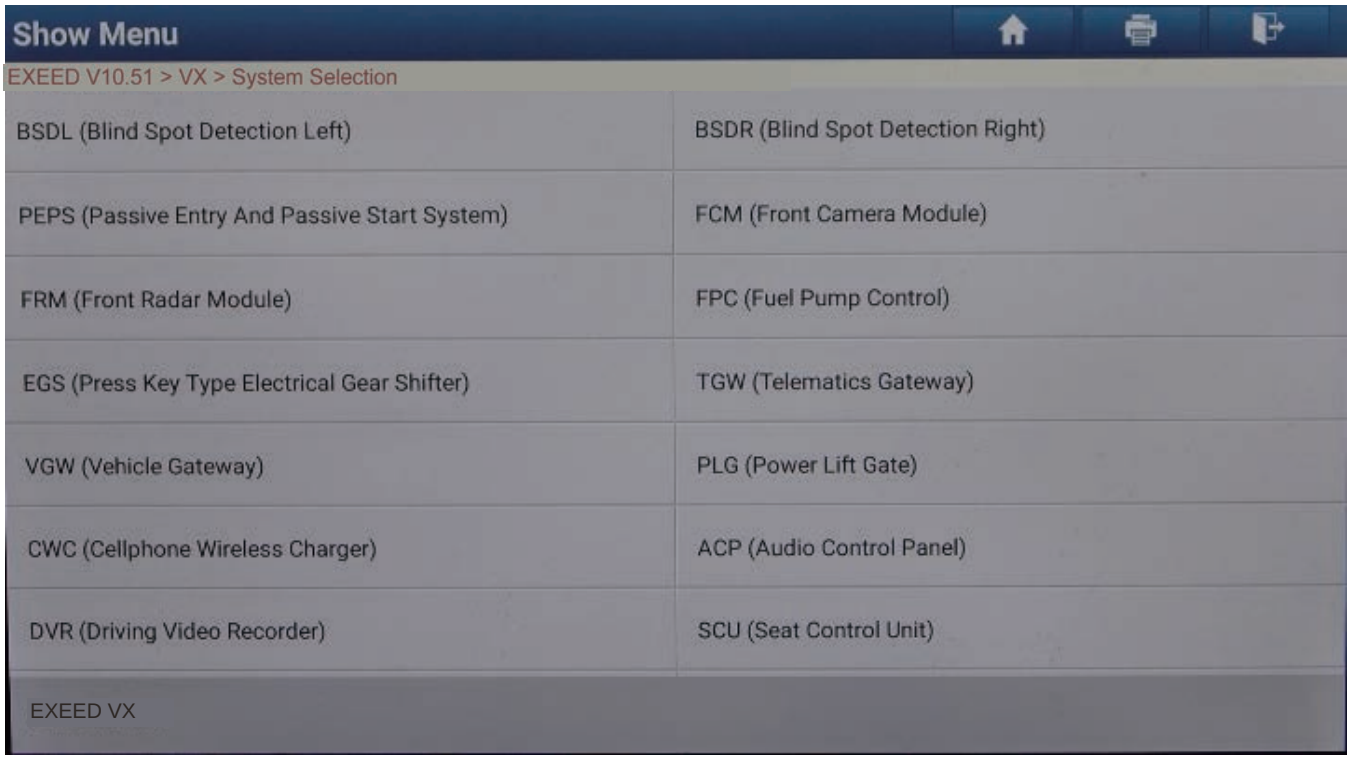
(3) Install the inner rear view mirror right protective cover.

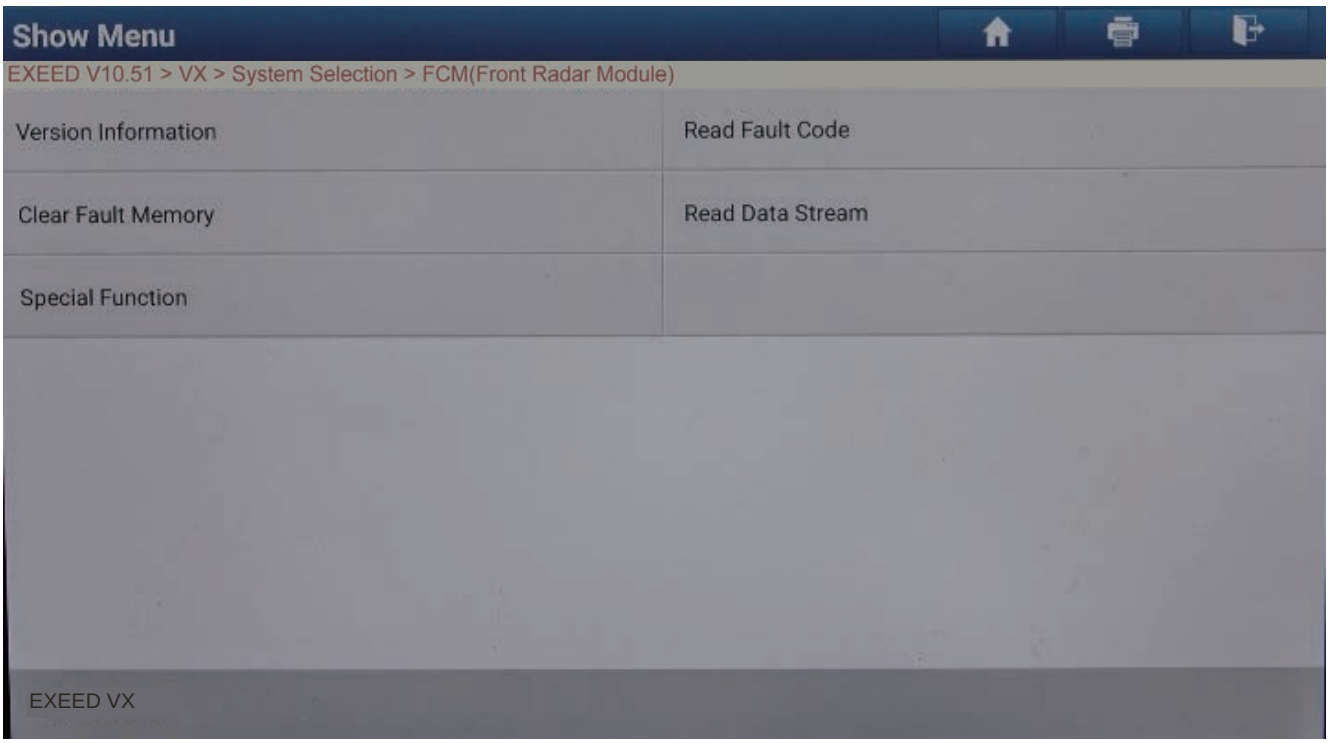
(4) Install the inside rear view mirror left protective cover.

■ **Matching Learning**

■ **Writing VIN code**

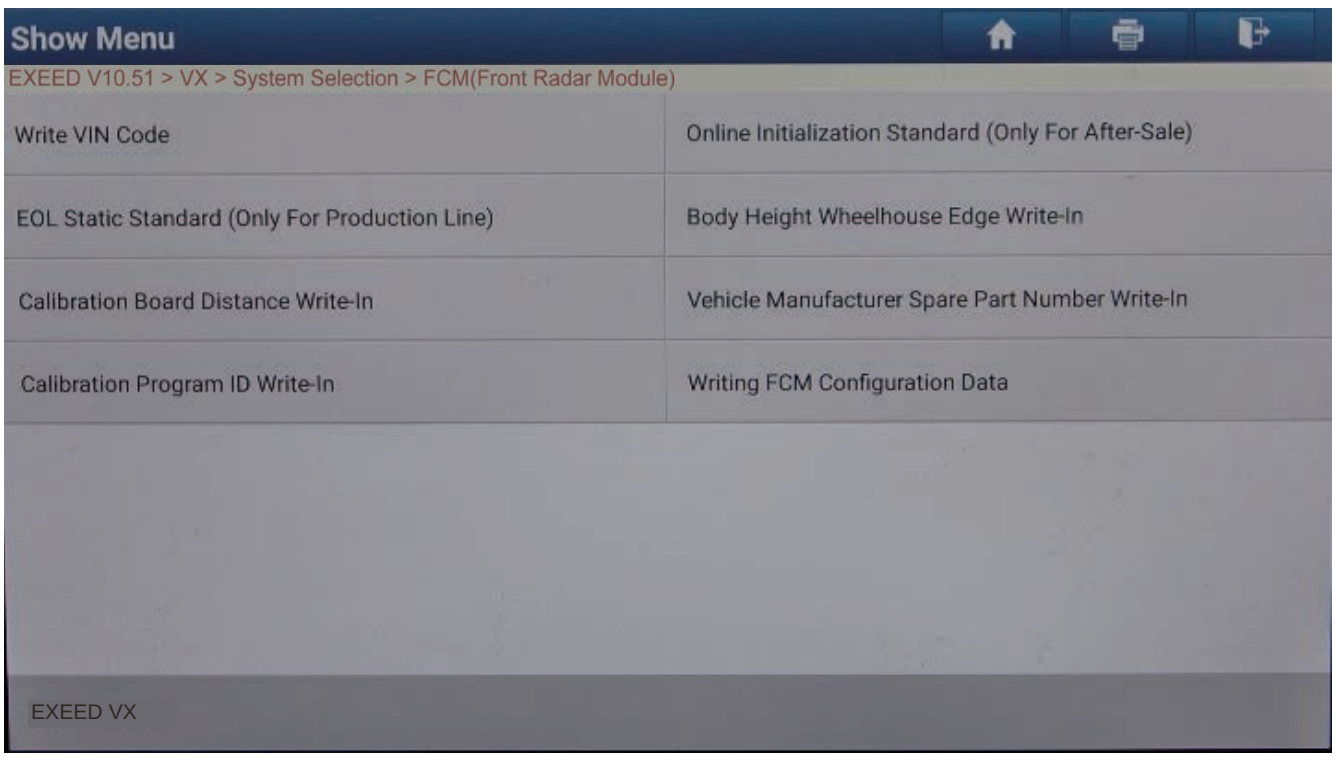
(1) Connect diagnostic tester, enter the system, select model and click special operation.





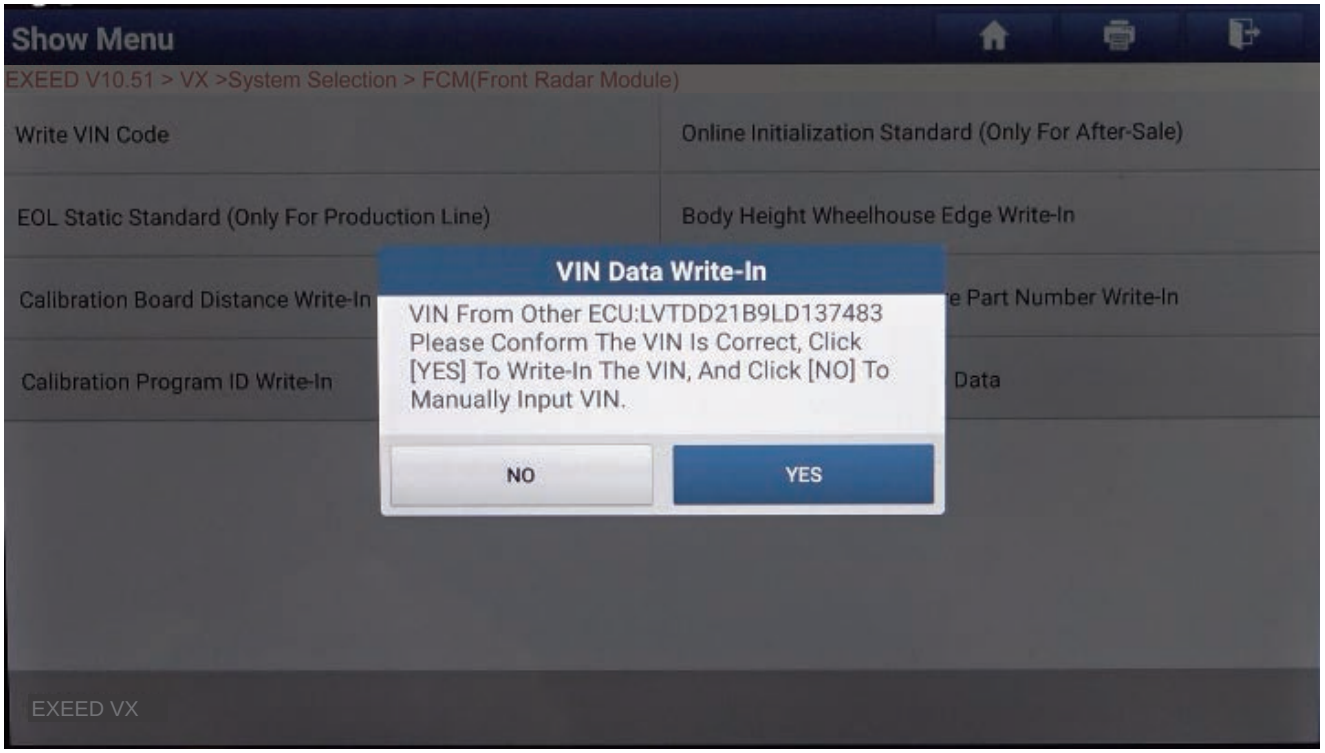
T20750

(2) Click “Write VIN Code”.



T20760

(3) Compare VIN code displayed on screen with vehicle. If the code is same, click “Yes”, otherwise click “No” and input it manually.

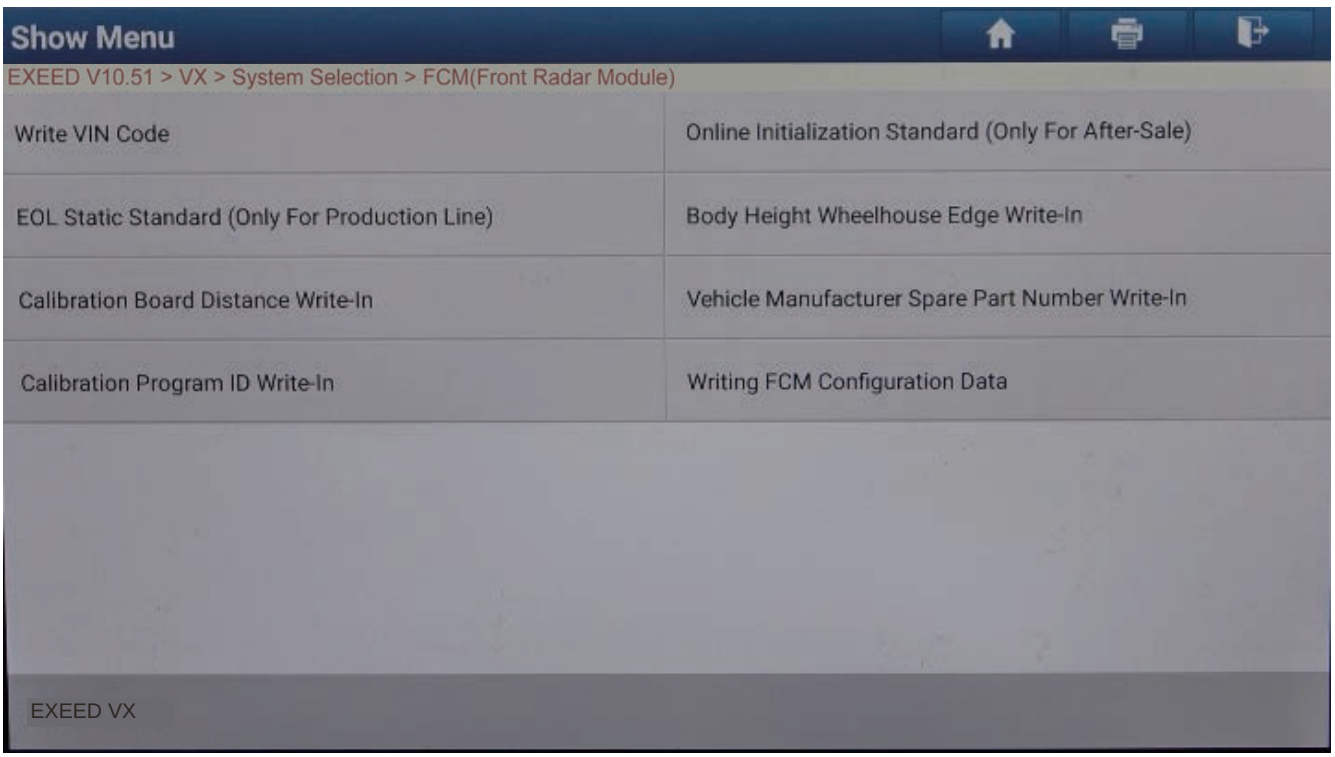


T20770

(4) Input corresponding VIN code and click “OK”.

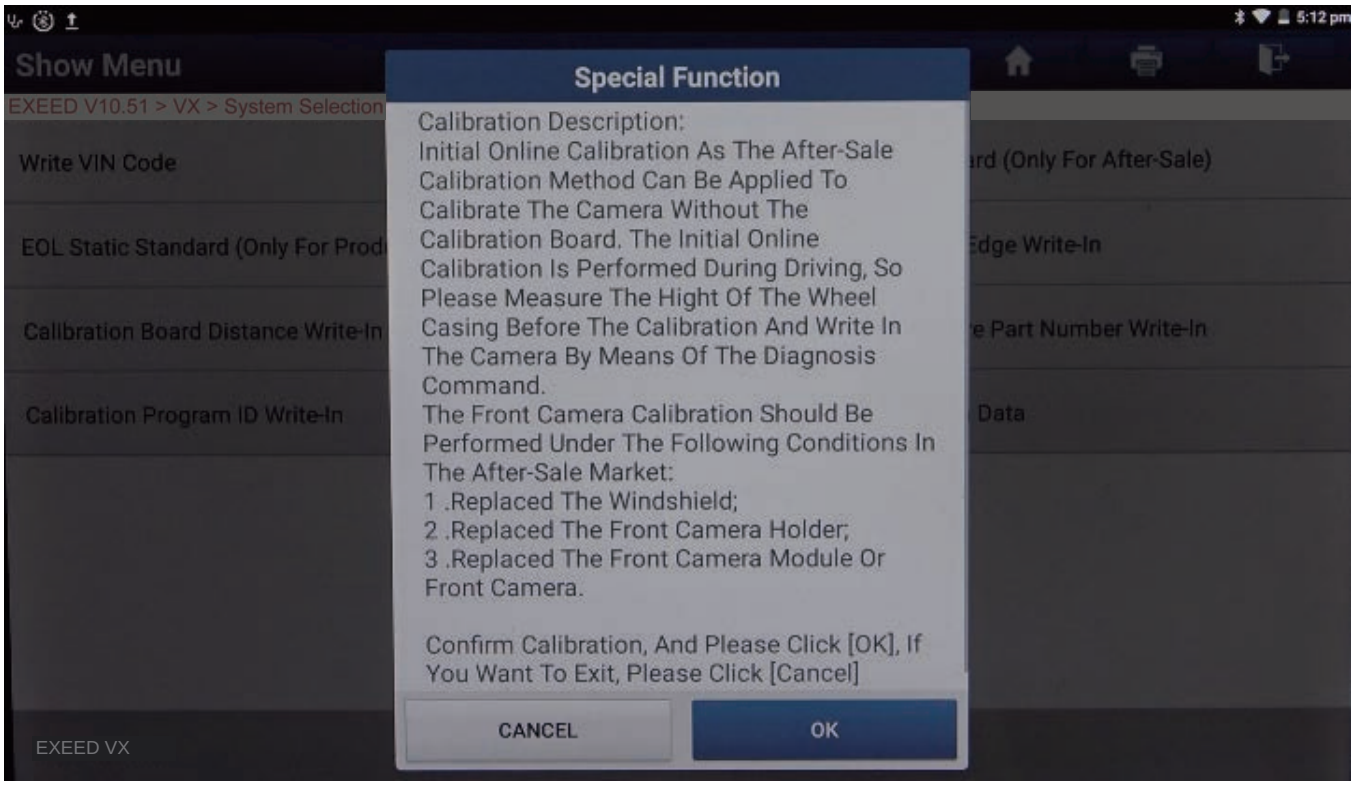
■ **Online initialization calibration**

(1) Click “Online Initialization Calibration (Only for After-Sales)”.



T20760

(2) Carefully read calibration precautions, confirm and click “Yes”.



(3) According to the information, drive the vehicle for 6 minutes.

(4) Calibration is finished.

11.4 BLIND SPOT DETECTION SYSTEM

1 System Overview

1.1 System Description

During actual driving, due to the blind spots on both sides of the vehicle, the driver may not pay attention to or fail to observe the situation in the side lane when changing lanes and overtaking, which may cause an accident. The blind spot detection system assists the driver to drive safely, which does not belong to vehicle driving safety system and cannot replace driver's control. It is only used to supplement the deficiencies of inside and outside rear view mirrors, and cannot replace the inside and outside rear view mirrors.

- The Blind Spot Detection System (BSD) consists of 2 24G millimeter wave radar sensors, 2 millimeter wave radar sensor shields, 2 millimeter wave radar sensor brackets and 2 warning lights.
- The millimeter wave radar sensor is responsible for the alarm strategy and sends out an alarm signal. The shield of millimeter wave radar sensor absorbs the clutter signal reflected from multipath.
- The millimeter wave radar sensor bracket is used to install the sensor and must meet the installation specifications.
- The warning light is used to prompt the driver for warning information of blind spots.

■ System Self-check

The radar system malfunction warning function means that the system will perform self-check every time it is powered on. When the radar system controller detects that the system is faulty, it will send out the visual and audible warning to notify the driver, and record the corresponding diagnostic trouble code.

■ Detection Target

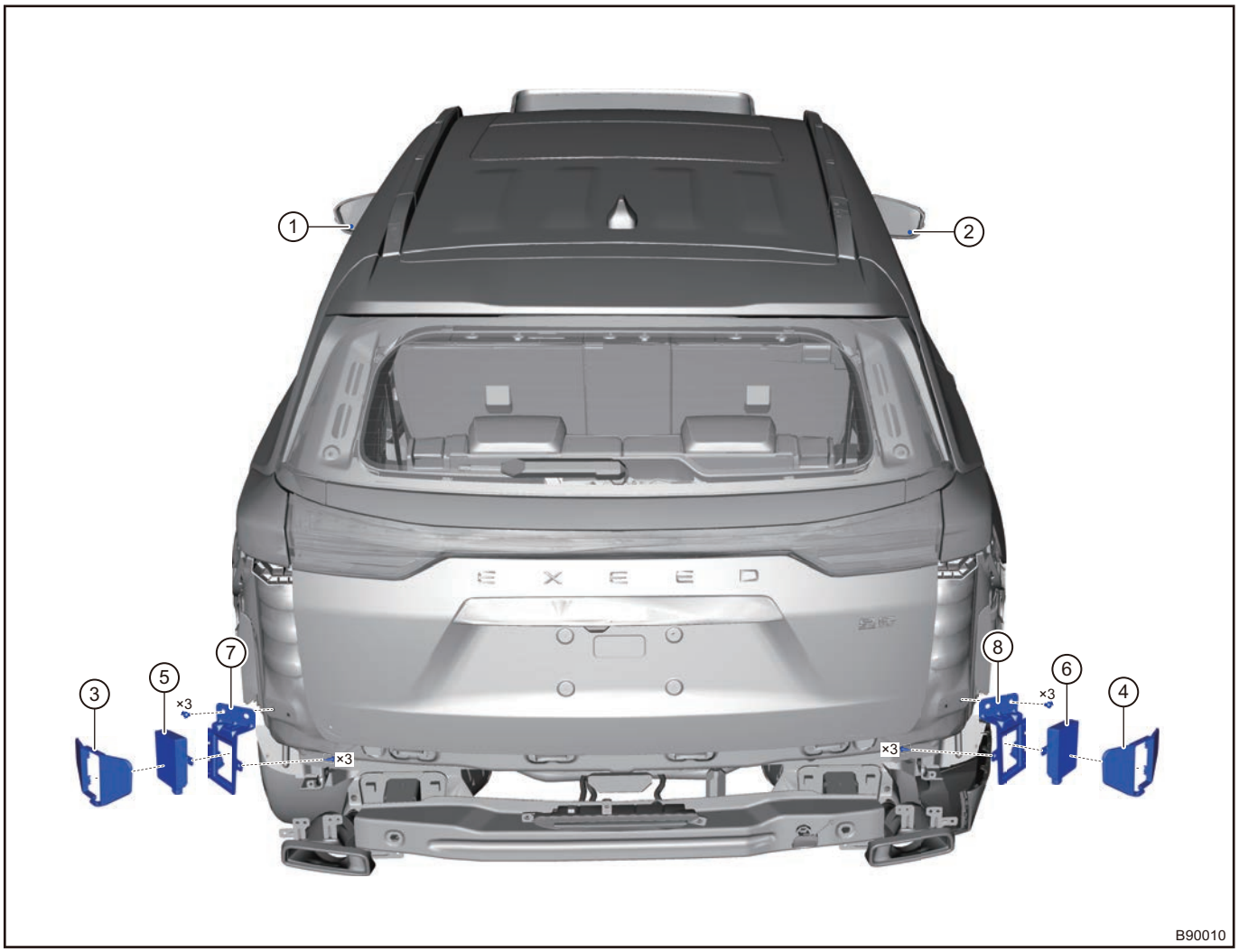
Detection target: Car, truck, motorcycle, bicycle. Because the reflection cross-sectional areas of motorcycle and bicycle are relatively small, the detection distance will be shorter than that of car and truck.The blind spot detection system does not alarm for stationary objects, and the minimum detection speed is 5 km/h.The blind spot detection function does not give an alarm to the stationary target in the alarm area. Such as stopped vehicles, vegetation, guardrails, tunnels, etc.

■ System Alert Level

When the alarm conditions are met, the blind spot detection system prompts the alarm through visual and sound methods. The alarm level is divided into two levels:

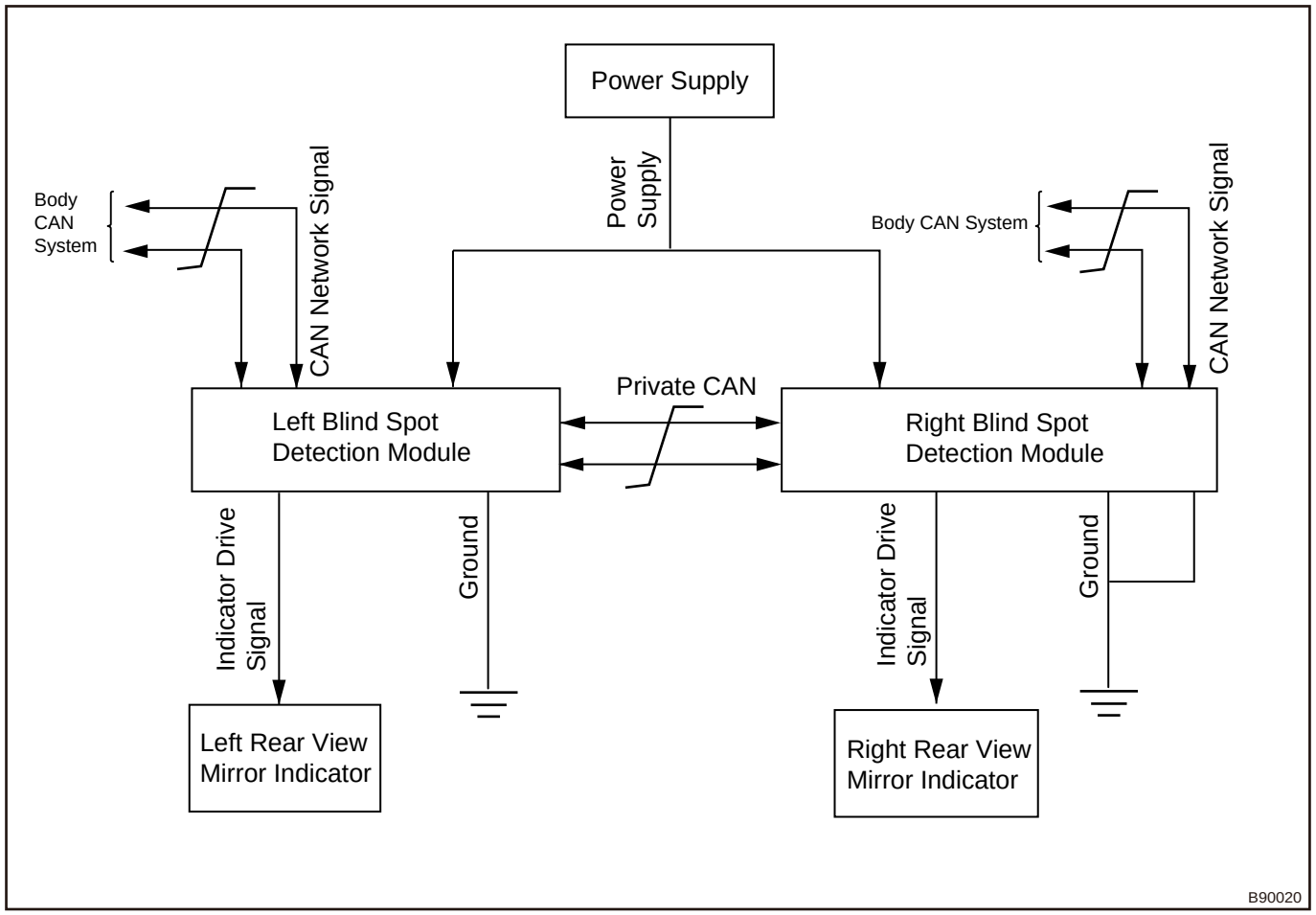
- Level 1, the measured target meets the alarm conditions, the first level alarm, the warning light remains ON to reminding the driver to drive carefully.
- Level 2, the measured target meets the alarm conditions, the driver turns on the corresponding side turn signal light, the second level alarm, to remind the driver of the risk of lane change with flashing and warning sound.

1.2 Description



1	Left LED Light	2	Right LED Light
3	Left Blind Spot Detection Module Cover Plate	4	Right Blind Spot Detection Module Cover Plate
5	Left Blind Spot Detection Radar	6	Right Blind Spot Detection Radar
7	Left Blind Spot Detection Radar Bracket	8	Right Blind Spot Detection Radar Bracket

1.3 System Principle



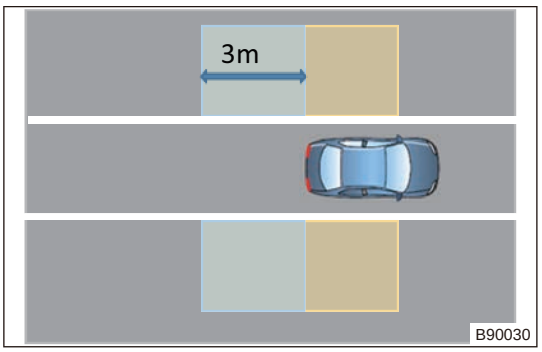
The control module is integrated inside the radar sensor. The radar communicates with the vehicle network through CAN bus. The communication between left radar sensor and right radar sensor is carried out through private CAN.BSDL receives vehicle speed signal, ignition switch status signal, turn signal light switch, yaw rate sensor data, steering wheel position signal, background light status, light intensity, wheel speed signal (-four wheels), gear position signal through CAN, and transmit the warning information to instrument cluster through CAN network.BSDR receives vehicle speed signal, ignition switch status signal, turn signal light switch, yaw rate sensor data, steering wheel position signal, background light status, light intensity, wheel speed signal (four wheels), gear position signal through CAN, and transmit the warning information and warning stop information to instrument cluster through CAN network.

1.4 System Function

Blind spot radar needs to implement the following functions: Blind Spot Detection (BSD), Lane Change Assist (LCA), Rear Cross Traffic Alert (RCTA), Door Opening Warning (DOW), Close Vehicle Warning (CVW) when moving forward, Rear Collision Warning (RCW) when reversing. Lane change assist function, blind spot detection function, front door opening warning function, reversing lateral warning function, and reversing rear collision warning function share warning lights and buzzers. The rear door opening warning function enables the LED lights on rear door, and the rear collision warning uses the turn signal light to alert target vehicle driver when moving forward.

■ Blind Spot Detection (BSD)

Blind spot detection function: If there is a moving vehicle in the driver's blind spot area, the system will provide warning information. The blind spot detection function is designed to assist driver to drive safely, which does not belong to vehicle driving safety system. Therefore, it only used to supplement the deficiencies of inside and outside rear view mirrors, not to replace the inside and outside rear view mirrors. The blind spot detection function is auxiliary function and cannot replace the driver's control.



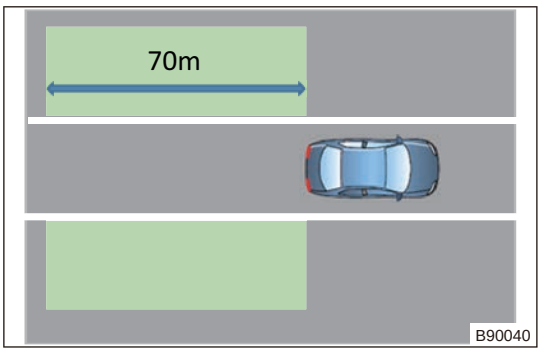
- Blind spot detection function is activated: The vehicle is activated in forward gear or neutral gear, and the vehicle speed is 5 km/h or more.

The blind spot detection areas are as follows:

- When the vehicle overtakes the target vehicle, the target vehicle will enter from the front of alarm area, and there will be an alarm suppression time of 2 seconds, that is, the target vehicle stays in the alarm area monitored by the blind spot for more than 2 seconds, and the driver does not turn on the turn signal light, then the corresponding side warning light is come on; if the driver turns on the turn signal light at this time, the corresponding side warning light flashes.
- When the target vehicle overtaking this vehicle, the target vehicle will enter from behind of the warning area. When the vehicle enters the warning area, and the driver does not turn on the turn signal light, the corresponding side warning light will come on; if the driver turns on the turn signal light at this time, the corresponding side warning light will flash and sound. (At this time, it is no relationship with relative speed)

■ Lane Change Assist (LCA)

Lane change assist function: When the rear vehicle is approaching quickly from the adjacent lane, according to the collision time, the radar will alert the dangerous vehicle in blind spot. The maximum alarm distance can up to 70 m.Lane change assist is designed to supplement the blind spots that cannot be eliminated by the vehicle inside and outside rear view mirrors (but cannot replace the rear view mirrors). It uses two radars at the rear of vehicle to detect the sides back and sides of the vehicle at all times. Evaluate the lane change situation when the vehicle wants to change lanes, and give early warning of possible collisions when there are moving vehicles in the blind spot area of the driver and approaching the vehicle quickly, so as to ensure the safety of the driver when changing lanes and greatly reduce traffic accidents.



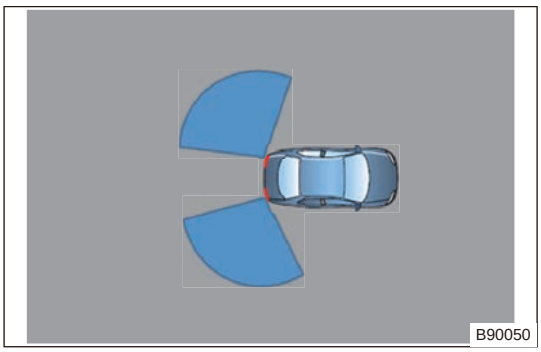
- Lane change assist function is activated: The vehicle is activated in forward gear or neutral gear, and the vehicle speed is 5 km/h or more.

The detection area of lane change assist is as follows:

- The lane change assist alarm evaluation algorithm is: An alarm will be sound when the Time to Collision (TTC) between the rear fast approaching vehicle and this vehicle is less than the alarm threshold of 3.5s. The driver does not turn on the turn signal light, the corresponding side warning light will come on; if the driver turns on the turn signal light at this time, the corresponding side warning light will flash and sound.
- The lane change assist area is not fixed, but changes with the shape of the road. The road shape can be calculated using yaw rate, steering wheel angle and vehicle speed. In order to ensure the function of the system, the turning radius of the road is greater than 500 m. According to the state of the turn signal light, LCA provides two different levels of alarm, including the light remains on and flashing, as well as sound alarm.

■ Rear Cross Traffic Alert (RCTA)

Reversing assist function: When the driver is reversing from parking area, especially in a very narrow and crowded parking area, because the sights on both sides of the vehicle are blocked by nearby vehicles, the driver cannot observe whether there are oncoming vehicles on both sides of the rear of the vehicle. An alarm is provided to the driver if a moving vehicle running behind crosses the route of the vehicle. This function is effective when reversing in a crowded area and the driver's view is blocked by buildings, vegetation or other parked vehicles. The reversing assist system is a comfort system that reminds the driver when the driver’s reversing view is affected.



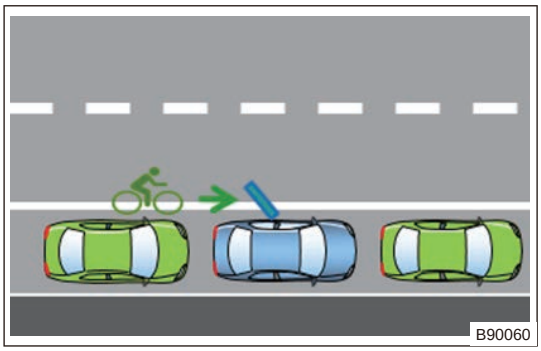
- Reversing assist function is activated: The vehicle is in reverse gear and the reverse speed is lower than 10 km/h.

The detection area of reversing assist is as follows:

- When the vehicle is reversing, an alarm will be sound when there is a possibility of collision between this vehicle and the vehicle in detection area and the Time to Collision (TTC) is less than the alarm threshold of 2 seconds. The corresponding side warning light flashes.

■ Door Opening Warning (DOW)

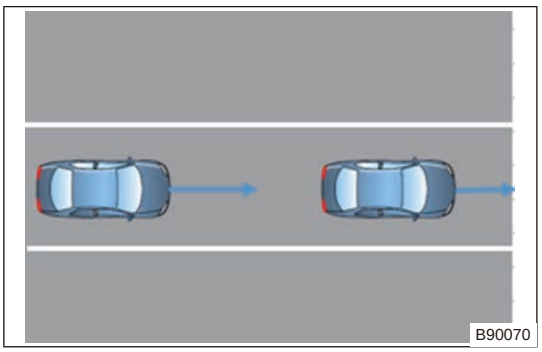
The door opening warning function detects the approaching vehicles and bicycles in the rear of the adjacent lanes through sensors, and gives an alarm when there is a risk of the door opening, so as to prompt the driver not to open the door at this time.



- Function activation condition: Any gear, vehicle speed is between 0 and 3 km/h.
- The target driving direction is toward the crash box of this vehicle (width is 1.5 m, length is 3 m). The radius of sector area is 48 meters. When the target vehicle enters the detection area, an alarm is generated when TTC is less than 3 seconds, and when driver opens the door, the alarm will be upgraded to level 2. LED flashes with sound alarm.

■ Close Vehicle Warning (CVW) When Moving Forward

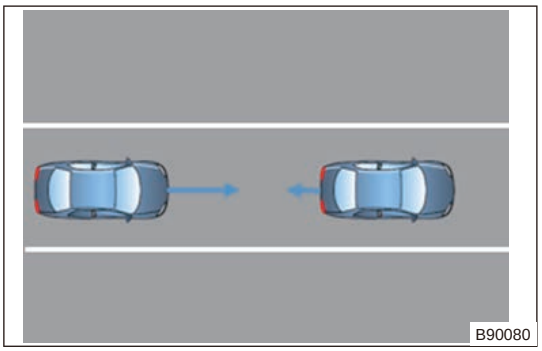
Close Vehicle Warning (CVW) when moving forward function: When this vehicle is moving forward or stationary in the lane. The target vehicle quickly approaches this vehicle in the same lane. At this time, the target vehicle is at risk of collision with this vehicle. The target vehicle will be warned by flashing turn signal light.



- Activation condition: When the vehicle is in forward gear or neutral gear, the vehicle speed is higher than or equal to 0 km/h, then CVW function will be activated.
- Warning condition: When the driving direction of target vehicle is towards this vehicle, and the vehicle speed is lower than 30 km/h, TTC is lower than the relative speed × 30/2.4s, this vehicle will flash the turn signal light to warn the target vehicle, when the speed of this vehicle is higher than 30 km/h, TTC is lower than 2.4 seconds, the vehicle will flash the turn signal light to warn the target vehicle.

■ Rear Collision Warning (RCW) When Reversing

Rear collision warning function when reversing: When this vehicle is reversing or stationary in the lane. The target vehicle quickly approaches this vehicle in the same lane. At this time, the target vehicle is at risk of collision with this vehicle. Flashing LED lights and sound alarm to warn the driver to stop reversing or driving forward instead.



- Activation condition: When this vehicle is in reverse gear, and vehicle speed is lower than 8 km/h, the RCW function is activated.
- Warning condition: When the target vehicle is driving towards this vehicle and the relative speed is 5～63 km/h, and when the pre-collision time between the target vehicle and this vehicle is less than 2.2 seconds or the target vehicle enters the mandatory alarm area (8.5 m behind the vehicle).

1.5 Component Operation Description

■ Blind Spot Detection Radar (24G Millimeter Wave Radar Sensor)

The blind spot detection module uses the principle of ultrasonic reflection to detect. It sends out ultrasonic and receive back wave from obstacle, controller calculates obstacle position and distance according to ultrasonic distance measuring principle, and sends data to display terminal to remind.

■ Blind Spot Detection Module Cover Plate

It absorbs the clutter signal reflected from multipath.

■ Blind Spot Detection Module Bracket

It is used to install the sensor and must meet the installation specifications.

■ Warning Light

It is used to prompt the driver that the warning information of blind spots.

2 DIAGNOSIS & TESTING

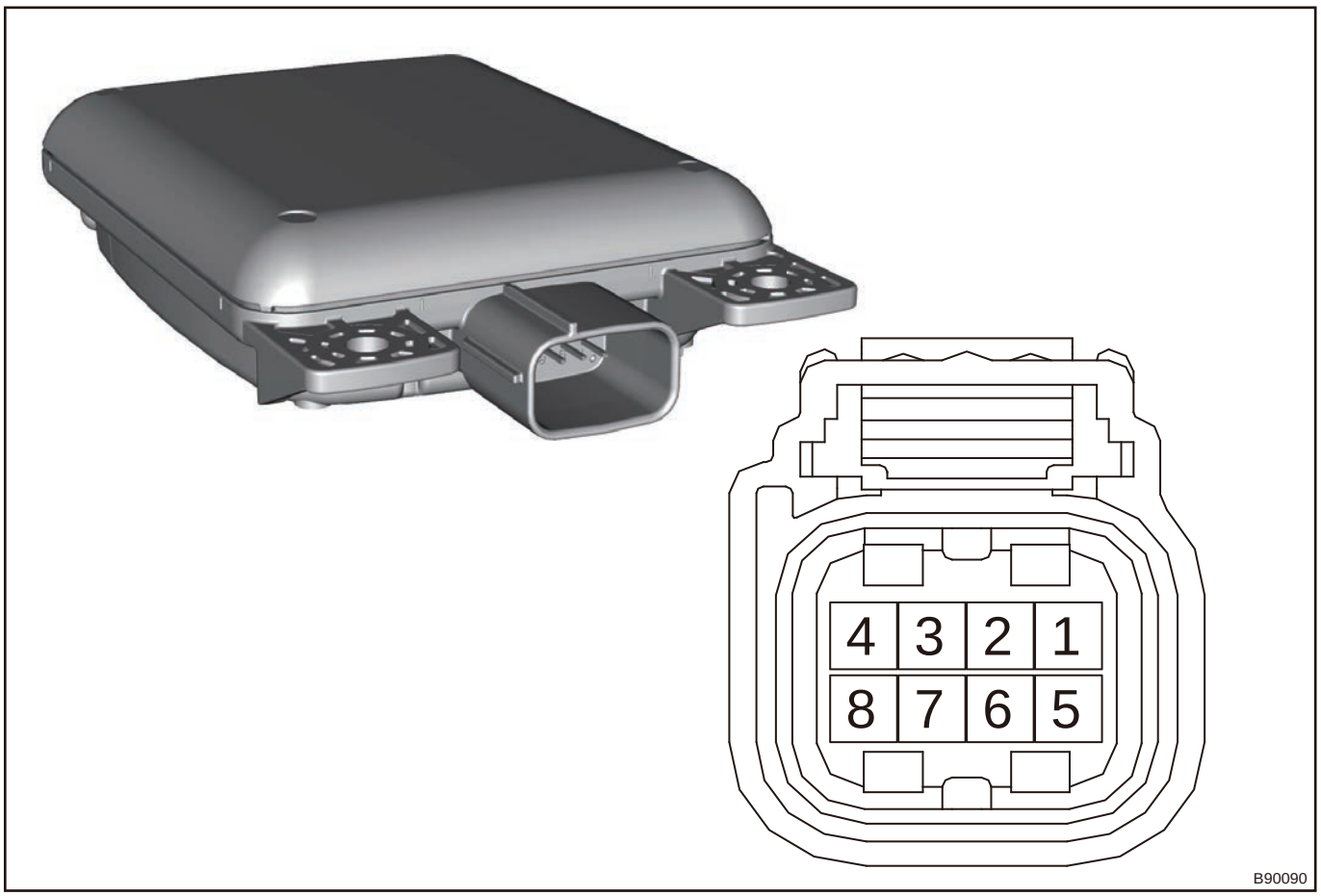
2.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair or adjust faulty components, or replace as necessary.

Symptom	Possible Cause
Blind spot detection does not operate	Add-on components leads to shielding or system interference
	Add-on components leads to shielding or system interference, or blind spot detection function off
	Module power supply ground fails
	Module itself fails
Blind spot detection abnormal	System voltage is abnormal
	Module installation location is improper
	Module fails
LED warning indicator abnormal	Rear view mirror is damaged
	Connection wiring is abnormal
	Module fails

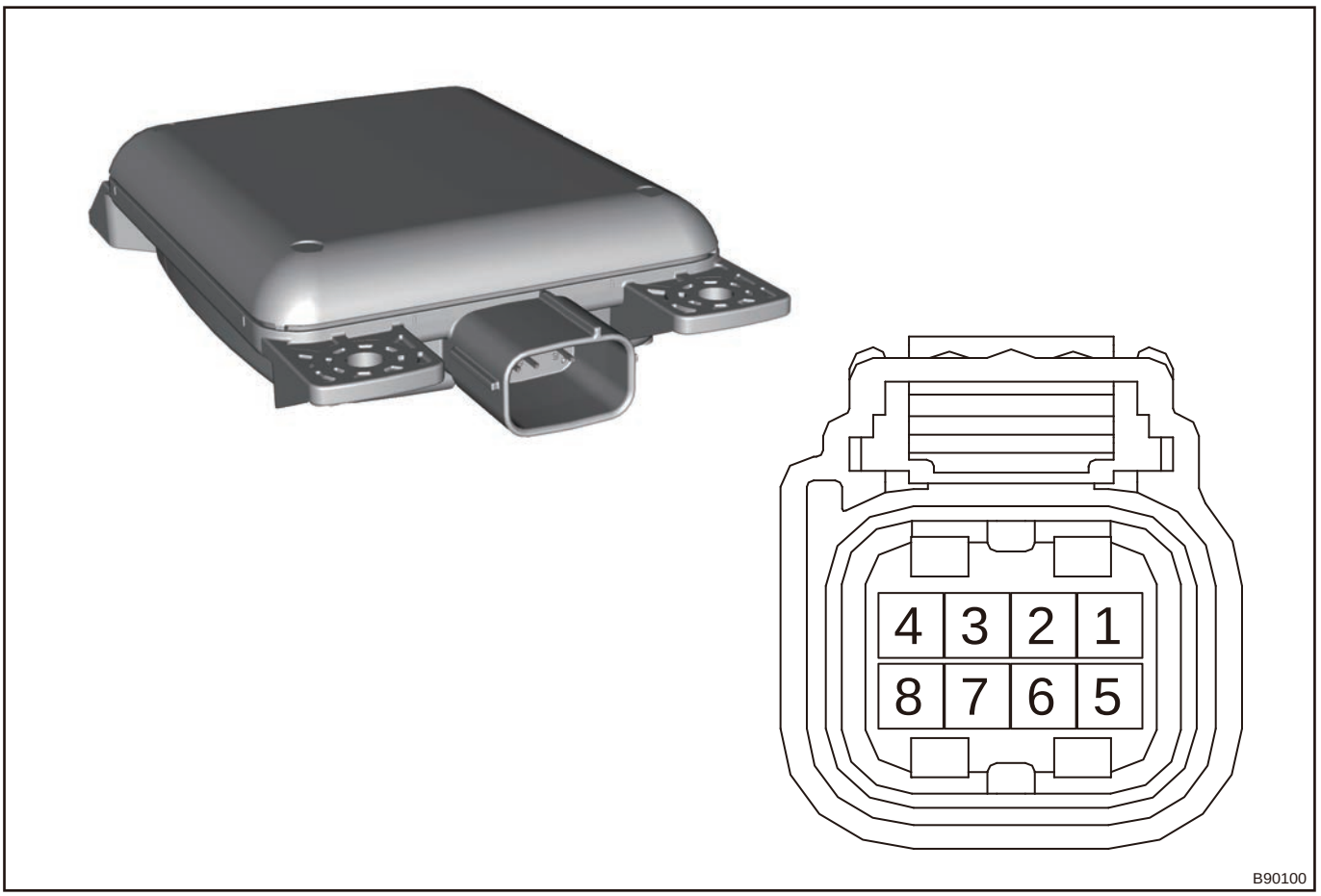
2.2 Blind Spot Detection Module Terminal Definition

■ Left Blind Spot Detection Module Terminal Definition



PIN	Description	PIN	Description
1	Special CAN-L	2	Special CAN-H
3	\	4	HMI Driver
5	Ground	6	Body CAN-L
7	Body CAN-H	8	Power Supply

■ **Right Blind Spot Detection Module Terminal Definition**



PIN	Description	PIN	Description
1	Special CAN-L	2	Special CAN-H
3	Ground	4	HMI Driver
5	Ground	6	Body CAN-L
7	Body CAN-H	8	Power Supply

2.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

(1) Turn ENGINE START STOP switch to LOCK.
(2) Connect diagnostic tester (the latest software) to diagnostic interface.
(3) Connect diagnostic tester (the latest software) to diagnostic interface.
(4) Use the diagnostic tester to record and clear DTCs stored in the blind spot detection system.
(5) Turn ENGINE START STOP switch to LOCK and wait for a few seconds.
(6) Turn ENGINE START STOP switch to ON, and then select read DTC.
(7) If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.
(8) If no DTC is detected, malfunction indicated by the DTC is intermittent.

2.4 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.

(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

2.5 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

2.6 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

2.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B124011	Power Supply Voltage Out of Range
B124015	Warning LED Open Circuit / Short to Battery
B12411C	Power Supply Voltage Out of Range
B124243	Non Volatile Memory Failure (EEPROM Error)
B124244	Data Integrity Fault in Volatile Memory (RAM)
B124245	Program Memory Failure (Code Flash Error)
B124246	Local Configuration Parameters (LCP) Invalid
B124257	Incompatible Software Component

DTC	DTC Definition
B124296	BSD Internal Failure
B124378	BSD Misalignment Error
B124555	Car Configuration Not Done
B124397	BSD Blockage
B1244F0	Other BSD Defected
U124188	Private CAN Bus Off

2.8 DTC Diagnosis Procedure

DTC	**B124243**	**Non Volatile Memory Failure (EEPROM Error)**
DTC	**B124244**	**Data Integrity Fault in Volatile Memory (RAM)**
DTC	**B124245**	**Program Memory Failure (Code Flash Error)**
DTC	**B124246**	**Local Configuration Parameters (LCP) Invalid**
DTC	**B124257**	**Incompatible Software Component**
DTC	**B124296**	**BSD Internal Failure**
DTC	**B124378**	**BSD Misalignment Error**
DTC	**B124397**	**BSD Blockage**
DTC	**B1244F0**	**Other BSD Defected**

DTC	DTC Definition	Possible Causes
B124243	Non Volatile Memory Failure (EEPROM Error)	• There are sand or foreign objects on the inner and outer surfaces of the rear bumper. • Blind spot detection module
B124244	Data Integrity Fault in Volatile Memory (RAM)	
B124245	Program Memory Failure (-Code Flash Error)	
B124246	Local Configuration Parameters (LCP) Invalid	
B124257	Incompatible Software Component	
B124296	BSD Internal Failure	
B124378	BSD Misalignment Error	
B124397	BSD Blockage	
B1244F0	Other BSD Defected	

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check for DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Using diagnostic tester, clear DTCs and read blind spot detection control module system DTCs again.

(b) Check if DTCs occur again.

OK → System is normal

NG

2	Check if the inner and outer surfaces of the rear bumper have mud and sand or foreign objects

(a) Check if the surface of the rear bumper radar and inner and outer of rear bumper have mud and sand or foreign objects.

NG → Clean the mud and sand or foreign objects

OK

3	Check if the vehicle blind spot detection control function is normal

OK → Turn off vehicle power supply (disconnect the negative battery cable), then clear DTC again

NG → Replace blind spot detection module

DTC	B12411C	Power Supply Voltage Out of Range

DTC	DTC Definition	Possible Causes
B12411C	Power Supply Voltage Out of Range	• Module assembly

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to “ON”.

(b) Use diagnostic tester (the latest software) to reread DTC in blind spot detection system.

OK	System is normal
NG	Replace module assembly

DTC	B124011	Warning LED Short to Ground

DTC	DTC Definition	Possible Causes
B124011	Warning LED Short to Ground	• Wire harness damaged • Rear view mirror lens

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

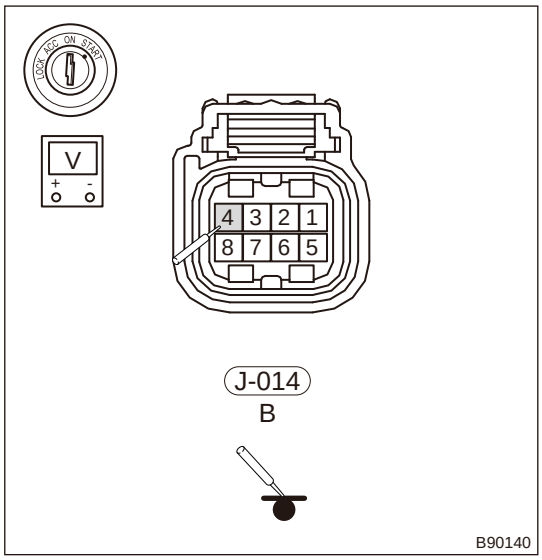
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check module output

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ignition switch to ON.

(b) Use a digital multimeter to check voltage between left blind spot detection module connector J-014 (4) and ground, and it should not be lower than 1 V.



OK	Exchange the warning LED test. (rear view mirror lens)

NG

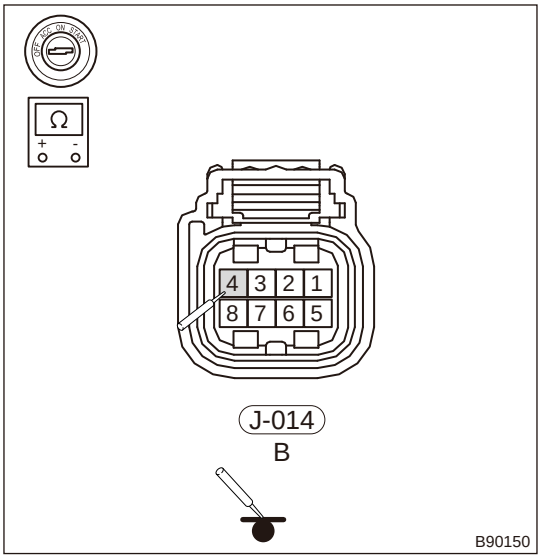
2	Check the connection line

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect left blind spot detection module connector J-014 and left outside rear view mirror connector F-016.

(c) Using ohm band of digital multimeter, measure resistance value between J-014 (4) and ground.

Multimeter Connection	Condition	Specified Condition
J-014 (4) - Body ground	OFF	∞



(d) Using ohm band of digital multimeter, measure resistance value of wire harness between J-014 (4) and F-016 (1).

Multimeter Connection	Condition	Specified Condition
J-014(4) - F-016(1)	OFF	⩽ 1 Ω

NG	**Repair or replace faulty wire harness**
OK	**Replace warning LED. (rear view mirror lens)**

DTC	B124015	Warning LED Open Circuit / Short to Battery

DTC	DTC Definition	Possible Causes
B124015	Warning LED Open Circuit / Short to Battery	• Wire harness damaged • Rear view mirror lens

■ **DTC Confirmation Procedure**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

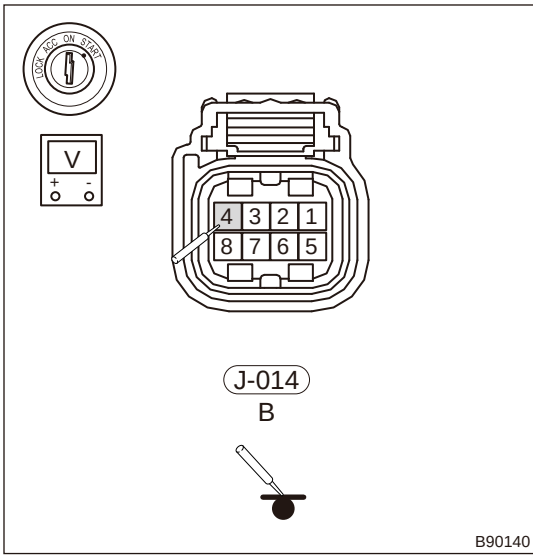
1	**Check module output**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ignition switch to ON.

(b) Disconnect left blind spot detection module connector J-014 and left outside rear view mirror connector F-016.

(c) Using voltage band of digital multimeter, measure voltage value between J-014 (4) and ground.



Multimeter Connection	Condition	Specified Condition
J-014 (4) - Body ground	ON	0V

(d) Using ohm band of digital multimeter, measure resistance value of wire harness between J-014 (4) and F-016 (1).

Multimeter Connection	Condition	Specified Condition
J-014(4) - F-016(1)	OFF	⩽ 1 Ω

OK	**Replace warning LED (rear view mirror lens)**
NG	**Handle and repair related wire harness**

DTC	B124555	Car Configuration Not Done

DTC	DTC Definition	Possible Causes
B124555	Car Configuration Not Done	• Car configuration not done

■ DTC Confirmation Procedure

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Reconfiguration

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Use the diagnostic tester to perform module configuration.

OK	**Perform running test after clearing DTCs**

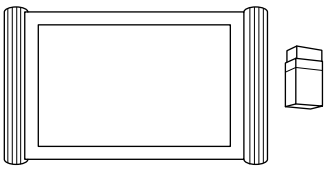
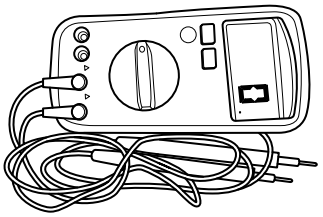
DTC	U124188	Private CAN Bus Off

DTC	DTC Definition	Possible Causes
U124188	Private CAN Bus Off	/

1	Refer to “CAN COMMUNICATION” for troubleshooting

3 ON-VEHICLE SERVICE

3.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006

3.2 Blind Spot Detection Module

■ **Removal**

Warning

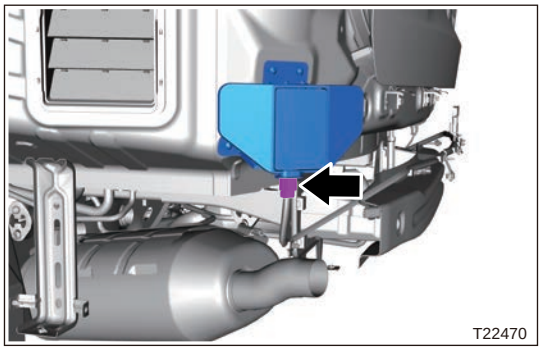
- **Removal and Installation of left and right modules are the same. Take left side as an example below.**
- **Be sure to wear safety equipment to prevent accidents, when removing blind spot detection module.**
- **Operate carefully to prevent damage to blind spot detection module, when removing blind spot detection module.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

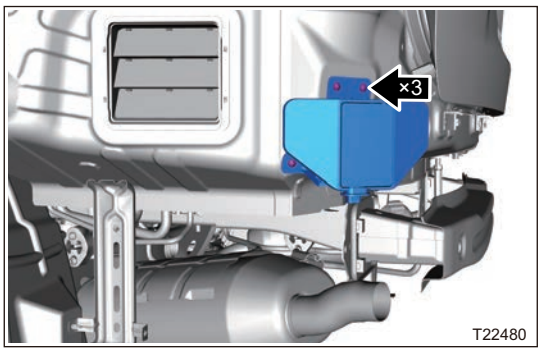
(2) Disconnect the negative battery cable for more than 1 minute.

(3) Remove the rear bumper assembly.

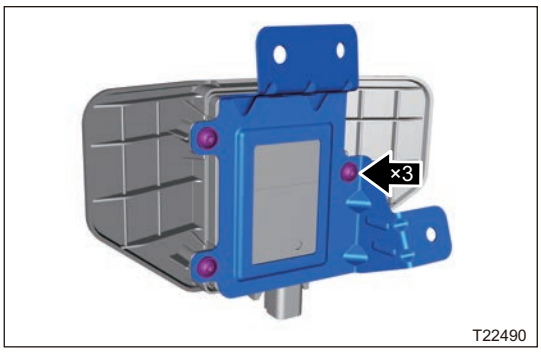
(4) Disconnect the left blind spot detection radar module connector.



(5) Remove 3 fixing screws and left blind spot detection radar module bracket.



(6) Remove 3 fixing screws from left blind spot detection radar module, and remove left blind spot detection radar module assembly.



(7) Gently separate left blind spot detection radar module from the shield of left blind spot detection radar module by hand, and remove left blind spot detection radar module.

■ Installation

Caution
• **Install connector in place, when installing blind spot detection module.** • **Check blind spot detection module system for proper operation, after installing blind spot detection module.** • **When sheet metal paint operation is performed on the rear bumper, there should not be a sudden change in the thickness of rear bumper. Dielectric constant of paint ＜ 100: Thickness of paint is less than 15um, weight of metal component is about 7%) dielectric constant of paint ＜ 50 (Thickness of paint is less than 45um)**

Caution
• **Installation angle of blind spot detection is 37°. Installation angle is the angle between sensor emission surface and longitudinal axis of vehicle body.** • **Make sure that the area of sensor view is free of any metal or complex structural parts (such as clips, steps, etc.) when installing.**

(1) Install the left blind spot detection radar module assembly.

1) Install left blind spot detection radar module to the fixed position of the shield of left blind spot detection radar module.

2) Install left blind spot detection radar module to the fixed position of bracket and fix 3 screws.

Torque: 2 ± 0.5 N m

3) Install left blind spot detection radar module bracket, and fix 3 screws.

Torque: 2 ± 0.5 N m

4) Connect the left blind spot detection radar module connector.

(2) Install the rear bumper assembly.

(3) Connect the negative battery cable.

11.5 PARKING SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to wear necessary safety equipment to prevent accidents, when removing reversing radar sensors.

(2) Operate carefully to avoid damaging reversing radar sensors, when removing reversing radar sensors.

(3) Be sure to wear necessary safety equipment to prevent accidents, when removing front radar sensor.

(4) Operate carefully to avoid damaging reversing radar sensor, when removing front radar sensor.

(5) Be sure to wear necessary safety equipment to prevent accidents, when removing rear camera assembly.

(6) Appropriate force should be applied when removing rear camera assembly. Be careful not to operate roughly.

(7) Be sure to wear necessary safety equipment to prevent accidents, when removing front camera assembly.

(8) Appropriate force should be applied when removing front camera assembly. Be careful not to operate roughly.

(9) As side camera is installed inside the outside rear view mirror assembly, it must be replaced together with outside rear view mirror assembly when damaged.

(10) Install connector in place and tighten fixing nuts to the specified torque, when installing the outside rear view mirror assembly.

(11) Make sure the outside rear view mirror assembly can move smoothly, flexibly and reliably after installing.

(12) After installing outside rear view mirror assembly, it is necessary to perform panoramic image calibration.

(13) Be sure to wear necessary safety equipment to prevent accidents, when removing reversing radar control module assembly.

(14) Appropriate force should be applied when removing reversing radar control module assembly. Be careful not to operate roughly.

(15) Tighten fixing bolts to the specified torque, when installing reversing radar control module assembly.

(16) Install connector in place when installing reversing radar control module assembly.

(17) Check reversing radar system for proper operation, after installing reversing radar control module assembly.

(18) Be sure to wear necessary safety equipment to prevent accidents, when removing panoramic control system module assembly.

(19) Appropriate force should be applied, when removing panoramic control system module assembly. Be careful not to operate roughly.

(20) Tighten fixing bolts to the specified torque, when installing panoramic control system module assembly.

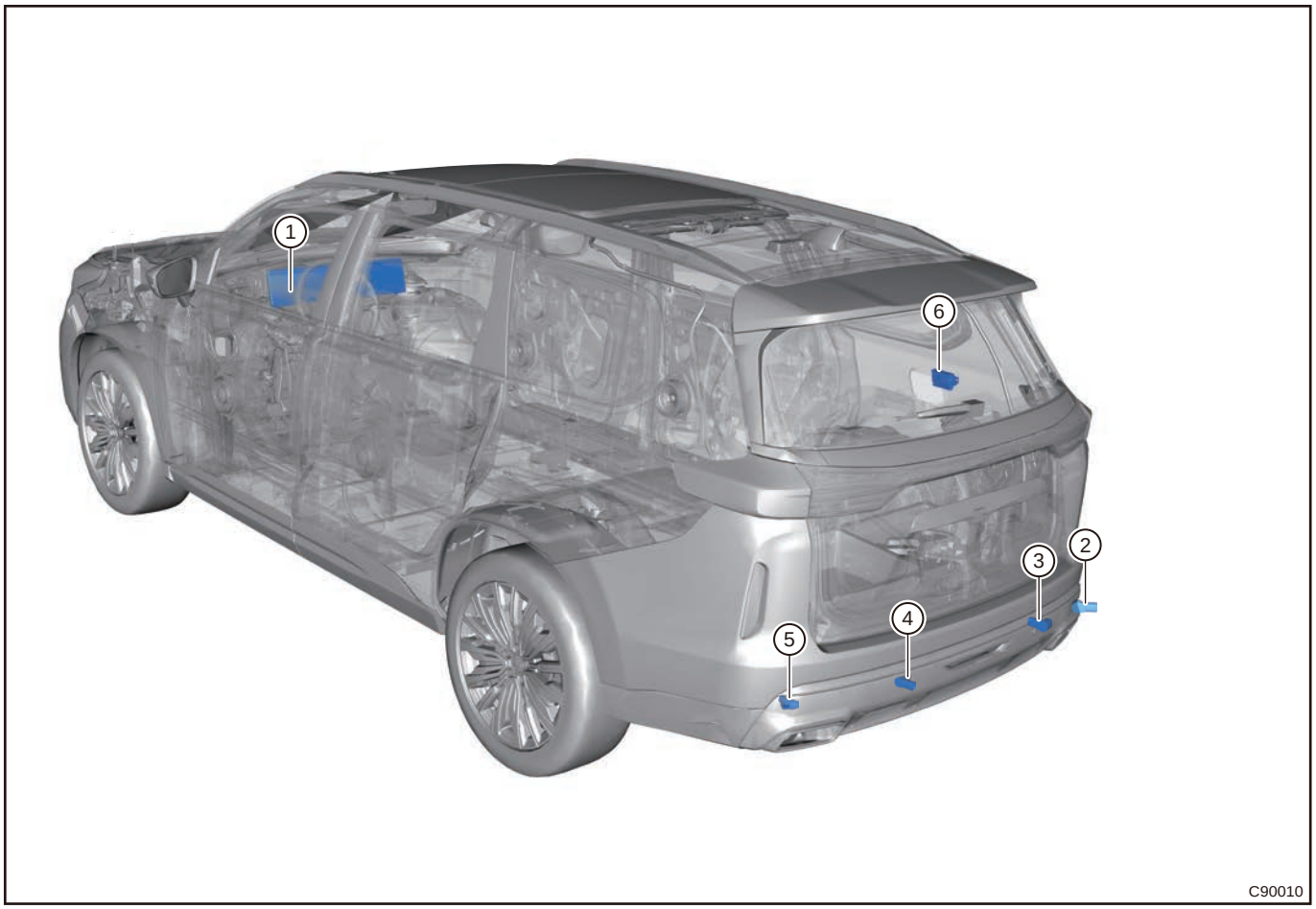
(21) Install connector in place when installing panoramic control system module assembly.

(22) Check reversing radar system for proper operation, after installing panoramic control system module assembly.

2 System Overview

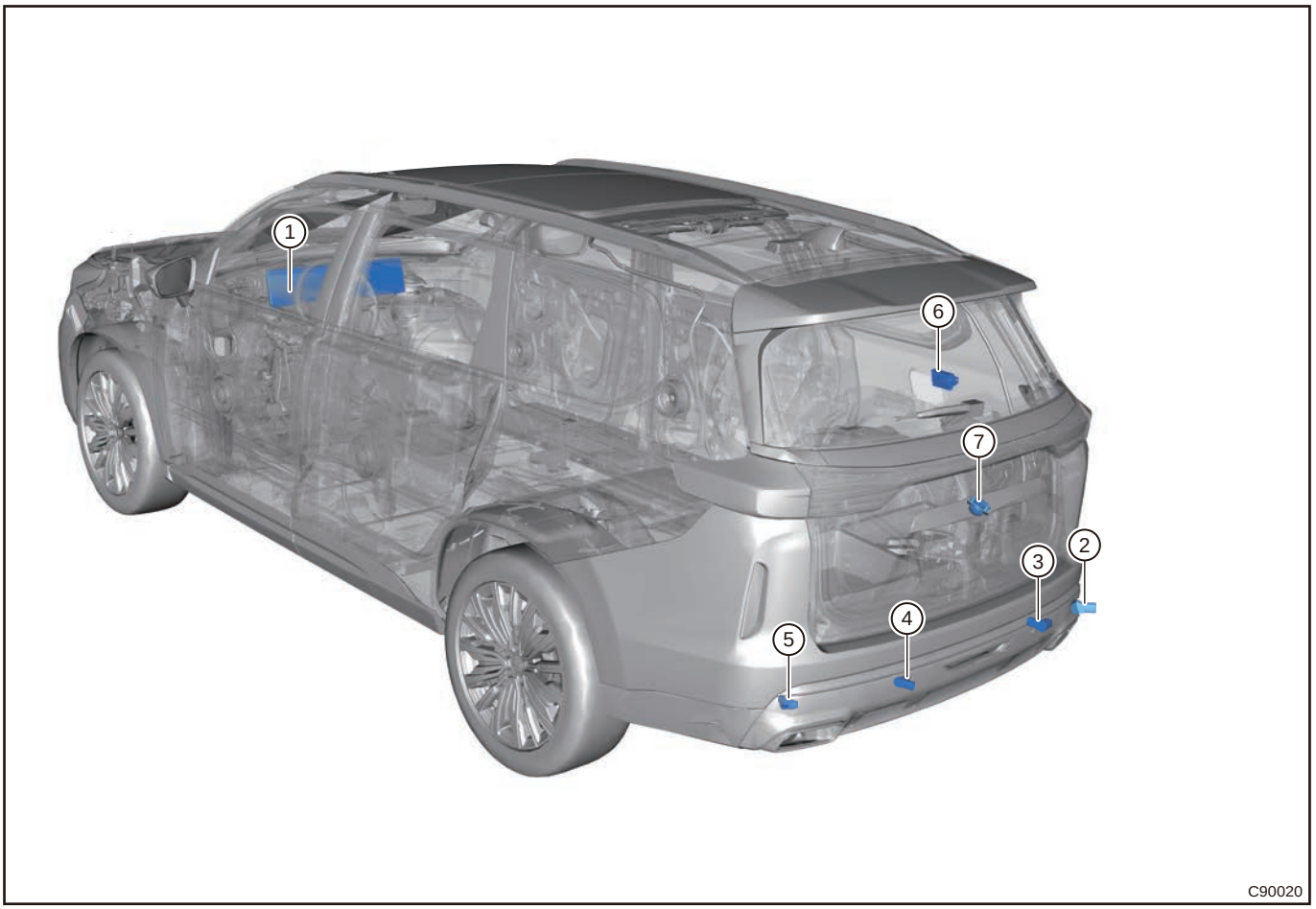
2.1 System Components Diagram

■ Reverse Radar System



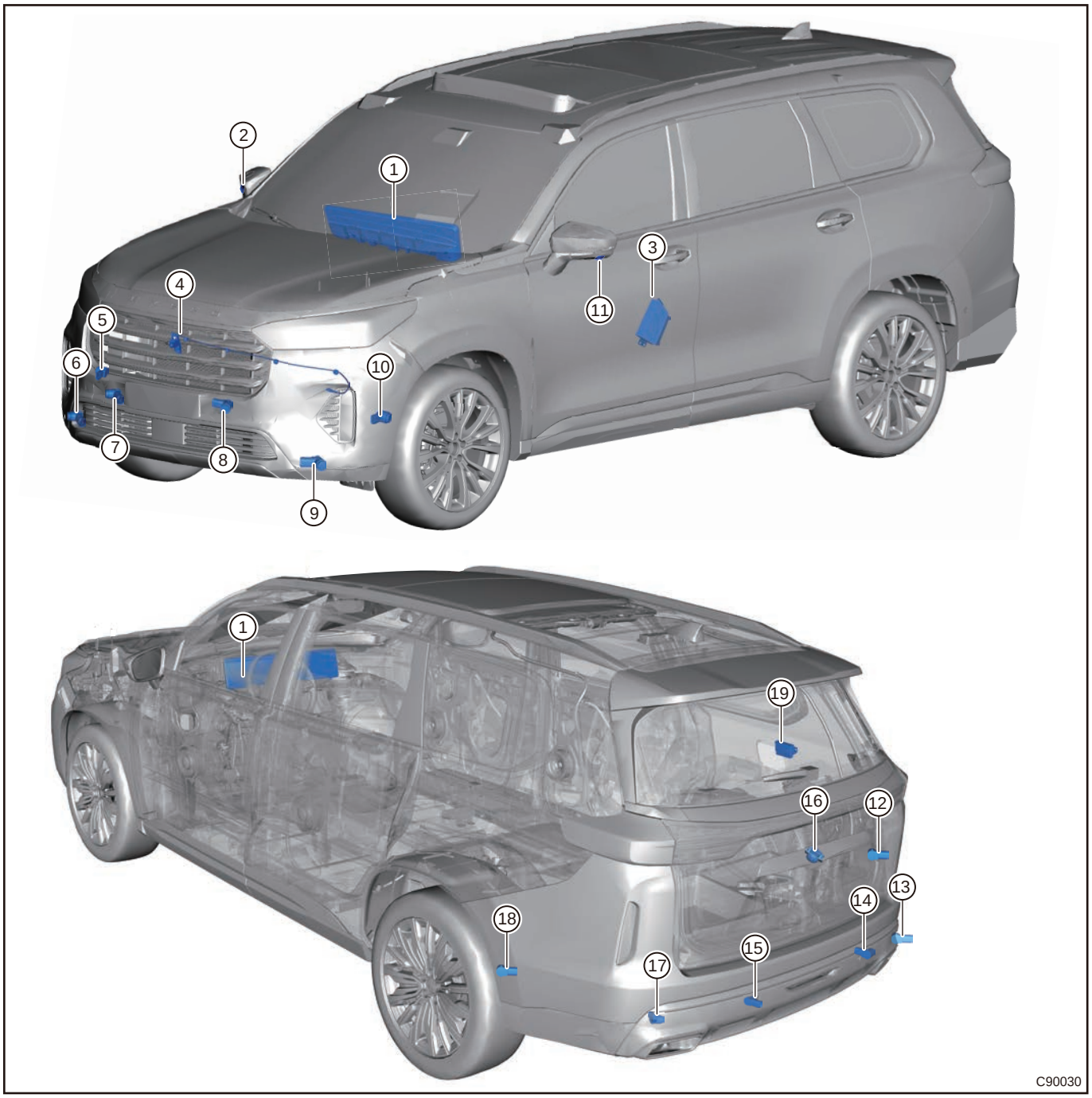
1	Hyperscreen	2	Rear Right Radar Sensor
3	Rear Right Center Radar Sensor	4	Rear Left Center Radar Sensor
5	Rear Left Radar Sensor	6	Reversing Radar Module

■ Dynamic Track HD Visual Parking Assist System



1	Hyperscreen	2	Rear Right Radar Sensor
3	Rear Right Center Radar Sensor	4	Rear Left Center Radar Sensor
5	Rear Left Radar Sensor	6	Reversing Radar Module
7	Rear Camera Assembly		

■ 360 Panoramic View Monitor System

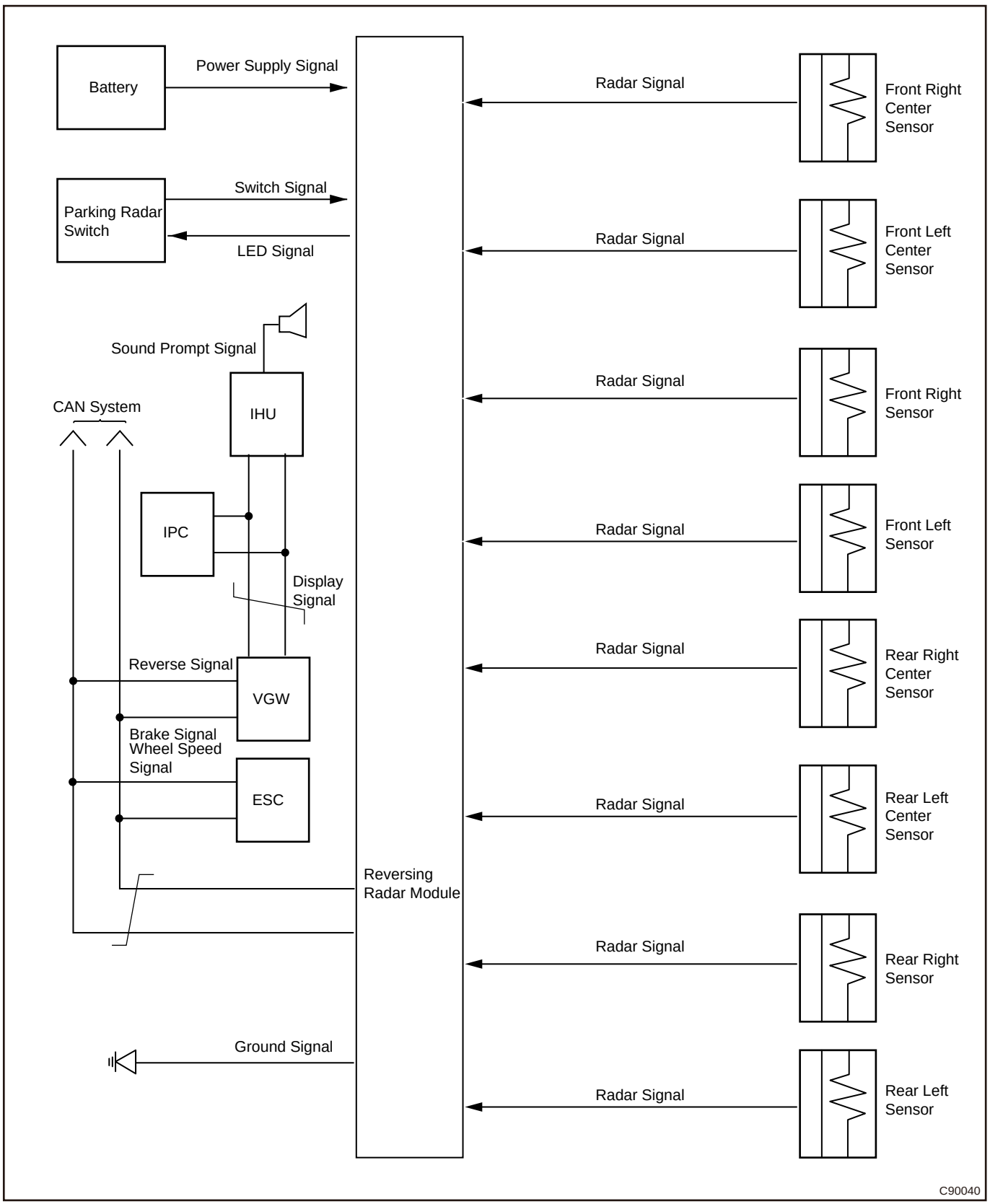


1	Hyperscreen	2	Right Camera Assembly
3	Panoramic Control System Module (AVM)	4	Front Camera Assembly
5	Front Right Side Radar Sensor	6	Front Right Center Radar Sensor
7	Front Center Radar Sensor	8	Front Center Radar Sensor
9	Front Left Center Radar Sensor	10	Front Left Side Radar Sensor

11	Left Camera Assembly	12	Rear Right Side Radar Sensor
13	Rear Right Center Radar Sensor	14	Rear Center Radar Sensor
15	Rear Center Radar Sensor	16	Rear Camera Assembly
17	Rear Left Center Radar Sensor	18	Rear Left Side Radar Sensor
19	Reversing Radar Module		

2.2 Reverse Radar System

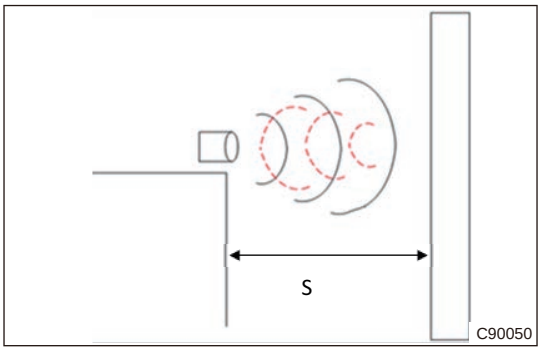
■ System Schematic Diagram



Parking radar auxiliary system uses digital sensors and ultrasonic technology to measure distance, which can remind the driver of the distance between the rear of vehicle and other objects, and give sound prompts and image display to reduce personnel injury or vehicle damage caused by reversing.

■ Operating Principle

Parking radar system uses ultrasonic reflection principle to detect distance. After parking radar sensors send out ultrasonic and receive back wave from obstacle, control module calculates obstacle distance (S= t×340÷2) according to ultrasonic distance measuring principle, and sends data to display terminal to display and alarm.



■ System Composition

Reversing radar system consists of instrument cluster, 1 radar control module and 4 sensors (digital ultrasonic sensors) or 8 sensors. Sensors adopt separated structure. Sensor bodies are same, but installation angles are different. Parts related to system consist of ENGINE START STOP switch, reverse switch, instrument cluster or DVD, PAS switch and vehicle speed (8 sensors system). ENGINE START STOP switch provides operating power for system; Reverse switch provides operation activation signal for system; Instrument cluster or DVD is end terminal of the system and provides sound alarm prompt and distance display function for driver. The PAS switch is only related with the 8 sensors system.

■ Reversing Radar Normal Alarm Display

When ENGINE START STOP switch is turned on, shift lever is moved to R and vehicle is reversing at a speed below 8 km/h, reversing radar is activated. The corresponding measured message will be displayed on multi-information display and alarms with buzzer in instrument cluster.The response way of reversing radar system is buzzer sounding. The table below shows the correspondence between buzzer response frequency and actual obstacle distance:

Alarm Type	1st Section	2nd Section	3rd Section	4th Section	5th Section
Displayed Area	Safe area	Pre-warning area	Amble area	Park area	Park area
Alarm Distance Range (cm)	＞ 150	95 - 150	65 - 90	40 - 60	⩽ 35
Buzzer Sound Frequency	No sound (OFF)	1Hz (ON 500 ms / OFF 500 ms)	2Hz (ON 250ms / OFF 250 ms)	4Hz (ON 125 ms / OFF 125 ms)	Continuous sound

Hint

- **When ignition switch is ON and shift lever is in R, small vehicle screen is displayed on instrument cluster. If no obstacle information is detected (obstacle distance is more than 150 cm), only small vehicle is displayed on instrument cluster, while arc is not displayed.**
- **If multiple sensors have detected an obstacle, instrument cluster will display distances between each sensor and obstacle, sound alarm will be sound from nearest obstacle, and processed based on signal from radar.**

2.3 Dynamic Track HD Visual Parking Assist System

■ Operation

Consists of: Instrument cluster, navigation, camera, 4 rear radar sensors and radar module.Reversing view monitor system consists of radar sensor (sensor), camera, control module and display alarm device etc. After starting vehicle, reversing radar system functions when shifting to reverse gear. When the radars detects an obstacle, multi-information display in instrument cluster will display distance information and buzzer sounds. Navigation system displays color image behind vehicle in real time and provides static or dynamic guidelines

for driver reference. By this way, the system can help driver to eliminate blind areas and blurred vision, improving driving safety.

■ **Reversing View Display**

Caution
In the panoramic view monitor system, rear camera of high configuration model is connected to panoramic view monitor system controller, and rear camera of medium configuration model is connected to navigation system.

(1) Description

- High and medium configuration models are fitted with reversing camera. The camera captures the views behind the vehicle which will be presented to driver by navigation system. Also, navigation system provides static guidelines or dynamic guidelines that move as turning of steering wheel so as to estimate the vehicle’ s reversing track lines.

(2) Dynamic back guidelines and local view of rear area

- After entering surrounding + rear view screen by shifting to reverse gear, static/dynamic back guidelines and local view of rear area will be displayed on rear view image.

(3) Definition of static back guidelines

- Red guidelines indicate about 0.5 m away from bumper;
- Yellow guidelines indicate about 1 m away from bumper;
- The closer green guidelines indicate about 2 m away from bumper;
- The far green guidelines indicate about 3 m away from bumper.

(4) Dynamic track lines

- Dynamic track lines are used for prejudging the vehicle’ s traveling trace, which varies as the wheel rotation.

2.4 360 Panoramic View Monitor System

■ **Function**

Composition: Panoramic view monitor system consists of four HD (100W) cameras (front camera, rear camera, left camera and right camera), controller, AVM system switch, LVDS video transmission line and connecting wire harness. Controller and head unit are connected by shielded wire.Function description: Panoramic view monitor system consists of a controller, four ultra wide angle cameras and LVDS video transmission lines, etc. It captures images from four directions (front, rear, left and right) and splices them into an aerial view around the vehicle using image processing algorithms, then displays it on the navigation display. Panoramic view monitor system provides surrounding view + single side view, three-dimensional surrounding view roaming, three-dimensional left/right side view, and dynamic/static reversing track. Side camera is integrated into the outside rear view mirror assembly. Panoramic control system module is located inside the glove box on front passenger side and shares a bracket with central gateway; front camera is located on the middle grille of front bumper and installed on the front bumper; rear camera is located under the back door and installed on the back door open switch assembly.

Function	Description
Single side and birds-eye view	Single side view of front, rear, left and right, and splicing view. Single side view can be switched
3D view and birds-eye view	Click on the birds-eye view to switch the corresponding 3D view, and the 3D view can be switched to any viewpoint by sliding
Wide-angle view	Combine the front view/rear view into a triplet wide-angle view through distortion correction
Panoramic startup animation	When AVM is starting, surround the vehicle all around
Turn signal light activating panoramic	When the turn signal light switch is turned on, the 3D view of rear left or rear right side of vehicle is displayed

Function	Description
Steering wheel steering angle activating panoramic	When steering wheel angle is higher than 180°, the 3D view of rear left or rear right side of vehicle is displayed
Enlarging view	Click on the enlarging view button to display the front/ rear enlarged view. When the auto enlarge setting option is turned on, it will receive the ultrasonic radar information, and automatically switch to the front/rear enlarged view when it is less than 30 cm
Virtual door opening view	Receive door signal, engine hood signal and sliding roof signal, and display the corresponding view on the birds-eye view and 3D view when the four doors, engine hood, back door and sliding roof are opened
Vehicle guideline	Click on to select the opening and closing of the vehicle guideline
Visual radar	Ultrasonic radar transmits the distance information to the panoramic controller, and displays the distance or alarm prompt information on the panoramic screen
License plate number setting	Receive the license plate number sent by audio head unit and display it in 3D vehicle icon
3D view switch button	Click the button around the vehicle to switch the corresponding view of 3D view
Front wheel steering	Receive the steering wheel angle signal and accurately display the steering angle of front wheels in 3D view
Real-time wheel speed	Receive the wheel speed signal and accurately display the wheel speed in 3D view
Real-time turn signal light display	Real-time display of turn signal light information when switch the turn signal light switch
RCTA warning information	Integrate BSD radar information, and display warning information in the view when RCTA alarms
Obstacles activating panoramic	Activate the panoramic view monitor after receiving the parking radar information

■ **System activation and exiting mode**

Caution

- **Panoramic view monitor system has professionally calibrated before leaving factory. Any removal and installation behaviors without permission that cause changes in installation position and angle of camera may affect the function and effect of panoramic view monitor system.**
- **Panoramic view monitor system functions to provide driving assist, however, object in image does not indicate the actual size and distance from it. There is a slight delay and blind spot in image relative to the actual condition, so this function is not a substitute for driver's operation and judgment. During on, off and use of the function, driver should pay attention to the surroundings to ensure safe driving.**
- **Never use panoramic view monitor when outside rear view mirrors are folded. Make sure to close back door securely when operating vehicle using panoramic view monitor.**
- **Distance from object seen from panoramic view monitor is different from the actual distance.**
- **Cameras are installed on front grille, outside rear view mirrors and above the rear license plate. Do not put anything on the camera.**
- **Do not spray water around the camera when washing vehicle with high pressure water. Otherwise, water drop may enter camera and condense on the lens, causing malfunction, fire or electric shock.**
- **Do not tap the cameras. They are precision instruments. Failure to do so may cause malfunction or damage, leading to fire or electric shock.**

Hint

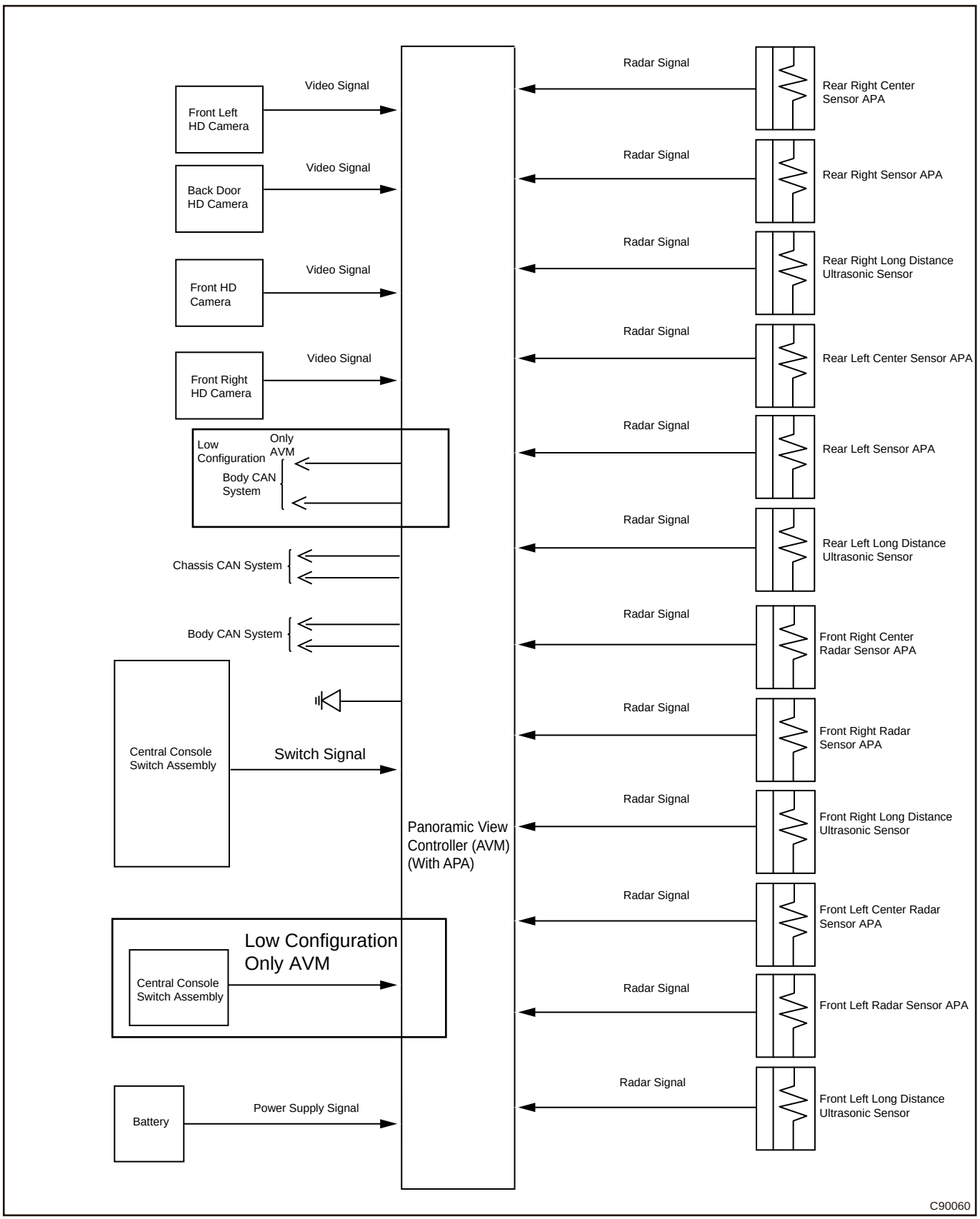
- **Be careful not to scratch the lens when cleaning dirt or snow on the surface of camera.**
- **Use the displayed route and aerial view as reference. Displayed route and aerial view are greatly affected by numbers of passenger in vehicle, fuel amount, vehicle location, road surface condition and road surface grade.**

<table>
<tr><th colspan="2">Activation Condition</th><th rowspan="2">System Activation</th><th colspan="2">Exit Condition</th></tr>
<tr><th>Preconditions</th><th>Trigger Condition</th><th>Corresponding Exit Condition</th><th>Priority Exit Condition</th></tr>
<tr><td rowspan="6">Vehicle speed < 20 km/h</td><td>Shift to R</td><td>R is activated</td><td>Exit R position, the duration is longer than 15 seconds, and there is no effective operation within the duration</td><td rowspan="6">Vehicle speed > 30 km/h</td></tr>
<tr><td rowspan="2">AVM switch is pressed</td><td rowspan="2">AVM switch is activated</td><td>Press AVM switch again</td></tr>
<tr><td>Operate other high priority switches</td></tr>
<tr><td rowspan="2">Turn on the turn signal light</td><td rowspan="2">Turn signal light is activated</td><td>Turn off the turn signal light and there is no effective operation within 500 ms</td></tr>
<tr><td>Operate other high priority switches</td></tr>
<tr><td>Steering wheel angle > 190°</td><td>Steering wheel angle is activated</td><td>Steering wheel angle is less than 180° and the duration is longer than 1 seconds, and there is no effective</td></tr>
</table>

Activation Condition		System Activation	Exit Condition	
Preconditions	**Trigger Condition**		**Corresponding Exit Condition**	**Priority Exit Condition**
			operation within the duration time	
			Operate other high priority switches	
D	Parking radar obstacle distance signal is received	Obstacles is activated	Exit after 15 seconds after obstacle-free distance information	Press the AVM switch, operate other high-priority switches, N or P, press the exit button
			N or P	
Vehicle speed = 0KM/h, remote start mode	Remote AVM request to turn on	Remote AVM is activated	Remote AVM request to turn off	Remote start mode is exited

2.5 Automatic Parking Assist System (APA)

■ System Principle



The Automatic Parking Assist System (APA) can assist the driver to park the vehicle in or out of the parking space identified by the system.The system can help the driver search and confirm the target parking space. The driver can also choose a parking space through the central control display. After the target parking space is confirmed, the system will realize the automatic parking function under the driver's supervision.The types of parking spaces supported by the system include parallel parking space, vertical parking space, inclined parking spaces, parallel boundary parking space and vertical boundary parking space. When the vehicle moving out from parallel boundary parking space, the driver can use the automatic moving out function. Under the supervision of the driver, the system will control the vehicle to travel to a position that is easy to move out to complete the moving out assistance.

■ Automatic Parking In

Operation Step

(1) Keep the vehicle driving normally.

(2) When the vehicle speed is lower than 25 km/h, and the lateral distance between driving path and available parking space is about 0.5 m-1.9 m, press the central control APA switch to turn on the automatic parking function.

(3) User controls the vehicle to keep driving. The vehicle searches for the surrounding parking spaces while driving. The system searches for the right parking space by default. The left turn signal light can be turned on to search for the left parking space. Each time a parking space is found, the central control display will display the parking information at the corresponding position, then depress the brake pedal to brake the vehicle. If there are multiple alternative parking spaces, you can click on the parking space through the central control display.

(4) After confirming the parking space to be parked, press the central control APA switch and release the brake pedal to start parking. Do not touch the steering wheel and shift lever during parking, pay close attention to the surrounding environment, and be ready to brake the vehicle at any time.

(5) After the vehicle is parked in the target parking space, the system will prompt the user the parking is finished, and the system will automatically switch the gear into P position and apply the park brake to complete the automatic parking.

■ Self-selected Parking Space Parking In

Operation Step

(1) Brake the driving vehicle to stop and depress the brake pedal, press the central control APA switch, and click the self-selected parking spaces. The APA system provides vertical parking spaces, horizontal parking spaces, and oblique parking spaces for selection.

(2) After clicking the parking space type, you can fine tune the target parking space posture through the large screen interface of the central control and click OK button.

(3) After confirming the parking space to be parked, follow the prompts on the display interface to start the automatic parking procedure. During automatic parking in, the driver does not need to perform vehicle operations, but needs to pay attention to the surroundings at all times. Be ready to brake vehicle at any time to ensure that the vehicle can be controlled in dangerous situations.

(4) After the vehicle is parked in the target parking space, the system will prompt the user the parking is finished, and the system will automatically switch the gear into P position and apply the park brake to complete the automatic parking.

■ Automatic Moving Out

Operation Step

(1) With the vehicle is stationary, start the engine and turn on the central control display.

(2) Press the parking switch button of center console, wait for the switch indicator to come on, the central control screen displays the parking operation interface, click "Automatically Moving Out" to enter the automatic moving out interface.

(3) The driver can confirm the moving out direction by turning the turn signal light lever.

(4) Follow the instructions on display interface to start the automatic moving out program.

(5) After the parking operation is completed, the system will automatically apply the electronic park brake and shift to P position. At this time the driver takes over the operation of the vehicle.

Hint

The automatic parking assist system may exit the program under the following conditions:

- **The vehicle speed is higher than 25km/h when looking for a parking space;**
- **Associated system controller malfunction;**
- **Turn off the Electronic Stability System (ESP);**
- **During parking, driver did not fasten the seat belt as required or did not close the door, etc. within 30 seconds;**
- **During parking, driver actively controls the steering wheel;**
- **During parking, driver actively operates the shift lever;**
- **During parking, driver actively depress the accelerator pedal;**
- **During parking, driver actively turns on the Electronic Parking Brake System (EPB);**
- **During parking, driver presses the automatic parking assist system switch again;**
- **During parking, there are fixed obstacles around the vehicle, and the vehicle cannot avoid it;**
- **The system whose arbitration logic is higher than automatic parking assist system s activated;**
- **The parking trajectory exceeds the planning.**

Hint

- **When the vehicle speed is lower than 25 km/h, the system has the function of searching parking spaces in the background, but the longest memory distance is not more than 15 m. In order to improve the recognition rate, it is advisable to control the vehicle speed at about 10 km/h.**
- **When searching for a parking space, the distance between vehicle and obstacles that make up the parking space should be 0.5 m - 1.9 m. The parking space may not be found if exceeds the range.**
- **When searching for a parking space, try to keep the vehicle passing through the parking space in a straight line, thus to achieve a better parking space detection effect.**
- **When selecting a parking space, the vehicle must be kept in a stopped state.**
- **The rattling sound during parking is the normal operating noise of brake system, and it is no need to worry about it.**
- **During parking, the steering, braking, accelerator pedal and gear position are controlled by the system. The driver can operate the brake pedal to control vehicle speed or stop the vehicle. The vehicle can continue to park after release the brake pedal.**
- **When parking on uneven road, fluctuation may occur in parking speed, and the vehicle may bump. Try to avoid using this system on uneven road.**
- **The system only supports the moving out function of parallel parking spaces. Appropriate adjustment space is required in front and rear of vehicle body. The moving out function may not be available when there is abnormal change in the parking space.**

Caution

- **To ensure safety, before activating the automatic parking assist system, make sure that the driver’ s seat belt is fastened and the doors, engine hood and back door are all closed;**
- **The system does not consider the changes in recognized target parking space, which may cause parking failure.**
- **When using automatic parking assist system, the vehicle may cross or hit the curbs during steering. Therefore, the driver must ensure that the brake intervention can be performed at any time, otherwise it may cause wheel or vehicle damage.**
- **Target recognition is restricted by the ultrasonic measurement physical laws and camera vision algorithms. The ability to recognize person, animals and various obstacles around the vehicle is limited. In addition, external sound sources or light and shadow may cause interference to the system, resulting in missing recognition or misrecognition of system. Therefore, before confirming the target parking space, the driver is responsible for paying attention to the surroundings of vehicle and confirming the availability of target parking space.**

Caution

Some cases that may not be recognized

- **Trailer towing bar and towing hook;**
- **Slender or wedge-shaped objects;**
- **Objects that are high and protruding, such as wall projections or loads;**
- **Objects with corners and sharp edges;**
- **Objects with fine surfaces or structures, such as fences;**
- **Barbed wire fence, fluffy snow, potholes in the ground;**
- **Object that above the detection range and the sensor cannot detect accurately;**
- **Certain objects whose surfaces do not reflect detection signals and persons wearing clothing of such materials;**
- **Other situations that affect target recognition.**

Warning

- **When using the automatic parking assist system, the driver must comply with the Road Traffic Safety Law of the People's Republic of China.**
- **The automatic parking assist system only provides assistance to the driver, and cannot operate normally under all driving conditions, weather conditions, traffic or road conditions.**
- **When using the system, the driver has responsibility to control the vehicle, monitor the system operation and intervene when necessary to avoid danger.**

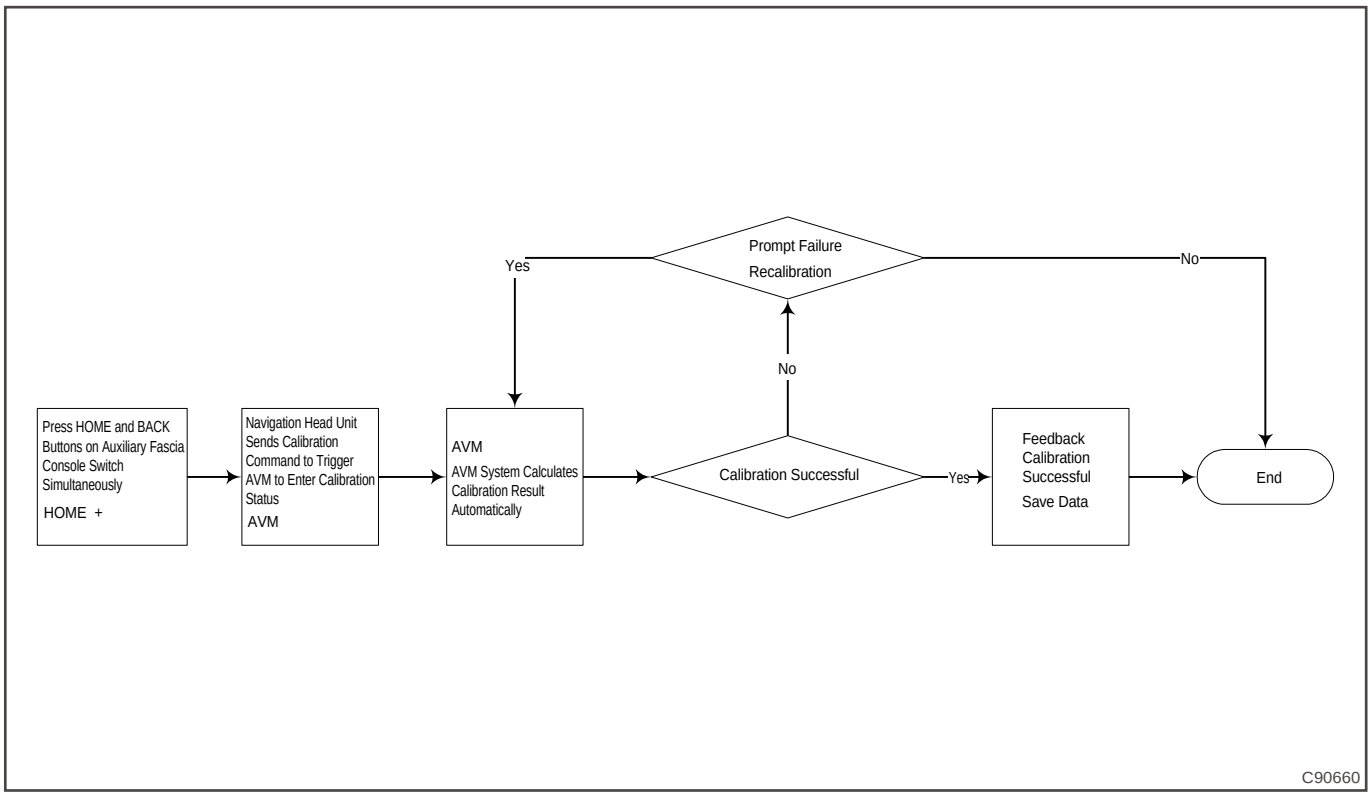
Caution

The use of the system is prohibited in the following cases:

- **Severe weather such as rain, snow, heavy fog, etc.;**
- **There are three-wheeled or two-wheeled non-motorized vehicles, low obstacles (such as parking lines, ground locks, stones, etc.) or vehicles with no continuous physical form of the lower body (such as large trucks, oil tankers, trailer, etc.) near the alternative parking spaces;**
- **Potholes on the road near the alternative parking spaces, or there are sidewalks or parking spaces with elevation difference on the road and cliffs (danger);**
- **The wheel size is different from the original wheel size. For example: installing non-original size wheels, spare wheels, snow chains or tires with non-standard tire pressure;**
- **Vehicle modification causes the size of vehicle to change or there is an extended load outside the vehicle during parking.**

2.6 Panoramic View Monitor System Calibration

■ Calibration Procedure



■ Calibration Steps

Status confirmation before calibration In order to ensure the success rate and effect of the calibration, the following status should be confirmed before calibration:

(1) All components on vehicle have been installed (including: spare tires, on-board tools, etc.), and all liquids have been filled to the state of leaving the factory (such as: brake fluid, coolant, washer fluid, gasoline, etc.);

(2) The vehicle has completed the calibration of steering system and four-wheel alignment, and has passed the inspection;

(3) The grid of calibration site are not obviously damaged/dirty, the guide rails are not loose or poorly fixed, and the lights above the site have been turned on;

(4) There are no people, vehicles or other obstacles in the area of the calibration site;

(5) There is no malfunction prompt of panoramic view monitor or camera in the vehicle instrument cluster;

(6) Four cameras (front/rear/left/right) lens surface is not covered by plastic protective film or has been removed;

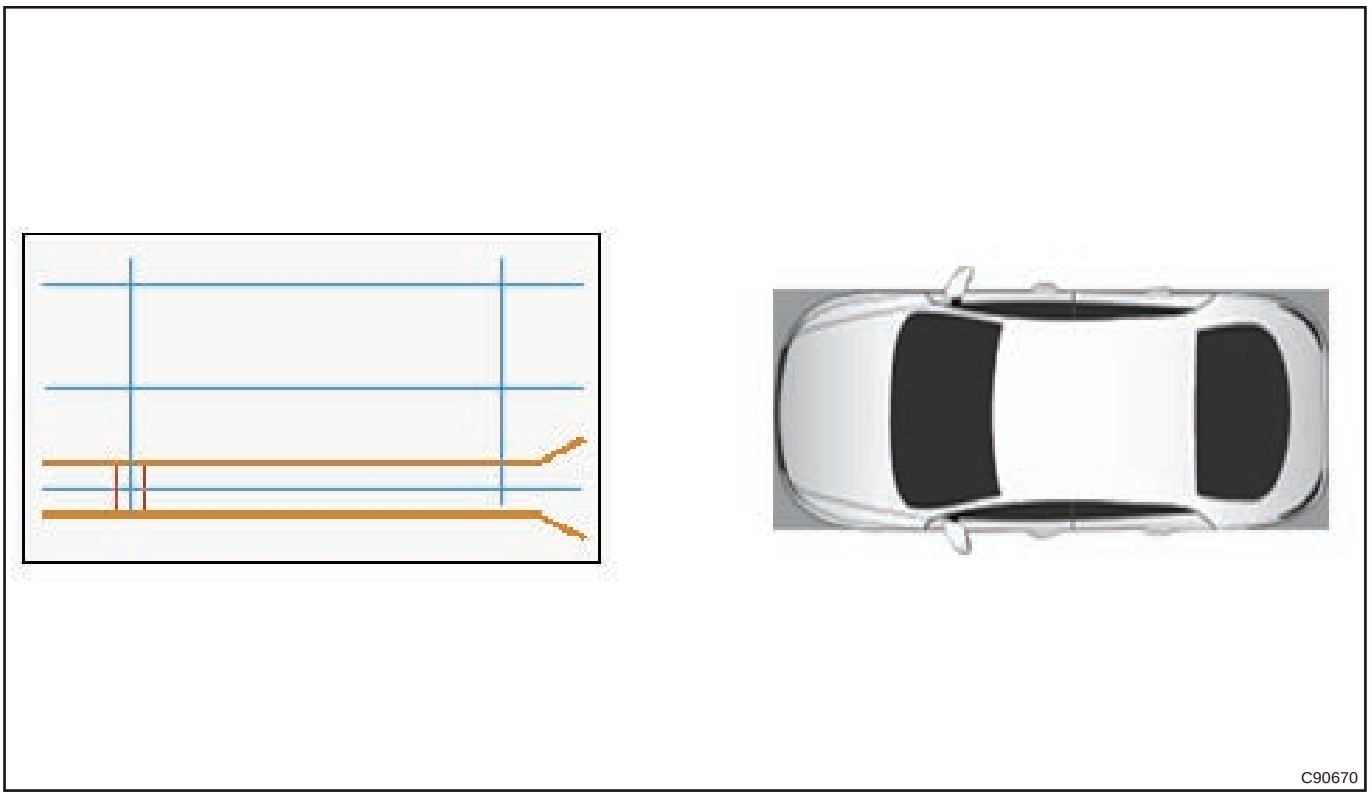
(7) During the calibration process, please make sure that there is no other person on the vehicle, and only the driver is allowed to perform calibration operations on driver seat.

Caution
When parts are supplied, in order to avoid accidental wear on the surface of panoramic view monitor system camera lens, a plastic protective film is usually attached to the lens. Please confirm whether it has been removed before calibration? If it is not removed, please remove the protective film before performing the calibration operation.

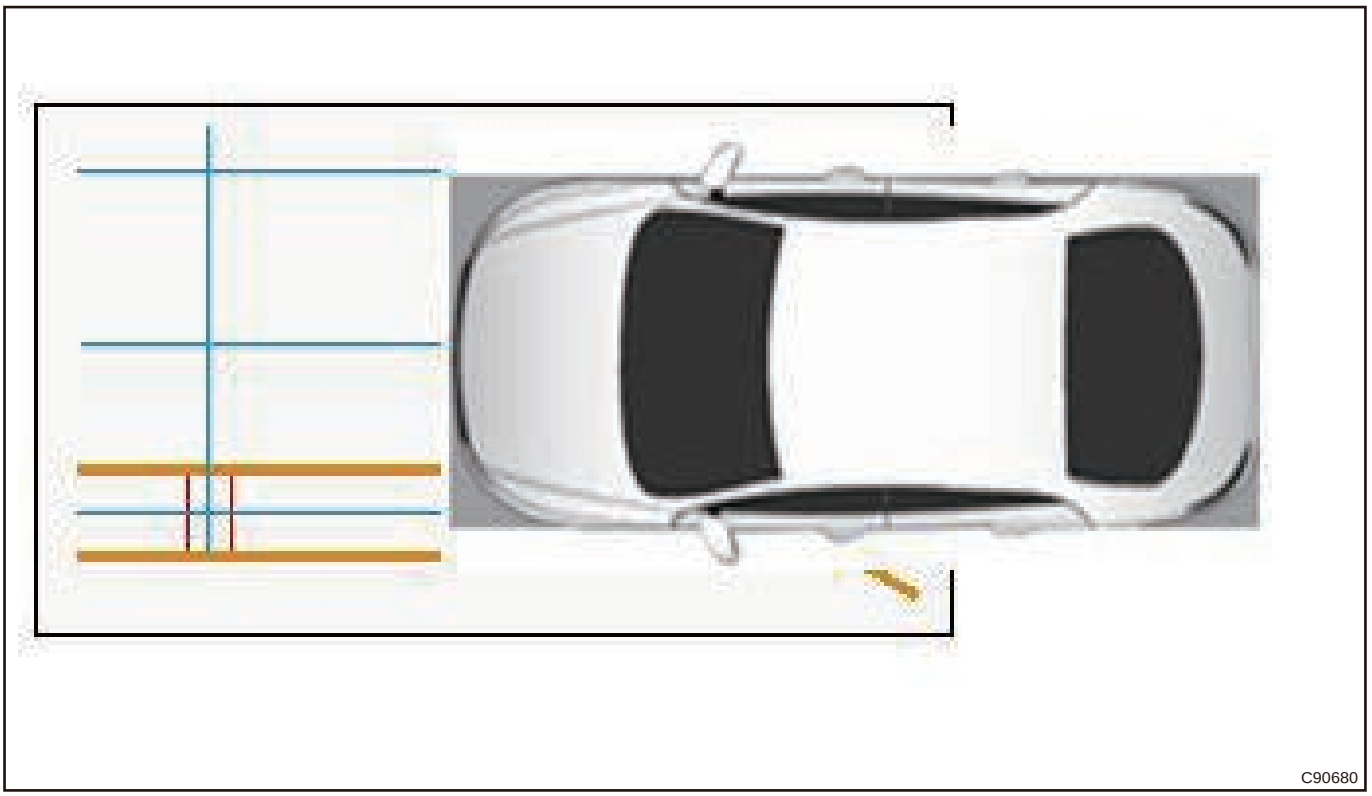
■ Calibration step 1 (vehicle enters the calibration station)

When the vehicle to be calibrated enters the calibration station, the steps are as follows:

(1) After coming out from last station, adjust the position of the vehicle so that the front and rear center of the vehicle is consistent with the center line of the guide rail, as shown in the illustration:



(2) Driving the vehicle forward, slightly adjust the steering wheel and make the front wheels enter the guide rails, as shown in the illustration:

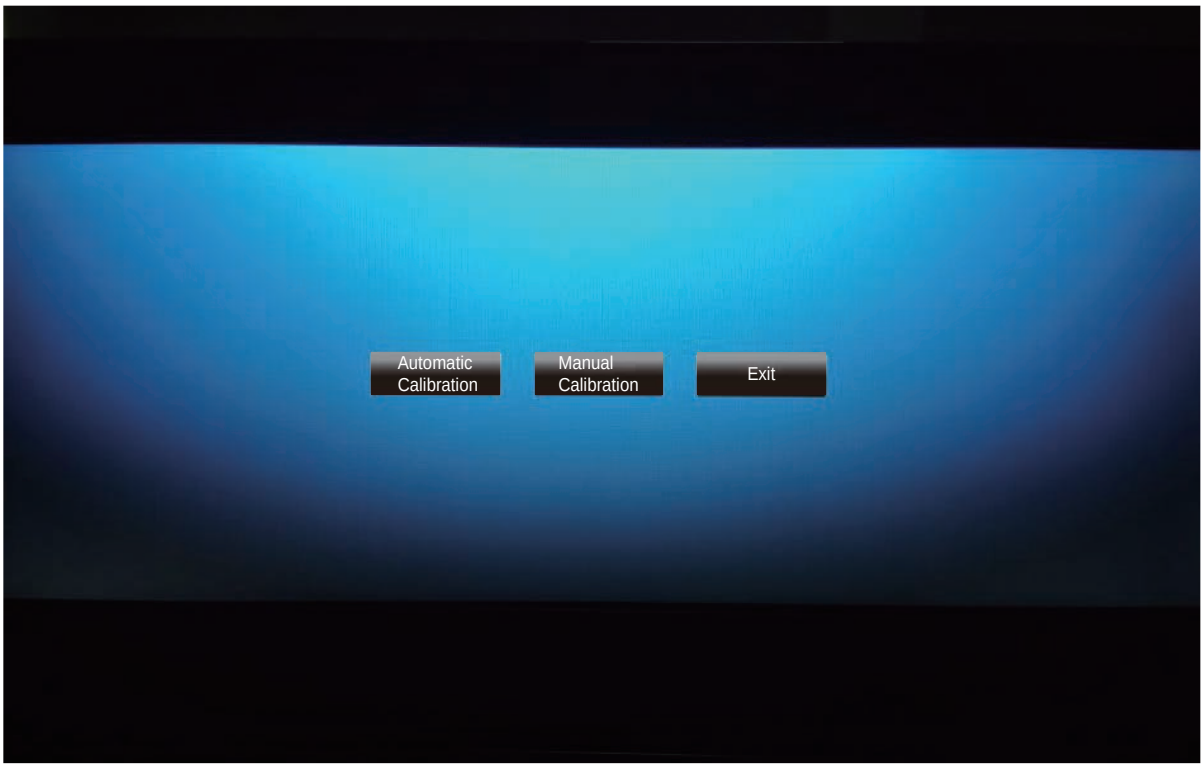


(3) Continues to drive along the guide rail, stops after front wheel enters the position, so that the two front wheels naturally enter the slot, and confirm that the front wheel axis is consistent with the center position of slot, as shown in the following illustration:

C90690

■ **Calibration step 2 (calibration function activated)**

In the IGN-ON or Start state, press both HOME and BACK buttons on auxiliary fascia console switch panel at the same time for 3 seconds and release them; if the operation is valid, the following interface will appear on the audio display. For the calibration operation on production line, please select the "Automatic Calibration" button. The "Manual Calibration" function is mainly used for after-sales calibration.



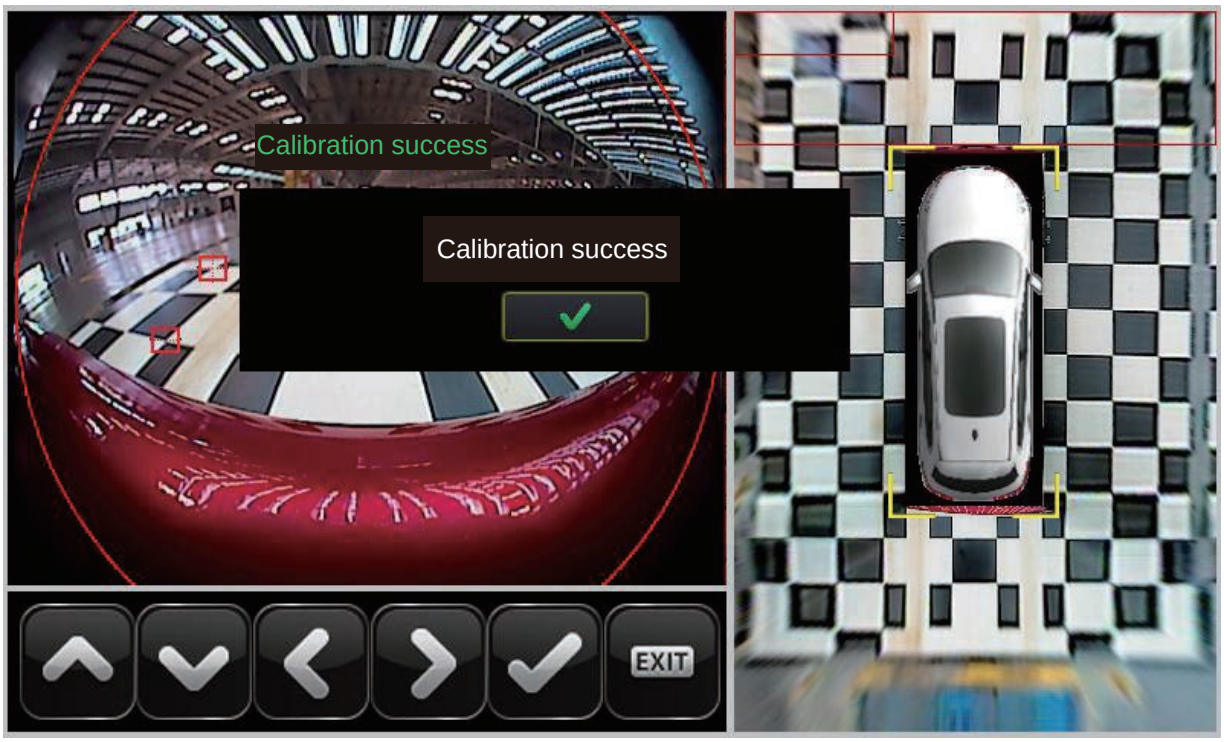
C90700

Caution
The command is valid only when both buttons are pressed at the same time and then released. If there is no response on the audio display after one operation, repeat the operation several times until prompt appears.

■ Calibration step 3 (automatic calibration process)

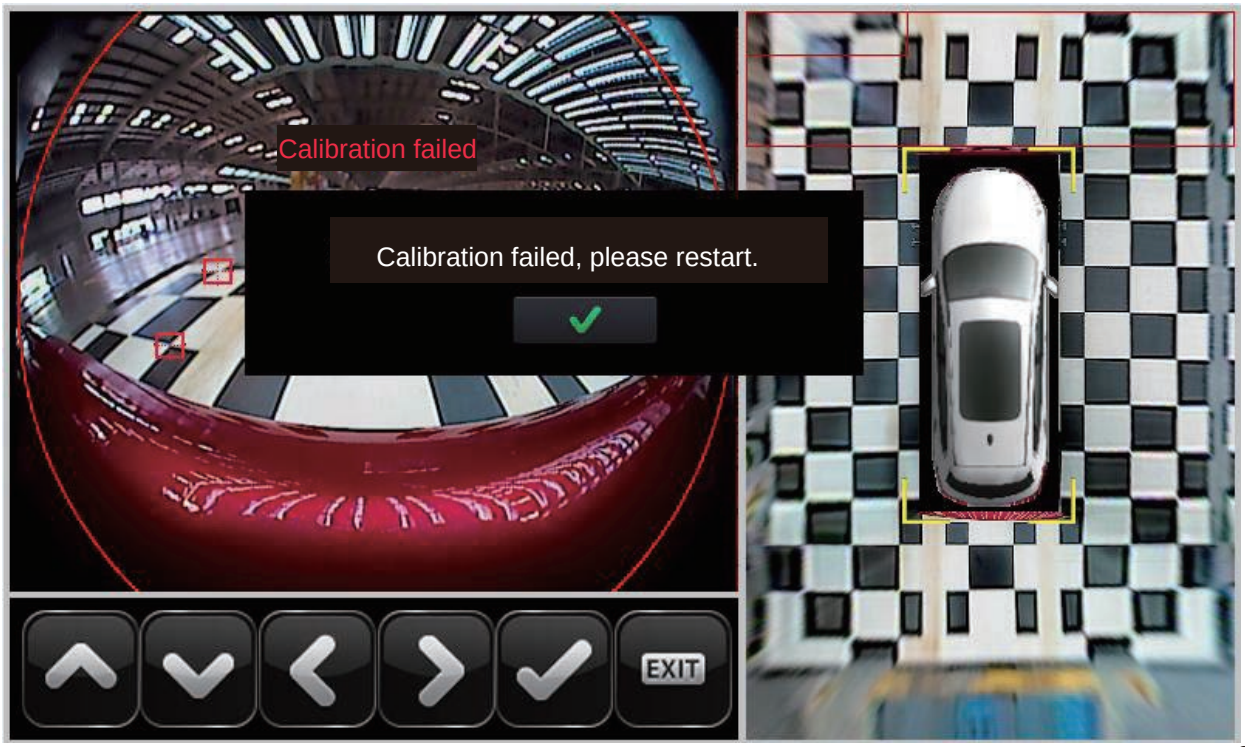
After step 2, the panoramic view monitor system will restart and automatically start the calibration action. After about 10 seconds, the audio display will prompt the calibration result.

(1) Calibration successful: prompt "Calibration success", click " √ " to confirm, the system restarts and calibration is completed, then drive the vehicle out of calibration station.



C90710

(2) Calibration failed: prompt "Calibration failed, please restart", after clicking " √ ", the system restarts and the calibration ends. If you need to re-calibrate, please re-adjust the vehicle and repeat the calibration step 1 to step 3 again.



Caution

- **During the automatic calibration, the panoramic view monitor system restarts twice, during which a brief blue screen or blurry screen may appear on the audio display; this state is normal and will automatically return to normal after the panoramic view monitor system restarts.**
- **After the calibration fails, please exit the system directly and do not save the data;**
- **If the vehicle is not at the calibration station, do not perform calibration operations.**

■ Introduction of Automatic Calibration and Determination Scheme

■ Main Content

The automatic calibration of panoramic view monitor system needs to automatically identify the preset calibration points in image, and calculate the relevant camera parameters by combining the image coordinates and physical coordinates of the calibration points to complete the calibration work. The time from when the system starts to enter the calibration state to its completion should be within 10 seconds. The automatic calibration result evaluation mainly completes the following two tasks:

(1) Determine whether the calibration point identification is accurate, and whether the calibration point can be correctly identified directly determines whether the calibration work can be successfully completed.

(2) Calibration effect evaluation: In the actual use environment, due to various deviation factors, even if the calibration point can be accurately identified, the calibration result will have a certain deviation. The deviation in mosaic image is mainly reflected in the image distortion, mosaic dislocation.

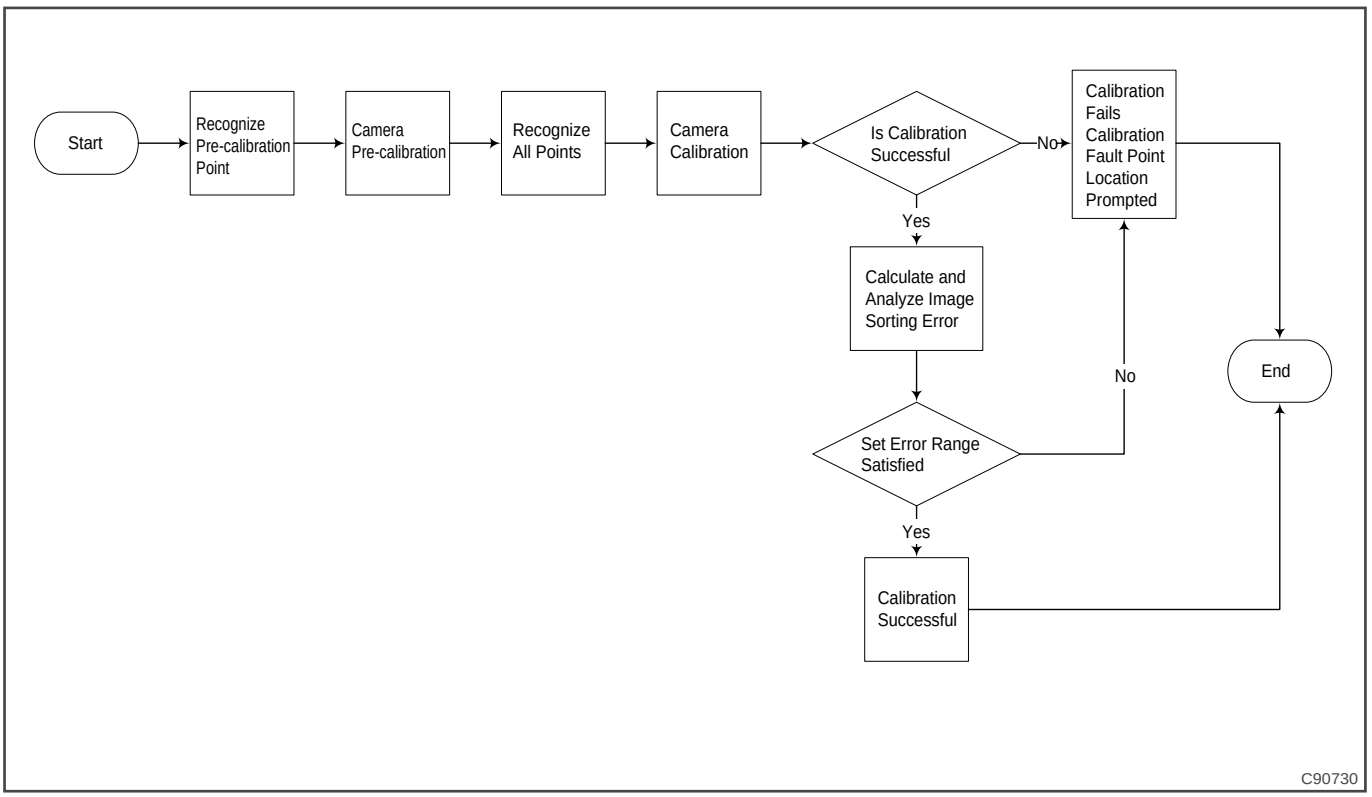
■ Solution Method

- At present, automatic calibration adopts a redundant calibration point. In addition to the image points that must be used for calibration, automatic calibration will also identify some auxiliary calibration points at the same time. It mainly use the necessary points to complete the calibration, and then use some auxiliary calibration points to verify whether the calibration point recognition is successful.
- By using the calibration data to calculate the physical coordinates corresponding to the auxiliary calibration points in the image, the deviation between calculated physical coordinates and real physical coordinates will fluctuate within a relatively small range, and the calibration can be determined to be successful if the deviation is within a certain threshold; Otherwise, the calibration fails.

■ Judgment Principle

- After calibration is completed, the physical point coordinate P_phy corresponding to any point coordinate P_img in the camera image can be obtained through calculation. Ideally, the calculated physical coordinate P_phy and its corresponding real physical coordinate P_PHY should be exactly the same. In the actual case, there will be a certain deviation E_pos = P_phy - P_PHY.
- Calculate the mean square deviation S (S=(1/n*Σ(E_pos_i^2))^(1/2)) between physical coordinates and real physical coordinates of all auxiliary points.
- The splicing effect is evaluated by the mean square deviation between calculated physical coordinates and the real physical coordinates of the calibration points in the splicing area.

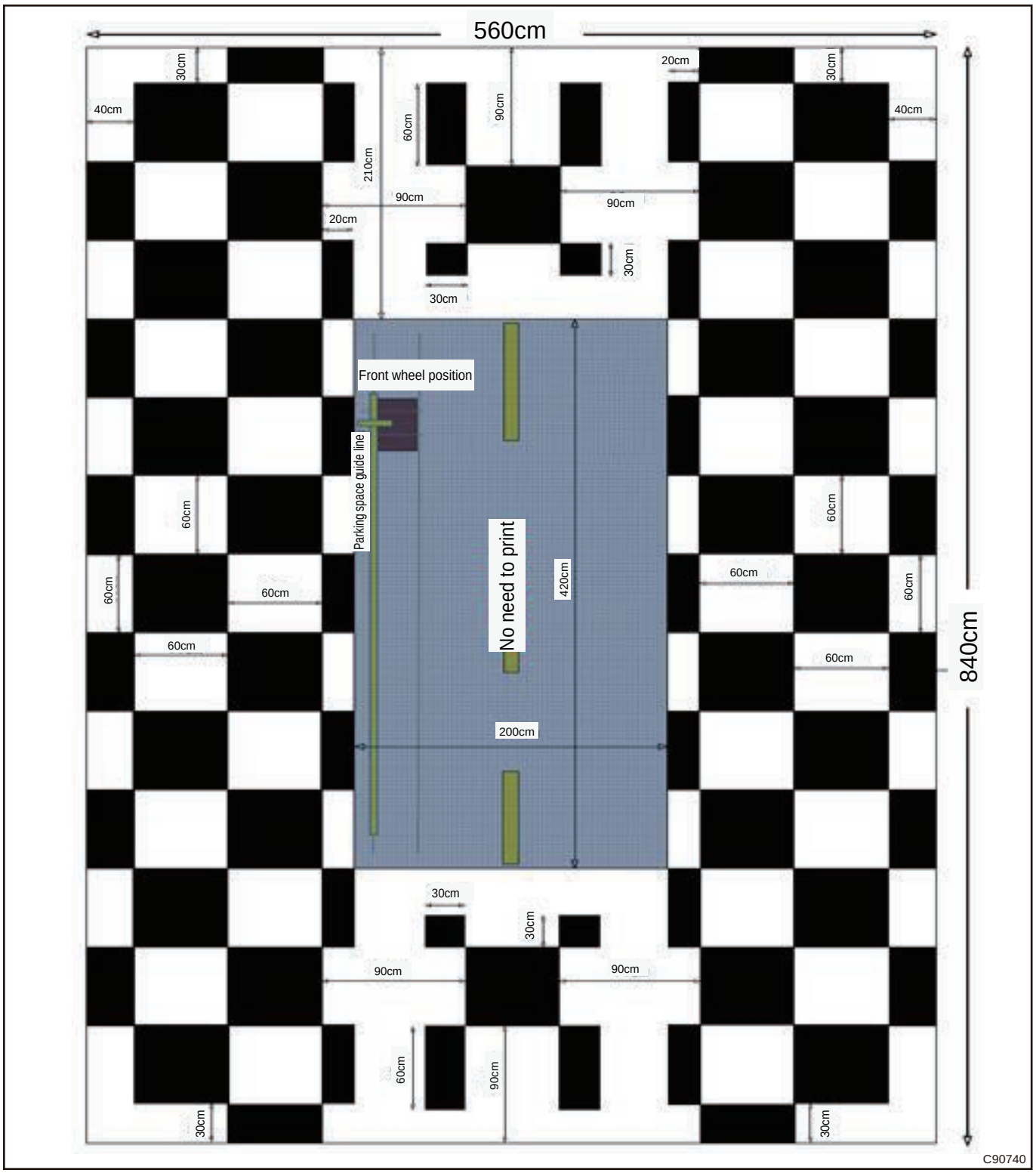
■ Calibration Procedure



■ Calibration Environment Requirement and Condition Layout

■ Site Requirement

Calibration site size: about 5.6 meters wide and about 8.4 meters long. The black blocks in picture are 60 cm*60 cm, 30 cm*30 cm, 20 cm*60 cm, 30 cm*60 cm, 40 cm*60 cm, and the accuracy is controlled within +/-5 mm. Make sure the black block is on the corresponding straight line with the deviation within 5mm on one side of the line. The vertical and vertical extension lines of any black square intersect at 90° with an deviation of ± 0.5°. Please refer to the illustration below for detailed dimensions.



Caution
The calibration site can be adapted to the vehicle with length of 4.4 m to 4.95 m and width of shorter than 2 m.

■ Ground Flatness Requirement

In order to ensure the calibration effect, the flatness of the ground after laying is required to be high, the flatness deviation is required to be within the maximum deviation of +/-10mm for any 2 meters length. If the construction conditions permit, it is recommended to be controlled within +/-5 mm.

■ Light Condition

The ambient lighting requirements of the calibration site are mainly diffuse light, LED lighting (LED tube specification: 1.2 meters long, 6500 K color temperature, power above 16 W), using LED tube vertical lighting, requiring ambient brightness between 300 lux and 1000 lux (It is recommended to use at least three rows of LED tubes, and at least 7 LED tubes in each row). The lighting LED tubes should be installed at a height of 3 to 5 meters directly above the calibration field. In order to prevent sunlight from entering the calibration field through doors and windows, it is required the doors and windows around the field are covered with thick white cloth or shading plates.

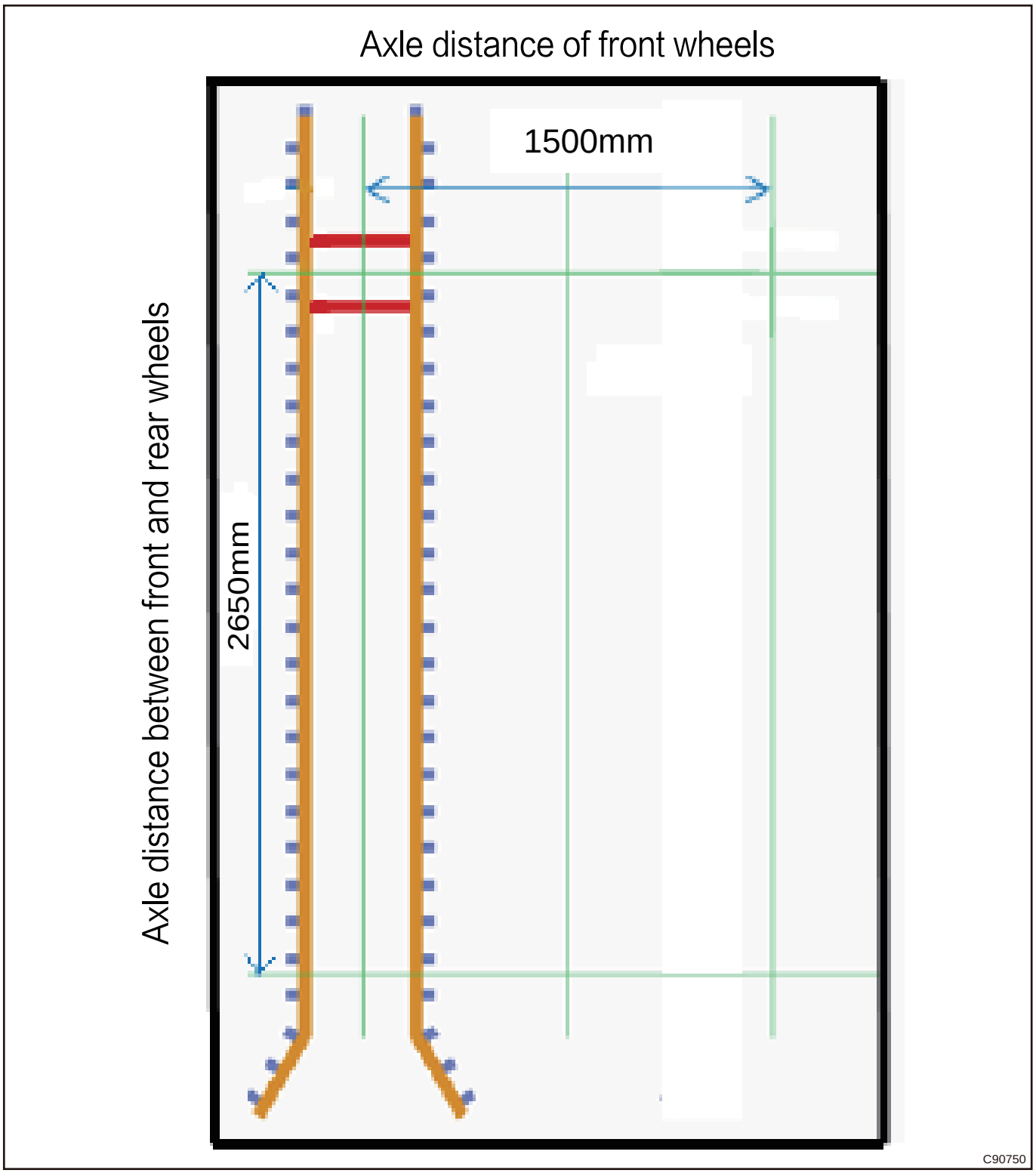
■ Floor Materials Requirements

It is recommended to use black and white acrylic matt outdoor paint (for example: Nadis acrylic outdoor paint) for the calibration of the site. When it comes to wear resistance and matt performance, a better matt paint specification can be selected according to the actual situation to achieve better wear resistance requirements. The checkerboard burr must be within ± 1 mm, and no spots larger than 2 mm are allowed inside the grid.

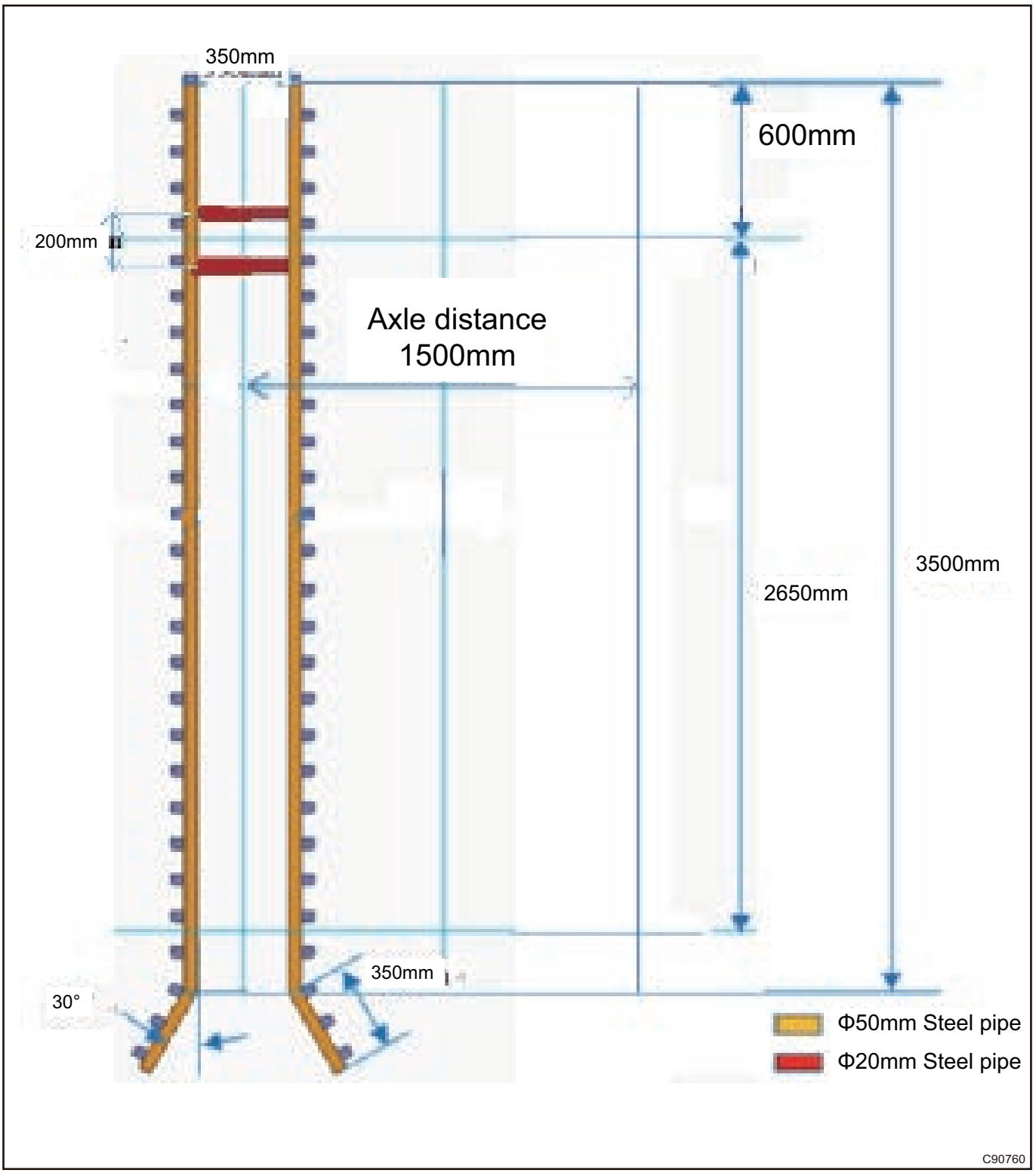
■ Design Requirements for Vehicle Body Area

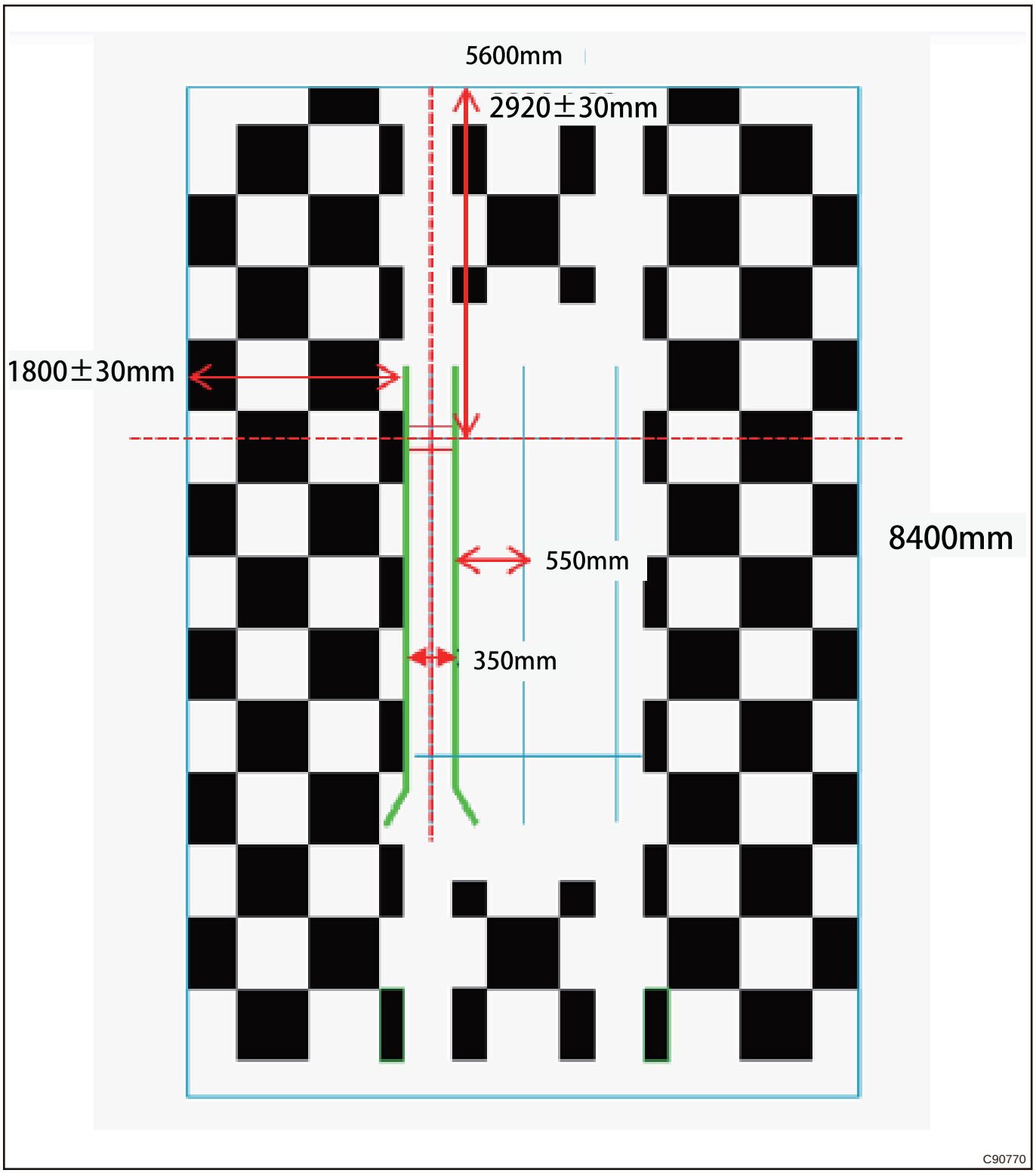
(1) Ground construction and laying: The cement floor is used to ensure that the cement floor and the surrounding floors are laid on the same plane, and treat the cement surface with a matte.

(2) Vehicle positioning device: The vehicle positioning adopts a single-sided and dual-rail positioning method, and the card position accuracy is required to be controlled within +/-5 cm, as shown in illustration.



(3) The type and design requirements of the guide rail: It is recommended to use steel pipes as the material for the guide rail used in calibration site. The type and size requirements are shown in illustration below.


350mm
600mm
200mm
Axle distance
1500mm
3500mm
2650mm
350mm
30°
Φ50mm Steel pipe
Φ20mm Steel pipe
C90760



Caution
The calibration site can be adapted to the vehicle range: 4.4 m ~ 4.95 m of length and shorter than 2 m of width.

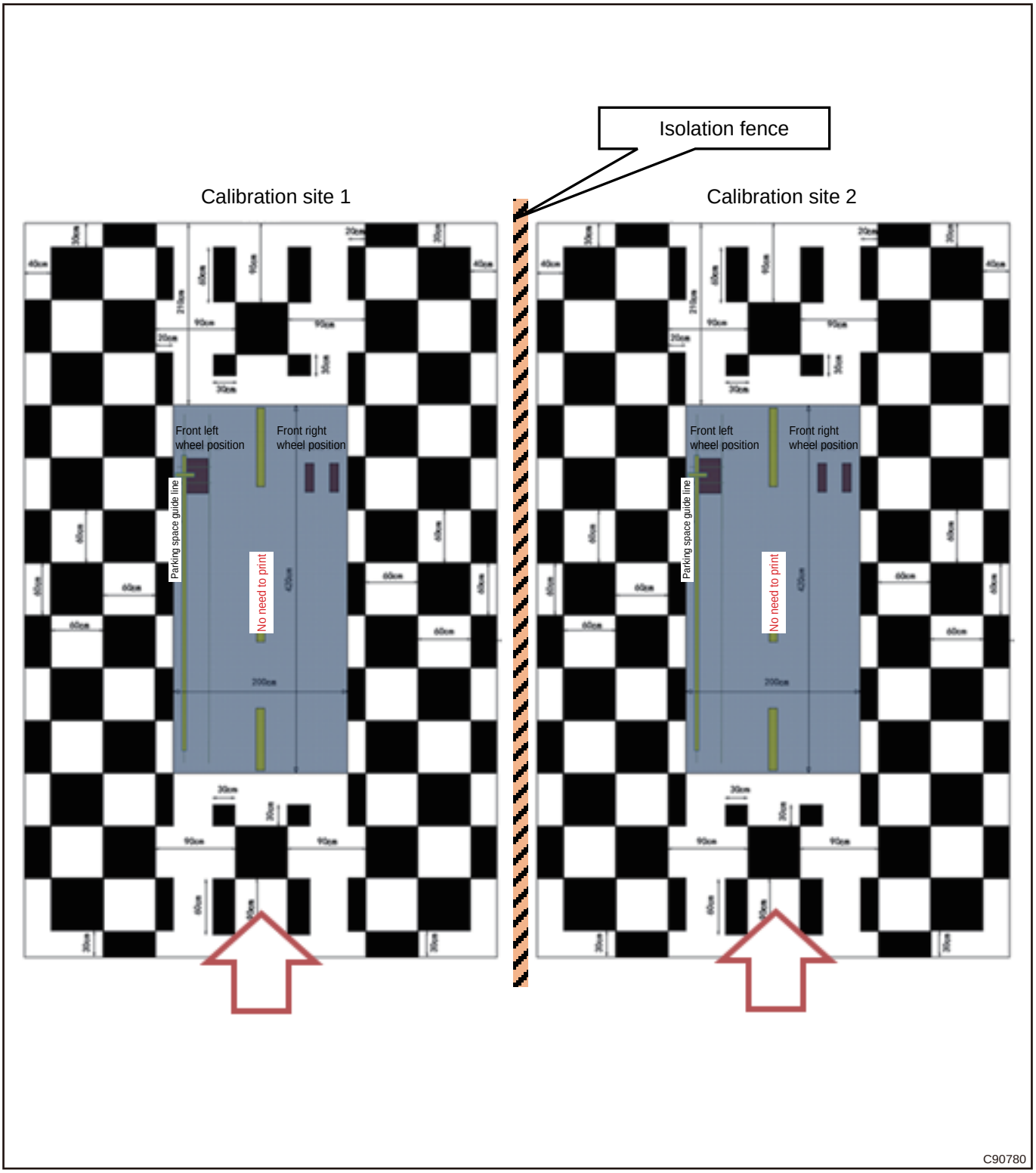
(4) Fixation requirements of the guide rail and ground:

1) Use expansion screws to fix it on the cement floor with ears around guide rail;

2) The thickness of the fixed ears is recommended to choose a material of 5 mm ~ 10 mm;

3) The fixed point arrangement needs to be on the same horizontal line as the center point of each grid side line (Note: When the fixed point is on the outer side, it needs to be performed according to this, if it is on the inner side, it can be implemented according to the actual situation).

(5) Isolation requirements between two sites: If two calibration sites are together (as shown in illustration below), they need to be isolated or shielded in the middle of the sites to avoid mutual interference during the calibration (recommended isolation fence height is higher than 1.2 meters, length is longer than 8.4 meters, the surface material is recommended to be white matte material).



■ **Personnel Requirements**

Operators who perform the calibration of the panoramic view monitor system need to undergo calibration training, and a dedicated person is recommended.

■ **Maintenance and Repair of Site**

In order to ensure the service life of calibration site and the calibration effect of panoramic view monitor, it is recommended that a dedicated person be responsible for the daily repair and maintenance of calibration site. Precautions as follows:

(1) Daily cleaning is recommended once a day; deep cleaning is recommended once a month; annual site inspection is recommended once a year; if the calibration chart is obviously dirty, damaged, or the calibration success rate is significantly reduced, immediate repair and maintenance are required;

(2) The site needs to be equipped with special and clean cleaning tools, such as mops or clothes, etc., and cannot be mixed with tools at other stations to avoid contamination with oil and ground reflections;

(3) In the calibration site area, it is necessary to avoid the entry, exit, stepping, etc. of irrelevant personnel, vehicles, etc., to avoid damage to the site.

3 DIAGNOSIS & TESTING

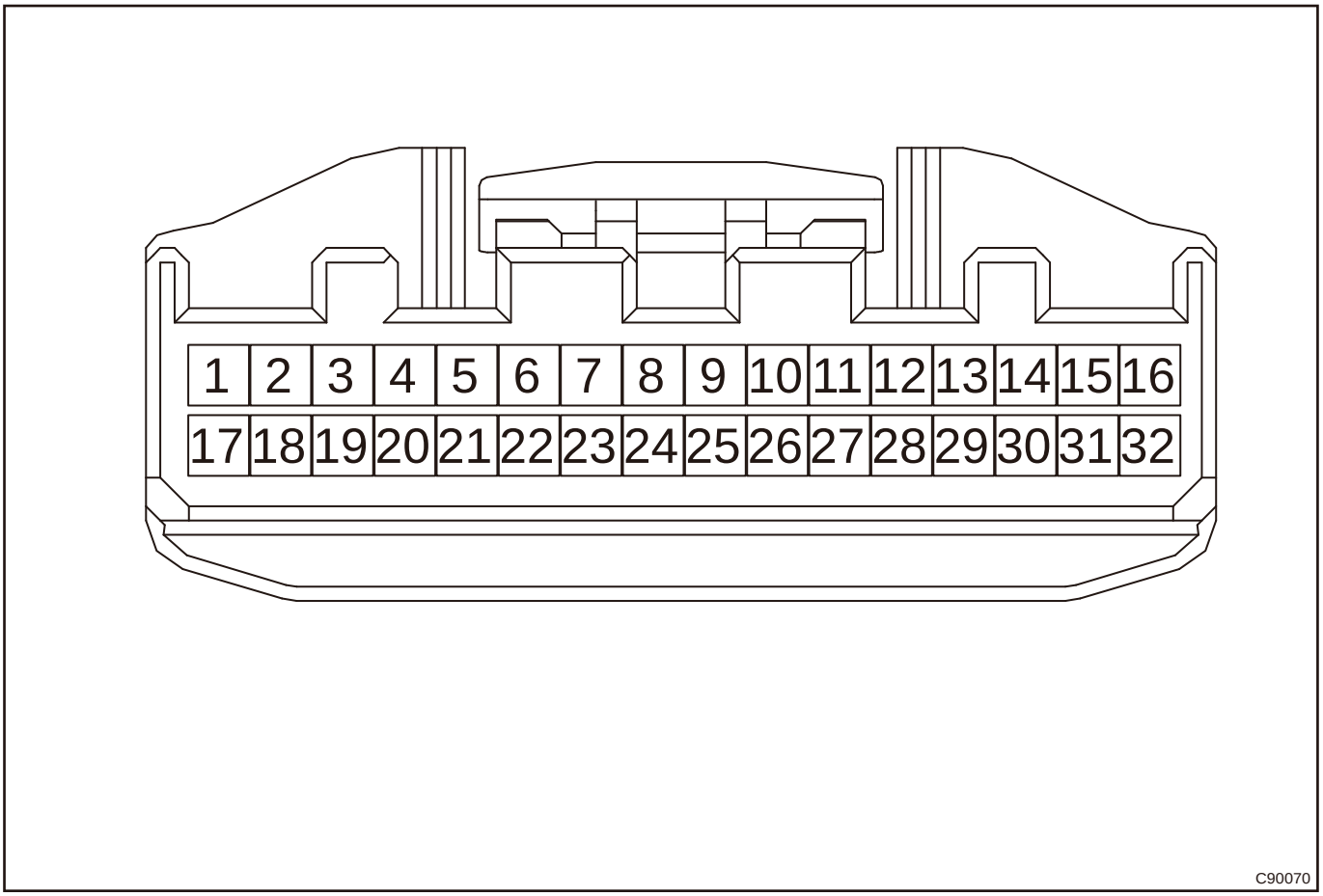
3.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
After reverse gear is engaged, there is no reversing view monitor and the meter does not display the reverse distance	Observe whether the back-up light is come on: If it is come on, check the reverse signal input of DVD/ navigation system and BCM. If it is not come on, check the back-up light switch and line
After reverse gear is engaged, there is no reversing view monitor and the meter display the reverse distance	Check the reverse signal input of DVD/navigation system, camera and line.
After reverse gear is engaged, there is reversing view monitor (if equipped with reversing view monitor) but the meter does not display the reverse distance	Check the reverse signal input of BCM, the LIN of BCM and reversing radar controller, and check the reversing radar controller
Sensor failure, and instrument cluster send an alarm	Check whether there is dirt on reversing radar sensor. If so, remove the dirt on the sensor and check whether the sensor is damaged. If necessary, replace the inspection sensor wire harness

3.2 Module Terminal List

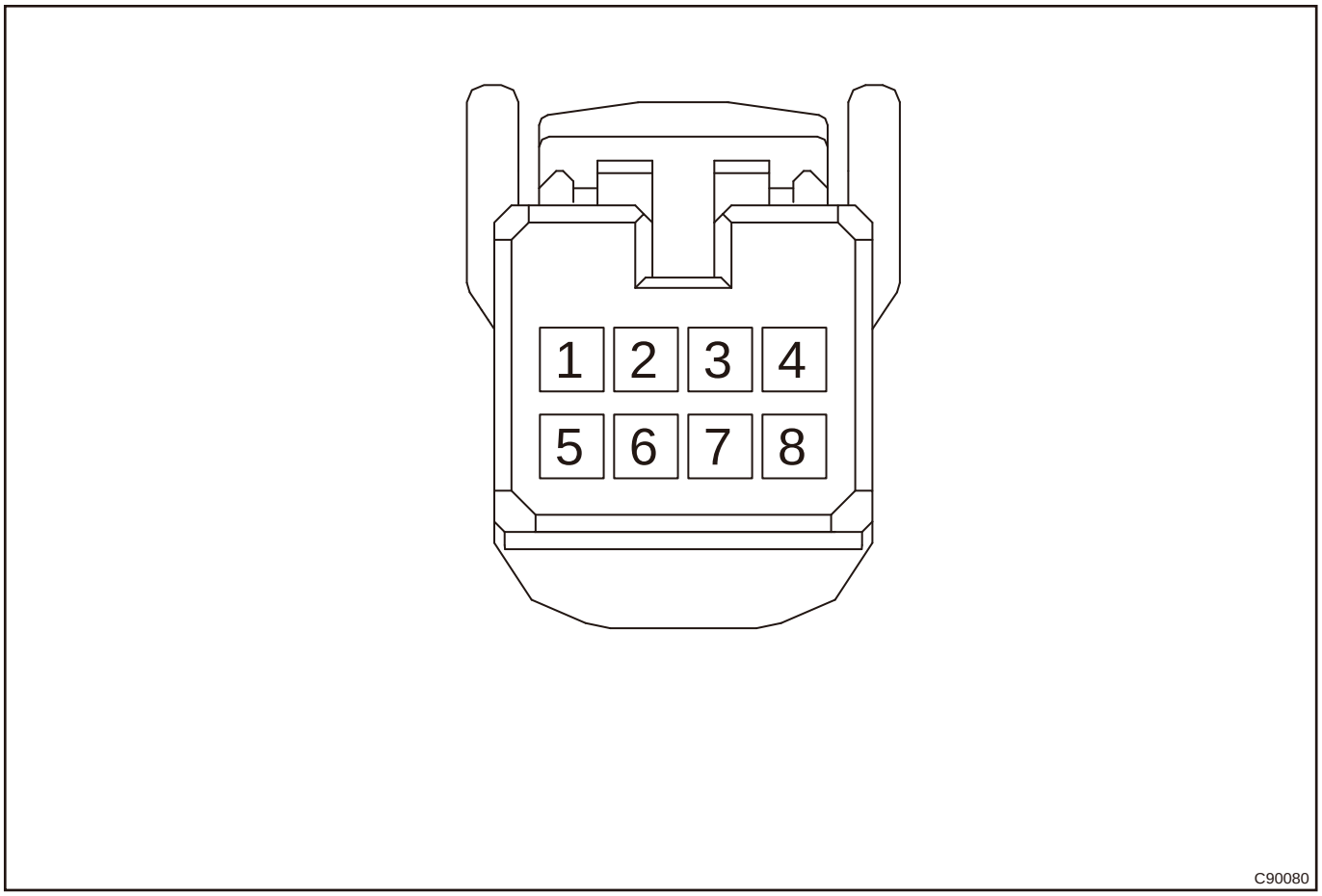
■ **Panoramic Control System (AVM) (With APA) Terminal List**



PIN	Description	PIN	Description
1	APA-LED	17	APA Switch Signal (Low Level)
2	PDC-LED	18	PDC Switch Signal (Low Level)
3	Signal Ground (Rear)	19	Signal Power Supply (Rear)
4	Signal (Rear Right)	20	Signal (Rear Left)
5	Signal (Rear Left)	21	Signal (Rear Left Center)
6	Signal (Rear Right Center)	22	Signal (Rear Right)
7	Signal Ground (Front)	23	Signal Power Supply (Front)
8	Signal (Front Right)	24	Signal (Front Left)
9	Signal (Front Left)	25	Signal (Left Center)
10	Signal (Right Center)	26	Signal (Front Right)
11	–	27	AVM Switch Signal (Low Level)

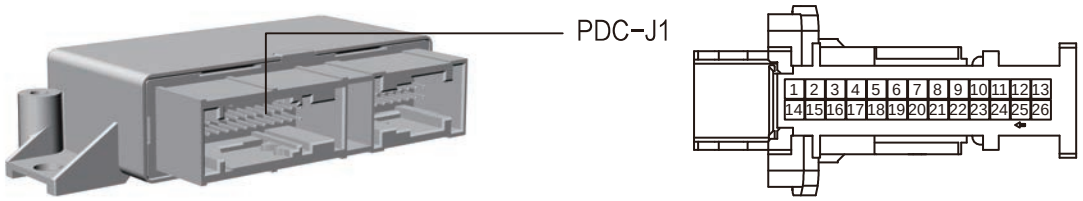
PIN	Description	PIN	Description
12	-	28	-
13	-	29	-
14	Chassis - CAN_L	30	Chassis - CAN_L
15	-	31	Power Supply
16	Ground	32	Power Supply

■ **Panoramic Controller (Without APA) - A Terminal Definition**



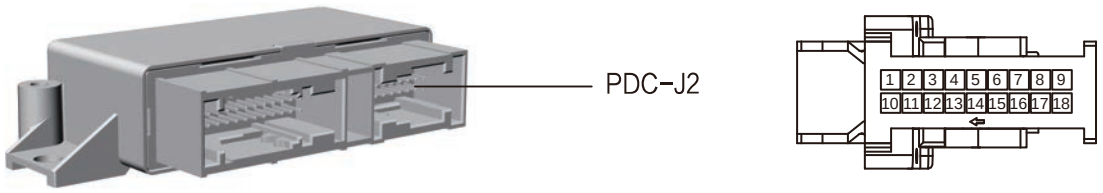
PIN	Description	PIN	Description
1	-	5	-
2	CAN H	6	CAN L
3	Ignition Signal	7	Switch Signal
4	Ground	8	Power Supply

■ Reverse Distance Assist System (PDC) Terminal List



C90071

PIN	Description	PIN	Description
1	–	14	Power Supply
2	–	15	–
3	–	16	PDC Warning Sound Off Button
4	–	17	PDC Warning Sound Off Button Indicator
5	–	18	Rear Radar Sensor Power Supply
6	Rear Left Outside Radar Sensor Signal	19	–
7	Rear Right Inside Radar Sensor Signal	20	Rear Left Inside Radar Sensor Signal
8	–	21	Rear Right Outside Radar Sensor Signal
9	–	22	Rear Radar Sensor Ground
10	–	23	CAN-L
11	–	24	CAN-H
12	–	25	–
13	Ground	26	–



C90072

PIN	Description	PIN	Description
1	–	10	Front Radar Sensor Ground
2	–	11	Front Left Outside Radar Sensor Signal
3	Front Left Inside Radar Sensor Signal	12	Front Right Inside Radar Sensor Signal
4	Front Right Outside Radar Sensor Signal	13	–
5	–	14	Front Radar Sensor Power Supply
6	–	15	–
7	–	16	–
8	–	17	–
9	–	18	–

3.3 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation

may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.6 Diagnosis Procedure

Use following procedures to troubleshoot the parking assist system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Standard voltage: Not less than 12 V

NG → **Replace battery**

OK

3	**Customer problem analysis**

Next

4	**Read DTCs**

History DTC → **Troubleshoot according to Intermittent DTC Fault Flow**

Current DTC

5	**Repair according to Diagnostic Trouble Code (DTC) Chart**

Next

6	**Adjust, repair or replace**

Next

7	**Conduct test and confirm malfunction has been repaired**

Next → End

3.7 Reversing Radar System Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B16000C	PDC ECU Failure
B160117	Supply Voltage Error - High Voltage
B165616	Supply Voltage Error - Low Voltage
B161004	Sensor for PDC Front Left Outer No Signal / No Communication
B161106	Sensor for PDC Front Left Outer Short Circuit to Ubat
B161209	Sensor for PDC Front Left Outer Open Circuit or Short Circuit to Ground
B16130C	Sensor for PDC Front Left Outer Defect
B161404	Sensor for PDC Front Left Inner No Signal / No Communication
B161506	Sensor for PDC Front Left Inner Short Circuit to Ubat
B161609	Sensor for PDC Front Left Inner Open Circuit or Short Circuit to Ground
B16170C	Sensor for PDC Front Left Inner Defect
B161804	Sensor for PDC Front Right Inner No Signal / No Communication
B161906	Sensor for PDC Front Right Inner Short Circuit to Ubat
B162009	Sensor for PDC Front Right Inner Open Circuit or Short Circuit to Ground
B16210C	Sensor for PDC Front Right Inner Defect
B162204	Sensor for PDC Front Right Outer No Signal / No Communication
B162306	Sensor for PDC Front Right Outer Short Circuit to Ubat
B162409	Sensor for PDC Front Right Outer Open Circuit or Short Circuit to Ground
B16250C	Sensor for PDC Front Right Outer Defect
B162604	Sensor for PDC Rear Left Outer No Signal / No Communication
B162706	Sensor for PDC Rear Left Outer Short Circuit to Ubat
B162809	Sensor for PDC Rear Left Outer Open Circuit or Short Circuit to Ground
B16290C	Sensor for PDC Rear Left Outer Defect
B163004	Sensor for PDC Rear Left Inner No Signal / No Communication
B163106	Sensor for PDC Rear Left Inner Short Circuit to Ubat
B163209	Sensor for PDC Rear Left Inner Open Circuit or Short Circuit to Ground

DTC	DTC Definition
B16330C	Sensor for PDC Rear Left Inner Defect
B163404	Sensor for PDC Rear Right Inner No Signal / No Communication
B163506	Sensor for PDC Rear Right Inner Short Circuit to Ubat
B163609	Sensor for PDC Rear Right Inner Open Circuit or Short Circuit to Ground
B16370C	Sensor for PDC Rear Right Inner Defect
B163804	Sensor for PDC Rear Right Outer No Signal / No Communication
B163906	Sensor for PDC Rear Right Outer Short Circuit to Ubat
B164009	Sensor for PDC Rear Right Outer Open Circuit or Short Circuit to Ground
B16410C	Sensor for PDC Rear Right Outer Defect
B165006	PDC Beepoff Switch Indicator Short to Ubat
B165107	PDC Beepoff Switch Indicator Short to Ground
B165407	PDC Beep Off Switch Short to Ground
B16B800	Configuration Error - Not Coded

3.8 DTC Diagnosis Procedure

DTC	B16000C	PDC ECU Failure

DTC	DTC Definition	Possible Cause
B16000C	PDC ECU Failure	• Controller is damaged

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check controller

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Using a diagnostic tester to clear DTCs, perform running test to check if malfunction occurs again.

NG	Replace controller
OK	System is normal

DTC	B160117	Supply Voltage Error - High Voltage
DTC	B165616	Supply Voltage Error - Low Voltage

DTC	DTC Definition	Possible Cause
B160117	Supply Voltage Error - High Voltage	• Power supply system failure • Wire harness connector failure
B165616	Supply Voltage Error - Low Voltage	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check system voltage

Start engine, and use voltage band of multimeter to check if battery voltage is normal (minimum voltage is not less than 12 V).

NG → **Repair or replace battery/alternator**

OK ↓

2	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check continuity of fuse RF35 in instrument panel fuse box with a digital multimeter.

NG → **Replace fuse**

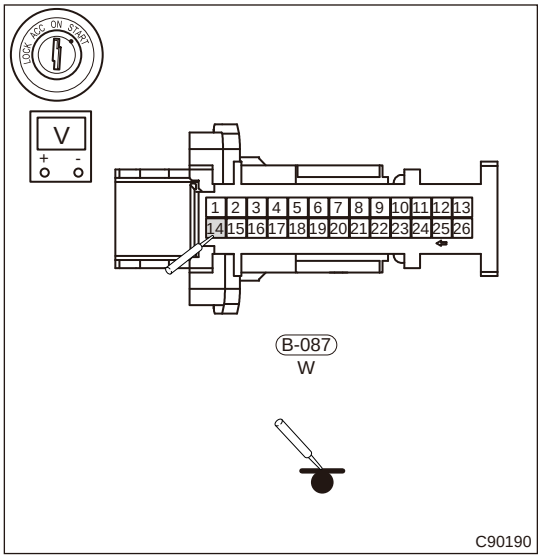
OK ↓

3	Check module power supply

(a) Turn ENGINE START STOP switch to OFF and connect the negative battery cable.

(b) Turn ENGINE START STOP switch to ON and use a digital multimeter to measure voltage of power. If the voltage is as required, make tests with a 21 W bulb. Bright test lamp indicates that power supply is sufficient, and dim test lamp indicates that power supply is insufficient and poor contact of wire harness may occur.

Multimeter Connection	Condition	Specified Condition
B-087 (J1-14) - Ground	ENGINE START STOP switch “ON”	Not less than 12 V



NG → **Repair wire harness**

OK

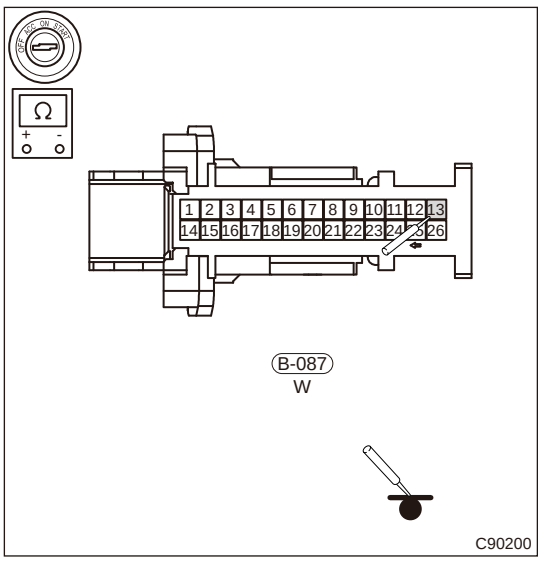
4	Check module ground

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the component connector.

(c) Use ohm band of digital multimeter to check for continuity between B-087 (J1-13) and ground.

Multimeter Connection	Condition	Specified Condition
B-087 (J1-13) - Ground	ENGINE START STOP switch “OFF”	⩽ 1 Ω



OK → **Replace module assembly**

NG → **Check or repair module ground**

DTC	B161106	Sensor for PDC Front Left Outer Short Circuit to Ubat
DTC	B161506	Sensor for PDC Front Left Inner Short Circuit to Ubat
DTC	B161906	Sensor for PDC Front Right Inner Short Circuit to Ubat
DTC	B162306	Sensor for PDC Front Right Outer Short Circuit to Ubat
DTC	B162706	Sensor for PDC Rear Left Outer Short Circuit to Ubat

DTC	**B163106**	**Sensor for PDC Rear Left Inner Short Circuit to Ubat**
DTC	**B163506**	**Sensor for PDC Rear Right Inner Short Circuit to Ubat**
DTC	**B163906**	**Sensor for PDC Rear Right Outer Short Circuit to Ubat**
DTC	**B165006**	**PDC Beepoff Switch Indicator Short to Ubat**

DTC	DTC Definition	Possible Cause
B161106	Sensor for PDC Front Left Outer Short Circuit to Ubat	• Sensor failure • Wire harness connector failure
B161506	Sensor for PDC Front Left Inner Short Circuit to Ubat	
B161906	Sensor for PDC Front Right Inner Short Circuit to Ubat	
B162306	Sensor for PDC Front Right Outer Short Circuit to Ubat	
B162706	Sensor for PDC Rear Left Outer Short Circuit to Ubat	
B163106	Sensor for PDC Rear Left Inner Short Circuit to Ubat	
B163506	Sensor for PDC Rear Right Inner Short Circuit to Ubat	
B163906	Sensor for PDC Rear Right Outer Short Circuit to Ubat	
B165006	PDC Beepoff Switch Indicator Short to Ubat	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check the malfunction of sensor for PDC rear left outer Open circuit or short circuit to ground**

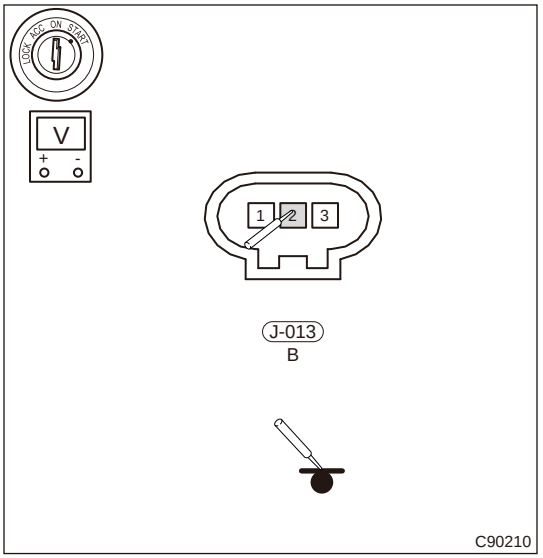
(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

(c) Disconnect parking radar controller connector B-087 and rear left radar sensor connector J-013.

(d) Turn ENGINE START STOP switch to ON, shift the shift lever to R.

(e) Using voltage band of digital multimeter, measure voltage between J-013 (2) and body ground.



Multimeter Connection	Condition	Specified Condition
J-013(2) - Ground	ENGINE START STOP switch "ON"	0V

OK → **Clear DTCs**

NG → **Repair or replace wire harness / connector**

DTC	**B161209**	**Sensor for PDC Front Left Outer Short Circuit to Ubat**
DTC	**B161609**	**Sensor for PDC Front Left Inner Short Circuit to Ubat**
DTC	**B162009**	**Sensor for PDC Front Right Inner Short Circuit to Ubat**
DTC	**B162409**	**Sensor for PDC Front Right Outer Short Circuit to Ubat**
DTC	**B162809**	**Sensor for PDC Rear Left Outer Short Circuit to Ubat**
DTC	**B163209**	**Sensor for PDC Rear Left Inner Short Circuit to Ubat**
DTC	**B163609**	**Sensor for PDC Rear Right Inner Short Circuit to Ubat**
DTC	**B164009**	**Sensor for PDC Rear Right Outer Short Circuit to Ubat**
DTC	**B165107**	**PDC Beepoff Switch Indicator Short to Ubat**
DTC	**B165407**	**PDC Beep Off Switch Short to Ground**

DTC	DTC Definition	Possible Cause
B161209	Sensor for PDC Front Left Outer Open Circuit or Short Circuit to Ground	• Sensor failure • Wire harness connector failure
B161609	Sensor for PDC Front Left Inner Open Circuit or Short Circuit to Ground	
B162009	Sensor for PDC Front Right Inner Open Circuit or Short Circuit to Ground	
B162409	Sensor for PDC Front Right Outer Open Circuit or Short Circuit to Ground	
B162809	Sensor for PDC Rear Left Outer Open Circuit or Short Circuit to Ground	
B163209	Sensor for PDC Rear Left Inner Open Circuit or Short Circuit to Ground	

DTC	DTC Definition	Possible Cause
B163609	Sensor for PDC Rear Right Inner Open Circuit or Short Circuit to Ground	
B164009	Sensor for PDC Rear Right Outer Open Circuit or Short Circuit to Ground	
B165107	PDC Beepoff Switch Indicator Short to Ground	
B165407	PDC Beep Off Switch Short to Ground	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

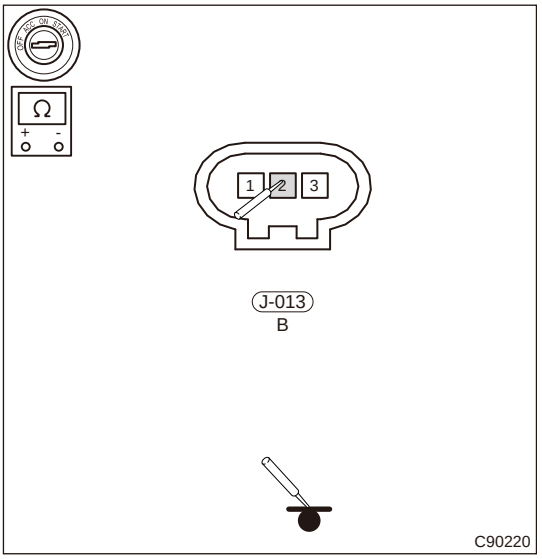
1	**Check the malfunction of sensor for PDC rear left open circuit or short circuit to ground**

(a) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(b) Disconnect parking radar controller connector B-087 and rear left radar sensor connector J-013.

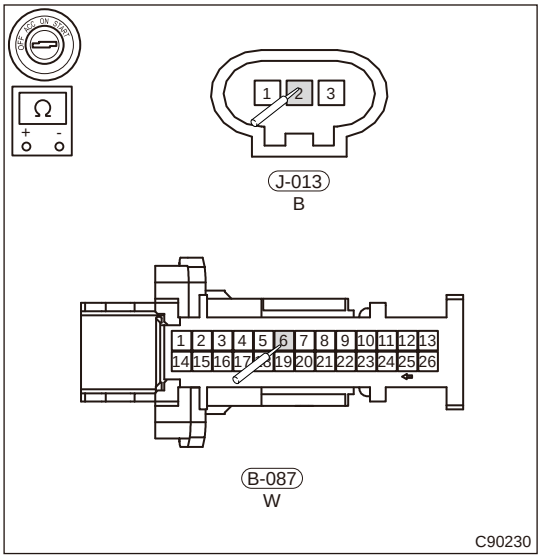
(c) Check for continuity between J-013 (2) and body ground with ohm band of digital multimeter.

Multimeter Connection	Condition	Specified Condition
J-013(2) - Ground	ENGINE START STOP switch “ON”	∞



(d) Use ohm band of digital multimeter to check for continuity between B-087 (J1-6) and J-013 (2).

Multimeter Connection	Condition	Specified Condition
B-087 (J1 -6) - J-013 (2)	Always	⩽ 1 Ω



OK	**Clear DTCs**
NG	**Repair or replace wire harness / connector**

DTC	B16B800	Configuration Error - Not Coded

DTC	DTC Definition	Possible Cause
B16B800	Configuration Error - Not Coded	• Not Coded

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Use the diagnostic tester to perform writing configuration data**

DTC	B161404	Sensor for PDC Front Left Inner No Signal / No Communication
DTC	B16170C	Sensor for PDC Front Left Inner Defect
DTC	B161804	Sensor for PDC Front Right Inner No Signal / No Communication
DTC	B16210C	Sensor for PDC Front Right Inner Defect
DTC	B162204	Sensor for PDC Front Right Outer No Signal / No Communication
DTC	B16250C	Sensor for PDC Front Right Outer Defect
DTC	B162604	Sensor for PDC Rear Left Outer No Signal / No Communication
DTC	B16290C	Sensor for PDC Rear Left Outer Defect
DTC	B163004	Sensor for PDC Rear Left Inner No Signal / No Communication
DTC	B16330C	Sensor for PDC Rear Left Inner Defect
DTC	B163404	Sensor for PDC Rear Right Inner No Signal / No Communication
DTC	B16370C	Sensor for PDC Rear Right Inner Defect

DTC	B163804	Sensor for PDC Rear Right Outer No Signal / No Communication
DTC	B16410C	Sensor for PDC Rear Right Outer Defect

DTC	DTC Definition	Possible Cause
B161004	Sensor for PDC Front Left Outer No Signal / No Communication	• Sensor failure • Wire harness connector failure
B16130C	Sensor for PDC Front Left Outer Defect	
B161404	Sensor for PDC Front Left Inner No Signal / No Communication	
B16170C	Sensor for PDC Front Left Inner Defect	
B161804	Sensor for PDC Front Right Inner No Signal / No Communication	
B16210C	Sensor for PDC Front Right Inner Defect	
B162204	Sensor for PDC Front Right Outer No Signal / No Communication	
B16250C	Sensor for PDC Front Right Outer Defect	
B162604	Sensor for PDC Rear Left Outer No Signal / No Communication	
B16290C	Sensor for PDC Rear Left Outer Defect	
B163004	Sensor for PDC Rear Left Inner No Signal / No Communication	
B16330C	Sensor for PDC Rear Left Inner Defect	
B163404	Sensor for PDC Rear Right Inner No Signal / No Communication	
B16370C	Sensor for PDC Rear Right Inner Defect	
B163804	Sensor for PDC Rear Right Outer No Signal / No Communication	
B16410C	Sensor for PDC Rear Right Outer Defect	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check the status of radar sensor and connector line

(a) Check the appearance of radar sensor body without scratches, breakage or damage, etc.

(b) Check the status of corresponding connector, and there should be no damage and open circuit, etc.; measure and check the reversing radar module connector and component connector without open circuit or misalignment, etc.

OK → Clear DTCs

3.9 Panoramic Control System (AVM) Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B172117	Control Module Battery Voltage is High
B172216	Control Module Battery Voltage is Low
B170013	AVM Front Camera LVDS Cable Open
B170011	AVM Front Camera Power Short to Ground
B170012	AVM Front Camera Power Short to Battery
B170113	AVM Left Camera LVDS Cable Open
B170111	AVM Left Camera Power Supply Short Circuit to Ground
B170112	AVM Left Camera Power Supply Short Circuit to Battery
B170213	AVM Right Camera LVDS Cable Open
B170211	AVM Right Camera Power Supply Short Circuit to Ground
B170212	AVM Right Camera Power Supply Short Circuit to Battery
B170313	AVM Rear Camera LVDS Cable Open
B170311	AVM Rear Camera Power Supply Short Circuit to Ground
B170312	AVM Rear Camera Power Supply Short Circuit to Battery
B170571	AVM ON/OFF Switch Mechanical Adhesion
B17061C	APA Function Indicator Light Circuit Failure
B170671	APA ON/OFF Switch Mechanical Adhesion
B17071C	PDC Function Indicator Light Circuit Failure
B170771	PDC ON/OFF Switch Mechanical Adhesion
B170C54	AVM No Calibration
B171204	AVM Controller Malfunction
B171309	Rear Right Long Distance Ultrasonic Sensor Hardware Fault
B171396	Rear Right Long Distance Ultrasonic Sensor Fault
B171409	Rear Right Lateral Ultrasonic Sensor Hardware Fault
B171496	Rear Right Lateral Ultrasonic Sensor Detection Failed

DTC	DTC Definition
B171509	Rear Right Ultrasonic Sensor Hardware Fault
B171596	Rear Right Ultrasonic Sensor Detection Failed
B171609	Rear Left Ultrasonic Sensor Hardware Fault
B171696	Rear Left Ultrasonic Sensor Detection Failed
B171709	Rear Left Lateral Ultrasonic Sensor Hardware Fault
B171796	Rear Left Lateral Ultrasonic Sensor Detection Failed
B171809	Rear Left Long Distance Ultrasonic Sensor Hardware Fault
B171896	Rear Left Long Distance Ultrasonic Sensor Fault
B171909	Front Right Long Distance Ultrasonic Sensor Hardware Fault
B171996	Front Right Long Distance Ultrasonic Sensor Fault
B171A09	Front Right Lateral Ultrasonic Sensor Hardware Fault
B171A96	Front Right Lateral Ultrasonic Sensor Detection Failed
B171B09	Front Right Ultrasonic Sensor Hardware Fault
B171B96	Front Right Ultrasonic Sensor Detection Failed
B171C09	Front Left Ultrasonic Sensor Hardware Fault
B171C96	Front Left Ultrasonic Sensor Detection Failed
B171D09	Front Left Lateral Ultrasonic Sensor Hardware Fault
B171D96	Front Left Lateral Ultrasonic Sensor Detection Failed
B171E09	Front Left Long Distance Ultrasonic Sensor Hardware Fault
B171E96	Front Left Long Distance Ultrasonic Sensor Fault
B172055	Not Coded

3.10 DTC Diagnosis Procedure

DTC	**B172117**	**Control Module Battery Voltage is High**
DTC	**B172216**	**Control Module Battery Voltage is Low**

DTC	DTC Definition	Possible Cause
B172117	Control Module Battery Voltage is High	• Battery • AVM module • Wire harness and connector
B172216	Control Module Battery Voltage is Low	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery voltage

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Check battery voltage (Not less than 12 V) with a digital multimeter.

NG → **Replace battery**

OK

2	Check charging system

(a) Turn ENGINE START STOP switch to OFF.

(b) Check positive and negative battery cables for broken or damage.

(c) Turn ENGINE START STOP switch to ON.

(d) Start the engine.

(e) Check if voltage of positive and negative battery is normal with a digital multimeter (13.5V-14.8V).

NG → **Repair or replace positive and negative battery cables and alternator**

OK

3	Check AVM module power supply fuse

(a) Turn ENGINE START STOP switch to OFF.

(b) Check if AVM module power supply fuses RF35 and RF19 are blown.

NG → **Replace power supply fuse**

OK

4	Check engine compartment fuse and relay box

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the engine compartment fuse and relay box connector.

(c) Using digital multimeter, check for continuity between fuse RF35 and Pin C1-14 of engine compartment fuse and relay box.

(d) Using digital multimeter, check for continuity between fuse RF19 and Pin C3-17 of engine compartment fuse and relay box.

NG → **Replace engine compartment fuse and relay box**

OK

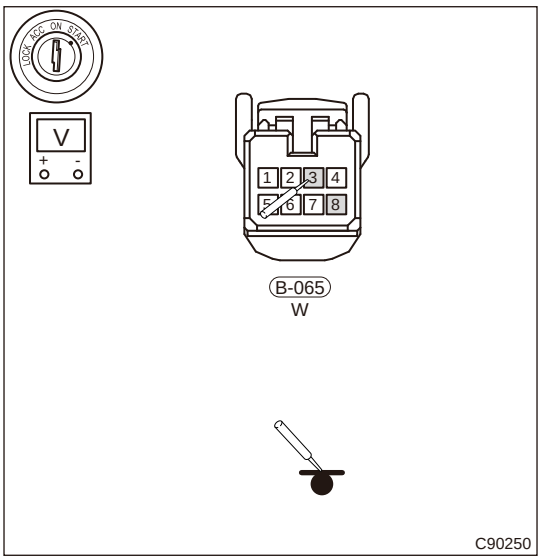
5	Check AVM module power supply wire harness

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the AVM connector B-065.

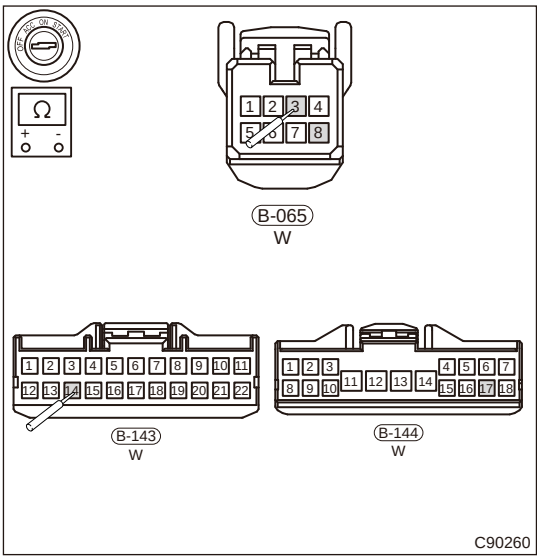
(c) Using a digital multimeter, check if the voltage between terminal B-065 (8), (3) and body ground is normal.

Multimeter Connection	Condition	Specified Condition
B-065 (3) - Body ground	Always	Not less than 12 V
B-065 (8) - Body ground	Always	Not less than 12 V



(d) Using digital multimeter, check for continuity between AVM module connector B-065 (8) - engine compartment fuse and relay box terminal B-144 (17) and terminal B-065 (3) - B-143 (14) to check for open in power supply wire harness.

Multimeter Connection	Condition	Specified Condition
B-065 (3) - B- 143 (14)	Always	⩽ 1 Ω
B-065 (8) - B- 144 (17)	Always	⩽ 1 Ω



NG → Repair or replace wire harness

OK

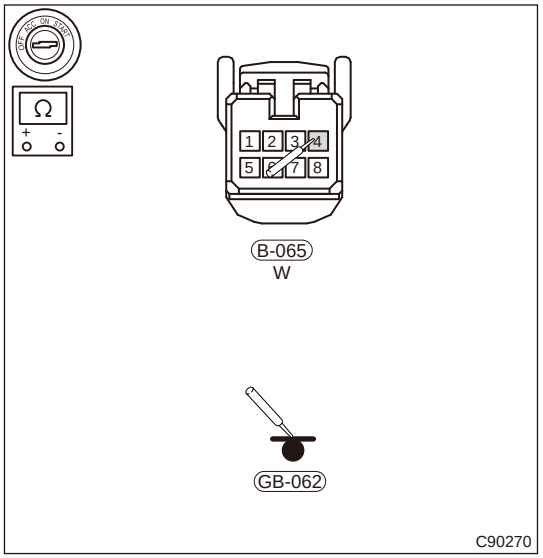
6	Check AVM module ground circuit

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect AVM module connector.

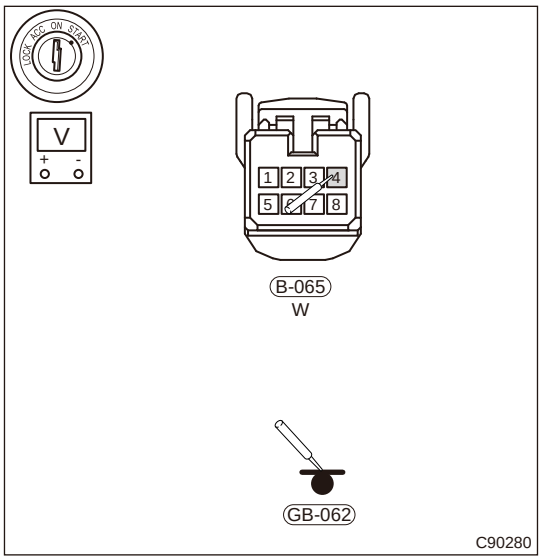
(c) Using digital multimeter, check for continuity between terminals (4) of B -065 and ground wire harness connector GB-062 to check for open in ground wire harness.

Multimeter Connection	Condition	Specified Condition
B-065 (4) - GB-062	Always	⩽ 1 Ω



(d) Using voltage band of digital multimeter, measure voltage between B-065 (4) and body ground to check for short to power supply.

Multimeter Connection	Condition	Specified Condition
B-065 (4) - GB-062	Always	0V



NG → **Repair or replace wire harness**

OK

7	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	**B170013**	**AVM Front Camera LVDS Cable Open**
DTC	**B170011**	**AVM Front Camera Power Short to Ground**
DTC	**B170012**	**AVM Front Camera Power Short to Battery**

DTC	DTC Definition	Possible Cause
B170013	AVM Front Camera LVDS Cable Open	• Camera • Wire harness • AVM module
B170011	AVM Front Camera Power Short to Ground	
B170012	AVM Front Camera Power Short to Battery	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Replace camera with a new one**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Replace front camera with a new one, connect negative battery cable, and turn ENGINE START STOP switch to ON. Start panoramic view monitor system and observe if the camera is working properly.

OK → **Replace front camera**

NG

2	**Check wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect panoramic view monitor control module connector B-068 and front camera connector Q-011.

(c) Using ohm band of multimeter, check for continuity between B-068 (1) and Q-011 (1).

Multimeter Connection	Condition	Specified Condition
B-068 (1) - Q-011 (1)	Always	⩽ 1 Ω

(d) Using ohm band of multimeter, check for continuity between B-068 (2) and Q-011 (2).

Multimeter Connection	Condition	Specified Condition
B-068 (2) - Q-011 (2)	Always	⩽ 1 Ω

NG → **Repair or replace wire harness and connector**

OK

3	Check for short to ground in wire harness or connector.

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect panoramic view monitor control module connector B-068 and front camera connector Q-011.

(c) Using ohm band of multimeter, check for continuity between B-068 (1) and ground, B-068 (2) and ground separately.

Multimeter Connection	Condition	Specified Condition
B-068 (1) - Body ground	Always	No continuity
B-068 (2) - Body ground	Always	No continuity

NG → **Repair or replace connector or wire harness that is shorted to ground**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	B170113	AVM Left Camera LVDS Cable Open
DTC	B170111	AVM Left Camera Power Supply Short Circuit to Ground
DTC	B170112	AVM Left Camera Power Supply Short Circuit to Battery

DTC	DTC Definition	Possible Cause
B170113	AVM Left Camera LVDS Cable Open	• Camera • Wire harness • AVM module
B170111	AVM Left Camera Power Supply Short Circuit to Ground	
B170112	AVM Left Camera Power Supply Short Circuit to Battery	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Replace camera with a new one

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Replace left camera with a new one, connect negative battery cable, and turn ENGINE START STOP switch to ON. Start panoramic view monitor system and observe if the camera is working properly.

OK → **Replace left camera**

NG

2	Check wire harness and connector

(a) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(b) Disconnect panoramic view monitor control module connector B-069 and left rear view mirror camera connector F-014.

(c) Using ohm band of multimeter, check for continuity between B-069 (1) and F-014 (1), B-069 (2) and F-014 (2) separately.

Multimeter Connection	Condition	Specified Condition
B-069 (1) - F-014 (1)	Always	⩽ 1 Ω
B-069 (2) - F-014 (2)	Always	⩽ 1 Ω

NG → **Repair or replace wire harness and connector**

OK

3	Check for short to ground in wire harness and connector

(a) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(b) Disconnect the panoramic view monitor control module connector B-069.

(c) Using ohm band of multimeter, check for continuity between B-069 (1) and ground, B-069 (2) and ground separately.

Multimeter Connection	Condition	Specified Condition
B-069(1) - Body ground	Always	∞
B-069(2) - Body ground	Always	∞

NG → **Repair or replace connector or wire harness that is shorted to ground**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	B170213	AVM Right Camera LVDS Cable Open
DTC	B170211	AVM Right Camera Power Supply Short Circuit to Ground
DTC	B170212	AVM Right Camera Power Supply Short Circuit to Battery

DTC	DTC Definition	Possible Cause
B170213	AVM Right Camera LVDS Cable Open	• Camera • Wire harness • AVM module
B170211	AVM Right Camera Power Supply Short Circuit to Ground	
B170212	AVM Right Camera Power Supply Short Circuit to Battery	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Replace camera with a new one

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(b) Replace right camera with a new one, connect negative battery cable, and turn ENGINE START STOP switch to ON. Start panoramic view monitor system and observe if the camera is working properly.

OK → **Replace right camera**

NG

2	Check for open in wire harness and connector

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect panoramic view monitor control module connector B-070 and right rear view mirror camera connector H-010.

(c) Using ohm band of multimeter, check for continuity between B-070 (1) and H-010 (1), B-070 (2) and H-010 (2) separately.

Multimeter Connection	Condition	Specified Condition
B-070 (1) - H-010 (1)	Always	⩽ 1 Ω
B-070 (2) - H-010 (2)	Always	⩽ 1 Ω

NG → **Repair or replace wire harness and connector**

OK

3	Check for short to ground in wire harness and connector

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the panoramic view monitor control module connector B-070.

(c) Using ohm band of multimeter, check for continuity between B-070 (1) and ground, B-070 (2) and ground separately.

Multimeter Connection	Condition	Specified Condition
B-070 (1) - Body ground	Always	∞
B-070 (2) - Body ground	Always	∞

NG → **Repair or replace connector or wire harness that is shorted to ground**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	B170313	AVM Rear Camera LVDS Cable Open
DTC	B170311	AVM Rear Camera Power Supply Short Circuit to Ground
DTC	B170312	AVM Rear Camera Power Supply Short Circuit to Battery

DTC	DTC Definition	Possible Cause
B170313	AVM Rear Camera LVDS Cable Open	• Camera • Wire harness • AVM module
B170311	AVM Rear Camera Power Supply Short Circuit to Ground	
B170312	AVM Rear Camera Power Supply Short Circuit to Battery	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Replace camera with a new one

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.
(b) Replace rear camera with a new one, connect negative battery cable, and turn ENGINE START STOP switch to ON. Start panoramic view monitor system and observe if the camera is working properly.

OK → **Replace rear camera**

NG

2	Check wire harness and connector

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect panoramic view monitor control module connector B-071 and rear camera connector T-013.

(c) Using ohm band of multimeter, check for continuity between B-071 (1) and T-013 (1), B - 071 (2) and T - 013 (2) separately.

Multimeter Connection	Condition	Specified Condition
B-071 (1) - T-013 (1)	Always	⩽ 1 Ω
B-071 (2) - T-013 (2)	Always	⩽ 1 Ω

NG → **Repair or replace wire harness and connector**

OK

3	Check for short to ground in wire harness and connector

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the panoramic view monitor control module connector B-071.

(c) Using ohm band of multimeter, check for continuity between B-071 (1) and body ground, B-071 (2) and body ground separately.

Multimeter Connection	Condition	Specified Condition
B-071 (1) - Body ground	Always	∞
B-071 (2) - Body ground	Always	∞

NG → **Repair or replace connector or wire harness that is shorted to ground**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK	Conduct test and confirm malfunction has been repaired

DTC	B170571	AVM ON/OFF Switch Mechanical Adhesion

DTC	DTC Definition	Possible Cause
B170571	AVM ON/OFF Switch Mechanical Adhesion	• AVM switch • Wire harness • AVM module

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Enter AVM system and read related data stream

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect the diagnostic tester.

(b) Read data stream “input status”.

(c) Press the switch to check the transition of data stream state to check if switch input is normal.

OK	Turn off vehicle power supply (disconnect the negative battery cable), then clear DTC again

NG

2	Replace AVM switch with a new one

(a) Turn ENGINE START STOP switch to OFF.

(b) Remove the old AVM switch.

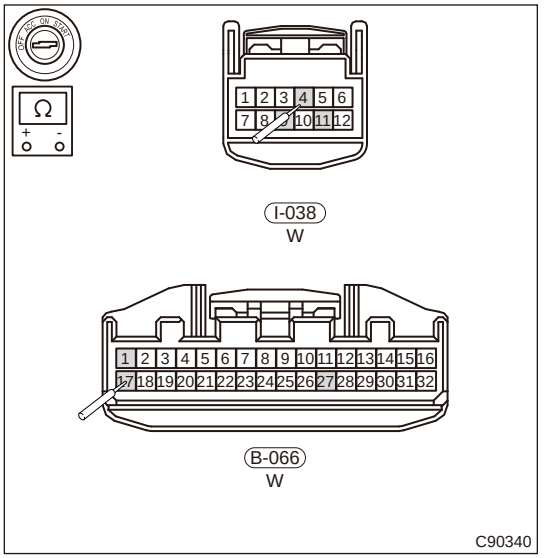
(c) Install new switch and perform running test.

OK	Replace AVM switch

NG

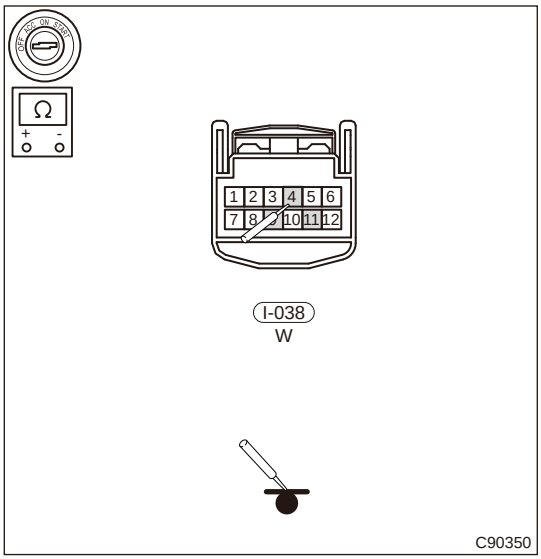
3	Check for open or short in wire harness

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect central console switch connector I-038 and AVM module connector B-66.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.
(g) Using ohm band of digital multimeter, check for continuity between I-038 (9) and B-066 (1), I-038 (4) and B-066 (17), I-038 (11) and B -066 (27) to check for open in circuit.



Multimeter Connection	Condition	Specified Condition
I-038 (9) - B-066 (1)	Always	⩽ 1 Ω
I-038 (4) - B-066 (17)	Always	⩽ 1 Ω
I-038 (11) - B-066 (27)	Always	⩽ 1 Ω

(h) Using ohm band of digital multimeter, check for continuity between terminals (9), (4) and (11) of connector I-038 and body ground to check for short to ground in instrument panel wire harness.



Multimeter Connection	Condition	Specified Condition
I-038 (9) - Body ground	Always	No continuity
I-038 (4) - Body ground	Always	No continuity
I-038 (11) - Body ground	Always	No continuity

NG → **Repair or replace connector or wire harness**

OK →

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	B17061C	APA Function Indicator Light Circuit Failure
DTC	B170671	APA ON/OFF Switch Mechanical Adhesion

DTC	DTC Definition	Possible Cause
B17061C	APA Function Indicator Light Circuit Failure	• APA Switch • Wire harness • AVM module
B170671	APA ON/OFF Switch Mechanical Adhesion	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Replace APA switch with a new one

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Remove the used APA switch.

(c) Install new switch and perform running test.

OK → **Replace APA switch**

NG

2	Check for open or short in wire harness

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

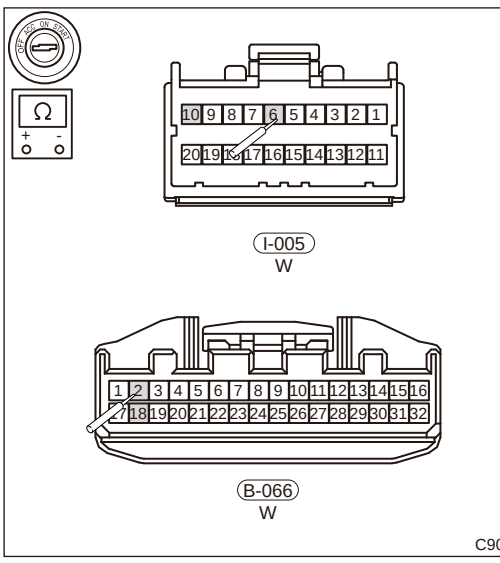
(c) Disconnect APA switch connector I-005 and AVM module connector B-066.

(d) Check if wire harnesses are worn, pierced, pinched or partially broken.

(e) Check for broken, bent, protruded or corroded terminals.

(f) Check if related connector pins are in good condition.

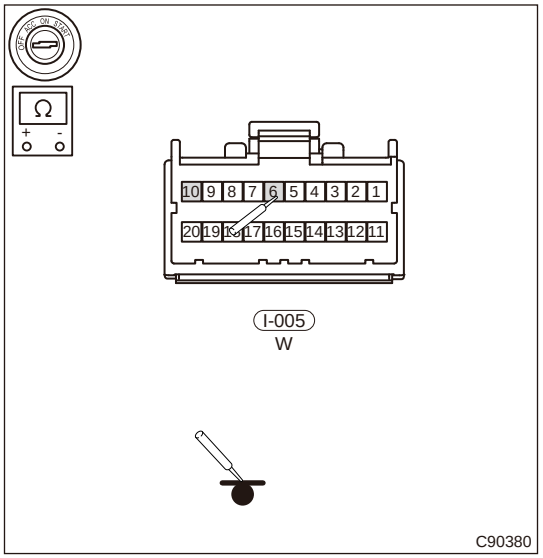
(g) Using ohm band of digital multimeter, check for continuity between I-005 (6) and B-066 (2), I-005 (10) and B-066 (18) to check for open in circuit.



Multimeter Connection	Condition	Specified Condition
I-005 (6) - B-066 (2)	Always	⩽ 1 Ω
I-005 (10) - B-066 (18)	Always	⩽ 1 Ω

(h) Using ohm band of digital multimeter, check for continuity between terminals 6, 10 of connector I-005 and body ground to check for short to ground in instrument panel wire harness.

Multimeter Connection	Condition	Specified Condition
I-005 (6) - Body ground	Always	No continuity
I-005 (10) - Body ground	Always	No continuity



NG → **Replace wire harness**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	B17071C	PDC Function Indicator Light Circuit Failure
DTC	B170771	PDC ON/OFF Switch Mechanical Adhesion

DTC	DTC Definition	Possible Cause
B17071C	PDC Function Indicator Light Circuit Failure	• PDC switch • Wire harness • AVM module
B170771	PDC ON/OFF Switch Mechanical Adhesion	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Replace PDC switch with a new one

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Remove the used PDC switch

(c) Install new switch and perform running test.

OK → **Replace PDC switch**

NG

2	Check for open or short in wire harness

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

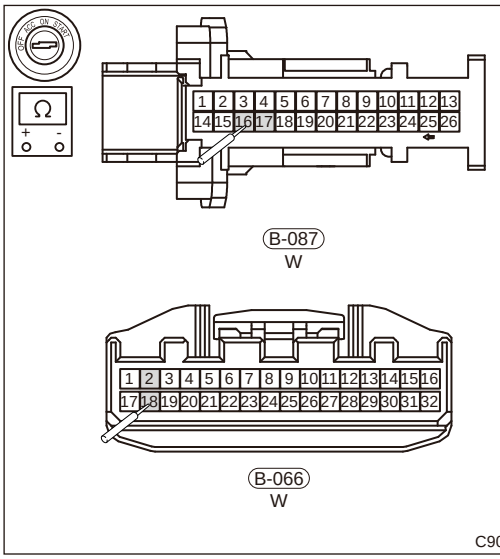
(c) Disconnect PDC switch B-087 and AVM module connector B-066.

(d) Check if wire harnesses are worn, pierced, pinched or partially broken.

(e) Check for broken, bent, protruded or corroded terminals.

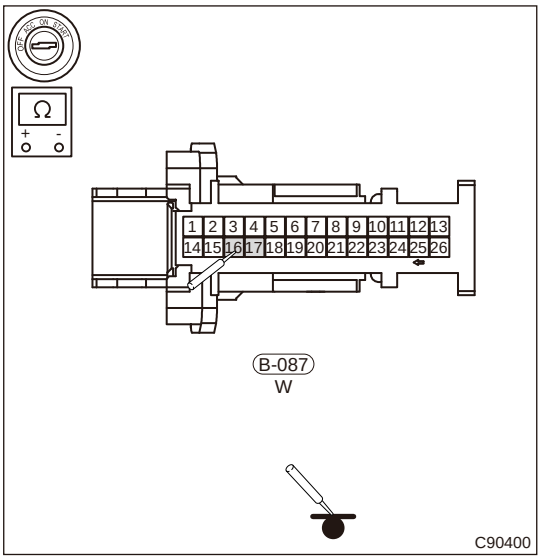
(f) Check if related connector pins are in good condition.

(g) Using ohm band of digital multimeter, check for continuity between B-087 (J1-16) and B- 066 (18); B-087 (J1-17) and B-066 (2) to check for open in circuit.



Multimeter Connection	Condition	Specified Condition
B-087 (J1-16) - B-066 (18)	Always	⩽ 1 Ω
B-087 (J1-17) - B-066 (2)	Always	⩽ 1 Ω

(h) Using ohm band of digital multimeter, check for continuity between terminals J1-16 and J1-17 of connector B-087 and body ground to check for short to ground in instrument panel wire harness.



Multimeter Connection	Condition	Specified Condition
B-087 (J1-16) - Body ground	Always	No continuity
B-087 (J1-17) - Body ground	Always	No continuity

NG → **Replace wire harness**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → Replace AVM module

OK → Conduct test and confirm malfunction has been repaired

DTC	B170C54	AVM No Calibration

DTC	DTC Definition	Possible Cause
B170C54	AVM No Calibration	• AVM No Calibration

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Recalibration

DTC	B171204	AVM Controller Malfunction

DTC	DTC Definition	Possible Cause
B171204	AVM Controller Malfunction	• AVM Controller Malfunction

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Replace AVM controller

OK → Clear DTCs

DTC	**B171309**	**Rear Right Long Distance Ultrasonic Sensor Hardware Fault**
DTC	**B171396**	**Rear Right Long Distance Ultrasonic Sensor Fault**
DTC	**B171409**	**Rear Right Lateral Ultrasonic Sensor Hardware Fault**
DTC	**B171496**	**Rear Right Lateral Ultrasonic Sensor Detection Failed**
DTC	**B171509**	**Rear Right Ultrasonic Sensor Hardware Fault**
DTC	**B171596**	**Rear Right Ultrasonic Sensor Detection Failed**
DTC	**B171609**	**Rear Left Ultrasonic Sensor Hardware Fault**
DTC	**B171696**	**Rear Left Ultrasonic Sensor Detection Failed**
DTC	**B171709**	**Rear Left Lateral Ultrasonic Sensor Hardware Fault**
DTC	**B171796**	**Rear Left Lateral Ultrasonic Sensor Detection Failed**
DTC	**B171809**	**Rear Left Long Distance Ultrasonic Sensor Hardware Fault**
DTC	**B171896**	**Rear Left Long Distance Ultrasonic Sensor Fault**
DTC	**B171909**	**Front Right Long Distance Ultrasonic Sensor Hardware Fault**
DTC	**B171996**	**Front Right Long Distance Ultrasonic Sensor Fault**
DTC	**B171A09**	**Front Right Lateral Ultrasonic Sensor Hardware Fault**
DTC	**B171A96**	**Front Right Lateral Ultrasonic Sensor Detection Failed**
DTC	**B171B09**	**Front Right Ultrasonic Sensor Hardware Fault**
DTC	**B171B96**	**Front Right Ultrasonic Sensor Detection Failed**
DTC	**B171C09**	**Front Left Ultrasonic Sensor Hardware Fault**
DTC	**B171C96**	**Front Left Ultrasonic Sensor Detection Failed**
DTC	**B171D09**	**Front Left Lateral Ultrasonic Sensor Hardware Fault**
DTC	**B171D96**	**Front Left Lateral Ultrasonic Sensor Detection Failed**
DTC	**B171E09**	**Front Left Long Distance Ultrasonic Sensor Hardware Fault**
DTC	**B171E96**	**Front Left Long Distance Ultrasonic Sensor Fault**

DTC	DTC Definition	Possible Cause
B171309	Rear Right Long Distance Ultrasonic Sensor Hardware Fault	• Ultrasonic sensor • Wire harness • AVM module
B171396	Rear Right Long Distance Ultrasonic Sensor Fault	
B171409	Rear Right Lateral Ultrasonic Sensor Hardware Fault	
B171496	Rear Right Lateral Ultrasonic Sensor Detection Failed	
B171509	Rear Right Ultrasonic Sensor Hardware Fault	
B171596	Rear Right Ultrasonic Sensor Detection Failed	

DTC	DTC Definition	Possible Cause
B171609	Rear Left Ultrasonic Sensor Hardware Fault	
B171696	Rear Left Ultrasonic Sensor Detection Failed	
B171709	Rear Left Lateral Ultrasonic Sensor Hardware Fault	
B171796	Rear Left Lateral Ultrasonic Sensor Detection Failed	
B171809	Rear Left Long Distance Ultrasonic Sensor Hardware Fault	
B171896	Rear Left Long Distance Ultrasonic Sensor Fault	
B171909	Front Right Long Distance Ultrasonic Sensor Hardware Fault	
B171996	Front Right Long Distance Ultrasonic Sensor Fault	
B171A09	Front Right Lateral Ultrasonic Sensor Hardware Fault	
B171A96	Front Right Lateral Ultrasonic Sensor Detection Failed	
B171B09	Front Right Ultrasonic Sensor Hardware Fault	
B171B96	Front Right Ultrasonic Sensor Detection Failed	
B171C09	Front Left Ultrasonic Sensor Hardware Fault	
B171C96	Front Left Ultrasonic Sensor Detection Failed	
B171D09	Front Left Lateral Ultrasonic Sensor Hardware Fault	
B171D96	Front Left Lateral Ultrasonic Sensor Detection Failed	
B171E09	Front Left Long Distance Ultrasonic Sensor Hardware Fault	
B171E96	Front Left Long Distance Ultrasonic Sensor Fault	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Caution
The following detection takes the front left long distance ultrasonic sensor as an example.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check the front left long distance ultrasonic sensor

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Remove the old front left long distance ultrasonic sensor.

(c) Install new front left long distance ultrasonic sensor and perform running test.

OK → **Replace the front left long distance ultrasonic sensor**

NG

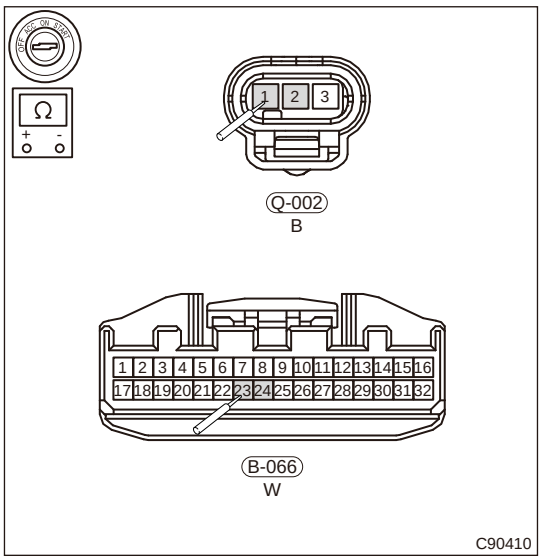
2	Check wire harness and connector

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect AVM module connector B-066 and front left long distance ultrasonic sensor connector Q-002.

(c) Using ohm band of multimeter, check for continuity between front left long distance ultrasonic sensor and AVM controller separately.

Multimeter Connection	Condition	Specified Condition
B-066 (23) - Q-002 (1)	Always	⩽ 1 Ω
B-066 (24) - Q-002 (2)	Always	⩽ 1 Ω



NG → **Replace wire harness and connector**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace AVM module**

OK → **Conduct test and confirm malfunction has been repaired**

DTC	B172055	Not Coded

DTC	DTC Definition	Possible Cause
B172055	Not Coded	• Not Coded

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

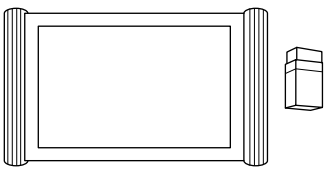
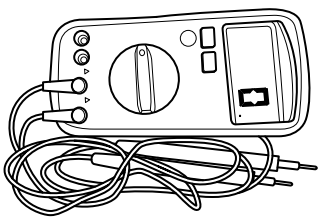
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Reconfiguration**

4 ON-VEHICLE SERVICE

4.1 Tools

Tool Name	Tool Drawing
Digital Multimeter	 RCH0001006
X-431 PAD Diagnostic Tester	 RCH0002006

4.2 Reversing Radar Sensor

■ **Removal**

Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing reversing radar sensors.** • **Operate carefully to avoid damaging reversing radar sensors, when removing reversing radar sensors.**

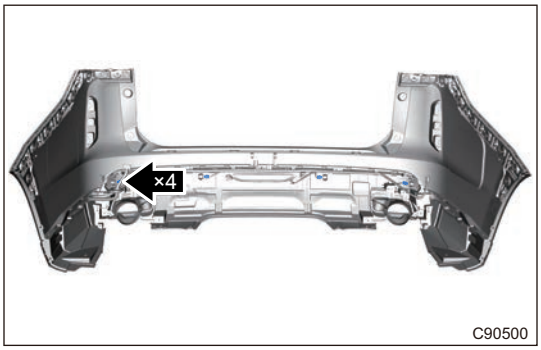
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear bumper.

(4) Disconnect the reversing radar sensor connector.

(5) Remove reversing radar sensor from slots of rear bumper assembly.



■ **Installation**

Warning
When installing reversing radar sensor, align the boss at end of reversing radar sensor with the slot on rear bumper assembly, and then firmly install reversing radar sensor.

Caution
• **Install connectors in place when installing reversing radar sensors.** • **Check reversing radar system for proper operation, after installing reversing radar sensors.**

(1) Install the reversing radar sensor.

1) Install reversing radar sensor to slots of rear bumper assembly.

2) Connect the reversing radar sensor connector.

(2) Install the rear bumper assembly.

(3) Connect the negative battery cable.

4.3 Front Radar Sensor (If Equipped)

■ **Removal**

Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing front radar sensor.** • **Operate carefully to avoid damaging reversing radar sensor, when removing front radar sensor.**

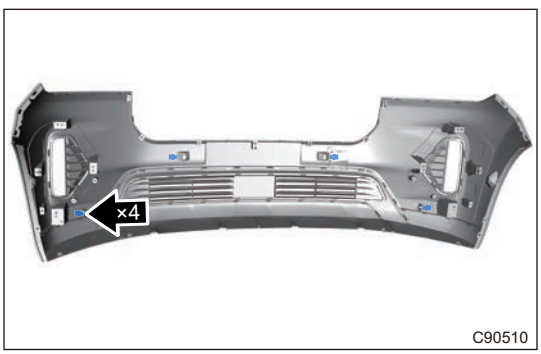
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the front bumper assembly.

(4) Disconnect the front radar sensor connector.

(5) Remove front radar sensor from slots of rear bumper assembly.



■ **Installation**

Caution
• **Install connectors in place when installing front radar sensor.** • **Check front radar system for proper operation, after installing front radar sensor.**

(1) Install the front radar sensor.

1) Install front radar sensor to slots of front bumper assembly.

2) Connect the front radar sensor connector.

(2) Install the front bumper assembly.

(3) Connect the negative battery cable.

4.4 Rear Camera Assembly (If Equipped)

■ **Removal**

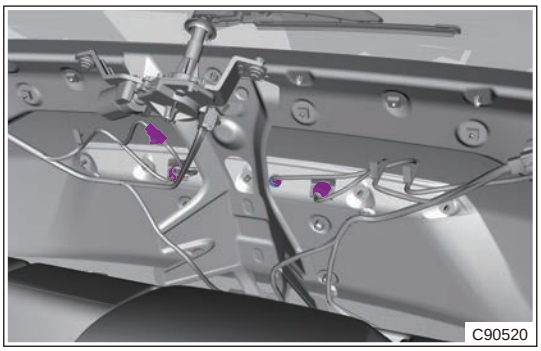
Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing rear camera assembly.** • **Appropriate force should be applied when removing rear camera assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

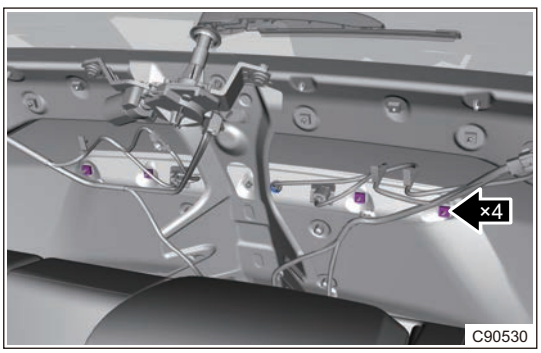
(2) Disconnect the negative battery cable.

(3) Remove the back door lower protector assembly.

(4) Disconnect the license light connector, back door switch connector and rear camera connector.

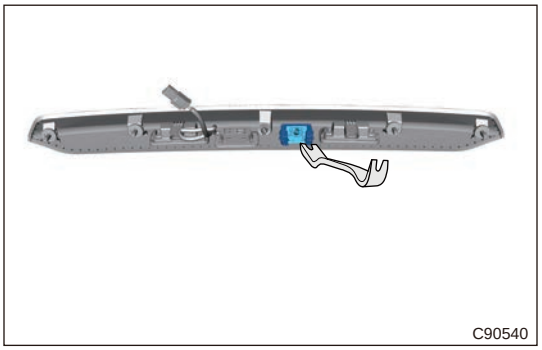


(5) Remove 4 fixing nuts from license plate light protector.



(6) Remove the license plate light protector.

(7) Remove the rear camera assembly with interior crow plate.



■ **Installation**

(1) Install rear camera assembly to the fixed position of license plate light protector.

(2) Install the license plate light protector.

(3) Install 4 fixing nuts of license plate light protector.

Torque: 3.5 ± 0.5 N m

(4) Install license light connector, back door switch connector and rear camera connector.

(5) Install the back door lower protector assembly.

(6) Connect the negative battery cable.

4.5 Front Camera Assembly (If Equipped)

■ **Removal**

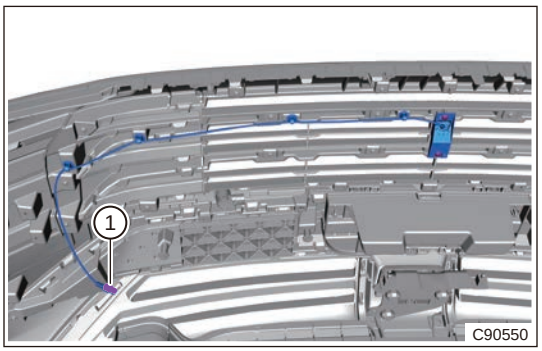
Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing front camera assembly.** • **Appropriate force should be applied when removing front camera assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

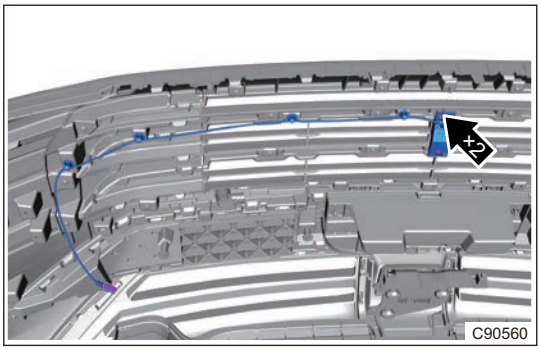
(2) Disconnect the negative battery cable.

(3) Remove the bumper assembly.

(4) Remove connector (1) from front camera.



(5) Using a cross screwdriver, remove the bumper.



(6) Remove the front camera assembly.

■ **Installation**

(1) Install front camera assembly onto the fixing clip of bumper and fix bolts.
(2) Install the front camera connector.
(3) Install the bumper assembly.
(4) Connect the negative battery cable.

4.6 Side Camera Assembly (Both Sides) (If Equipped)

■ **Removal (Take left side as an example)**

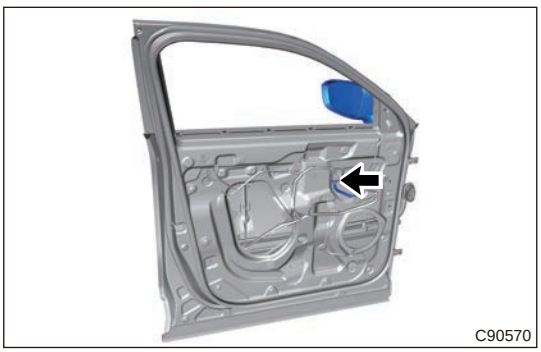
Warning
As side camera is installed inside the outside rear view mirror assembly, it must be replaced together with outside rear view mirror assembly when damaged.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

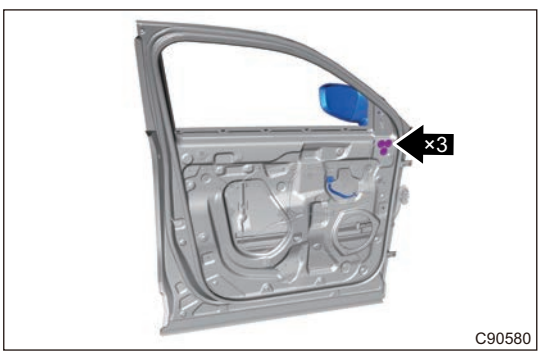
(2) Disconnect the negative battery cable.

(3) Remove the front left door protector assembly.

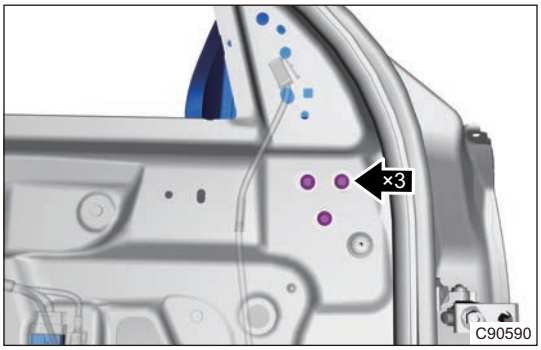
(4) Disconnect the left outside rear view mirror connector.



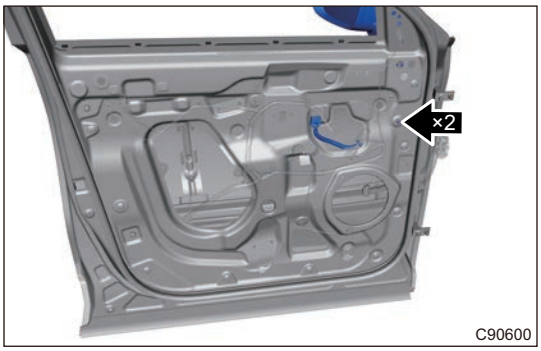
(5) Remove 3 plugs from left door sheet metal assembly.



(6) Remove 3 fixing bolts from left outside rear view mirror assembly.



(7) Disconnect 2 wire harness clips from left door sheet metal assembly.



(8) Remove the left outside rear view mirror assembly.

■ **Installation**

Caution
• **Install connector in place and tighten fixing nuts to the specified torque, when installing the outside rear view mirror assembly.** • **Make sure the outside rear view mirror assembly can move smoothly, flexibly and reliably after installing.** • **After installing outside rear view mirror assembly, it is necessary to perform panoramic image calibration.**

(1) Install left outside rear view mirror assembly, and install 2 wire harness clips to the corresponding positions on left door sheet metal assembly.

(2) Install and tighten 3 fixing bolts of left outside rear view mirror assembly.

Torque: 7 ± 1 N·m

(3) Install 3 plugs of left door sheet metal assembly.

(4) Connect the left outside rear view mirror assembly connector.

(5) Install the front left door inner protector assembly.

(6) Connect the negative battery cable.

4.7 Reversing Radar Control Module Assembly

■ **Removal**

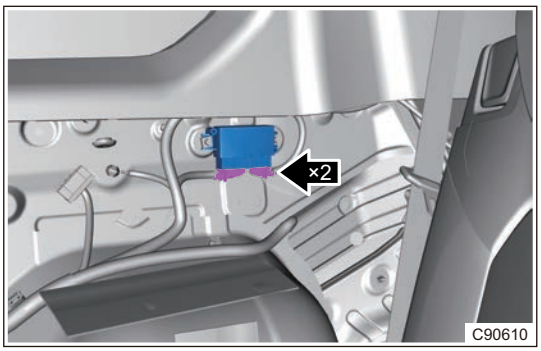
Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing reversing radar control module assembly.** • **Appropriate force should be applied when removing reversing radar control module assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

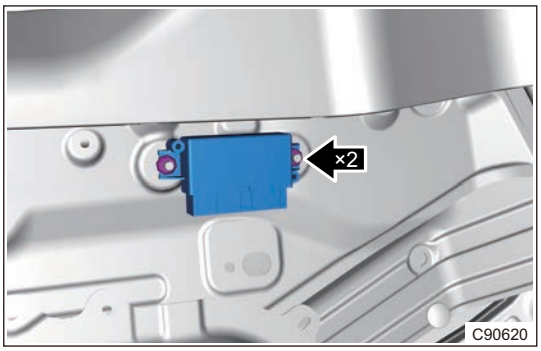
(2) Disconnect the negative battery cable.

(3) Remove the luggage compartment left wheel house assembly.

(4) Disconnect the reversing radar control module assembly connectors.



(5) Remove 2 fixing bolts between reversing radar control module assembly and vehicle body.



(6) Remove the reversing radar control module assembly.

■ **Installation**

Warning
• **Tighten fixing bolts to the specified torque, when installing reversing radar control module assembly.** • **Install connector in place when installing reversing radar control module assembly.** • **Check reversing radar system for proper operation, after installing reversing radar control module assembly.**

(1) Install reversing radar control module assembly and fix 2 fixing nuts.

Torque: 4 ± 0.5 N·m

(2) Connect the reversing radar control module assembly connector.
(3) Install the right luggage compartment protector assembly.
(4) Connect the negative battery cable.

4.8 Panoramic Control System Module (If Equipped)

■ **Removal**

Caution
• **Be sure to wear necessary safety equipment to prevent accidents, when removing panoramic control system module assembly.** • **Appropriate force should be applied, when removing panoramic control system module assembly. Be careful not to operate roughly.**

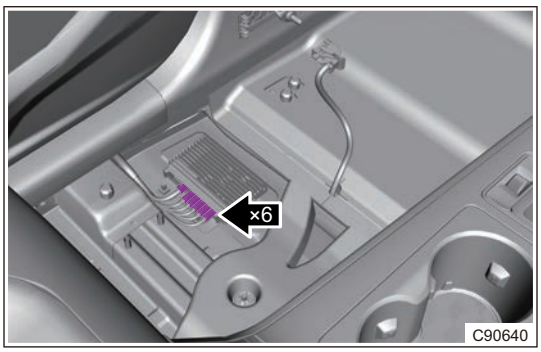
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

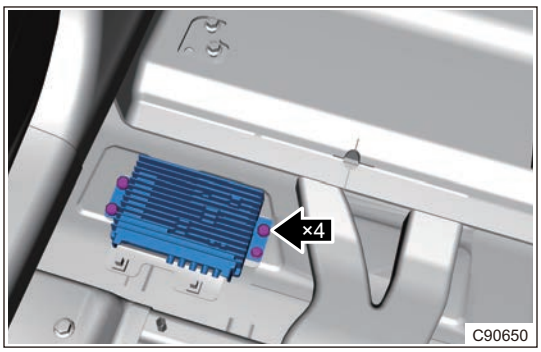
(3) Remove the front passenger seat assembly.

(4) Turn over the front floor carpet.

(5) Disconnect the panoramic control system module connector.



(6) Remove 4 bolts from panoramic control system module.



(7) Remove the panoramic control system module assembly.

■ Installation

Caution
• **Tighten fixing bolts to the specified torque, when installing panoramic view monitor control module assembly.** • **Install connector in place when installing panoramic view monitor control module assembly.** • **Check reversing radar system for proper operation, after installing panoramic view monitor control module assembly.**

(1) Install panoramic control system module assembly, and fix 4 bolts.

Torque: 7 ± 1 N·m

(2) Connect the panoramic control system module connector.
(3) Install the front floor carpet.
(4) Install the front passenger seat assembly.
(5) Connect the negative battery cable.

11.6 FATIGUE MONITORING

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to wear necessary safety equipment to prevent accidents, when removing fatigue monitoring camera.

(2) Appropriate force should be applied when removing fatigue monitoring camera. Be careful not to operate roughly.

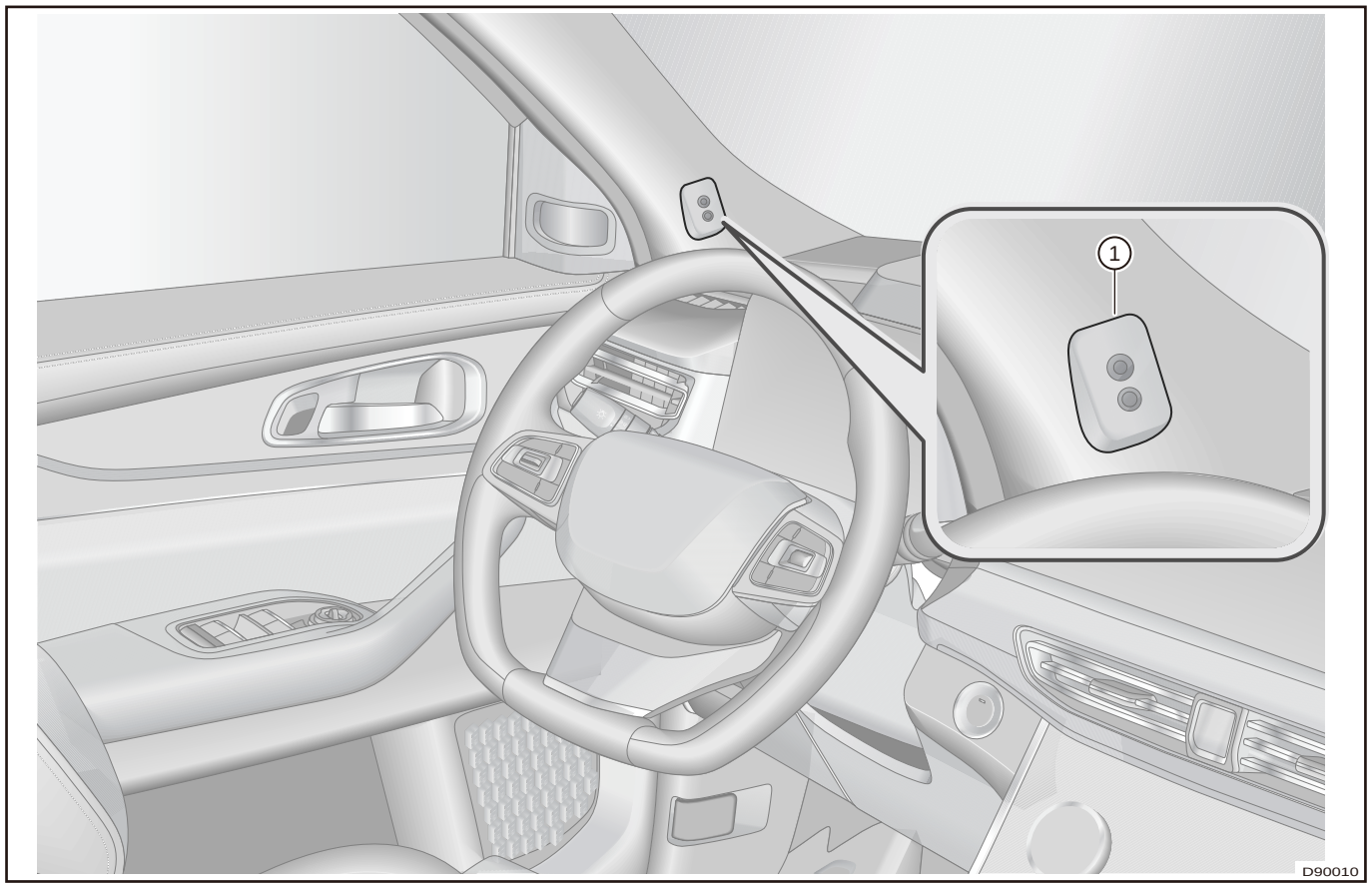
(3) Try to prevent interior and body paint surface from being scratched when removing fatigue monitoring camera.

2 System Overview

2.1 System Description

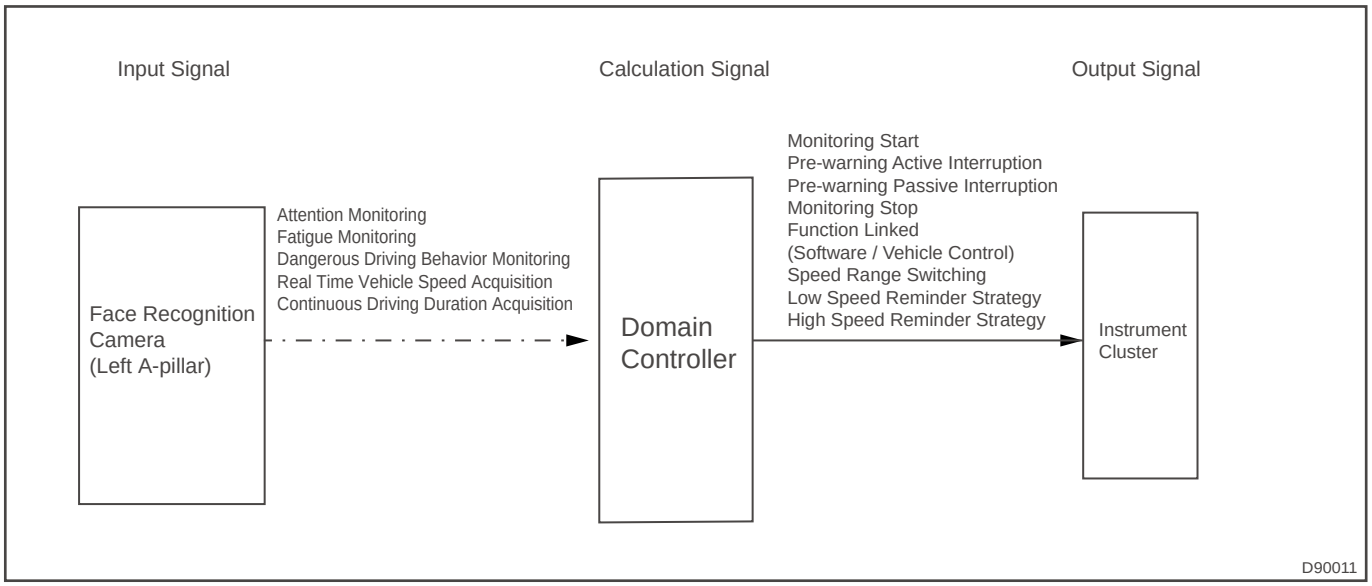
The fatigue monitoring system monitors driver’ s physiological image response through the camera, and relies on Baidu Vision AI capabilities. When driver’ s fatigue and dangerous driving state are found, it uses a series of reminders to keep driver’ s attention in driving state. Avoid danger caused by fatigue driving.

2.2 System Components Diagram



1	Face Recognition Camera

2.3 System Schematic Diagram



For fatigue monitoring, the signal is input by the face recognition camera, calculated by the domain controller and output to the instrument cluster.

2.4 System Function

■ Image recognition

The image data is collected by the camera, and the data is subject to user's natural action.The camera obtains the following contents in the instrument cluster, and the following is an example of the content (-supports recognition of wearing sunglasses, and the camera has an infrared mode to support night recognition):

Category	Action	Diagram	Note
Dangerous driving behavior	Head movement	 D90020	Detect normal head movement, only head movement may be more dangerous. For example, look to the left, look to the right, etc.
	Drink	 T20030	Take water cup and mineral water to drink normally, excluding detection of eating
	Normal smoking	 D90040	

Category	Action	Diagram	Note
	Normal calling	 D90050	What we detect is driver normal calling action. We will give a prompt only when the calling action lasts for a certain period of time
Fatigue driving feature	Normal yawning	 D90060	
	Eyes closed for a long time	 D90070	Head-down drowsiness is detected by the deviation of sight. Since it is impossible to distinguish head-down drowsiness and looking down, data shows that closing eyes for 1.5s-3s is prone to accidents

■ Fatigue monitoring dimension input

Vehicle monitors the following contents and inputs reminder strategy:

Category	Item	Description
Vehicle speed	0 km/h ⩽ vehicle speed < 60 km/h	Generally in special road section, congested road section and urban road section.
	60km/h ⩽ vehicle speed < 120km/h	Generally in urban express lanes, loops and highway, vehicle speed is relatively high, short-term loss of attention may lead to danger.
	Vehicle speed ＞ 120 km/h	Beyond the speed of domestic road design, facing greater danger.
Frequency and duration of fatigue behavior	Eyes closed	Duration
	Head movement	Duration
	Calling	Times (only prompt after a single call lasts for a certain period of time)
	Yawning	Number of times
	Drinking	Number of times
	Smoking	Number of times

■ **Monitoring switch**

The monitoring switch automatically controls the start, pause, and end of monitoring, and at the same time performs mode switching according to the real-time speed.

Status	Value
Start monitoring	When vehicle speed reaches 30 km/h, continuous monitoring starts. The speed can exclude temporary parking rest state and some non dangerous states. After detection starts, instrument panel cluster displays DMS icon
Small eye detection	After driving fatigue monitoring system starts, driver is judged to have small eyes if driver closes eyes continuously for 10 s when the face is detected, long-term eye-close warning will be turned off during this trip (In the application of project, it is necessary to strictly control camera point not to be too high, so as to avoid false recognition of closing eyes at viewing angle); When driving behavior monitoring system is on, whether driver has small eyes or not will be judged again every 30 minutes. If driver has small eyes, long-term eye-close warning will be turned off during this trip
Interrupt warning	When user feels excessively disturbed by reminder, user can actively interrupt reminder of Xiaoyun: Wake up Xiaodu (wake up Xiaoyun to interrupt and end the warning state). The above strategy only interrupts this warning
Monitoring stops	When speed is lower than 30 km/h, detection will be stopped, and detection record will not be cleared. When speed is 0, detection data will be cleared. There is a monitoring switch in setting
Speed range switching (around 30 km/h)	After switching speed range, monitoring duration and times will not be cleared; Switching speed range will not interrupt current reminder.

■ **Warning type**

According to strategy, warning can be divided into four levels:

Level	Degree	Strategy	Application	Description	Reminder method
Level 1	Weak	User actively perceives	User attention is normal	Mild behaviors are less dangerous and do not need to disturb user excessively.	Icon (triggered separately, see specific behavior).
Level 2	Light	User passively perceives	Users are not focused	User behavior may bring some dangers, so passive perception intervention.	Icon, sound (-triggered separately, see specific behavior).
Level 3	Light	User passively perceives	Users are not focused	User behavior may bring some dangers, so passive	Icon, sound (-uniform design) voice broadcast (triggered separately, see

Level	Degree	Strategy	Application	Description	Reminder method
				perception intervention.	specific behavior).
Level 4	Medium	Continuous sound awaken	User loses some attention	Short time passive perception fails to take effect, so continuous sound awaken will be performed.	Icon, voice broadcast, continuous sound prompt (- long sound is turned off continuously) (- triggered separately, see specific behavior).
Awakening strategy		Wake-up mitigation strategy	After waking up user, make further mitigation	Through music, chatting and navigating to service area.	Music, voice, navigating to service area (- prompt according to time dimension).

■ **Reminder strategy**

DMS prompts are divided into [basic prompt strategy] and [awakening strategy]

- Basic prompt strategy: Whole basic prompt strategy adopts successive degradation scheme, the first trigger is prompt, the next trigger is prompt, and the degree of prompt will be weakened.

Recognized Behavior	Duration/Times	Slow Mode	Fast Mode
Eyes always closed	2 s	Instrument cluster icon + voice + short sound	Instrument cluster icon + voice + short sound
	4 s	Instrument cluster icon + voice + long sound	Instrument cluster icon + voice + long sound
One way continuous	3 s/1 time	Instrument cluster icon + short sound	Instrument cluster icon + short sound
Line of sight deviation	3 s/2 times	Instrument cluster icon + short sound + voice	Instrument cluster icon + voice + long sound
	3 s/3 times +	Instrument cluster icon + short sound	Instrument cluster icon + short sound
Yawning	1 time	Instrument cluster icon + sound (awakening strategy)	Instrument cluster icon + sound (awakening strategy)
	2 times	Instrument cluster icon + sound (awakening strategy)	Instrument cluster icon + sound (awakening strategy)
	3 times +	Instrument cluster icon + sound (awakening strategy)	Instrument cluster icon + sound (awakening strategy)
Calling with hand	1 time	Instrument cluster icon + short sound + voice	Instrument cluster icon + short sound + voice
	2 times +	Instrument cluster icon	Instrument cluster icon + short sound

Recognized Behavior	Duration/Times	Slow Mode	Fast Mode
Drinking	1 time	Instrument cluster icon + short sound + voice	Instrument cluster icon + short sound + voice
	2 times +	Instrument cluster icon	Instrument cluster icon
Smoking	1 time	Instrument cluster icon	Instrument cluster icon
	2 times	Instrument cluster icon + short sound + voice	Instrument cluster icon + short sound + voice
	3 times +	Instrument cluster icon	Instrument cluster icon

- The closed eyes state ends (waking up). During the warning process, when the user corresponding fatigue state disappears, the warning ends:

Strategy	Warning Ends
Eyes closed	Closed eyes state ends: Eyes open, images cannot be recognized, camera malfunctions

- **Awakening strategy**Awakening strategy scene: For fatigue states such as yawning and long-time eyes closed, “awakening strategy” will be performed after strategy prompt is completed or user wakes up.

  After the prompt is interrupted by voice interaction, etc., no awakening strategy will be performed this time.

  Long sound playing strategy (only long eyes closed and line of sight deviation): After playing for 6 s, system actively stops long sound warning.

■ Dangerous driving behavior warning

Line of sight deviation

Logic	Warning Tips
First time in 10 minutes	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...)
Twice in 10 minutes	When speed is 60 km/h or more, Icon: DMS icon flashes (twice in 1 s, lasts for 2 s); Voice prompt: Don't be distracted, drive well. Xiaoyun finds that you are distracted, pay attention to road conditions ahead and drive well; Continuous sound: Similar to sound effect of unfastened seat belt. When speed is less then 60 km/h, Icon: DMS icon flashes (twice in 1 s, lasts for 2 s); Short sound prompt: Sound (du... du... du...); Voice prompt: Don't be distracted, drive well. Xiaoyun finds that you are distracted, pay attention to road conditions ahead and drive well.
3 + times in 10 minutes	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...)

Calling

Logic	Warning Tips
First trigger	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...) Voice prompt: Please put down your mobile phone, it's dangerous to make a phone call while driving; It's very dangerous to call while driving. Please pay attention to driving safety.
2nd + trigger (speed ⩽ 60 km/h)	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s)
2nd + trigger (speed > 60 km/h)	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...)

Smoking

Logic	Warning Tips
Take the first puff each time (two smoking actions ⩾ 10 min, count as once)	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s)
Take the second puff each time (two smoking actions ⩾ 10 min, count as once)	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...) Voice prompt (- only once in the whole process): Choke to death, don't smoke, it's not safe to smoke while driving; Stop smoking and pay attention to driving safety
Take the third puff each time (two smoking actions ⩾ 10 min, count as once)	Icon: DMS icon flashes

Drinking

Logic	Warning Tips
Drink water for the first time in the whole process	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...) Voice prompt: Drinking water is dangerous when driving, pay attention next time
Drink water for the second time in the whole process	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s)

■ Warning of mild fatigue

Basic prompt strategy

Trigger Condition	Warning Tips
Mild fatigue (yawn) for the first time	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...) Voice prompt: Prompt end, execute awakening strategy
Mild fatigue (yawn) for the twice + time	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Sound (du... du... du...) Voice prompt: Prompt end, execute awakening strategy

Awakening strategy

- Trigger time: Trigger after the end of basic prompt.
- Time judgment: From the starting time of last awakening strategy (yawn + eyes closed).
- Judge whether music is playing: Just listen, local, Bluetooth, FM (provided by Neusoft interface).

■ Warning of severe fatigue

Basic prompt strategy

Trigger Condition	Warning Tips
Severe fatigue: Eyes closed for 2 s for a long time	Icon: DMS icon flashes (twice in 1 s, lasts for 2 s) Sound prompt: Similar to sound of not fastening seat belt. Voice prompt: Wake up quickly, pay attention to road condition, it is very dangerous
Eyes closed for 4 s	As above
State of eyes closed for a long time ends	Trigger awakening strategy

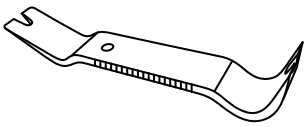
Multiple triggers: Basic prompt strategy of multiple triggers does not make degradation distinction.

Awakening strategy

- Trigger time: Severe fatigue, user wakes up, after the end of basic prompt strategy.
- Judgment of navigating to service area: If it is at a high speed (speed > 60 km/h), navigation guidance strategy will be implemented, otherwise, only voice prompt: Are you very sleepy? Find a place to rest.

3 ON-VEHICLE SERVICE

3.1 Tool

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

4 Removal and Installation of Fatigue Monitoring Camera

4.1 Removal

Warning
• **Be sure to wear necessary safety equipment to prevent accidents, when removing fatigue monitoring camera.** • **Appropriate force should be applied when removing fatigue monitoring camera. Be careful not to operate roughly.** • **Try to prevent interior and body paint surface from being scratched when removing fatigue monitoring camera.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the left A-pillar upper protector.

(4) Disconnect the fatigue monitoring camera wire harness connector.

(5) Remove the fatigue monitoring camera.

4.2 Installation

(1) Install the fatigue monitoring camera.
(2) Connect the fatigue monitoring camera wire harness connector.
(3) Install the left A-pillar upper protector.
(4) Connect the negative battery cable.
(5) Press ENGINE START STOP switch and perform running test.

11.7 HEAD UP DISPLAY

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Be sure to wear safety equipment to prevent accidents, when removing head up display.

(2) Appropriate force should be applied when removing head up display. Be careful not to operate roughly.

(3) Try to prevent interior and body paint surface from being scratched when removing head up display.

2 System Overview

2.1 System Description

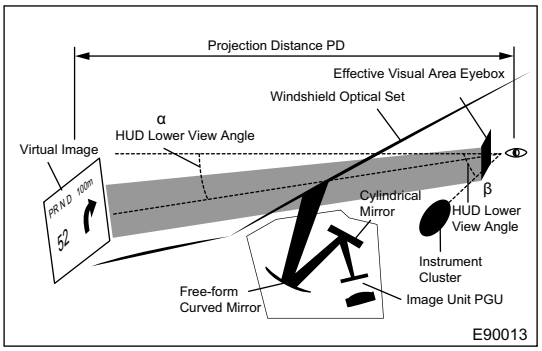
Head up display, call HUD for short, is a driving assist instrument used in vehicle. It is a kind of integrated optical electronic equipment composed of electronic components, display components, controllers, etc. Through optical system and electronic control, HUD projects driving information (such as speed, turning, driving range, etc.), navigation information, driving assistance (ADAS) and other information to front windshield in the form of images and characters, forming a virtual image in front of driver field of vision, so that driver can obtain corresponding information in real time without adjusting line of sight; HUD can adaptively adjust brightness of virtual image to match visual requirements by capturing brightness signal of external environment; At the same time, adjust image position to fully meet needs of drivers of different heights. Through the application of HUD, driving safety and comfort can be greatly improved.

■ Running noise

Under the whole vehicle environment, when adjusting HUD, the noise of test motor is no more than 40 dB at 50 cm away from HUD.

■ Optical principle

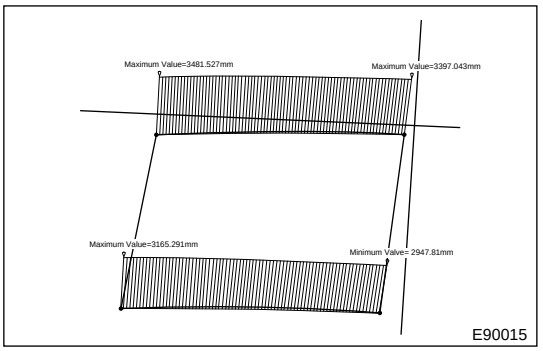
The optical imaging principle of HUD is: HUD drives the image unit to emit a light beam, which is reflected by a cylindrical mirror and a free-form curved mirror, then the light beam is projected to the front windshield, and then front windshield reflects the light beam to driver’ s eyes, so that the driver can see an enlarged virtual image at a greater distance ahead.

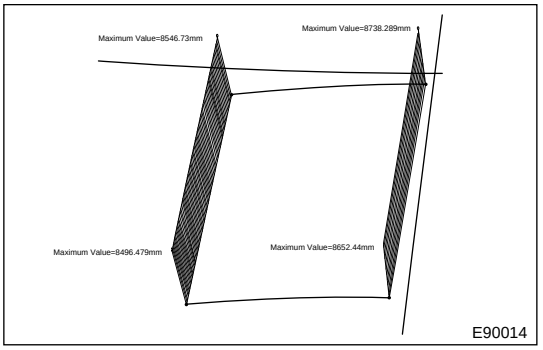


■ Windshield demand

As a part of the imaging system, the front windshield has certain requirements on radius of curvature, variation range and wedge angle. The curvature radius parameter information of front windshield of M32T in the HUD projection area is shown in illustration:
Curvature radius analysis of front windshield of M32T (- transverse direction)
Curvature radius analysis of front windshield of M32T (- vertical direction)

- Variation range of glass curvature radius in horizontal direction: 8500-8700.
- Variation range of glass curvature radius in vertical direction: 2950 - 3500.





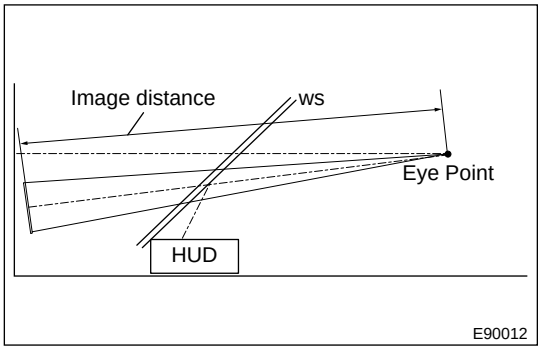
■ Image parameters

(1) The main parameters of M32T HUD image are as follows:

Type	Parameters	Tolerance Requirements	Note
Image size	241 mm x 80 mm	± 6 %	Calculated based on FOV and projection distance
Image distance	2300 mm	± 6 %	/
Field of view angle	6° x 2°	± 6 %	/
Lower view angle	3.5°	± 0.3°	/
Left view angle	0°	± 0.5°	
Eye box size	130 mm × 50 mm	/	Whole image seen within eye box
Eye movement range	± 50 mm	/	Whole image seen within moving range of eye box
HUD virtual image brightness	⩾ 10,000 cd/m2	/	White light brightness, highest brightness
Ghosting	/	Central eye box ⩽ 2 mm, total eye box ⩽ 3 mm	/
Distortion	/	5%	HUD factory status

(2)

The image distance is the distance from the eye point to the actual virtual image center, and the HUD projection distance is 2300 mm.



(3) The field of view angle is the opening angle of the left and right edges and the top and bottom edges of the virtual image seen at the eye point. The field of view angle of HUD is 6° x 2°.

(4) The lower view angle is the angle between the line connecting eye point and center point of virtual image and horizontal plane. The lower view angle of M32T HUD is 3.5°.

(5) The left view angle is the angle between line connecting eye point and center point of image and vertical plane. The left visual angle of M32T HUD is 0°.

(6) The size of the eye box indicates the range of eye movement in which whole image can be seen on driver side for the virtual image. The size of the eye box of M36T HUD is 130 mm x 50 mm.

(7) The eye movement range indicates the adjustable amount of eye box. The eye movement range of M32T HUD is ± 50 mm.

(8) HUD virtual image brightness is the brightness of HUD virtual image projected on front windshield. The maximum brightness of virtual image of HUD is required to be ⩾ 10,000 cd/m2.

(9) The ghosting defines the overlapping degree of different virtual images formed by reflection of inner and outer surfaces of glass when HUD is projected on the front windshield. The ghosting of HUD requires that the measured value of central eye box ⩽ 2 mm, and the range of whole eye box ⩽ 3 mm.

(10) The distortion is that the actual HUD image will deviate from ideal value, which leads to a certain degree of distortion of image. This distortion degree is usually described by a ratio. The distortion requirement of HUD at factory is ⩽ 5%.

■ **Operating voltage range**

HUD		CAN		Description
Data Stream/ Others	**Voltage Value**	**Data Stream/ Others**	**Voltage Value**	
Low voltage function prohibition	8.5V	Low voltage network prohibition	5.8V	Drop from normal voltage to the lowest voltage that cannot work
Low voltage function recovery	9V	Low voltage network recovery	6 V	Recover from low voltage to the lowest voltage that can work normally
High voltage function prohibition	16.5V	High voltage network prohibition	18.5V	Recover from normal voltage to the highest voltage that cannot work normally
High voltage function recovery	16V	High voltage network recovery	18V	Drop from high voltage to the highest voltage that can work normally
Low voltage recovery time	200 ms ± 10 %	Low voltage recovery time	< 500 ms ± 10 %	Delay time from low voltage to normal voltage

HUD		CAN		Description
Data Stream/ Others	Voltage Value	Data Stream/ Others	Voltage Value	
High voltage recovery time	200 ms ± 10 %	High voltage recovery time	< 500 ms ± 10 %	Delay time from high voltage to normal voltage
Note description: • Setting voltage of DTC is 9 ~ 16 V and delay time is 200 ms ± 10 %. • CAN voltage is defined by network platform department. If there is conflict with the above table, the network platform department shall prevail. • Deviation of above voltage is controlled within ± 0.1 V.				

(1) Normal operating voltage range: 9 V to 16.0 V, including 9 V and 16.0 V (all voltages refer to the voltage at HUD power supply connection):

- When battery voltage is below 8.5 V, HUD output will be controlled according to the definition of low voltage protection.
- When battery voltage is higher than 16.5 V, HUD output will be controlled according to the function definition of high voltage protection.
- When battery voltage returns from abnormal to normal, all outputs will return to the output defined by respective function definitions.

(2) High voltage protection function:

- If voltage is higher than 16.5 V, function output will be suspended in order to protect HUD.
- If voltage drops from high voltage to 16 V or below, HUD will resume function output.

(3) Low voltage protection function:

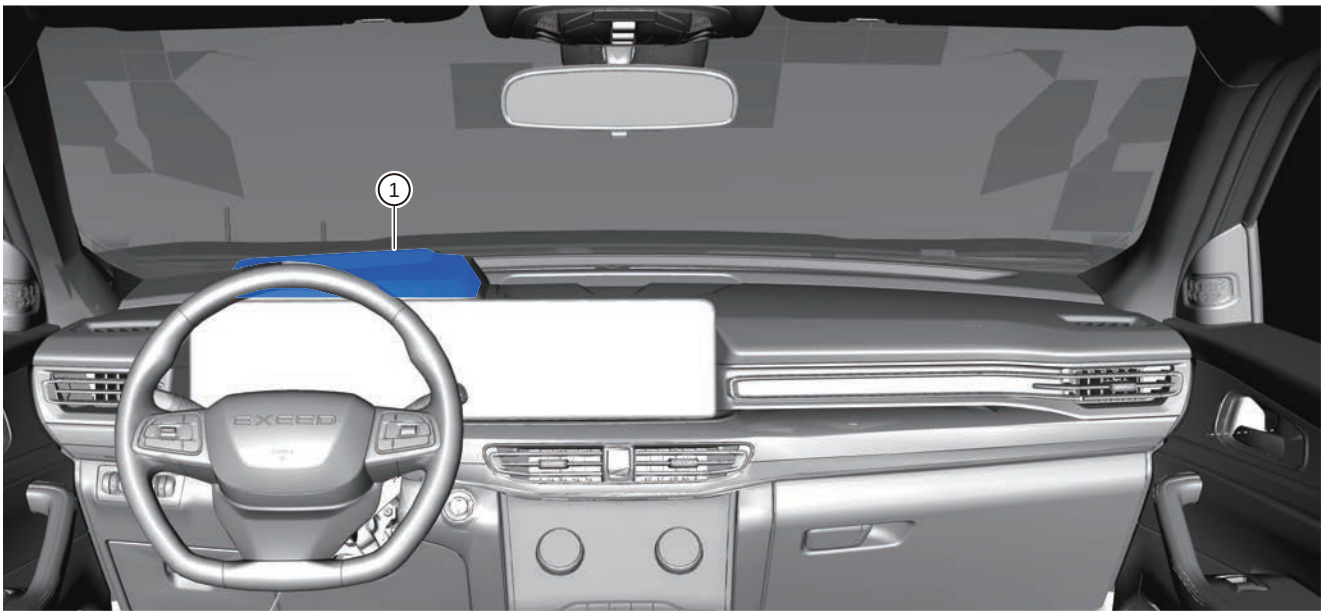
- If voltage is lower than 8.5 V, in order to save power, HUD will turn off output except CAN communication port.
- If voltage rises from low voltage to 9 V or above, HUD output will resume.

(4) Voltage range of 6 V ~ 16 V ensures CAN communication is normal.

■ Operating current range

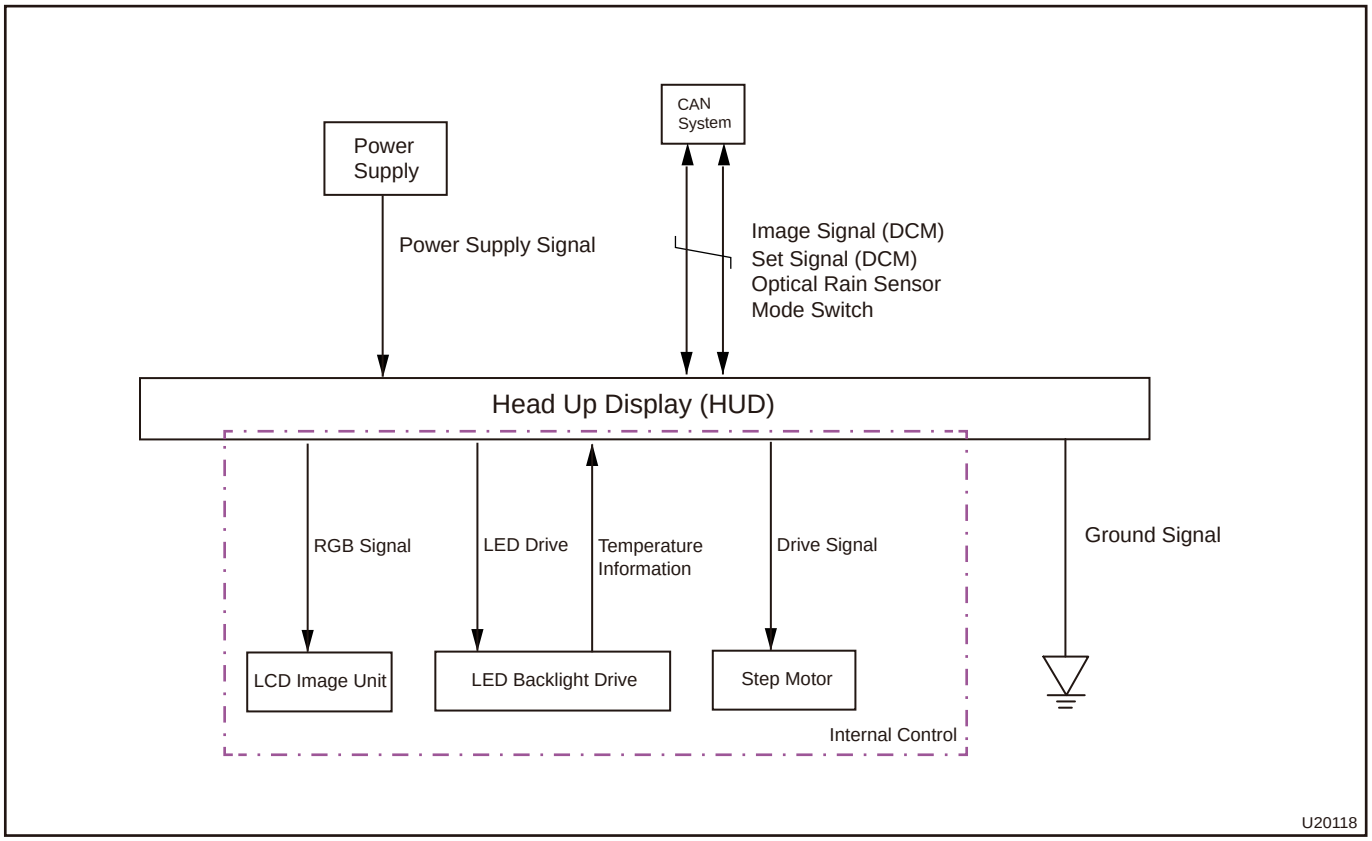
Operating current	Sleep current
< 1 A (HUD current under long-term stable operation condition)	⩽ 0.2 mA

2.2 System Component Diagram



1	Head Up Display

2.3 System Schematic Diagram

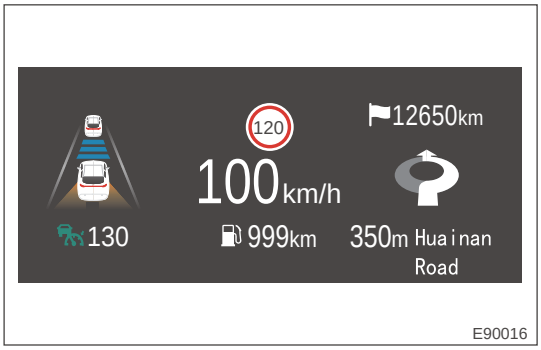


The head up display receives image signal, setting signal, switch signal and rain sensor signal in head unit through CAN and projects driving information, navigation information and driving assistance information to windshield in front of driver through the internal control unit.

2.4 Human-computer Interaction

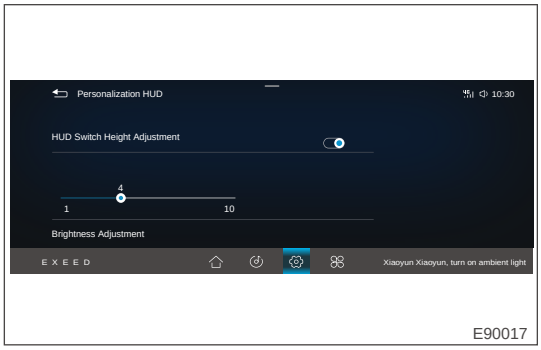
■ HUD display image

HUD display image signal is sent by DMC through CAN. HUD projects image on front windshield after receiving CAN signal. HUD can display driving status, ADAS signal, entertainment, navigation and other information as needed. HUD display information is as shown in illustration:



■ Head up display adjustment/setting

Through the touch screen menu setting, HUD display ON/OFF function can be controlled, image brightness and position can be adjusted, and normal mode/snow mode and other display styles can be switched. As shown in illustration below, brightness, height, function customization and mode switching are only effective when HUD is on.



Setting Item	Function	Description
ON/OFF	Turn HUD display information on or off	Control whether HUD is displayed.
Image height adjustment	Manually adjust the height of HUD display image	Adjust HUD height to adapt to use habits of different drivers.
Image brightness adjustment	Automatic adjustment	Vehicle collects ambient light brightness through rain light sensor, and HUD automatically adjusts HUD display image brightness according to the collected ambient brightness signal value, so as to adapt to different ambient brightness.
	Manual Adjustment	After HUD brightness is adjusted automatically, driver can fine-tune brightness to adapt to usage habits of different drivers
Snow mode switch	Normal mode/snow mode	HUD display style (including normal mode and snow mode) is selected according to the external environment. Snow mode: Due to white and bright background of external environment, HUD is required to adjust display style to meet requirements of user to recognize display content normally.
HUD display mode	Display interface settings	Navigation/ADAS interface interchanges left and right.

2.5 HUD functional requirements

According to CAN signal, HUD displays vehicle information, navigation information, active safety information and entertainment information through optical projection on front windshield. At the same time, the user can turn on/off HUD display, adjust HUD display brightness and height, and switch display mode through touch screen of central console.
It takes about 6 seconds for HUD from wake-up to normal display.

■ HUD function display

(1) Driving information display

- HUD displays current speed and driving mileage.

(2) Active safety display

- When adaptive cruise system operates, HUD displays adaptive cruise state, set target speed information, following distance information and icon of vehicle in front;

- When lane departure system operates, HUD displays different lane information, and prompts warning/alarm status through left and right deviation of vehicle;
- When front collision warning system/automatic emergency braking system operates, HUD displays the warning information of front collision warning system/automatic emergency braking system;
- When traffic signal recognition system operates, HUD displays speed limit information; When driving speed exceeds set speed, HUD displays speed limit information;
- When blind spot monitoring system operates, HUD displays blind spot monitoring information.

(3) Navigation information display

- HUD displays steering angle (straight, right turn, U-turn, left front turn, roundabout and other relevant navigation steering information).

(4) Bluetooth phone information display

- When Bluetooth phone function operates, HUD displays name of corresponding person.

■ HUD action sequence

(1) When there is no memorized height information, HUD height is 6th gear (a total of 10 gears, 1 gear is the lowest virtual image, 10 gear is the highest virtual image);

(2) When there is no memorized brightness level information and no RLS valid signal is received, HUD brightness is 25% of the maximum virtual image brightness when backlight is turned on;

(3) When there is no memorized HUD switch status information, HUD status information is OFF (HUD factory setting is ON);

(4) When there is no memorized snow mode switch status information, snow mode switch status information is OFF;

(5) When there is no memorized ADAS position status information, HUD shows that ADAS is on left side;

(6) The setting interface status of IHU should be displayed according to HUD feedback signal.

■ Over temperature protection

HUD is ON:

Function overview	Through obtaining HUD internal temperature information, judge whether TFT screen is in over temperature state. If TFT temperature is too high, HUD will gradually reduce display brightness.
Basic process	When internal temperature of HUD exceeds a certain value (threshold 1, to be calibrated), HUD will reduce image brightness; If HUD internal detection temperature > 85 ℃ (to be calibrated), HUD screen will pop up the text "HUD temperature is too high, turn off HUD" for 3 s, at the same time, set STAT_HUDDisplayOnOff value to 0, and then turn off HUD display; When HUD detects that temperature drops to 45 ℃, HUD will turn on again, and brightness will be displayed according to gear value and RLS signal value saved during manual adjustment.
Signal process	Precondition satisfied → internal temperature information (sensor) → HUD drives LED → image brightness adjustment.
Others	Vehicle collects ambient light brightness through rain light sensor, and HUD automatically adjusts HUD display image brightness according to the collected ambient brightness signal value, so as to adapt to different ambient brightness.
	When HUD goes to sleep, rotate lens back to Park position to prevent sunlight from shining on screen.

3 Diagnosis & Testing

3.1 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.2 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- When circuit signal is interrupt during detection, wiggle related wire harnesses and connectors.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.3 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.4 Diagnosis Procedure

Use following procedures to troubleshoot the system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Check if battery voltage is normal.

NG → **Replace battery**

OK →

3	**Customer problem analysis**

Next →

4	**Read DTCs**

History DTC → **Troubleshoot according to Intermittent DTC malfunction procedures**

Current DTC →

5	**Repair according to Diagnostic Trouble Code (DTC) Chart**

Next →

6	**Adjust, repair or replace**

Next →

7	**Conduct test and confirm malfunction has been repaired**

Next → **End**

3.5 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B136016	Supply Voltage Too Low
B136017	Supply Voltage Too High
B136102	HUD Motor Drive Failure
B136203	HUD LED Drive Circuit Short Circuit
B136301	HUD Overheating (Temperature Too High)
B136471	HUD Mirror Position Switch Failure
B136517	HUD TFT Signal Line Error
B136602	HUD FPD Link (Flat Panel Display Link) Lock Error
B136766	HUD Abnormal Reset Error

DTC	DTC Definition
B136892	HUD EEPROM Error
B136992	HUD FLASH Error
B136A92	HUD RAM Error
U012287	Lost Communication With ESC
U014087	Lost Communication With BCM
U015587	Lost Communication With IPC
U024587	Lost Communication With IHU
U024887	Lost Communication With PEPS
U041681	Invalid Data Received From ESC
U042281	Invalid Data Received From BCM
U042381	Invalid Data Received From IPC
U042681	Invalid Data Received From PEPS
U054681	Invalid Data Received From IHU
U135088	CAN Bus Off

3.6 DTC Diagnosis Procedure

DTC	**B1360-16**	**Supply Voltage Too Low**
DTC	**B1360-17**	**Supply Voltage Too High**
DTC	**B1365-17**	**HUD TFT Signal Line Error**
DTC	**B1367-66**	**HUD Abnormal Reset Error**
DTC	**B1368-92**	**HUD EEPROM Error**
DTC	**B1369-92**	**HUD FLASH Error**
DTC	**B136A-92**	**HUD RAM Error**

DTC	DTC Definition	Possible Cause
B1360-16	Supply Voltage Too Low	• Power supply fault; • Line connection fault; • HUD intermittent fault; • HUD motor fault.
B1360-17	Supply Voltage Too High	
B1365-17	HUD TFT Signal Line Error	
B1367-66	HUD Abnormal Reset Error	
B1368-92	HUD EEPROM Error	
B1369-92	HUD FLASH Error	
B136A-92	HUD RAM Error	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery voltage

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Start engine, and use voltage band of multimeter to check if battery voltage is normal. (Rated voltage: Not less than 12 V)

Multimeter Connection	Condition	Specified Condition
Battery (+) - Battery (-)	ENGINE START STOP switch "ON"	Not less than 12 V

NG → **Repair or replace battery/alternator.**

OK

2	Check fuse

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Check continuity of fuse MF03 (125A), RF16 (5A) and RF08 (5A) in instrument panel fuse and relay box and engine compartment assembly with digital multimeter.

NG → **Replace fuse.**

OK

3	Check interior power supply wire harness

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

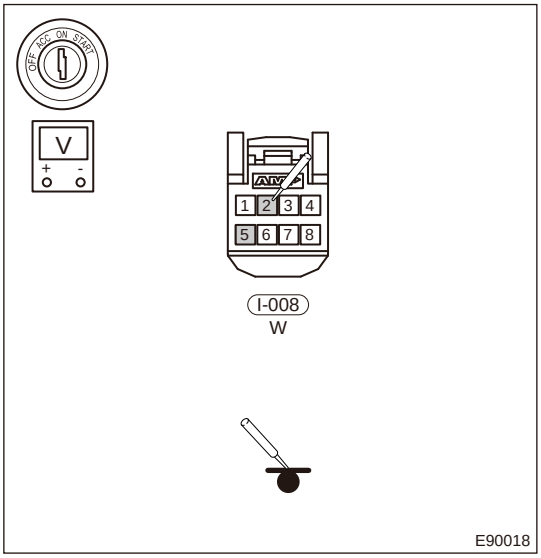
(c) Disconnect the head up display connector I-008.

(d) Connect the negative battery cable.

(e) Turn ENGINE START STOP switch to ON.

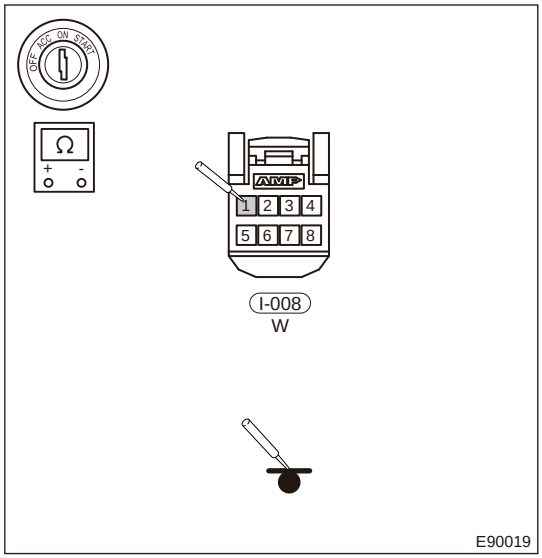
(f) Using a digital multimeter, separately measure the voltage between connectors I-008 (5), I-008 (2) and ground according to table below.

Multimeter Connection	Condition	Specified Condition
I-008 (5) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
B-008 (2) - Body ground		Not less than 12 V



(g) Using a digital multimeter to measure the resistance between interior wire harness connector I-008 (1) and ground according to table below.

Multimeter Connection	Condition	Specified Condition
I-008 (1) - Body ground	ENGINE START STOP switch "OFF"	∞



NG → **Repair or replace related wire harness.**

OK

4	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect the negative battery cable.

(b) Use diagnostic tester to clear DTCs.

(c) Start the engine.

(d) Check if the same DTCs are still output.

NG → **Replace the head up display module.**

OK → **System is normal.**

DTC	**U012287**	**Lost Communication With ESC**
DTC	**U014087**	**Lost Communication With BCM**
DTC	**U015587**	**Lost Communication With IPC**
DTC	**U024587**	**Lost Communication With IHU**
DTC	**U024887**	**Lost Communication With PEPS**
DTC	**U041681**	**Invalid Data Received From ESC**
DTC	**U042281**	**Invalid Data Received From BCM**
DTC	**U042381**	**Invalid Data Received From IPC**
DTC	**U042681**	**Invalid Data Received From PEPS**
DTC	**U054681**	**Invalid Data Received From IHU**
DTC	**U135088**	**CAN Bus Off**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

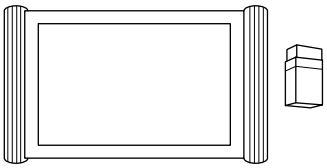
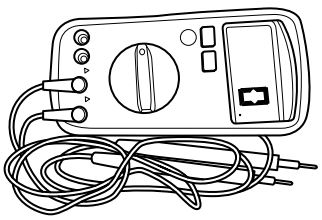
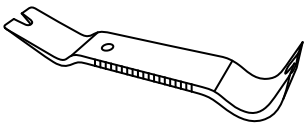
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Refer to CAN communication system for the above communication faults.**

4 On-vehicle Service

4.1 Tools

Tool Name	Tool Drawing
Diagnostic Tester	 S00001
Digital Multimeter	 S00002
Interior Crow Plate	 S00020

4.2 Replacement of Head Up Display (HUD)

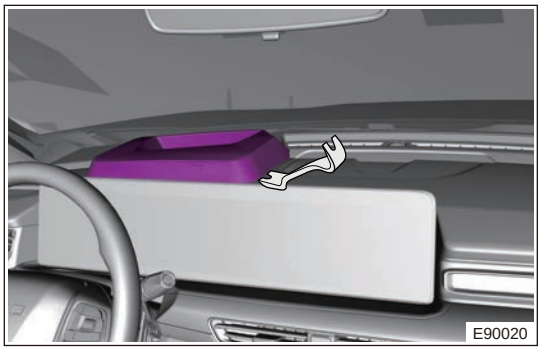
■ **Removal**

Warnings
• **Try to prevent interior and body paint surface from being scratched when removing head up display.** • **Be sure to wear safety equipment to prevent accidents, when removing head up display.** • **Appropriate force should be applied when removing head up display. Be careful not to operate roughly.**

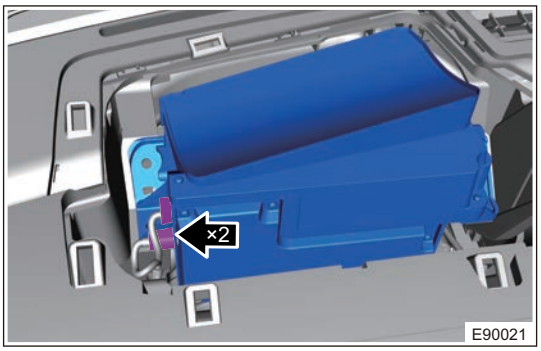
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

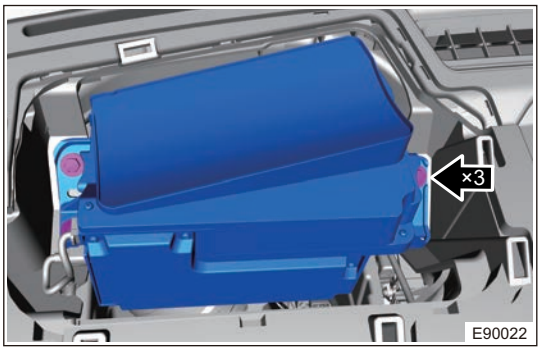
(3) Remove head up display cover with interior crow plate.



(4) Disconnect the head up display wire harness connector.



(5) Remove 3 fixing bolts from head up display.



(6) Remove the head up display.

■ Installation

(1) Install head up display to a proper position.
(2) Fix 3 fixing bolts of head up display.
(3) Connect the head up display wire harness connector.
(4) Install the head up display cover.
(5) Connect the negative battery cable.
(6) Press ENGINE START STOP switch and perform running test.

11.8 DRIVE RECORDER

1 Warnings and Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

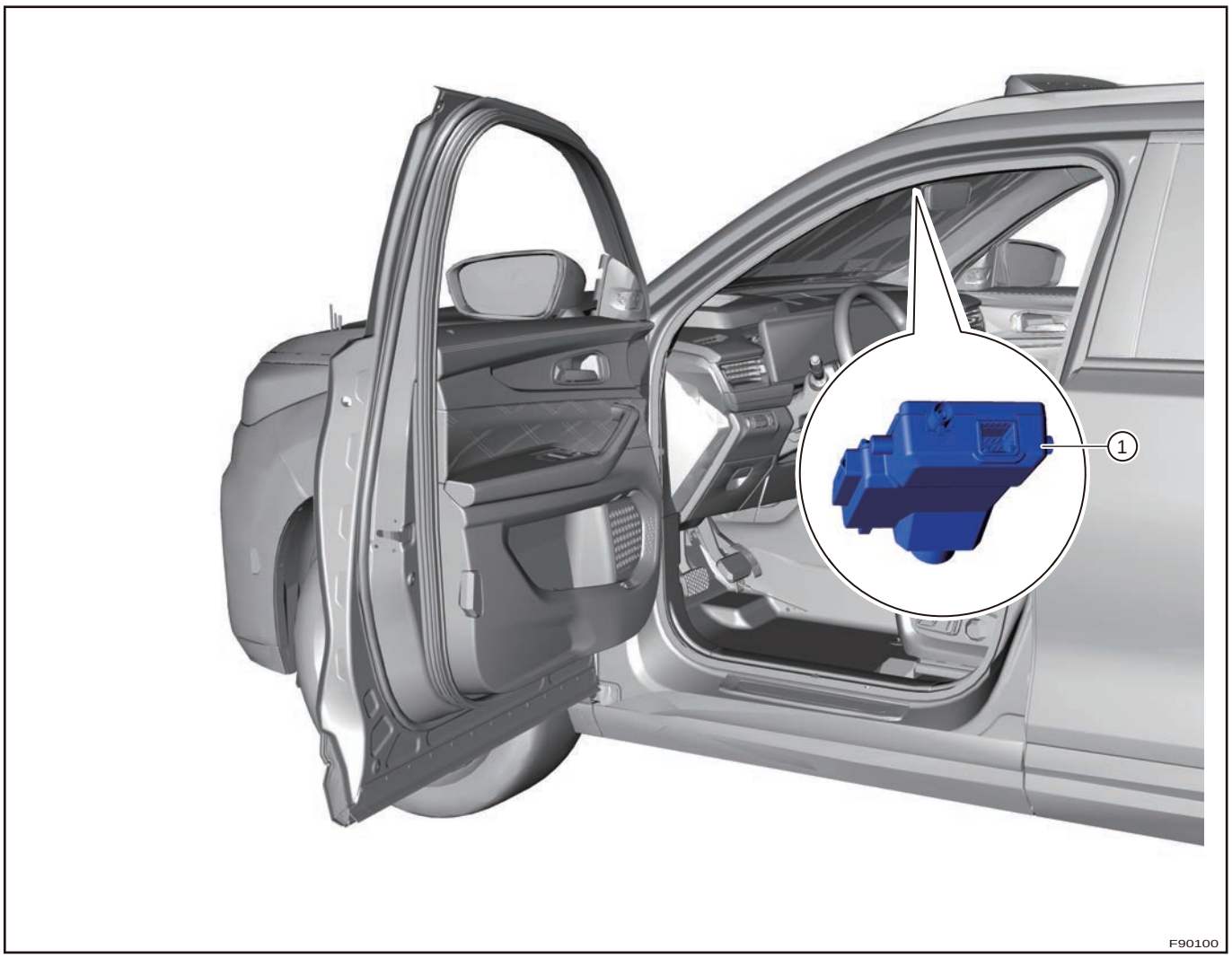
(1) Prevent camera lens from being scratched during removal and installation of drive recorder.

2 System Overview

2.1 System Description

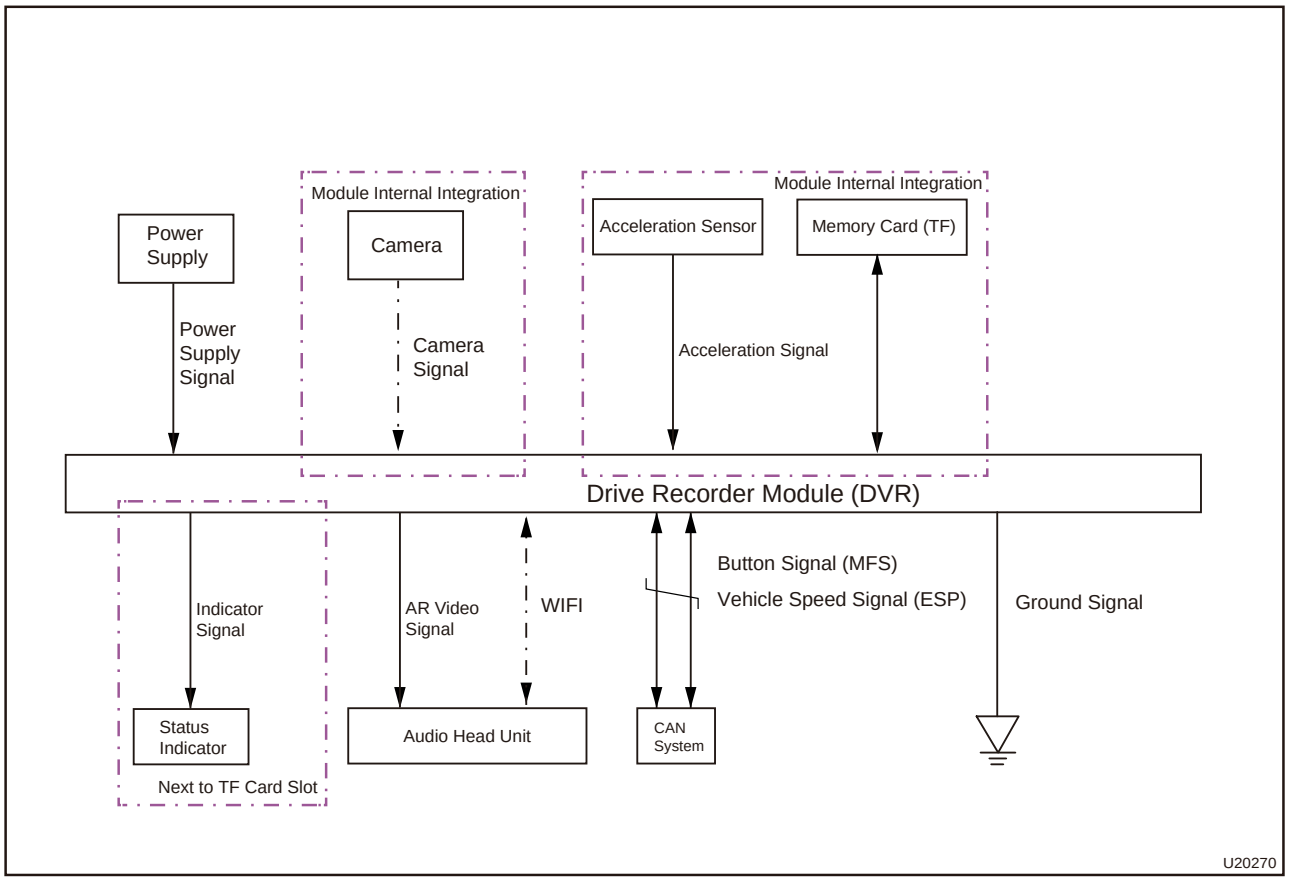
This product is a two-in-one product with a drive recorder and an AR navigation camera. The video display operation and AR navigation video of drive recorder need to be displayed on central control navigation screen.

2.2 System Component Diagram



1	Drive Recorder

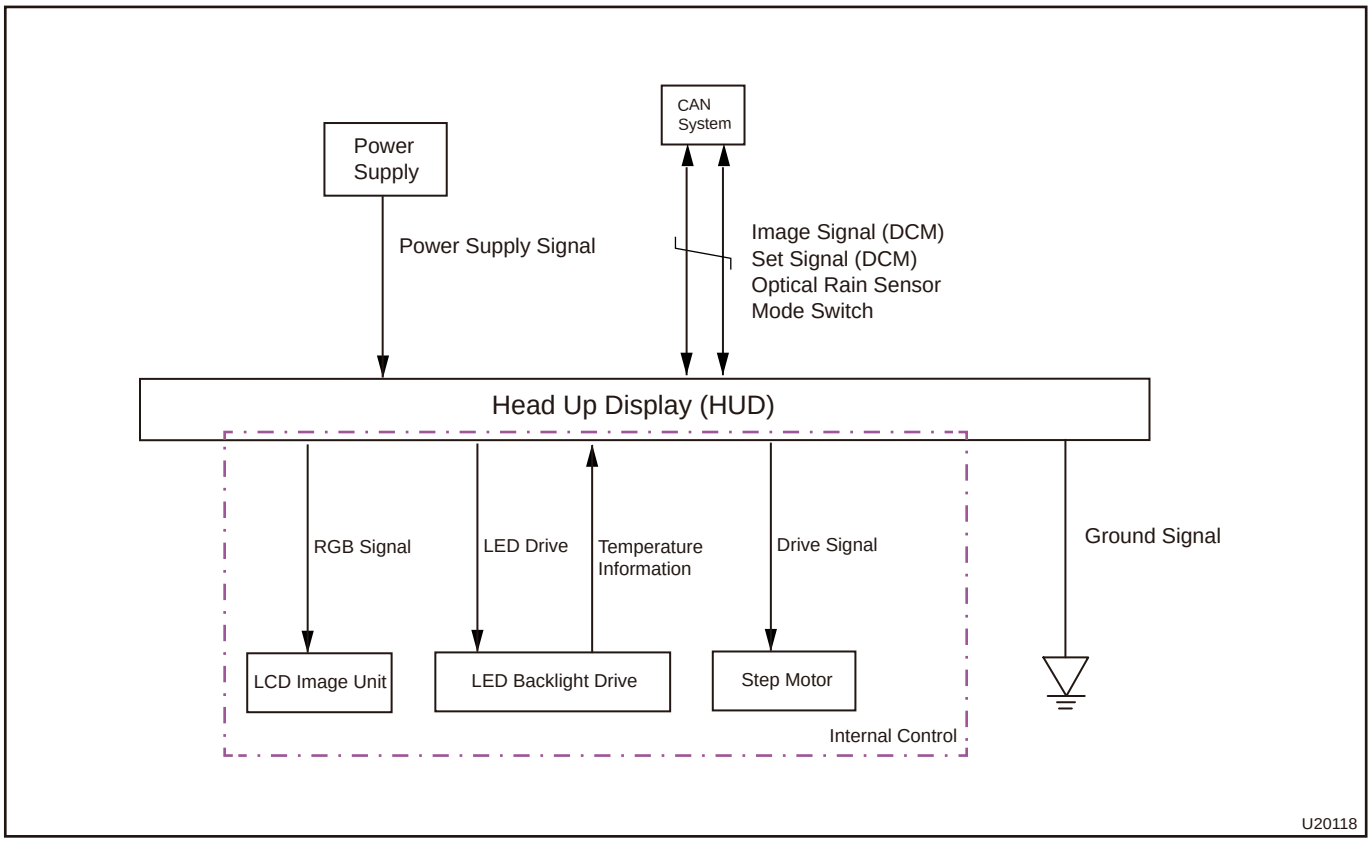
2.3 System Principle



2.4 Function Specification

(1) Function specification

1) System ON



Under normal operating voltage range, the system ON logic is as shown in table below:

BAT	ON (KL15)	CAN Communication	Parking Monitoring	System Condition
OK	OFF	Available	ON or OFF	System starts and starts to record automatically
		None	ON	When vibration intensity of vehicle exceeds the set threshold, the drive recorder will be waken up by the signal from built-in G-sensor to record 20s video. After recording the video, if there is no continuous G-sensor signal, the system will shut down automatically. (no information watermark)
			OFF	Vehicle vibrates and drive recorder cannot be waken up to record video

BAT	ON (KL15)	CAN Communication	Parking Monitoring	System Condition
	ON	Available or not available	ON or OFF	System starts and starts to record automatically
Abnormal	/	/	/	System cannot start

2) System OFF

Under normal operating voltage range, the system OFF logic is as shown in table below:

BAT	ON (KL15)	CAN Communication	System Condition
OK	ON	Available	ON
		Interrupted	Drive recorder can record video properly, but CAN related function cannot operate properly
	OFF	Available	System is in normal operating status, recording is normal and system does not turn off
		Interrupted	System off
Abnormal	/	/	System off

3) Operating current

Single head unit: ⩽ 300 mA.

4) Static current

Drive recorder system: ⩽ 0.1mA.

Start drive recorder with BATT terminal of head unit connector connected to multimeter (dialed to current band), cuts off the power supply at ON position under normal operating status, and the stable current value measured by multimeter after head unit enter sleep mode (CAN network is turned off and system does not operate) is the static current.

(2) Product feature

1) Function overview

Function	Description	Note
DVR Video Output	120° ± 5° in horizontal, 140° ± 5° in diagonal	5G WiFi connection, IHU display realizes display function, time delay ⩽ 500 ms
AR Navigation Video Output	Angle 55°, intercept video images according to HMI requirements, and meet AR navigation calibration requirements	LVDS connection, IHU display realizes display function, time delay ⩽ 30 ms
Frame Rate	30 fps	
Lens Pixels	⩾ 1920*1080	
Low-light Level	0.1 lux	
Dynamic Range	> 95 dB	
Signal Noise Ratio	> 40 dB	
Storage Medium	TF card (8 GB ~ 128 GB supported)	

Function	Description	Note
Record Function	Support	
Parking Monitoring	Support	
Power-off Storage Protection	Support	
ON Position Signal Detection	Support	
Snapshotting	Support	
File Playback	Support	
General/Emergency Recording	Support	
CAN Communication	Support	
Indicator	Two-color indicator of red and blue; device operates normally: Blue light constants on; Wi Fi connection/data interaction: Blue light flashes slowly; device failure/function abnormality: Red light constants on; recording abnormality/no TF card: Red light flashes slowly; software upgrade: Red and blue lights flash alternately	

2) System parameter

Function	Description	Note
Drive Recorder	Starts to record automatically after starting	
Recording Resolution	1080P (by default), 720P	
Recording Time	1 minute, 3 minutes (by default), 5 minutes	
Driving Information Overlay	ON (by default), OFF	
Recording	ON, OFF (by default)	
Gravity Sensing Sensitivity	High, Medium (by default), Low	
Wide Dynamic	ON (by default), OFF	
Snapshotting	Taking photo, Short video, Taking photo + Short video (by default)	

3) System features

Primary Function	Secondary Function	Description	Note
General Recording	Video recording	Video recording is circularly covered during recording, video is saved in TF card	
	Video recording switch	Video recording switch	ON by default
	Recording resolution	1920*1080@30 frame/ 1280*720@30 frame	1920*1080@30 frame by default

Primary Function	Secondary Function	Description	Note
	Sound recording switch	ON/OFF	Sound recording OFF by default
	Recording file time	1 minute/3 minutes/5 minutes	
	Driving information overlay	Driving information overlay switch	ON by default
		Driving information is from CAN network	
		Driving information includes: Vehicle speed, gear position, accelerator, high beam light, low beam light, front fog light, rear fog light, left turn signal light, right turn signal light, parking brake, foot brake, seat belt	
	Time watermark	When "driving information overlay" is set to on, there is current time watermark in screen of video file; When "driving information overlays" is set to off, time watermark is not overlaid in screen of video file; Time source: DVR RTC clock;	
	HDR switch	HDR switch	ON is for DVR function screen by default
Emergency Recording	Emergency recording	When vibration is greater than vibration acceleration threshold of emergency recording, 10 s video before and after vibration moment is saved in emergency video area separately; Emergency video file is overwritten circularly.	When recording is off, emergency recording will not be turned off
	Vibration acceleration induction sensitivity	Three vibration acceleration thresholds: High, medium, low	Medium by default
	Emergency recording overwriting	Emergency recording overwrite switch; When it is set to on, if emergency recording storage area is full, the earliest emergency video will be replaced by new emergency video; When it is set to off, if emergency video storage area is full, it	ON by default; Reminder is only displayed to make a text prompt on central navigation screen when WiFi is connected to central control navigation. If central navigation is not connected, it cannot be displayed.

Primary Function	Secondary Function	Description	Note
		will not be replaced, only a reminder will be given;	
Parking Monitoring	Parking monitoring	If vibration is greater than the parking monitoring vibration acceleration threshold with drive recorder turned off, it will turn off after turning on to recored for 20 seconds.	Duration is the same as that of emergency recording video
	Parking monitoring switch	Parking monitoring switch	ON by default
Taking Pictures	Taking pictures	1. Photo resolution is the same as current video resolution; 2. Recording is not paused when taking pictures; 3. The photo is stored in photo storage area of TF card; 4. The photo is overwritten circularly.	
	Steering wheel button control capturing	Respond to steering wheel button to take pictures;	
Playback	Video playback	Play the video file recorded by drive recorder in TF card on central control navigation head unit.	
	Photo playback	Play the photo file recorded by drive recorder in TF card on central control navigation head unit.	
File Management	File management	Manage (delete) the video and photo file stored in TF card of DVR on central control navigation head unit.	
	Formatting TF card	Format the TF card by central control navigation screen operation.	
AR Navigation Video Output	AR navigation video output	Capture video output of corresponding area with a 55° field of view	Specific angle is subject to real vehicle calibration
		AR navigation optical axis calibration, by adjusting AR navigation video interception area location, make AR navigation video center point coincide with theoretical optical axis center point;	
Specific angle is subject to real vehicle calibration	DVR video output and interaction	DVR outputs video and interacts via Wi-Fi	

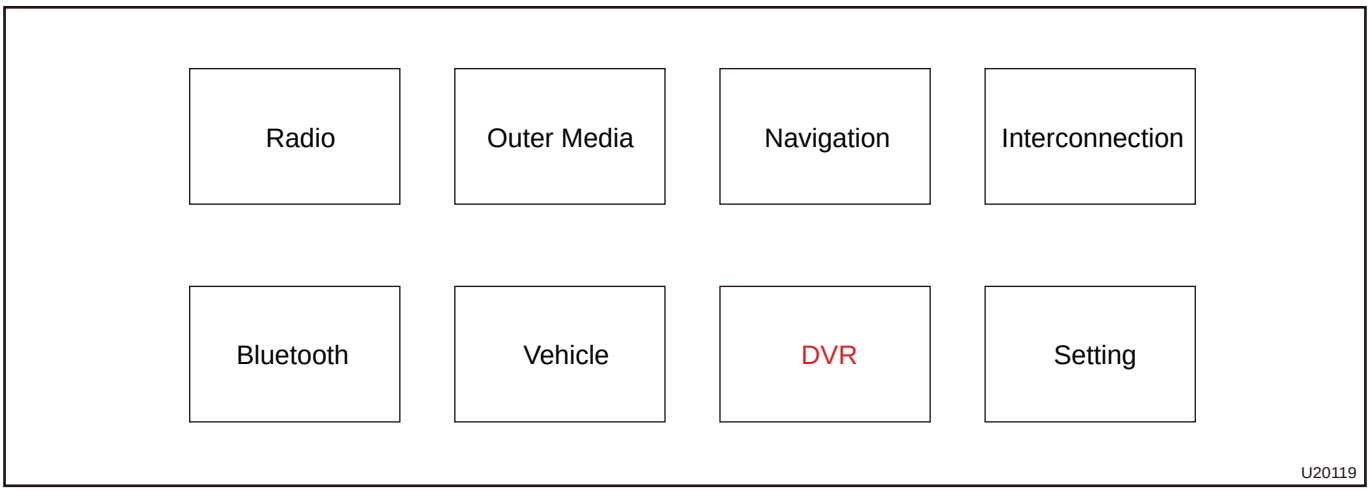
Primary Function	Secondary Function	Description	Note
		After DVR application is turned on by central control navigation head unit, it connects with wifi and starts to transmit data; After exiting DVR application, it stops data transmission and interaction, disconnect wifi connection;	
		WIFI ID and password are transmitted through LVDS (IIC in LVDS);	
		Use RTSP transport protocol to transmit real-time screen	
		Function includes: Real-time preview, normal video playback, taking pictures, file management, setting, etc.	
		Switching between WIFI 2.4G and 5G, controlled by LVDS (IIC in LVDS);	5G channel by default

Primary Function	Secondary Function	Description	Note
Power management, CAN network	ON position signal response	When power is turned on in ON position, system turns on and starts recording; When power is turned off in ON position and there is no CAN communication, system turns off and stops recording, and save the video file.	
	Video storage protection with power off	When it detects that power supply is cut off, start to save the video when stopping recording. Use super capacitor to save power and save the recording file before the moment of power off.	
	CAN network wake-up	System starts after receiving wake-up command from CAN network.	
	Transmit information	1. Vehicle driving information	
		2. Wake-up command	
Status indication	Indicator	Two-color indicator of red and blue; device operates normally: Blue light constants on, Wi-Fi connection/data interaction: Blue light flashes slowly; device failure/function abnormality: Red light constants on; recording abnormality/no TF card: Red light flashes slowly; software upgrade: Red and blue indicator blinks alternately	

(3) Functional requirement

Caution
The schematic diagram of UI interface in this chapter is only for the assistance function description. The specific UI is subject to actual design.

This product is a two-in-one product with a drive recorder and an AR navigation camera. The video display operation and AR navigation video of drive recorder need to be displayed on central control navigation screen. The operation method of DVR depends on whether central control navigation head unit supports it. The function introduction in this section takes touch method as an example. Button operation method depends on whether there are buttons on button panel that support DVR operation. The voice control depends on whether voice engine has supported corpus.



1) Drive recorder connection

   Drive recorder is connected with central control navigation through WiFi channel; Without entering DVR function, the WiFi connection between drive recorder and central control navigation is disconnected; When users need to view the video of drive recorder and operate drive recorder, click DVR icon in main interface, and central control navigation communicates through IIC in LVDS, transmits WiFi ID and password, and sends WiFi connection command to DVR; When DVR receives connection command of central control navigation head unit, connect WiFi hotspot of central control navigation head unit; After WiFi connection is successful, central control navigation head unit enters real-time preview interface of drive recorder.

   On real-time preview screen, decode and display H.264 video streaming from head unit camera of DVR in real time (there is a certain delay due to video capture, encoding, transmission, decoding and player cache, the delay is less than 500MS).

2) TF card album folder:

   i. General recording folder:

   - Folder name: “NOR”.
   - Internal file name: NOR_date_time A.MP4 (NOR_20180723_123233A.MP4).
   - Storage space = (total capacity of TF card - 500M (reserved buffer space)) *3/4.

   ii. Emergency recording folder:

   - Folder name: “EVT”.
   - Internal file name: EVT_date_time A.MP4 (EVT_20180723_123233A.MP4).
   - Storage space = (total capacity of TF card - 500M (reserved buffer space)) *1/5.

   iii. Photo folder

   - Folder name: “PHO”.
   - Internal file name: PHO_date_time A.JPG (PHO_20180723_123233A.JPG).
   - Storage space = (total capacity of TF card - 500M (reserved buffer space)) *1/20.

3) General recording

   i. Recording interface

   When B+ and ACC ON signal are powered on, or B+ is powered on and CAN network communication is normal, and voltage and power circuit are normal, drive recorder will automatically start recording.

   After the central control navigation is connected with drive recorder, it will enter the real-time preview interface to view the real-time image of the recorder. If the drive recorder is recording video normally, there is REC on the interface accompanied with red dot flashing. If the drive recorder is not recording video normally, only one red dot is always ON but not flashing, and there is no REC.

   ii. Video operation

When the drive recorder is in the pause state, click ICON to continue recording; ICON changes to . When the drive recorder is in the recording state, click ICON to pause recording; ICON changes to .

The drive recorder is equipped with MIC, which can record audio synchronously while recording video. The user can turn off or turn on the sound recording through the central control navigation screen. Sound recording is OFF by default. In the real-time preview interface, click ICON to turn on sound recording, ICON changes to . Click ICON to turn off sound recording, ICON changes to .

iii. Video recording

The video recording of the drive recorder has been continuing. Due to the limited capacity of the TF card, the memory card will be full after the TF card is recorded for a period of time. The drive recorder adopts the logic of cyclic storage of video. When the memory card is full, the latest video will overwrite the earliest recorded video in the folder.

The recorder supports up to 1080P resolution video, and the default is 1920*1080@30 frame; the user can change the resolution to 1280*720@30 frame through the central control navigation screen. After changing to 1280* 720@30 frame, it can also be manually changed back to 1920*1080@30 frame.

The recorded video is stored by time segment. The system default is 3 minutes, which can be manually changed to 1 minute or 5 minutes.

4) Emergency video recording

i. Emergency video trigger

There are two sources of signals that trigger emergency recording: G-sensor of drive recorder and acceleration value of vehicle body. The vehicle transmits the key position status to drive recorder through CAN. When the drive recorder receives the key position status (ignition action) sent by the vehicle, it triggers the emergency recording by judging whether the body gravity acceleration value exceeds the set threshold value (the threshold value needs to be set according to the actual vehicle verification).

When the drive recorder receives the vehicle key position state turns to ON position signal disconnection state after ignition, during ON position signal disconnection and next ignition state, the drive recorder triggers emergency recording through its own G-sensor signal. When the acceleration of vibration exceeds the threshold set by G-sensor, the recorder will be triggered to store an emergency video.

The inductive sensitivity of G-sensor can be set to "high", "medium" and "low” through the large screen navigation of central control. The default is "medium".

ii. Emergency video storage mechanism

The emergency video is a 20s video, which is stored in the "emergency video" folder. The 20s video consists of 10s video before and after the time when the vibration is sensed. The resolution of the emergency video is the same as that of the normal video currently set. If the normal video is set to 1080P or 720P, the resolution of the emergency video is also 1080P or 720P.

Due to the space of the "emergency video" folder is also limited, the memory card in "emergency video" folder will also be full, so the emergency video folder also adopts the mechanism of circular overwrite. When user sets emergency recording overwrite to “ON”, when “emergency video” folder is full, the newly generated emergency video will overwrite the earliest recorded emergency video. If user sets emergency recording overwrite to "OFF", when "emergency video" folder is full, the new emergency video will not overwrite any video, only prompt: "Emergency video folder is full, emergency recording overwrite is set to off".

5) Time watermark

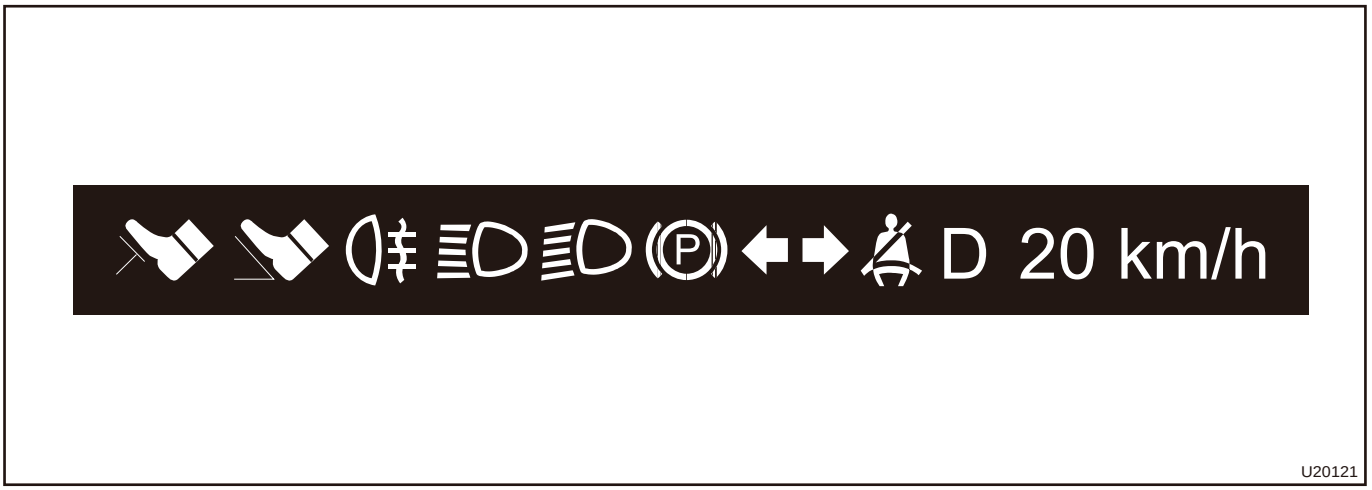
The time watermark is corrected by LVDS, and it will be corrected once when starting up. The time watermark contains date and time information in the format of "year-month-day hour: minute: second". The time watermark can be set to off (the same setting switch as driving information overlay setting switch). If user sets it to off, the recorded video does not contain time watermark.

6) Driving information overlay

DVR will receive the vehicle driving information from CAN network and save it in the video recording file in the form of watermark icon. The information watermark of DVR is acquired according to the CAN signal. When there is no CAN signal, the information watermark will not be displayed and CAN network will not actively wake up other ECU. See the table below for driving information.

Display composite information	Vehicle speed	20km/h
	Gear position	D
	Accelerator pedal	
	High beam light	
	Low beam light	
	Rear fog light	
	Right turn signal light	
	Left turn signal light	
	Hand brake	
	Foot brake	
	Seat belt warning status (consistent with instrument warning light status)	

The watermarks of light, brake and seat belt display as follows:



Driving information comes from CAN network. When the vehicle performs corresponding actions and the drive recorder receives corresponding CAN information, the corresponding icon will be highlighted; if the corresponding actions are not performed, the corresponding icon will be grayed out; if the high beam light is turned on, the high beam light icon will be highlighted; if the high beam light is turned off, the high beam light icon will be grayed out. Vehicle speed information display: Numbers km/h.

These vehicle status information is not visible on real-time preview interface, but it will be superimposed and recorded on the video stored in TF card. When the user plays back the recorded video, the vehicle driving information can be seen.

7) Video storage protection with power off

When system detects that power supply is cut off, system will immediately start recording stop and recording save action, use super capacitor to store electricity, complete recording file before the moment of power off.

8) Parking monitoring

If the user sets the parking monitoring function as ON, when the vehicle stops and stalls, the ON gear is off, and the drive recorder is shut down, if the vehicle vibrates and the vibration acceleration value exceeds the threshold value of G-sensor, the drive recorder will be awakened and recorded video for a period of 20s after awakening, which is stored in the "emergency video" folder. If G-sensor does not continue to sense vibration, the drive recorder will be shut down.

The parking monitoring function is OFF by default. The user can turn on parking monitoring function through central control navigation.

9) Taking pictures

i. Photograph operation and control

When the drive recorder is on, you can quickly take a picture by pressing TBD button on steering wheel. Press the button once to take a picture. You can take photos by clicking ICON in UI interface of central control navigation. The minimum response interval between two consecutive photographing commands is 500 ms.

ii. Photograph storage

The photos taken are consistent with the currently set video resolution, such as if the set video is 1080P or 720P, and the photos taken are also 1080P or 720P. Photographs are taken during the video recording process, and the video recording is not affected. Photograph storage uses the logic of circular overlay. When the "Photograph" folder is full, the latest photograph will overwrite the earliest photograph.

10) Playback of video/photograph

i. Playback and deleting of video in TF card

On video list interface in TF card, select one video and click “Delete” to delete the video. Long press a video in the list, and the "Select All" option will appear. If all videos are selected, click "-Delete" to delete from the first video, "Delete" icon will change to "Cancel" icon, and click "Cancel" to stop deleting. Deleted videos cannot be recovered.

On video list interface in TF card, select one video and click “Playback” to start playing the current video. If all videos are selected, click "Playback" to start playing from the first video.

Time watermark and driving status information (such as “driving information” setting is on during video capture) can be displayed on the video playback interface. Click ICON to pause playback, ICON will change to , click ICON to play continues; ICON will change to . Drag the time progress bar to quickly locate the video playback time.

Click "Return" icon to exit photo playback and return to DVR main interface.

ii. Playback and deleting of photos in TF card

On photo list interface in TF card, select one photo and click “Delete” to delete the photo. If all photos are selected, click "Delete" to delete from the first photo, "Delete" icon will change to "-Cancel" icon, and click "Cancel” to stop deleting. Deleted photos cannot be recovered.

On photo list interface in TF card, click one photo, this photo will be displayed at left area of screen.

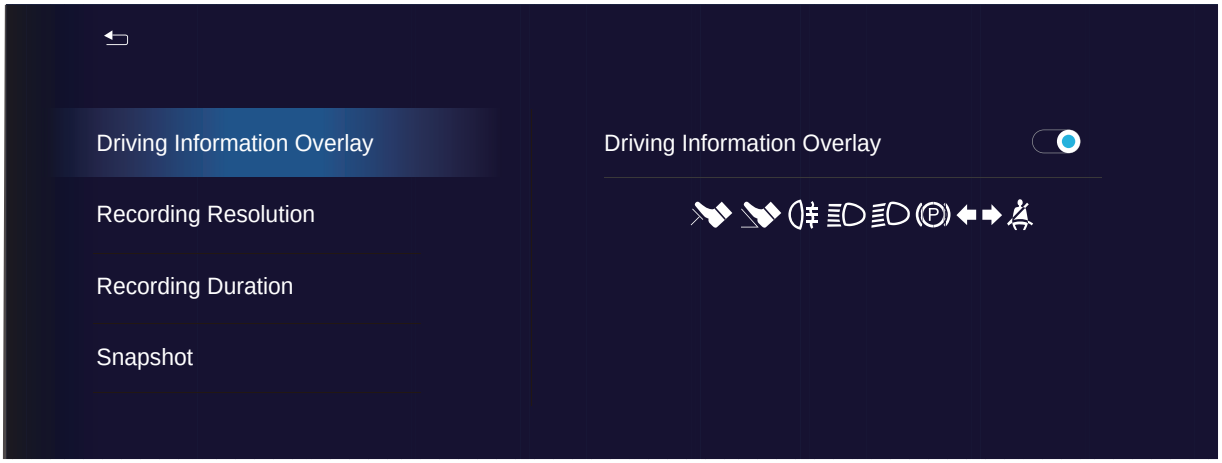
Time watermark and driving information (such as “driving information” setting is on during photo taking) can be displayed on the photo playback interface. Click ICON, the photos will be played automatically at speed of 3 s per photo from the current photo, ICON will change to , click will pause automatic play, ICON returns to .

Click “<” or “>” ICON, it will change to previous or next photo.

Click "Return" icon to exit photo playback and return to DVR main interface.

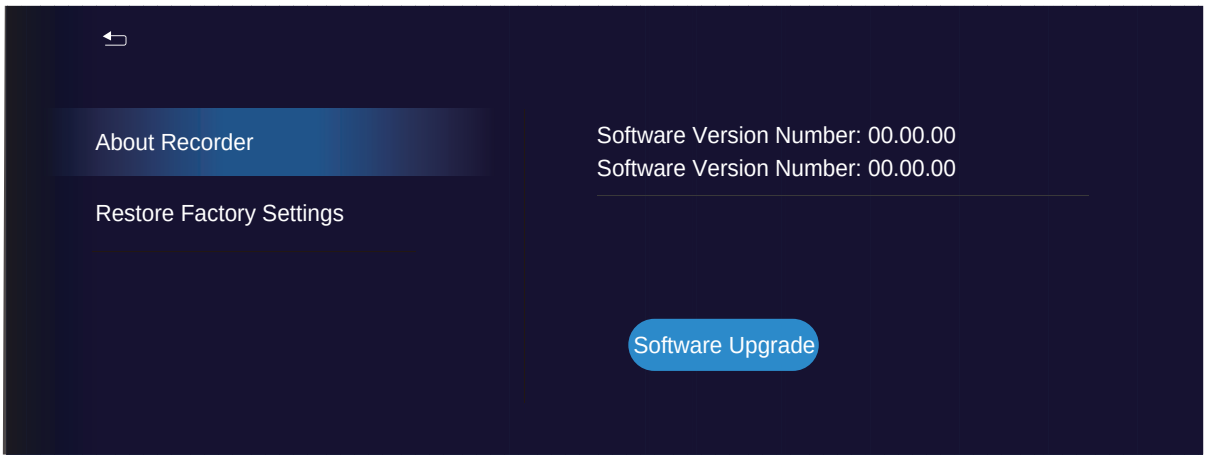
11) Setting

On the real-time preview interface, click setting ICON to enter setting menu interface of drive recorder, setting items of drive recorder contains the following:



U20246

U20248



U20252

Driving information overlay: ON (default) and OFF.

Resolution: 1080P (default) and 720P.

Video duration: 1 minute, 3 minutes (default) and 5 minutes.

Sound recording: ON, OFF (by default).

Vibration sensitivity: High, Medium (default) and Low.

Wide dynamic: ON (default) and OFF.

Emergency recording overwriting: ON (default) and OFF.

Parking monitoring: ON and OFF (default).

Format: Select to format the memory card on the recorder.

Factory settings: Restore the factory default settings of recorder.

Firmware upgrade: When there is a correct upgrade file in TF card, click "Firmware upgrade" to update system firmware of recorder.

12)AR navigation video output

i. AR navigation video output

When DVR is turned on and central control navigation starts and successfully configures LVDS transmission pair (MAX96705), DVR turns on AR navigation video output. When DVR detects that ON signal is turned off, and after CAN network is turned off, DVR turns off AR navigation video output.

ii. AR navigation video requirement

DVR head unit intercepts camera center FOV (H) = 55° range video (resolution: 920*520), transmits it to central navigation head unit via LVDS, for AR navigation map analysis and processing; Output video frame rate requires 30 frames.

13)Status indication

Status indicator is located next to the TF card slot, indicator is red-blue indicator.

Blue indicator constant on indicates that device operates normally.

Blue indicator flashes slowly, that is, blue indicator flashes at a frequency of 0.5 HZ, indicating that the wifi connection is successful.

Red indicator constant on indicates that device failure or abnormal function, including abnormal TF card or low card speed, video stopping and machine fault.

Red indicator flashes slowly, that is, blue indicator flashes at a frequency of 0.5 HZ, indicating that video is abnormal or there is no TF card.

Alternating red and blue flashes indicate that the software is being upgraded.

(4) Electrical requirement

1) Steering wheel drive-by-wire

i. Drive-by-wire button definition

“Mode” button on steering wheel is the user-customizable button, which can be defined by the user as: sound source switching or drive recorder snapshot. If it is defined as drive recorder snapshot, you can perform drive recorder snapshot function by pressing Mode button. User can customize the snapshot in the setting interface of the drive recorder: Photo taking, short video and photo taking + short video (default).

(5) Interaction between DVR and central control

Drive recorder function involves the interaction among central control IHU, central control APK and drive recorder.

Main functions of central control are:

- As a hot spot, central control needs to support DVR Wi-Fi access.
- It is necessary to provide CAN writing interface to send CAN data for central control APK.
- It is necessary to provide CAN data callback interface, notify APK when central control receives relevant CAN data.

Main functions implemented by APK:

- Interact with the DVR through Wi-Fi.
- Notify the DVR of some central control information (such as Wi-Fi SSID, etc.) through the CAN writing interface provided by the central control.
- Feedback the CAN information (such as TF card status, etc.) received by the central control from DVR.

Main functions implemented by DVR:

- Basic functions of drive recorder.

- Report DVR status and other information through CAN.
- Respond APK by requirements sent from CAN (such as TF card status, etc.)

The CAN command interacting with DVR is an event message, and the time interval between two messages is not less than 20 ms. Like a CAN message which is composed of multiple frames, the sending interval of two frames is 20 ms.

The main protocols for CAN interaction between central console and DVR are as follows:

Command Type	Parameter Length	Sending Timing	Note
MAC Address	6 Byte	Sent when IHU is turned on, when there is a change, when DVR requests, and when IHU responds (when DVR is turned on)	For example: 00:23: DE:2C:34:DF, sending from start to end; parameter length (6 Byte) + 1 (1 Byte check digit) is the total data length.
Wi-Fi Name	64 Byte max	Sent when IHU is turned on, when there is a change, when DVR requests, when IHU responds, and when IHU turns on AP	Wi-Fi name is variable length. When the overall length of data is more than 6, it is necessary to send it by frame.
Wi-Fi Password	64 Byte max	Sent when IHU is turned on, when there is a change, when DVR requests, when IHU responds, and when IHU turns on AP	Wi-Fi name is variable length. When the overall length of data is more than 6 Byte, it is necessary to send it by frame.
Wi-Fi Connection	1 Byte	When DVR APK starts/ exits	
UDP broadcast terminal number	2 Byte	When head unit APK starts, when DVR requests actively	Used for notifying APK to connect with DVR by DVR broadcasting
TF card status	1 Byte	DVR sends actively when TF status changes, DVR sends passively when APK requires actively (- when APK starts)	The status of card includes: TF card status is normal, no card is inserted (IHU display: memory card is not inserted into recorder), TF card is not formatted (IHU display: recorder memory card is not formatted), card is abnormal (IHU display: recorder memory card is abnormal)
DVR Status	1 Byte	DVR sends actively when DVR status changes, DVR sends passively when APK requires actively (- when central console starts)	Included status: DVR status is normal, DVR status is abnormal
Photo folder status	1 Byte	DVR sends actively when photo space is full, DVR sends passively when APK requires actively	Included status: Photo space is not full/Photo space is full (IHU display: photo folder of drive recorder is full)

Command Type	Parameter Length	Sending Timing	Note
Emergency video folder status	1 Byte	DVR sends actively when emergency video space is full, DVR sends passively when APK requires actively	Included status: Emergency video space is not full/Emergency video space is full (IHU display: emergency video folder of drive recorder is full)
DVR Requirement	1 Byte	When DVR needs to actively acquire the central console information	SSID information and others needs to be known when DVR starts
APK Requirement	1 Byte	When DVR needs to actively acquire the DVR status	APK requires actively. After DVR receives this requirement, TF status, DVR status, photo space status and emergency video space is sent by CAN

3 Diagnosis & Testing

3.1 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.2 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- When circuit signal is interrupt during detection, wiggle related wire harnesses and connectors.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.3 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation

may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.4 Diagnosis Procedure

Use following procedures to troubleshoot the inside rear view mirror system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Standard voltage: Not less than 12 V

NG → **Replace battery**

OK

3	**Customer problem analysis**

Next

4	**Read DTCs**

History DTC → **Troubleshoot according to Intermittent DTC malfunction procedures**

Current DTC

5	**Repair according to Diagnostic Trouble Code (DTC) Chart**

Next

6	**Adjust, repair or replace**

Next

7	**Conduct test and confirm malfunction has been repaired**

Next	End

3.5 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1B5000	Image Sensor Failure - Abnormal Image Acquisition	Abnormal image acquisition	1. Accidental failure; 2. Sensor failure.	1. Reset module and clear DTC; 2. Replace module for testing.
B1B5100	DSP Failure	DSP failure	1. Accidental failure; 2. Module internal fault.	
B1B5200	WIFI Failure - WIFI Module Abnormal	WIFI module abnormal	1. Accidental failure; 2. Module internal fault.	1. Reset module and clear DTC; 2. Replace module for testing.
B1B5300	G-sensor Fault - Abnormal Collision Sensing	Abnormal collision sensing	1. Accidental failure; 2. Module internal fault.	1. Reset module and clear DTC; 2. Replace module for testing.
B1B544A	Abnormal Memory Card - Low Write Speed of Memory Card, Serious Fragmentation of Memory Card, Memory Card Damage	Low write speed of memory card, serious fragmentation of memory card, memory card damage	1. Accidental failure; 2. The memory card is abnormal.	1. Reset module and clear DTC; 2. Replace a new memory card with a correct format for testing; 3. Replace module for testing

3.6 DTC Diagnosis Procedure

DTC	B1B5000	Image Sensor Failure - Abnormal Image Acquisition
DTC	B1B5100	DSP Failure

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check intermittent fault

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Wait for 120 seconds, turn the ignition switch to ON and then to OFF.

(b) Clear DTC again.

OK	If DTC still exists, replace module hardware.

NG

2	Check camera

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Check camera for obstruction or damage.

NG → **Check, repair and replace module assembly.**

OK

3	Check related wire harness and connector

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

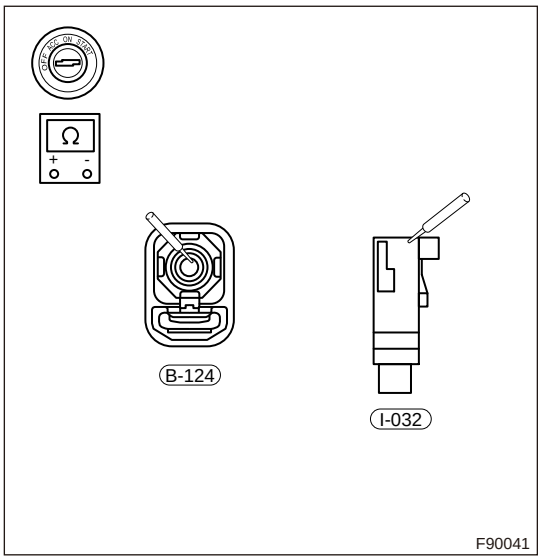
(b) Disconnect the DVR module assembly connector B-124.

(c) Check if related wire harnesses are worn, pinched or broken.

(d) Check if related connector terminals are loose, broken, bent or corrosive.

(e) According to the table below, use a digital multimeter to check for continuity between DVR module assembly connectors B-124 (1, 2) and I-032 (1, 2).

Multimeter Connection	Specified Condition
B-124 (1, 2) - I-032 (1, 2)	⩽ 1 Ω
B-124 (1, 2) - I-032 (1, 2)	⩽ 1 Ω



NG → **Check and repair wire harness and connector.**

OK

4	Check controller module

NG → **Check and repair or replace controller**

OK → **Go back to step 1 and recheck.**

DTC	B1B5200	WIFI Failure - WIFI Module Abnormal
DTC	B1B5300	G-sensor Fault - Abnormal Collision Sensing

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check intermittent fault**

(a) Wait for 120 seconds, turn the ignition switch to ON and then to OFF.
(b) Clear DTC again.

OK → **If DTC still exists, replace module hardware.**

NG

2	**Check controller module**

NG → **Check and repair or replace controller.**

OK → **Go back to step 1 and recheck.**

DTC	**B1B544A**	**Abnormal Memory Card - Low Write Speed of Memory Card, Serious Fragmentation of Memory Card, Memory Card Damage**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check intermittent fault**

(a) Wait for 120 seconds, turn the ignition switch to ON and then to OFF.
(b) Clear DTC again.

OK → **If DTC still exists, replace module hardware.**

NG

2	**Check memory card**

(a) Check memory card for contamination or damage.

NG → **Check, repair and replace memory card with correct format for testing.**

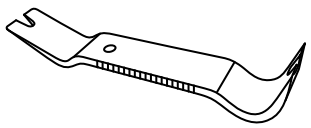
OK

3	**Check controller module**

NG	Check and repair or replace controller.
OK	Go back to step 1 and recheck.

4 On-Vehicle Service

4.1 Tools

Tool Name	Tool Drawing
Interior crow plate	 S00020

4.2 Replacement of Drive Recorder

■ **Removal**

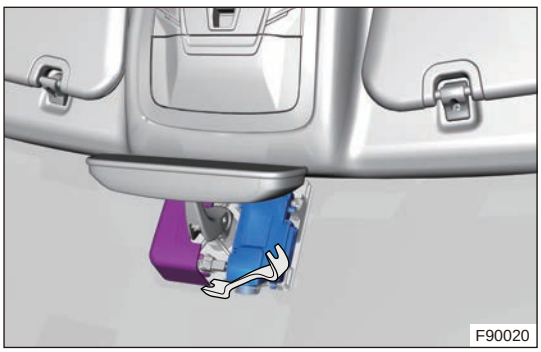
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable

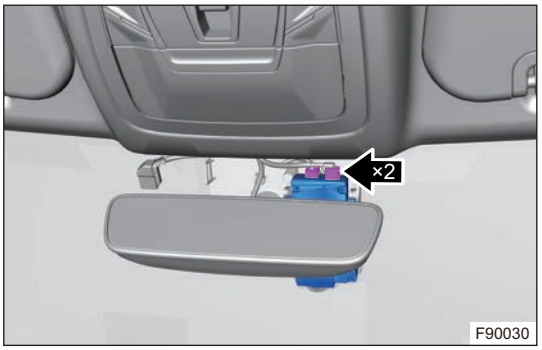
(3) Using an interior crow plate, pry off and remove the inside rear view mirror right protective cover.


F90010

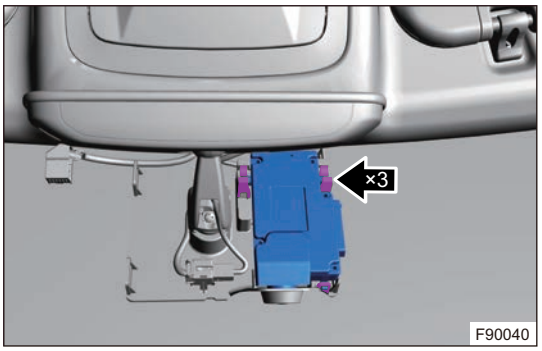
(4) Using an interior crow plate, pry off the inside rear view mirror left protective cover.


F90020

(5) Remove the drive recorder connector



(6) Remove the fixing columns on both sides of drive recorder along the upward direction of bracket base, and take out the lens of drive recorder and front end pin, and finally remove drive recorder.



■ Installation

(1) Align lens and front end pins of drive recorder with the corresponding holes on the base of multi-function bracket and insert them.

(2) When front end pins of drive recorder is inserted in place, the fixed columns on left and right sides of drive recorder are just at upper end of bracket base. Press down the fixed columns on left and right sides along the direction of bracket base, and assemble them to the corresponding structure of base. After drive recorder is assembled, insert connectors of drive recorder respectively.

(3) Pull off protective film on drive recorder lens.

(4) Install the inside rear view mirror left protective cover.

(5) Install the inside rear view mirror right protective cover.

11.9 REAR VIEW MIRROR

1 Warnings and Precautions

1.1 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to wear safety equipment to prevent accidents, when removing outside rear view mirror assembly.

(2) Operate carefully to prevent components from being damaged, when removing outside rear view mirror assembly.

(3) Try to prevent interior and body paint surface from being scratched, when removing outside rear view mirror assembly.

(4) Avoid breaking claw, when removing outside rear view mirror lens assembly.

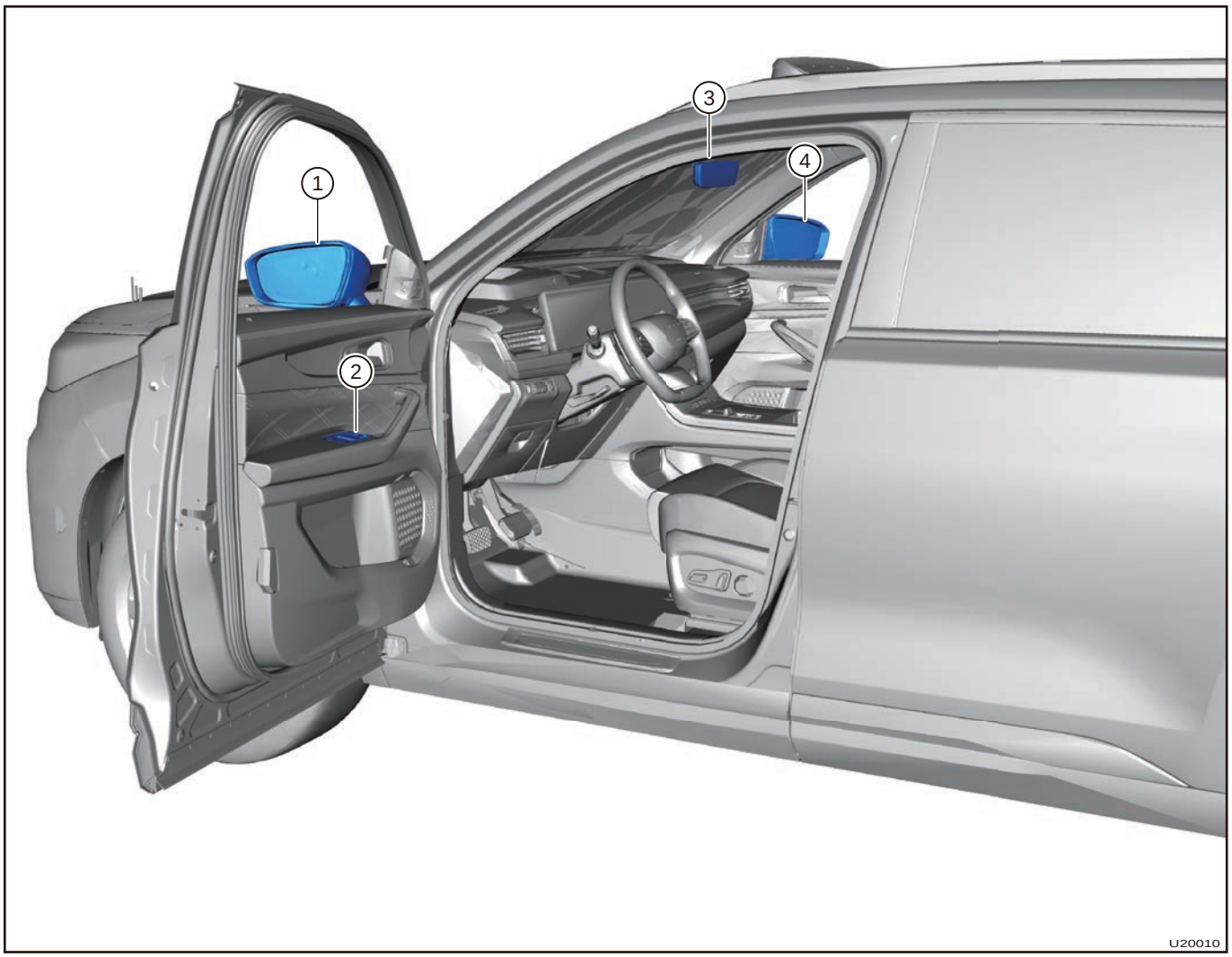
(5) Make sure the lens can move smoothly, flexibly and reliably after installing outside rear view mirror lens assembly.

2 System Overview

2.1 System Description

This vehicle is equipped with power outside rear view mirror assembly and inside rear view mirror assembly. Power outside rear view mirror assembly: Driver can control the rotation of outside rear view mirror internal motor by operating the outside rear view mirror adjustment switch in vehicle, thus adjusting the mirror surface to a required visual angle and folding mirror.Outside rear view mirror adjustment switch: Located on front left door protector. With ENGINE START STOP switch ON, press the outside rear view mirror adjustment switch to “L” or “R” position to select left or right outside rear view mirror assembly, and then press the up or down and left or right button of outside rear view mirror adjustment switch to a required visual angle.Manual glare-resistant inside rear view mirror assembly: It is necessary to adjust inside rear view mirror to desired direction with hands. When driving at night, to reduce glare, adjust the inside rear view mirror assembly to required angle by pulling glare-resistant rod backward.Automatic glare-resistant inside rear view mirror assembly (if equipped): It is composed of a special mirror, two photosensitive diodes and an electronic controller. The electronic controller receives the front and back light signals from the photosensitive diodes. If light shines on the inside rear view mirror, for example if the light behind is brighter than that in front, the electronic controller will output a voltage to the conductive layer. The voltage on conductive layer will change the color of electrochemical layer on mirror surface. The higher the voltage is, the darker the color of electrochemical layer is. At this time, ever if a strong light shines on the rear view mirror, a dark light will be reflected on the driver’s eyes through the glare-resistant inside rear view mirror, which will not be glaring. The electrochemical layer on mirror surface will change continuously and automatically according to the incident intensity of light behind, thus preventing glare. When reversing the vehicle, the glare-resistant function of glare-resistant inside rear view mirror will be released.

2.2 System Components Diagram



1	Left Outside Rear View Mirror Assembly	3	Inside Rear View Mirror Assembly
2	Rear View Mirror Folding Switch	4	Right Outside Rear View Mirror Assembly

2.3 System Principle

Operation of rear view mirror

- The up and down, left and right movement of outside rear view mirror is signaled by front left window switch and adjusted and controlled by door control module.
- The defrosting of outside rear view mirror starts with the defrost request signal received by BCM via CAN (defroster operating time: 20 minutes timing ends, defrosting stops) and then the heating signal is transmitted to the rear view mirror heating relay to perform heating.

3 Diagnosis & Testing

3.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Outside rear view mirror cannot operate	Fuse
	Outside rear view mirror adjustment switch
	Outside rear view mirror assembly
	Wire harness or connector
Outside rear view mirror intermittent malfunction	Ground
	Wire harness or connector
Rear view mirror defroster cannot operate	Wire harness or connector
	Rear defroster switch
	Outside rear view mirror assembly
	BCM is damaged

3.2 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.3 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- When circuit signal is interrupt during detection, wiggle related wire harnesses and connectors.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.4 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.5 Diagnosis Procedure

Use following procedures to troubleshoot the inside rear view mirror system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Standard voltage: Not less than 12 V

NG → **Replace battery**

OK

3	**Customer problem analysis**

Next

4	**Read DTCs**

History DTC → **Troubleshoot according to Intermittent DTC malfunction procedures**

Current DTC

5	**Repair according to Diagnostic Trouble Code (DTC) Chart**

Next

6	**Adjust, repair or replace**

Next

7	**Conduct test and confirm malfunction has been repaired**

Next → **End**

3.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B104111	Outside Rear View Mirror Folding Relay Circuit Short to Power Supply
B104113	Outside Rear View Mirror Folding Relay Circuit Open
B105112	Outside Rear View Mirror Defroster Relay Circuit Short to Power Supply
B105011	Rear Defroster Relay Circuit Open or Short to Ground
B105012	Rear Defroster Relay Circuit Short to Power Supply

3.7 DTC Diagnosis Procedure

DTC	B104111	Outside Rear View Mirror Folding Relay Circuit Short to Power Supply

DTC	DTC Definition	Possible Cause
B104111	Outside Rear View Mirror Folding Relay Circuit Short to Power Supply	• Check wire harness connector • Outside rear view mirror • Check BCM

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check for short to power supply in wire harness and connector**

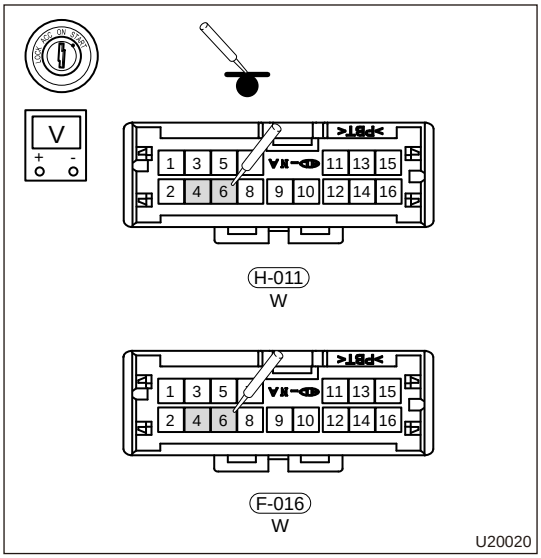
Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the connectors H-011 and F-016.

(c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.

(d) Using voltage band of digital multimeter, check for voltage between H-011 (4) - ground, H-011 (6) - ground, F-016 (4) - ground and F-016 (6) - ground separately.



Multimeter Connection	Condition	Specified Condition
H-011 (4) - Ground	ENGINE START STOP switch "ON"	0 V
H-011 (6) - Ground	ENGINE START STOP switch "ON"	0 V
F-016 (4) - Ground	ENGINE START STOP switch "ON"	0 V
F-016 (6) - Ground	ENGINE START STOP switch "ON"	0 V

NG → **Repair or replace faulty wire harness or connector**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace BCM module**

OK → **System operates normally**

DTC	B104113	Outside Rear View Mirror Folding Relay Circuit Open

DTC	DTC Definition	Possible Cause
B104113	Outside Rear View Mirror Folding Relay Circuit Open	• Check wire harness connector • Outside rear view mirror • Check BCM

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

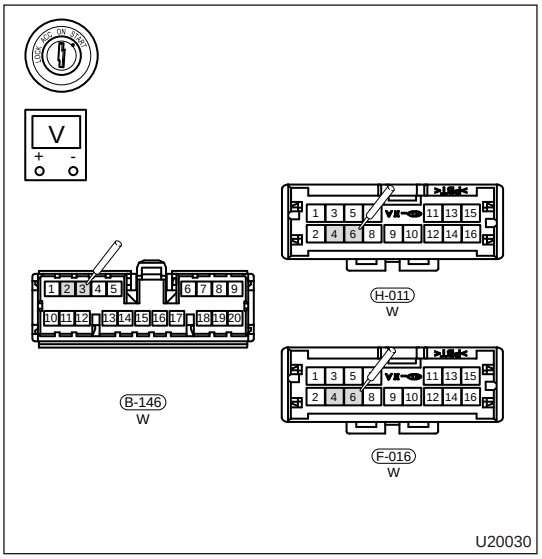
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).

- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check wire harness and connector for open

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
(b) Disconnect the connectors B-146, H-011 and F-016.
(c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
(d) Using voltage band of digital multimeter, check for voltage between B-146 (3) - H-011 (6), B- 146 (3) - F-016 (6), B-146 (2) - H-011 (4) and B-146 (2) - F-016 (4) separately.



Multimeter Connection	Condition	Specified Condition
B-146 (3) - H- 011 (6)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (3) - F-016 (6)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (2) - H- 011 (4)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146(2) - F-016(4)	ENGINE START STOP switch "OFF"	⩽ 1 Ω

NG → **Repair or replace faulty wire harness or connector**

OK

2	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.
(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace BCM module**

OK → **System operates normally**

DTC	**B105012**	**Rear Defroster Relay Circuit Short to Power Supply**
DTC	**B105112**	**Outside Rear View Mirror Defroster Relay Circuit Short to Power Supply**

DTC	DTC Definition	Possible Cause
B105012	Rear Defroster Relay Circuit Short to Power Supply	• Relay • Wire harness or connector • BCM module
B105112	Outside Rear View Mirror Defroster Relay Circuit Short to Power Supply	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check relay**

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Using ohm band of digital multimeter, check relay (RRLY11) (RRLY12).

Multimeter Connection	Condition	Specified Condition
87# - 30#	When battery voltage is not applied to 86#-85#	∞
87# - 30#	When battery voltage is applied to 86#-85#	⩽ 1 Ω
5#-3#	When battery voltage is not applied to 1#-2#	∞
5#-3#	When battery voltage is applied to 1#-2#	⩽ 1 Ω

NG → **Replace relay**

OK

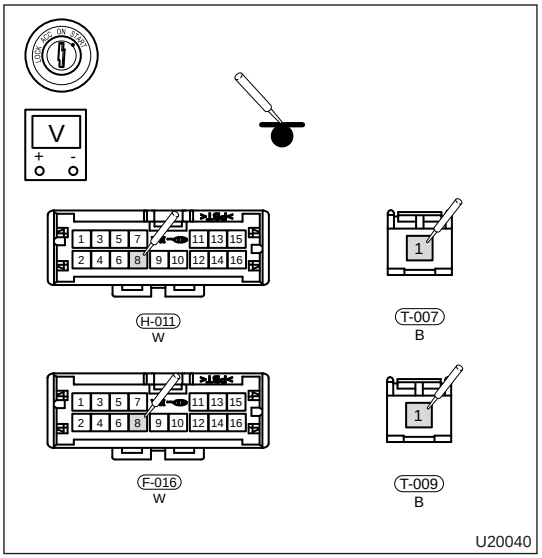
2	**Check for short to power supply in wire harness and connector**

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the connectors H-011, F-016, T-007 and T-009.

(c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.

(d) Using voltage band of digital multimeter, check for voltage between H-011 (8) - ground, F-016 (8) - ground, T-007 (1) - ground, and T-009 (1) - ground separately.



Multimeter Connection	Condition	Specified Condition
H-011 (8) - Ground	ENGINE START STOP switch "ON"	0 V
F-016 (8) - Ground	ENGINE START STOP switch "ON"	0 V
T-007 (1) - Ground	ENGINE START STOP switch "ON"	0 V
T-009 (1) - Ground	ENGINE START STOP switch "ON"	0 V

NG → **Repair or replace faulty wire harness or connector**

OK

3	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace BCM module**

OK → **System operates normally**

DTC	B105011	Rear Defroster Relay Circuit Open or Short to Ground

DTC	DTC Definition	Possible Cause
B105011	Rear Defroster Relay Circuit Open or Short to Ground	• Relay • Wire harness or connector • BCM module

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check relay

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
(b) Using ohm band of digital multimeter, check relay (RRLY12).

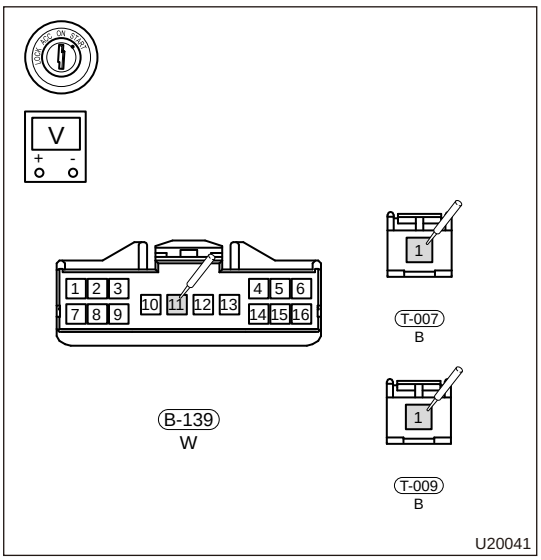
Multimeter Connection	Condition	Specified Condition
5#-3#	When battery voltage is not applied to 1#-2#	∞
5#-3#	When battery voltage is applied to 1#-2#	⩽ 1 Ω

NG → **Replace relay**

OK

2	Check wire harness and connector for open

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
(b) Disconnect the connectors B-139, T-007 and T-009.
(c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
(d) Using voltage band of digital multimeter, check for continuity between B-139 (11) - T-007 (1) and B-139 (11) - T-009 (1) separately.



Multimeter Connection	Condition	Specified Condition
B-139 (11) - T- 007 (1)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
B-139 (11) - T- 009 (1)	ENGINE START STOP switch “OFF”	⩽ 1 Ω

NG → **Repair or replace faulty wire harness or connector**

OK

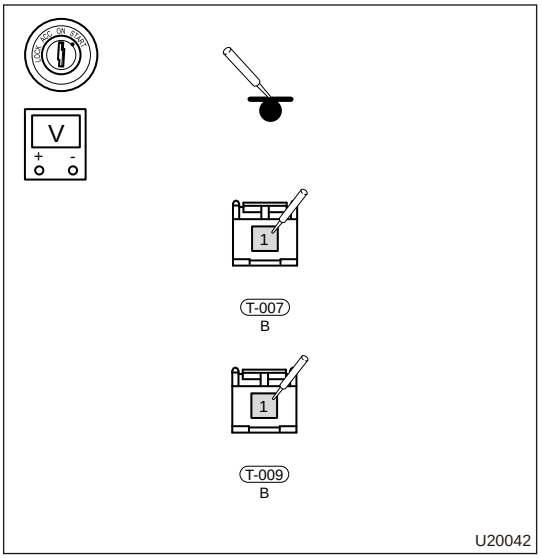
3	Check for short to ground in wire harness and connector

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the connectors T-007 and T-009.

(c) Using voltage band of digital multimeter, check for continuity between T-007 (1) - ground and T-009 (1) - ground separately.

Multimeter Connection	Condition	Specified Condition
T-007 (1) - Ground	ENGINE START STOP switch "OFF"	∞
T-009 (1) - Ground	ENGINE START STOP switch "OFF"	∞



NG → **Repair or replace faulty wire harness or connector**

OK

4	Reconfirm DTCs

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

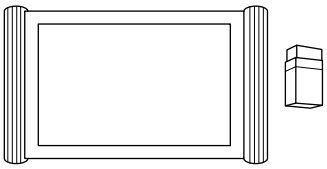
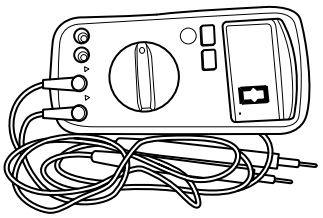
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace BCM module**

OK → **System operates normally**

4 On-Vehicle Service

4.1 Tools

Tool Name	Tool Drawing
Digital Multimeter	 RCH0001006
X-431 PAD Diagnostic Tester	 RCH0002006

4.2 Replacement of Outside Rear View Mirror Assembly

■ **Removal**

Hint
• **Use same procedures for right and left sides.** • **Procedures listed below are for left side.**

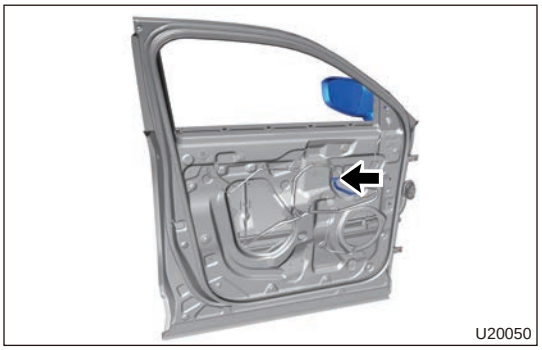
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing outside rear view mirror assembly.** • **Operate carefully to prevent components from being damaged, when removing outside rear view mirror assembly.** • **Try to prevent interior and body paint surface from being scratched, when removing outside rear view mirror assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch

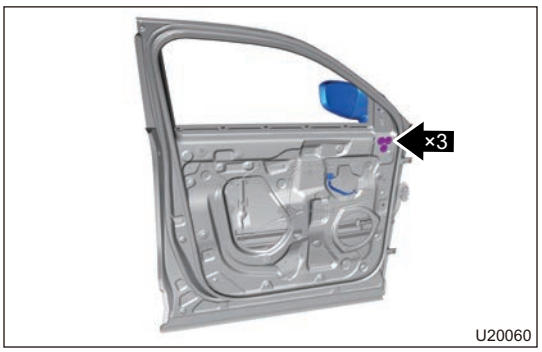
(2) Disconnect the negative battery cable

(3) Remove the front left door inner protector assembly.

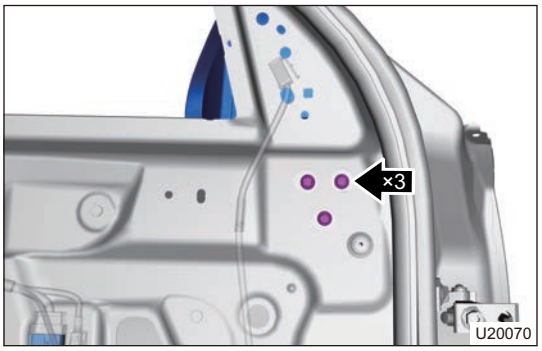
(4) Disconnect the left outside rear view mirror assembly connector.



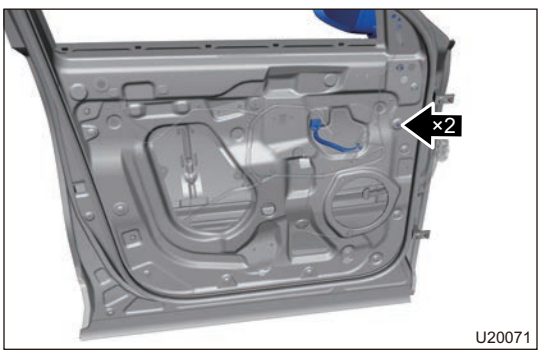
(5) Remove 3 block covers from left door sheet metal assembly.



(6) Remove 3 fixing bolts from left outside rear view mirror assembly.



(7) Disconnect the connect between 2 wire harness clips and left door sheet metal assembly.

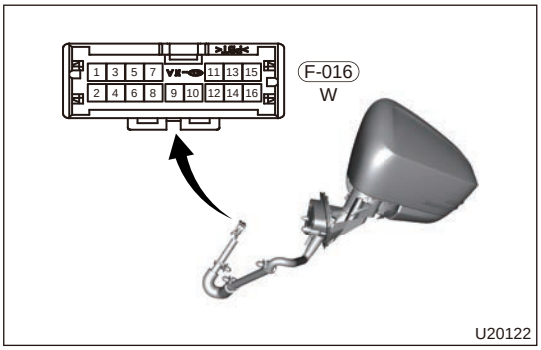


(8) Remove the left outside rear view mirror assembly.

■ Inspection

Caution
When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

(1) Apply battery voltage to terminals of outside rear view mirror assembly connector and check operation of outside rear view mirror assembly according to table below.



Multimeter Connection	Specified Condition
Battery positive (+) → Terminal 11 Battery negative (-) → Terminal 12	UP
Battery positive (+) → Terminal 12 Battery negative (-) → Terminal 11	DOWN
Battery positive (+) → Terminal 10 Battery negative (-) → Terminal 11	LEFT
Battery positive (+) → Terminal 11 Battery negative (-) → Terminal 10	RIGHT

■ **Installation**

Caution

- **Install connector in place and tighten fixing nuts to the specified torque, when installing the outside rear view mirror assembly.**
- **Make sure the outside rear view mirror assembly can move smoothly, flexibly and reliably after installing.**
- **After installing outside rear view mirror assembly, it is necessary to perform panoramic image calibration (if equipped).**

(1) Install the left outside rear view mirror assembly, and install the 2 wire harness clips to a corresponding positions on the left door sheet metal assembly.

(2) Install and tighten 3 fixing bolts to left outside rear view mirror assembly (10# spline wrench).

Torque: 7 ± 1 N·m

(3) Install 3 block covers to left door sheet metal assembly.

(4) Connect the left outside rear view mirror assembly connector.

(5) Install the front left door inner protector assembly.

4.3 Replacement of Outside Rear View Mirror Lens Assembly

■ **Removal**

Hint

- **Use same procedures for right and left sides.**
- **Procedures listed below are for left side.**

Warnings

- **Be sure to wear safety equipment to prevent accidents, when removing outside rear view mirror assembly.**
- **Avoid breaking claw, when removing outside rear view mirror lens assembly.**
- **Avoid damaging lens due to dropping when removing outside rear view mirror lens assembly.**
- **Try to prevent body paint surface from being scratched when removing outside rear view mirror lens assembly.**

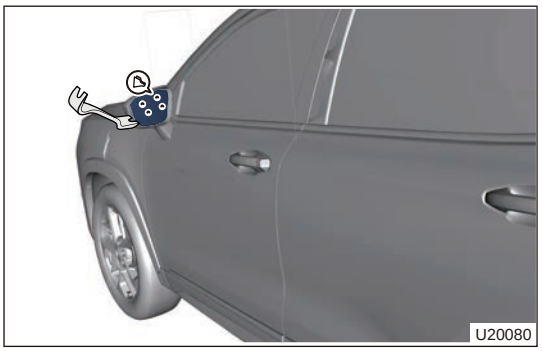
(1) Turn off all electrical equipment and ENGINE START STOP switch

(2) Disconnect the negative battery cable

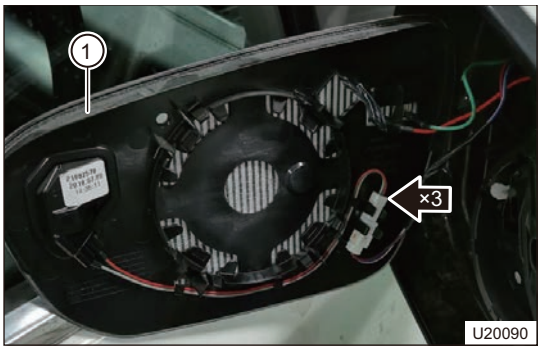
(3) Press the outside rear view mirror surface to tilt it.

(4) Apply protective tape around exterior frame of outside rear view mirror.

(5) Using an interior crow plate, pry off the claws of outside rear view mirror lens assembly.



(6) Disconnect the connector from rear view mirror lens assembly, and remove the left outside rear view mirror lens assembly (1) (if equipped with rear view mirror heater).



■ **Installation**

Caution
• **Make sure the lens can move smoothly, flexibly and reliably after installing outside rear view mirror lens assembly.**

(1) Install the rear view mirror lens assembly connector. (If equipped with rear mirror heater)

(2) Install the rear view mirror lens to rear view mirror frame.

(3) Connect the negative battery cable.

4.4 Replacement of Outside Rear View Mirror Adjustment Switch

■ **Removal**

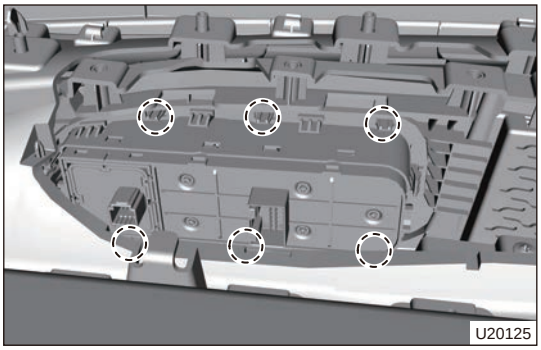
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing outside rear view mirror adjustment switch.** • **DO NOT scratch instrument panel assembly when removing outside rear view mirror adjustment switch.**

(1) Turn off all electrical equipment and ENGINE START STOP switch

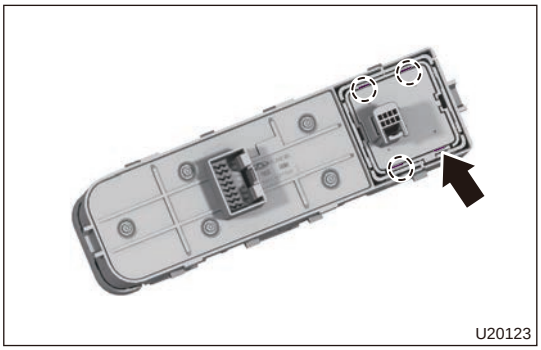
(2) Disconnect the negative battery cable

(3) Remove the front left door protector assembly.

(4) Using an interior crow plate, pry off claws from power glass regulator switch and remove the power glass regulator switch.



(5) Using an interior crow plate, pry off claws from outside rear view mirror adjustment switch and remove the outside rear view mirror adjustment switch.



■ **Installation**

Caution
• **Operate carefully to prevent damage to other components when installing outside rear view mirror adjustment switch.** • **Install connectors in place, when installing outside rear view mirror adjustment switch.** • **Check that switch can operate normally after installing outside rear view mirror adjustment switch.**

(1) Install outside rear view mirror adjustment switch to power glass regulator switch.

(2) Install power glass regulator switch to front left door protector assembly.

(3) Install the front left door protector assembly.

4.5 Replacement of Inside Rear View Mirror Assembly

■ **Removal**

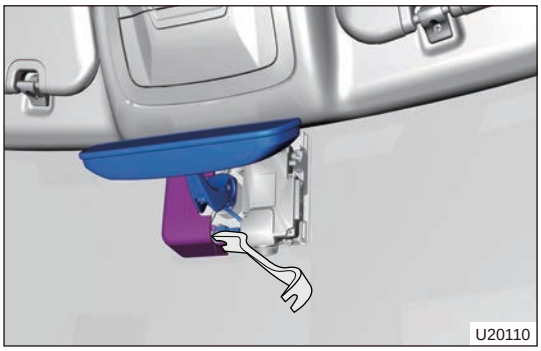
Warnings
• **Appropriate force should be applied when removing inside rear view mirror assembly. Be careful not to operate roughly.** • **Try to prevent front windshield assembly from being scratched when removing inside rear view mirror assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch

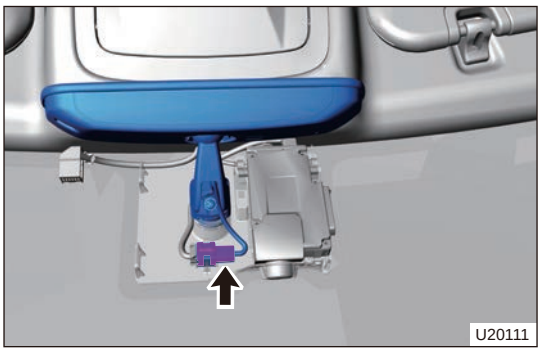
(2) Disconnect the negative battery cable

(3) Using an interior crow plate, pry off and remove the inside rear view mirror right protective cover.

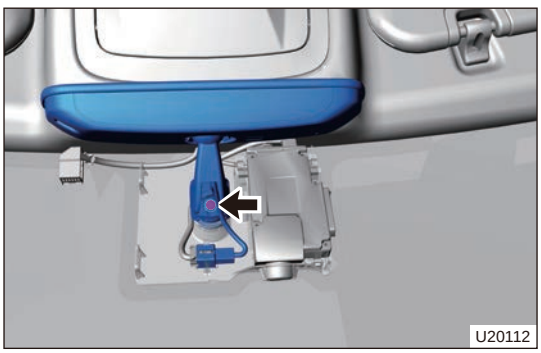
(4) Using an interior crow plate, pry off the inside rear view mirror left protective cover.



(5) Disconnect the inside rear view mirror wire harness connector.



(6) Remove screws from inside rear view mirror base and remove inside rear view mirror assembly.



■ Installation

Caution
• **Before installation, check if there is any obvious appearance defects (such as scratches, material missing, damage, etc.) and select the qualified parts.** • **The inside rear view mirror should be within the normal range required by view and the lens assembly should be matched with lens base assembly firmly without any looseness.**

(1) Slide the inside rear view mirror base into the base slot on the front windshield from top to bottom, and install and tighten the screw on the base.
(2) Connect the inside rear view mirror wire harness connector.
(3) Install the inside rear view mirror left protective cover to proper position.
(4) Install the inside rear view mirror right protective cover.

11.10 WINDOW/SLIDING ROOF

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) To protect window regulating system, window jam protection function will be canceled in some cases, and auto window UP function will also be canceled, to avoid possible potential risk, at this time window only has general regulating function, window regulating function of corresponding door will resume after jam protection learning.

(2) When removing/installing sliding roof fixing bracket, an assistant is needed to hold it. During operation, prevent the sliding roof fixing bracket from dropping, which may cause an accident.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to wear safety equipment to prevent accidents, when removing glass regulator switch.

(2) Prevent window glass from dropping which will cause damage, when removing front and rear door glass assembly.

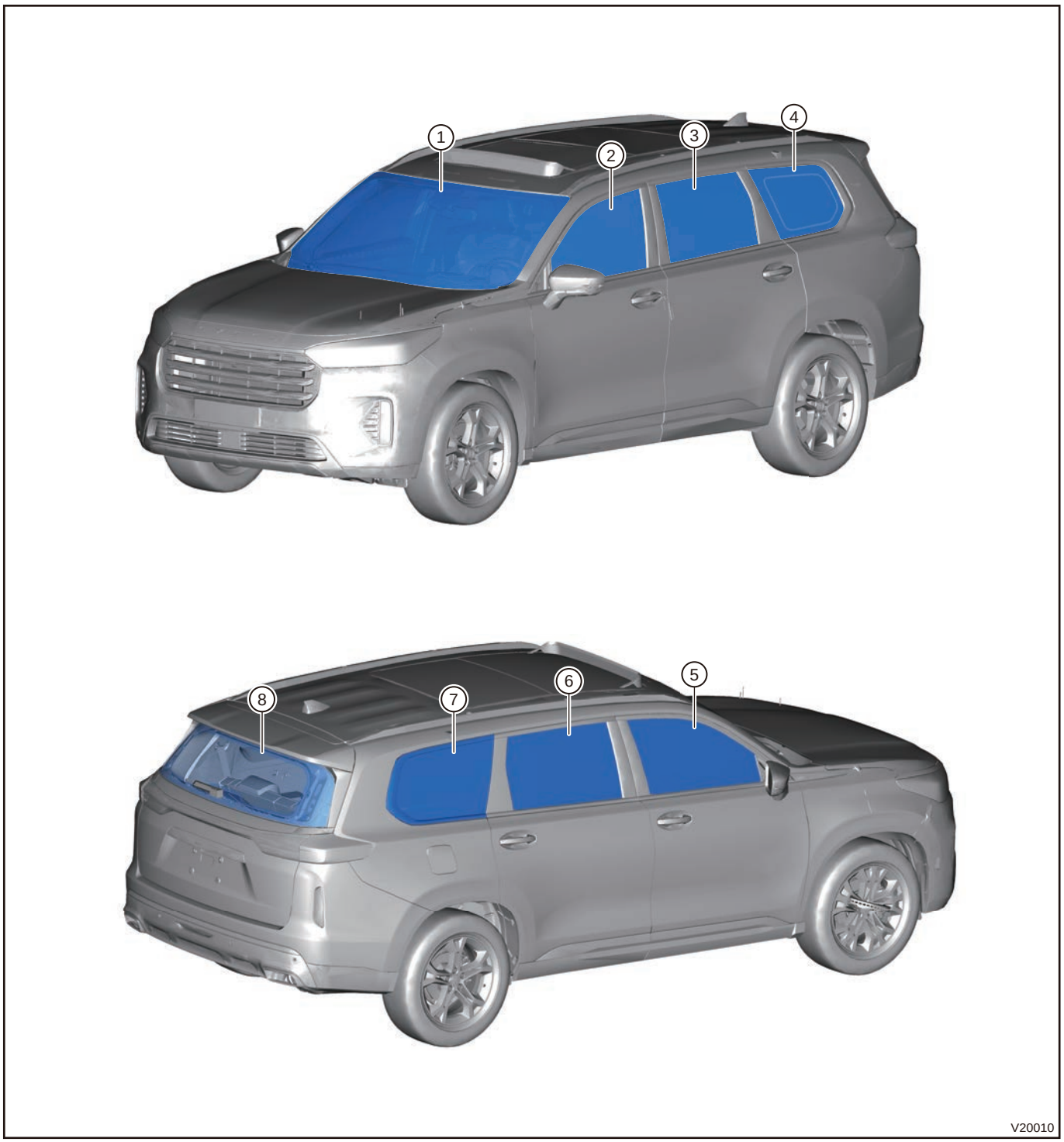
(3) When removing front windshield assembly, two persons are required and prevent it from dropping.

(4) When removing rear windshield assembly, two persons are required and prevent it from dropping.

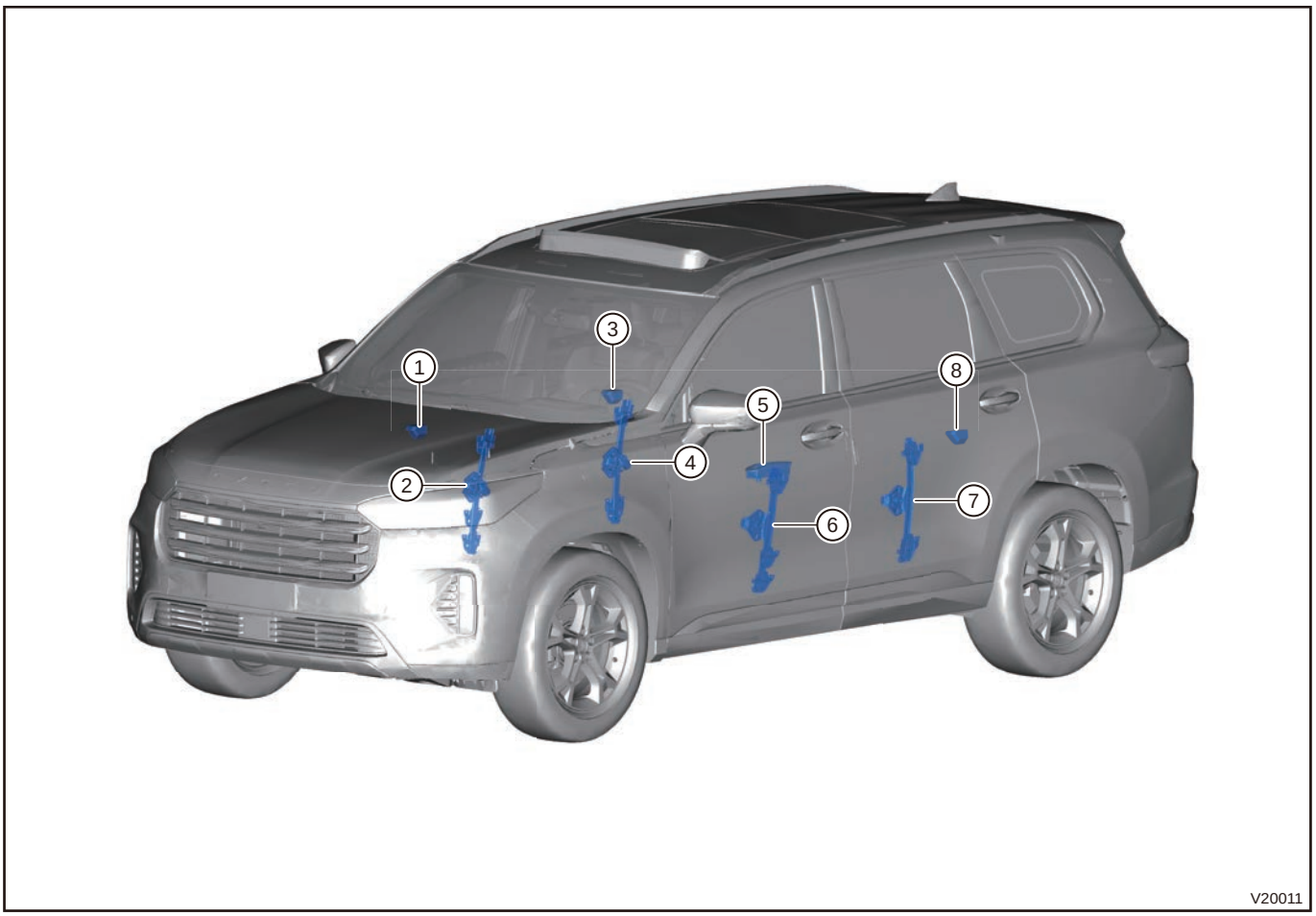
(5) Appropriate force should be applied, when removing sliding roof front and rear glass. Be careful not to operate roughly, to avoid damage to sliding roof glass.

2 System Overview

2.1 System Components Diagram

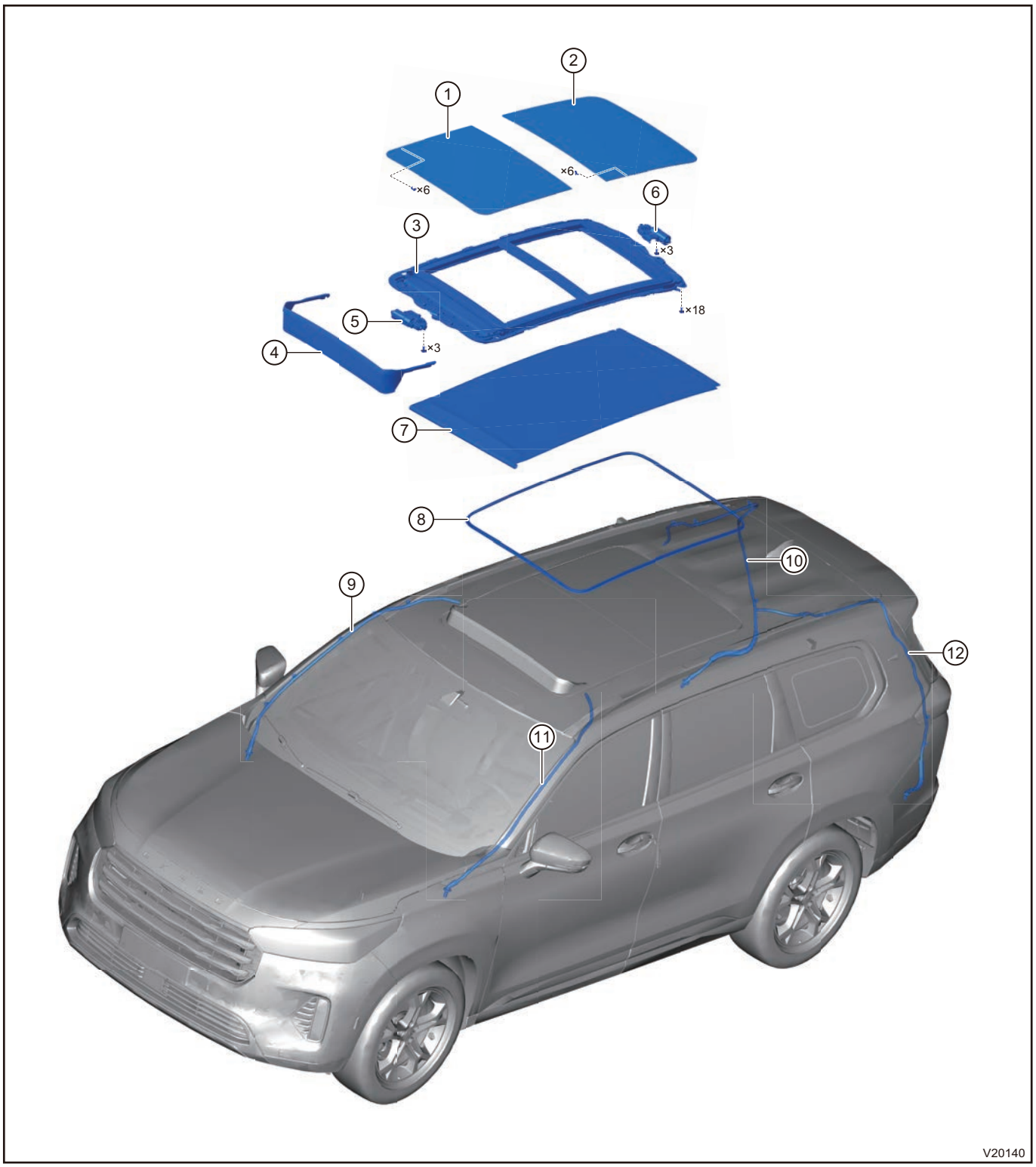


1	Front Windshield Assembly	2	Front Left Door Glass Assembly
3	Rear Left Door Glass Assembly	4	Left Triangular Window Glass Assembly
5	Front Right Door Glass Assembly	6	Rear Right Door Glass Assembly
7	Right Triangular Window Glass Assembly	8	Rear Windshield Assembly



1	Front Right Door Glass Regulator Switch Assembly	2	Front Right Door Glass Regulator
3	Rear Right Door Glass Regulator Switch Assembly	4	Rear Right Door Glass Regulator
5	Front Left Door Glass Regulator Switch Assembly	6	Front Left Door Glass Regulator
7	Rear Left Door Glass Regulator	8	Rear Left Door Glass Regulator Switch Assembly

Power window control system controls each window glass UP/DOWN function by operating the glass regulator control switches on door inner protector assembly. Main control devices of this system include: Front left door glass regulator switch (built into driver side door) and glass regulator switches (built into front and rear passenger side doors). Press the front left door glass regulator switch or any switch on glass regulator switch, to transmit the UP/DOWN signal to corresponding power glass regulator motor, thus controlling UP/DOWN operation of corresponding power window glass.

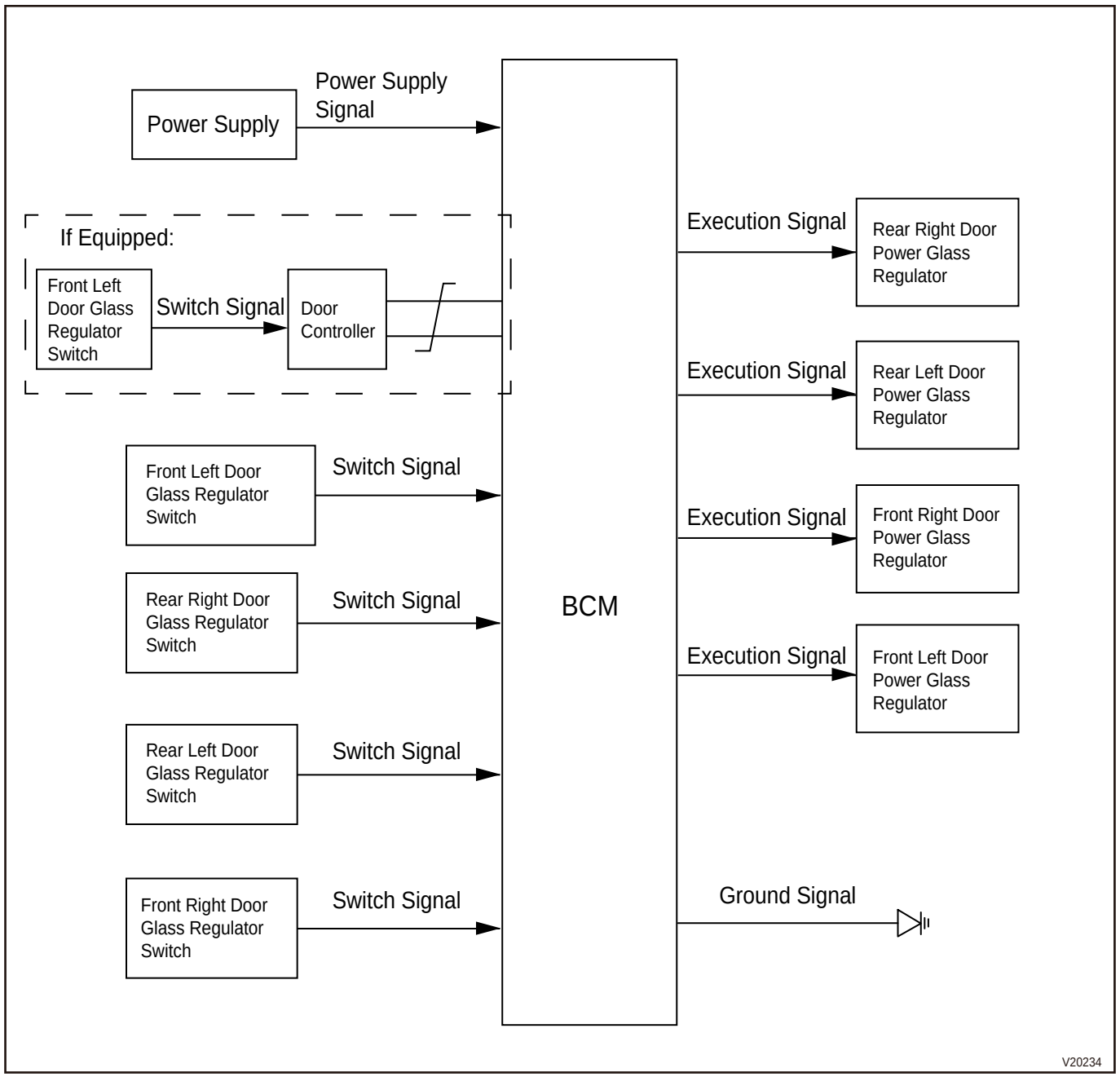


1	Sliding Roof Front Glass Assembly	2	Sliding Roof Rear Glass Assembly
3	Sliding Roof Frame	4	Sliding Roof Wind Screen
5	Sliding Roof Glass Motor	6	Sliding Roof Sun Visor Motor
7	Sliding Roof Sun Visor Assembly	8	Sliding Roof Weatherstrip

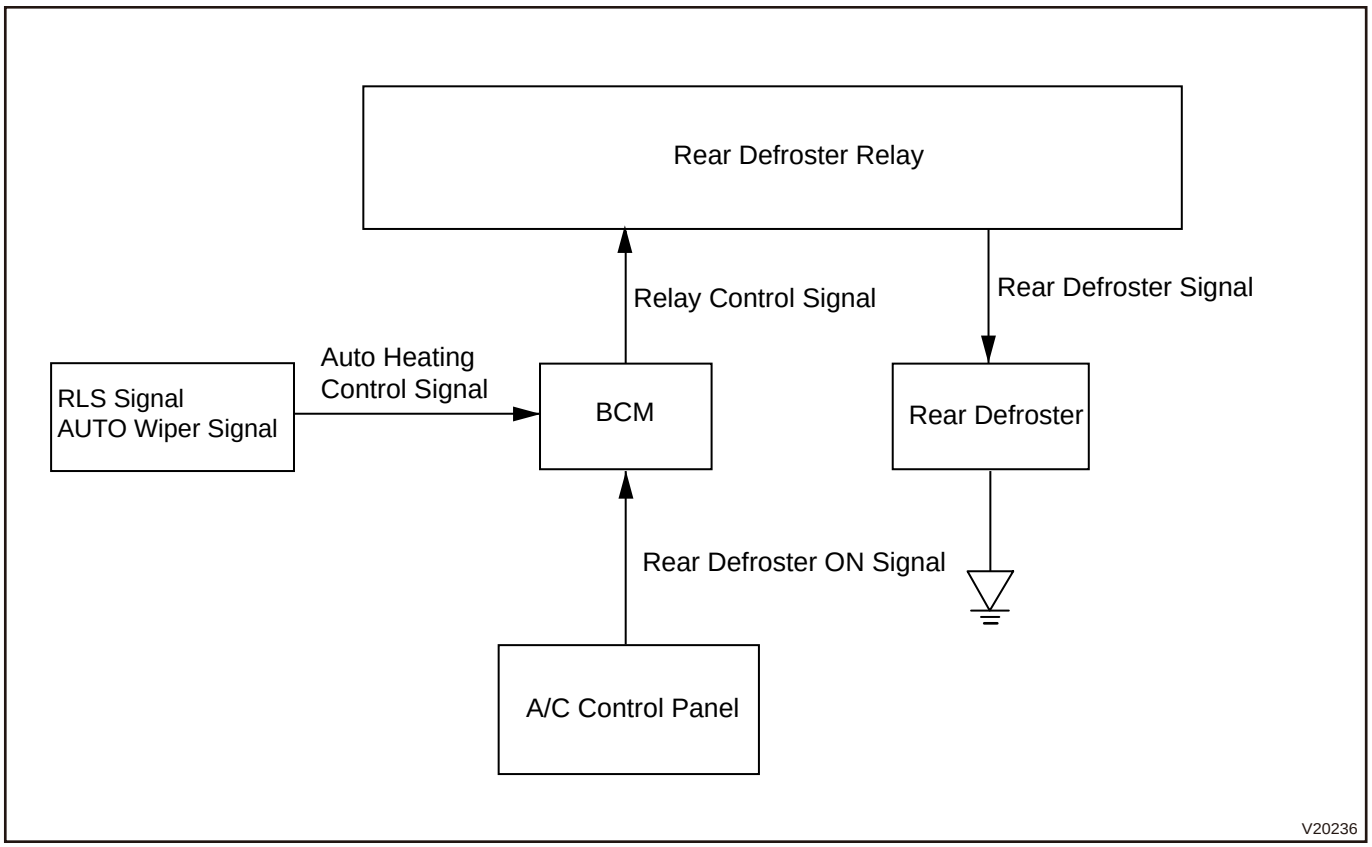
9	Front Right Sliding Roof Drain Hose Assembly	10	Rear Right Sliding Roof Drain Hose Assembly
11	Front Left Sliding Roof Drain Hose Assembly	12	Rear Left Sliding Roof Drain Hose Assembly

On this model, panoramic sliding roof consists of sliding roof switch, sliding roof glass, electronic sun visor, glass motor, sun visor motor, control module, wire harness and sliding roof drain hose.

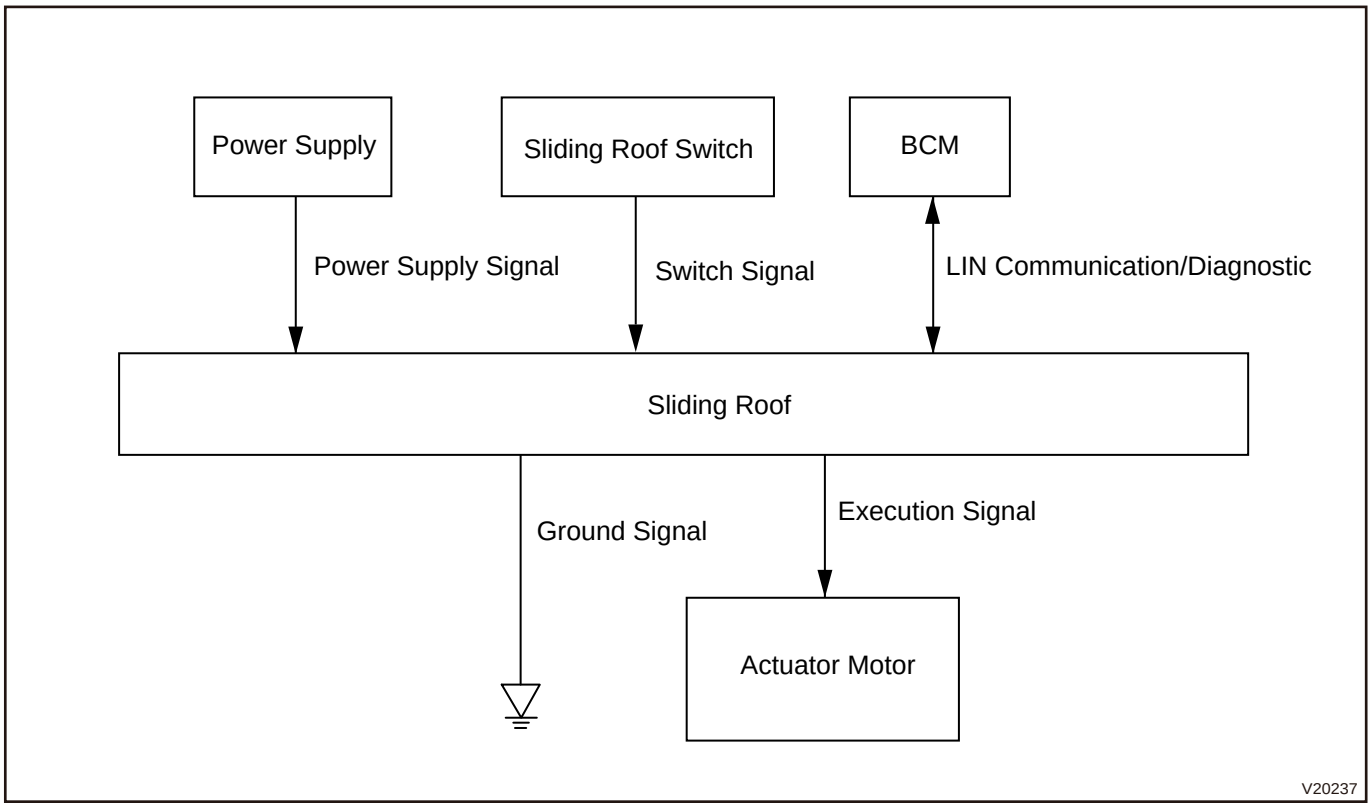
2.2 System Schematic Diagram



Battery provides 12 V power supply to BCM, four door glass regulator switches send UP/DOWN signals to BCM. BCM controls operation of power glass regulator. So that glass can perform UP/DOWN operation.



A/C control panel sends rear defroster request signal to BCM, BCM controls to turn on the rear defrost relay, and rear defroster performs defrost operation. After that, BCM sends rear defroster feedback signal to A/C control panel, and A/C control panel operation indicator illuminates.



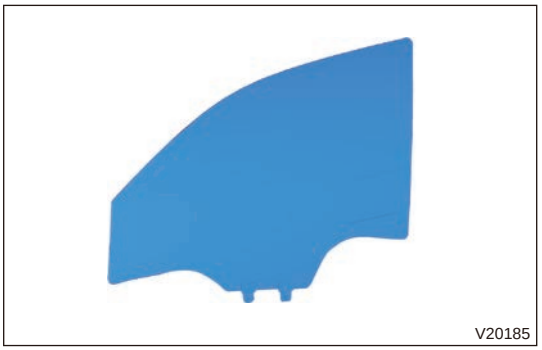
Battery provides 12 V power supply to sliding roof module. When sliding roof module receives switch information, sliding roof module drive motor starts to perform open and close.

3 Component Operation Description

3.1 Glass Assembly

■ Main function

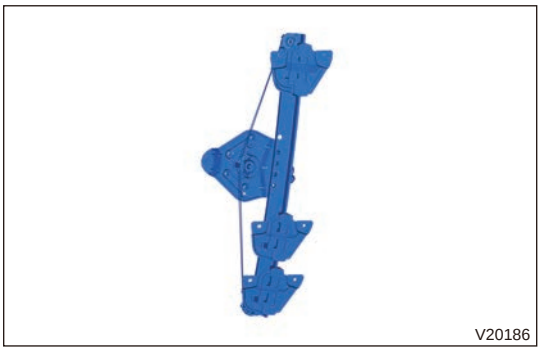
Vehicle glass is indispensable in vehicle body accessories, which is mainly used to provide protective function. There are four types of vehicle glasses classified by location: Front windshield glass, side window glass, rear windshield glass and sliding roof glass.



3.2 Glass Regulator

■ Main function

Vehicle glass regulator is a door accessory used to perform up and down movements of door glass in the door system. It is a special component to adjust door glass opening amount, which has a function to ensure stable operation as well as normal opening and closing operation of door glass.



3.3 Operation

■ Main component function

Components	Description
Power window lock switch	Located on front left door inner protector assembly. It controls the operation of front and rear passenger side glass regulator switches. When power window lock switch is in lock position, only driver side glass regulator switch can control UP/DOWN operation of power window glass.
Power glass regulator switch	Located on door inner protector assembly. Each power glass regulator switch controls UP/DOWN operation of corresponding power window glass.
Power glass regulator	It can change position of power window glass.

■ System function

Function	Description
Manual UP function	Power window glass goes up when glass regulator control switch is pulled up and held while it stops as the switch is released.
Manual DOWN function	Power window glass goes down when glass regulator control switch is pushed down and held while it stops as the switch is released.

Function	Description
Automatic DOWN	Power window glass goes down automatically when glass regulator control switch is pressed shortly. To stop it partway, push or pull the switch again.
Power window LOCK function	Operation of corresponding power window glass is impossible with all passenger side power glass regulator switches when power window lock switch is pressed. At this time, only operation of driver side power window glass is possible. This function can be canceled only when power window lock switch is pressed again.

4 Diagnosis & Test

4.1 Problem Symptoms Table

⚠ Caution
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Driver side/passenger side power window glass cannot be operated with driver side glass regulator switch	Power supply, fuse
	Driver side glass regulator switch
	Driver side/passenger side power glass regulator
	Wire harness or connector
	Body Control Module (BCM)
Passenger side power window glass cannot be operated with passenger side glass regulator control switch	Power supply, fuse
	Passenger side power glass regulator switch
	Passenger side power glass regulator
	Wire harness or connector
	Body Control Module (BCM)
Power window glass has intermittent problem	Ground
	Wire harness or connector
Sliding roof water leakage	Sliding roof weatherstrip damaged
	Drain hose clogged or folded
	Distance between sliding roof glass and roof hole is extremely large or height of glass is poor
Wind noise from sliding roof	Poor fixation of sliding roof glass and roof
Abnormal starting and operation	Poor connection in wire harness, fuse or ground wire
	Poor sliding roof control unit, sliding roof motor
	Sun visor control unit, sun visor fault

Symptom	Suspected Area
	Improper installation position between sun visor mounting
	Sun visor comes off from guide rail
	Foreign matters in guide rail
Incorrect starting	Sun visor switch fault
	Poor sliding roof motor
	Sun visor comes off from guide rail, guide rail is scratched with trim strip after it is damaged
	Sun visor module fault
	Sun visor motor fault
Operating noise of sun visor	Operation is resisted when sun visor comes off from guide rail or trim strip is damaged
	Lack of grease in guide rail of sun visor
	Impact between drain hose and vehicle body
	Distance between sliding roof glass and roof hole is extremely large or height of glass is poor
	Sun visor mounting bracket deformed or position incorrect

4.2 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Replace battery**

OK

3	**Customer problem analysis**

Next

4	**Read DTCs**

Result

Result	Go to
DTC occurs	A
No DTC	B

B → **Perform repair according to problem symptoms table**

A

5	**Read DTCs (current DTC and history DTC)**

Result

Result	Go to
DTC occurs	A
No DTC	B

B → **Troubleshoot according to Intermittent DTC malfunction procedures**

A

6	**Repair according to Diagnostic Trouble Code (DTC) Chart**

Next

7	**Adjust, repair or replace**

Next

8	**Conduct test and confirm malfunction has been repaired**

Next → **End**

4.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

(1) Turn ENGINE START STOP switch to OFF.
(2) Connect the diagnostic tester (the latest software).
(3) Turn ENGINE START STOP switch to ON.
(4) Use the diagnostic tester to record and clear DTCs stored in the system.
(5) Turn ENGINE START STOP switch to OFF and wait several seconds.
(6) Turn ENGINE START STOP switch to ON and check DTCs in the system again.
(7) If DTC is detected, it indicates current malfunction.

(8) If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- When circuit signal is interrupt during detection, wiggle related wire harnesses and connectors.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B100C13	Front Left Window Circuit Open
B100C71	Front Left Window Relay Stuck
B100D13	Front Right Window Circuit Open
B100D71	Front Right Window Relay Stuck
B100E13	Rear Left Window Circuit Open
B100E71	Rear Left Window Relay Stuck
B100F13	Rear Right Window Circuit Open
B100E71	Rear Left Window Relay Stuck
B100F13	Rear Right Window Circuit Open
B100F71	Rear Right Window Relay Stuck
B103A87	APM Controller Internal Fault
B103287	Lost Communication With APM MCU

4.7 DTC Diagnosis Procedure

DTC	**B100C13**	**Front Left Window Circuit Open**
DTC	**B100C71**	**Front Left Window Relay Stuck**

■ Description

DTC	DTC Definition	Possible Cause
B100C13	Front Left Window Circuit Open	• Ground • Line connector • Glass regulator switch • Glass regulator motor • BCM module
B100C71	Front Left Window Relay Stuck	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check ground point**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
(b) Check the BCM ground point.

NG → **Repair or replace ground wire harness or ground point.**

OK

2	**Use diagnostic tester to perform active test for window system**

OK → **Go to step 5: Check control circuit of front left door glass.**

NG

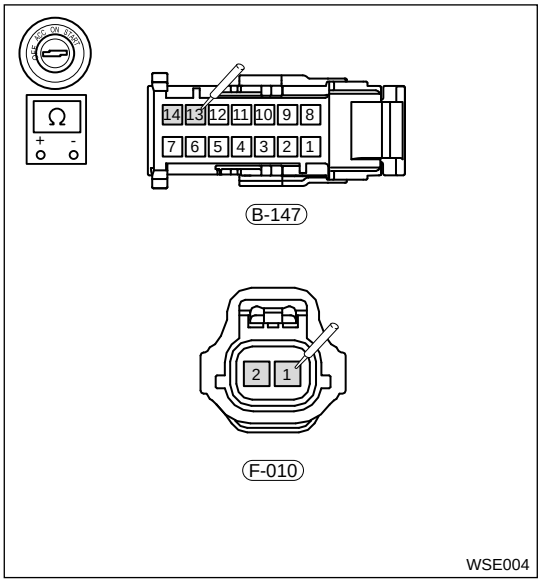
3	**Check execution circuit of front left window system**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.

(b) Disconnect front left door glass regulator motor wire harness connector F-010 and BCM connector B-147.

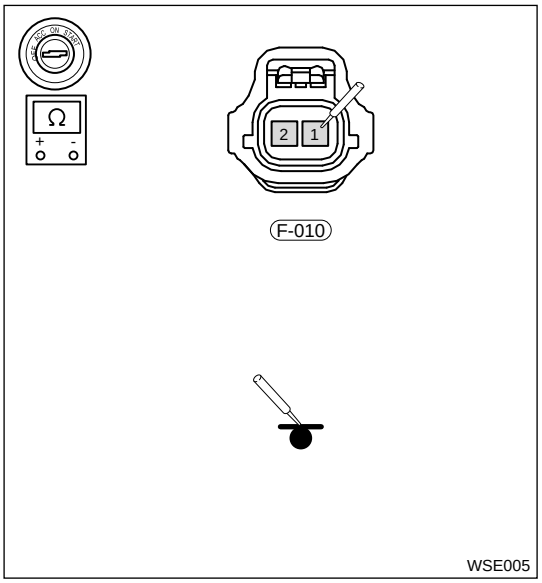
(c) Using ohm band of multimeter, check for continuity between F-010 (1) - B-147 (13) and F- 010 (2) - B-147 (14) separately.

Digital Multimeter	Condition	Specified Condition
F-010 (1) - B-147 (13)	Always	⩽ 1 Ω
F-010 (2) - B-147 (14)		⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between F-010 (1) and ground, F-010 (2) and ground separately to check if it is short to ground.

Digital Multimeter	Condition	Specified Condition
F-010(1) - Ground	Always	∞
F-010 (2) - Ground		∞



(e) Using ohm band of multimeter, check for continuity between F-010 (1) and power supply (+), F-010 (2) and power supply (+) separately to check if it is short to power supply.

Digital Multimeter	Condition	Specified Condition
F-010 (1) - Power Supply (+)	Always	∞
F-010 (2) - Power supply (+)		∞

NG → **Replace wire harness and connector.**

OK

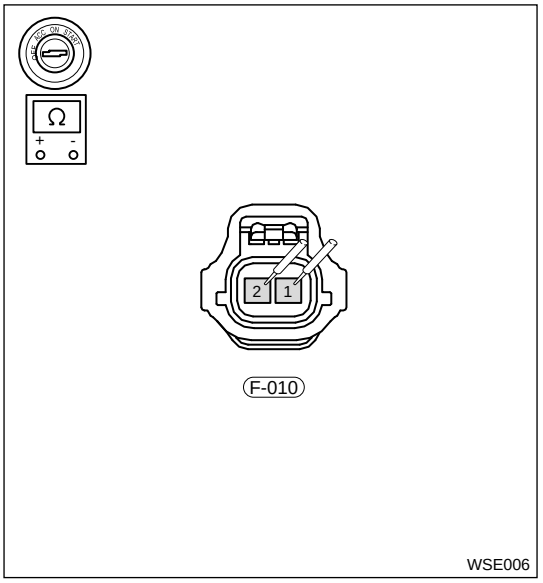
4	**Check front left window regulator motor**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the front left window regulator motor connector F-010.

(c) Using ohm band of multimeter, check resistance between F-010 (1) and F-010 (2).

Digital Multimeter	Condition	Specified Condition
F-010 (1) - F-010 (2)	Always	⩽ 1 Ω



(d) Apply 12 V voltage to both terminals (1) and (2) of front left window regulator motor connector F-010, and observe if regulator motor operates.

NG	**Replace front left window regulator motor.**
OK	**Replace BCM.**

5	**Check front left door glass control circuit**

(a) Turn ENGINE START STOP switch to ON.

(b) Check if fuse MF03 (125A) of engine compartment main fuse and relay box is blown.

(c) Check if fuses RF52 (30A), RF51 (30A), RF54 (20A) of instrument panel fuse and relay box are blown.

(d) Using voltage band of multimeter, measure if the voltage of terminal C5-1, C5-2, C3-6 of front compartment fuse and relay box is 12 V.

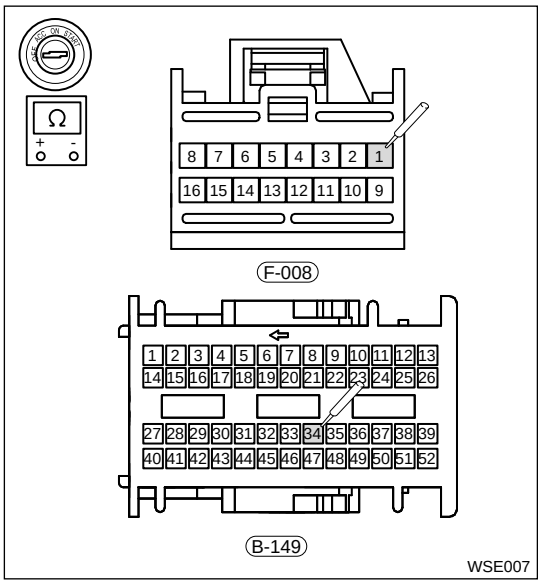
(e) Using voltage band of multimeter, measure if the voltage of terminal BCM B-147 (07), B-147 (10), B-146 (20) is 12 V.

(f) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(g) Disconnect front left door glass regulator switch F-008 and BCM connector B-149.

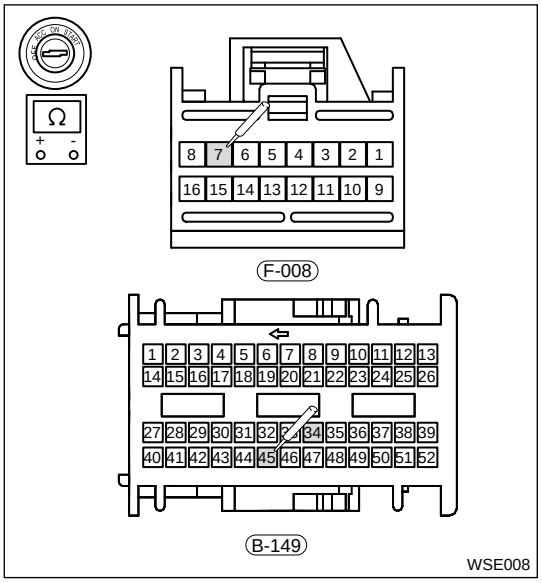
(h) Using ohm band of multimeter, check for continuity between F-008 (1) and B-149 (34).

Digital Multimeter	Condition	Specified Condition
F-008 (1) - B-149 (34)	Always	⩽ 1 Ω



(i) Using ohm band of multimeter, check for continuity between F-008 (7) and B-149 (45).

Digital Multimeter	Condition	Specified Condition
F-008 (7) - B-149 (45)	Always	⩽ 1 Ω



NG → **Replace wire harness and connector.**

OK

6	Check the front left door power glass regulator switch

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Remove the front left door power regulator switch F-008.

(c) Using ohm band of multimeter, measure resistance between front left power window regulator switch F-008 (1) and F-008 (7).

Digital Multimeter	Condition	Specified Condition
F-008 (1) - F-008 (7)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

(d) Check glass regulator switch for stuck and damage.

NG → **Replace front left door glass regulator switch.**

OK

7	Reconfirm DTCs

(a) Connect all the connectors.

(b) Connect the negative battery cable.

(c) Turn ENGINE START STOP switch to “ON”.

(d) Use diagnostic tester (the latest software) to read the DTCs stored in body control system again.

NG	**Replace Body Control Module (BCM).**
OK	**System operates normally.**

DTC	**B100D13**	**Front Right Window Circuit Open**
DTC	**B100D71**	**Front Right Window Relay Stuck**

■ **Description**

DTC	DTC Definition	Possible Cause
B100D13	Front Right Window Circuit Open	• Ground • Line connector • Glass regulator switch • Glass regulator motor • BCM module
B100D71	Front Right Window Relay Stuck	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check ground point**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
(b) Check the BCM ground point.

NG	**Repair or replace ground wire harness or ground point.**

OK

2	**Use diagnostic tester to perform active test for window system**

OK	**Go to step 5: Check control circuit of front left door glass.**

NG

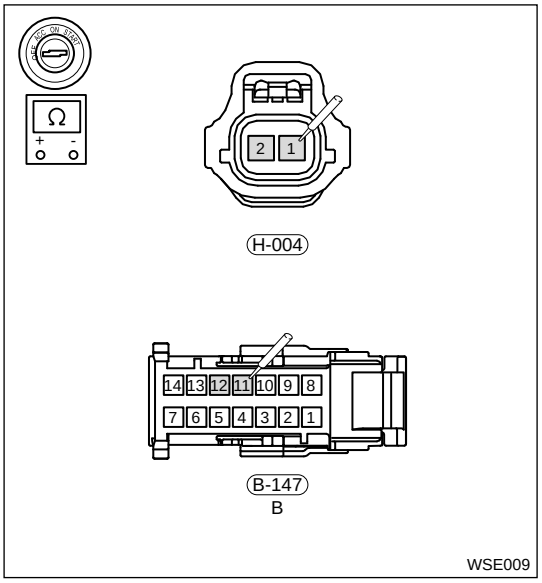
3	**Check execution circuit of front left window system**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.

(b) Disconnect front right door glass regulator motor connector H-004 and BCM connector B-147.

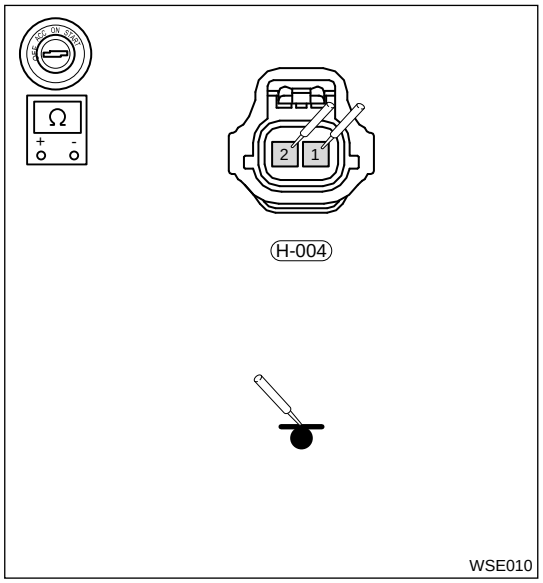
(c) Using ohm band of multimeter, check for continuity between H-004 (1) and B-147 (11), H-004 (2) and B-147 (12) separately.

Multimeter Connection	Condition	Specified Condition
H-004 (1) - B- 147 (11)	Always	⩽ 1 Ω
H-004 (2) - B- 147 (12)		⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between H-004 (1) and ground, H -004 (2) and ground separately to check if it is short to ground.

Multimeter Connection	Condition	Specified Condition
H-004 (1) - Ground	Always	∞
H-004 (2) - Ground		∞



(e) Using ohm band of multimeter, check for continuity between H-004 (1) and power supply (+), H-004 (2) and power supply (+) separately to check for short circuit to power supply.

Multimeter Connection	Condition	Specified Condition
H-004 (1) - Power Supply (+)	Always	∞
H-004 (2) - Power Supply (+)		∞

NG	**Replace wire harness and connector.**

OK

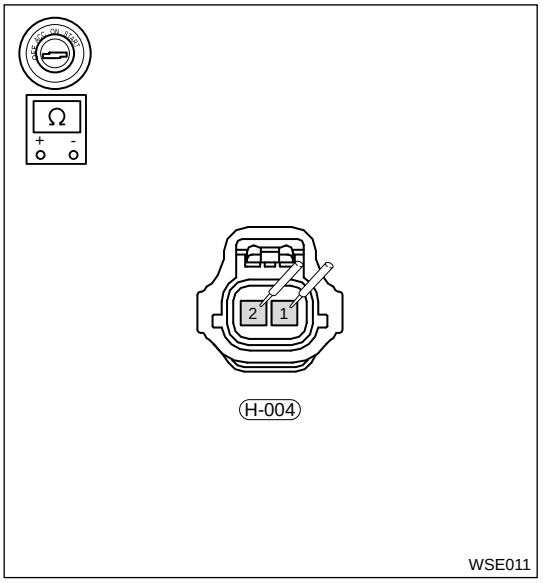
4	**Check front right window regulator motor**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the front right window regulator motor connector H-004.

(c) Using ohm band of multimeter, check resistance between H-004 (1) and H-004 (2).

Multimeter Connection	Condition	Specified Condition
H-004 (1) - H- 004 (2)	Always	⩽ 1 Ω



(d) Apply 12 V voltage to terminals (1) and (2) of front right window regulator motor connector H-004, and observe if the regulator motor moves.

NG	**Replace the front right window regulator motor.**
OK	**Replace BCM.**

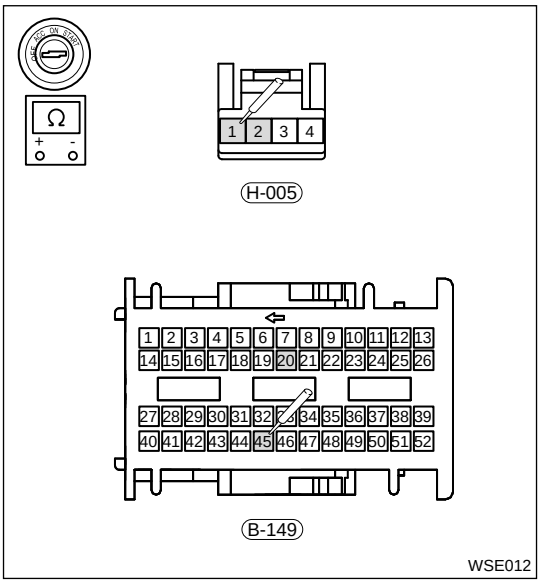
5	**Check control circuit of front right glass regulator**

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the front right door regulator switch H-005 and BCM connector B-149.

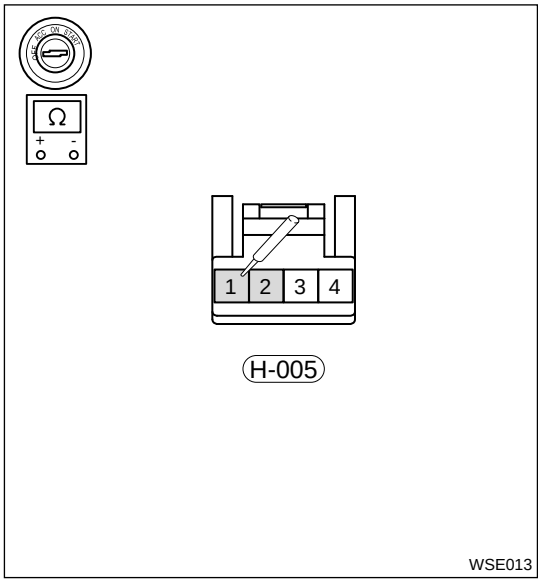
(c) Using ohm band of multimeter, check for continuity between H-005 (1) and B-149 (45), H- 005 (2) and B-149 (20) separately.

Multimeter Connection	Condition	Specified Condition
H-005 (1) - B- 149 (45)	Always	⩽ 1 Ω
H-005 (2) - B- 149 (20)	Always	⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between H-005 (1) and ground, H-005 (2) and ground.

Multimeter Connection	Condition	Specified Condition
H-005 (1) - Ground	Always	∞
H-005 (2) - Ground	Always	∞



(e) Using ohm band of multimeter, check for continuity between H-005 (1) and battery (+), H-005 (2) and battery (+).

Multimeter Connection	Condition	Specified Condition
H-005 (1) - Power Supply (+)	Always	∞
H-005 (2) - Power Supply (+)	Always	∞

NG → **Replace wire harness and connector.**

OK

6	Check front left glass regulator switch assembly (which controls front right regulator)

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Remove the front left door power regulator switch F-008.

(c) Use ohm band of multimeter to measure resistance of front left power window regulator switch F-008 (2) - F-008 (7).

Multimeter Connection	Condition	Specified Condition
F-008 (2) - F-008 (7)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

(d) Check glass regulator switch for stuck and damage.

NG → **Replace front left door glass regulator switch.**

OK

7	Check front right door power glass regulator switch

(a) Turn ENGINE START STOP switch to “ON”, disconnect the negative battery cable.
(b) Check glass regulator switch for stuck and damage.
(c) Remove the front right door power glass regulator switch H-005.
(d) Use ohm band of multimeter to measure resistance between H-005 (1) and H-005 (2).

Multimeter Connection	Condition	Specified Condition
H-005 (1) - H- 005 (2)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

NG → **Replace front right door glass regulator switch.**

OK

8	Reconfirm DTCs

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Turn ENGINE START STOP switch to “ON”.
(d) Use diagnostic tester (the latest software) to read the DTCs stored in body control system again.

NG → **Replace Body Control Module (BCM).**

OK → **System operates normally.**

DTC	B100E13	Rear Left Window Circuit Open
DTC	B100E71	Rear Left Window Relay Stuck

■ **Description**

DTC	DTC Definition	Possible Cause
B100E13	Rear Left Window Circuit Open	• Ground • Line connector • Glass regulator switch • Glass regulator motor • BCM module
B100E71	Rear Left Window Relay Stuck	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.

- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check ground point**

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
(b) Check the BCM ground point.

NG → **Repair or replace ground wire harness or ground point.**

OK

2	**Use diagnostic tester to perform active test for window system**

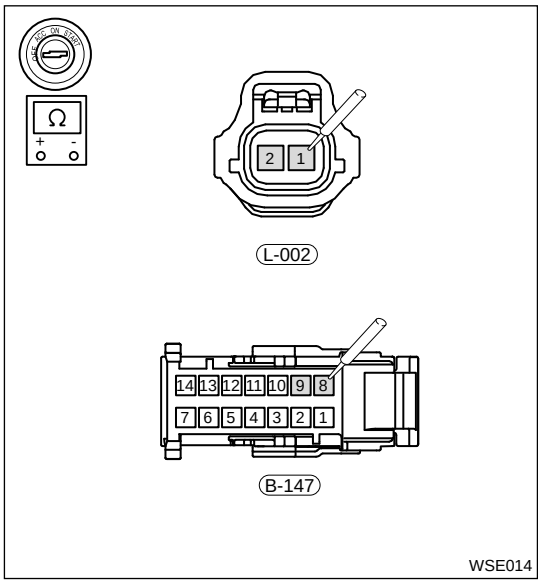
OK → **Go to step 5: Check rear left door glass control circuit.**

NG

3	**Check execution circuit of rear left window system**

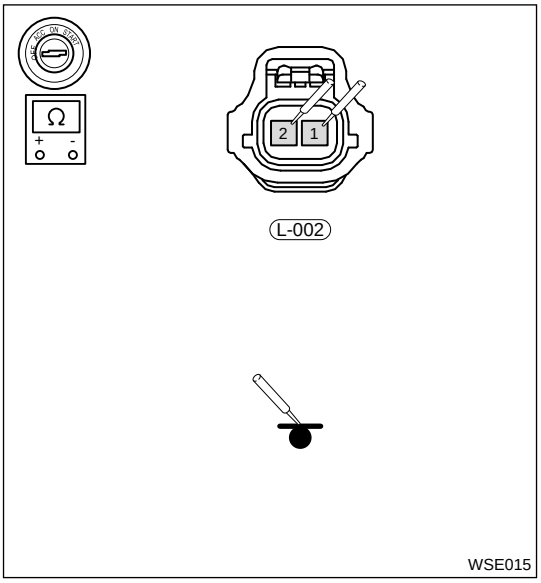
(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
(b) Disconnect rear left door glass regulator motor connector L-002 and BCM connector B-147.
(c) Using ohm band of multimeter, check for continuity between L-002 (1) and B-147 (8), L- 002 (2) and B-147 (9) separately.

Multimeter Connection	Condition	Specified Condition
L-002 (1) - B-147 (8)	Always	⩽ 1 Ω
L- 002 (2) - B- 147 (9)		⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between L -002 (1) and ground, L -002 (2) and ground separately to check if it is short to ground.

Multimeter Connection	Condition	Specified Condition
L-002 (1) - Ground	Always	∞
L-002 (2) - Ground		∞



(e) Using ohm band of multimeter, check for continuity between L-002 (1) - battery (+), L-002 (2) - battery (+) separately to check for short circuit to power supply.

Multimeter Connection	Condition	Specified Condition
L-002 (1) - battery (+)	Always	∞
L-002 (2) - battery (+)		∞

NG → **Replace wire harness and connector.**

OK →

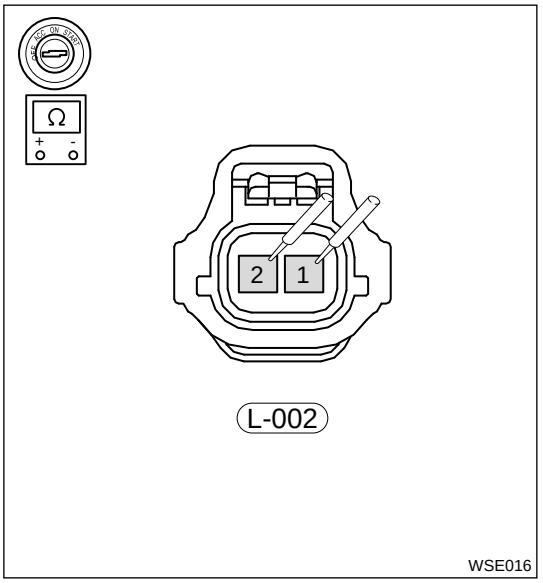
4	Check rear left window regulator motor

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the rear left window regulator motor connector L-002.

(c) Using ohm band of multimeter, check resistance between L-002 (1) and L-002 (2).

Multimeter Connection	Condition	Specified Condition
L-002 (1) - L-002 (2)	Always	⩽ 1 Ω



(d) Apply 12 V voltage to both terminals of rear left window regulator motor connector L-002, observe if the regulator motor is moving.

NG	**Replace rear left window regulator assembly.**
OK	**Replace BCM.**

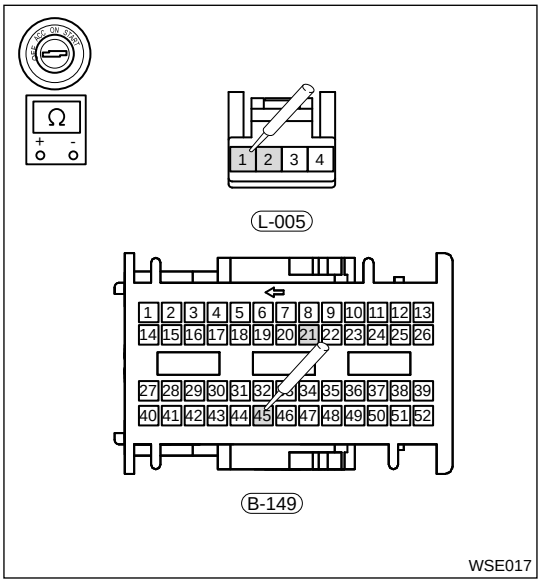
5	**Check control circuit of rear left glass regulator**

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect rear left door glass regulator switch L-005 and BCM connector B-149.

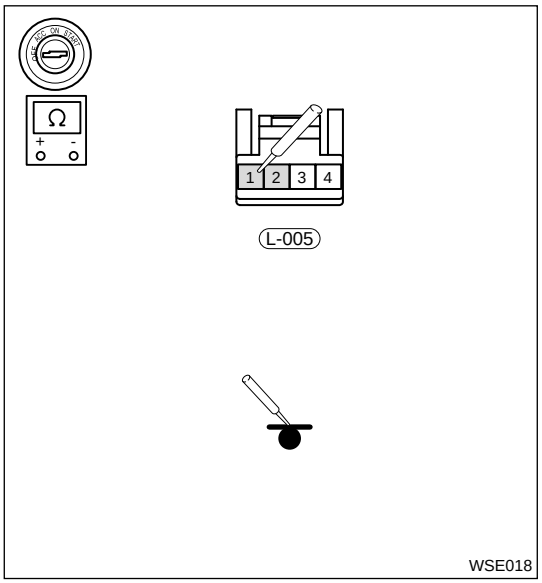
(c) Using ohm band of multimeter, check for continuity between L-005 (2) and B-149 (21), and L-005 (1) and B-149 (45).

Multimeter Connection	Condition	Specified Condition
L-005 (2) - B-149 (21)	Always	⩽ 1 Ω
L-005 (1) - B-149 (45)		⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between L-005 (1) - ground and L-005 (2) - ground to check for short circuit to ground.

Multimeter Connection	Condition	Specified Condition
L-005 (1) - Ground	Always	∞
L-005 (2) - Ground	Always	∞



(e) Using ohm band of multimeter, check for continuity between L-005 (1) - battery (+) and L-005 (2) - battery (+) to check for short circuit to ground.

Multimeter Connection	Condition	Specified Condition
L-005 (1) - battery (+)	Always	∞
L-005 (2) - battery (+)	Always	∞

NG → **Replace wire harness and connector.**

OK

6	Check front left door glass regulator switch assembly (which controls rear left glass regulator)

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Remove the front left door power glass regulator switch F-008.

(c) Using ohm band of multimeter, measure resistance between F-008 (3) and F-008 (7).

Multimeter Connection	Condition	Specified Condition
F-008 (3) - F-008 (7)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

(d) Check glass regulator switch for stuck, damage.

NG → **Replace front left door glass regulator switch assembly.**

OK

7	Check rear left door power glass regulator switch

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Check glass regulator switch for stuck and damage.

(c) Remove the rear left door power glass regulator switch L-005.

(d) Using ohm band of multimeter, measure resistance between L-005 (1) and L-005 (2).

Multimeter Connection	Condition	Specified Condition
L-005 (1) - L-005 (2)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω

Multimeter Connection	Condition	Specified Condition
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

NG → **Replace rear left door glass regulator switch.**

OK →

8	Reconfirm DTCs

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Turn ENGINE START STOP switch to “ON”.
(d) Use diagnostic tester (the latest software) to read the DTCs stored in body control system again.

NG → **Replace Body Control Module (BCM).**

OK → **System operates normally.**

DTC	B100F13	Rear Right Window Circuit Open
DTC	B100F71	Rear Right Window Relay Stuck

■ **Description**

DTC	DTC Definition	Possible Cause
B100F13	Rear Right Window Circuit Open	• Ground • Line connector • Glass regulator switch • Glass regulator motor • BCM module
B100F71	Rear Right Window Relay Stuck	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check ground point

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
(b) Check the BCM ground point.

NG → **Repair or replace ground wire harness or ground point.**

OK

2	Use diagnostic tester to perform active test for window system

OK → Go to step 5: Check rear right door glass control circuit.

NG

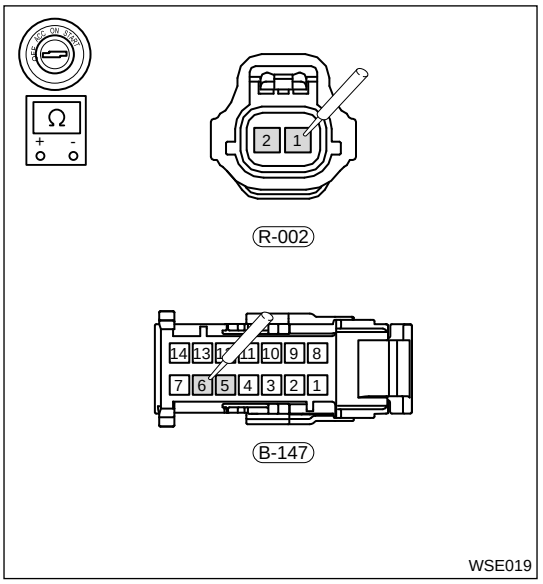
3	Check execution circuit of rear right window system

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.

(b) Disconnect rear right door glass regulator motor connector R-002 and BCM connector B-147.

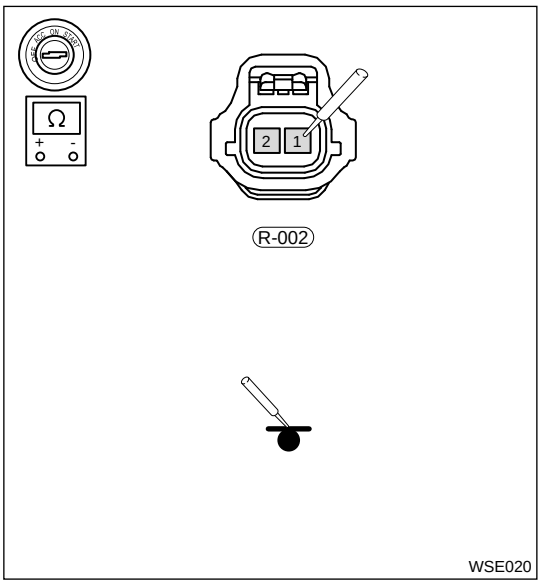
(c) Using ohm band of multimeter, check for continuity between R-002 (1) and B-147 (6), R-002 (2) and B-147 (5) separately.

Multimeter Connection	Condition	Specified Condition
R-002 (1) - B- 147 (6)	Always	⩽ 1 Ω
R-002 (2) - B- 147 (5)		⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity of R-002 (1) - ground, R-002 (2) - ground separately to check for short circuit to ground.

Multimeter Connection	Condition	Specified Condition
R-002 (1) - Ground	Always	∞
R-002 (2) - Ground		∞



(e) Using ohm band of multimeter, check for continuity between R-002 (1) - battery (+), R-002 (2) - battery (+) separately to check for short circuit to ground.

Multimeter Connection	Condition	Specified Condition
R-002 (1) - battery (+)	Always	∞
R-002 (2) - battery (+)		∞

NG → **Replace wire harness and connector.**

OK

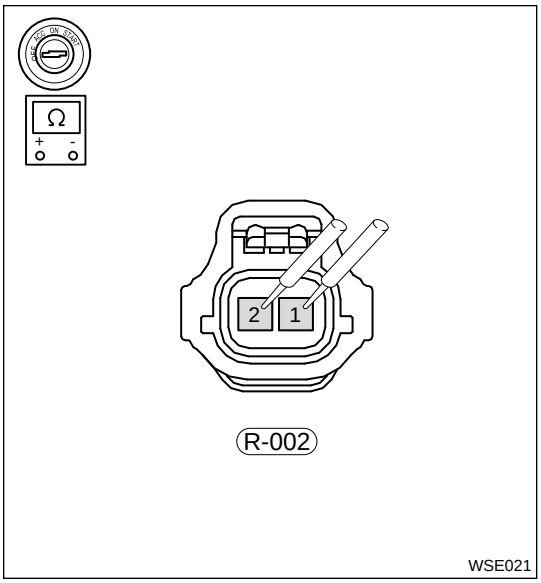
4	Check rear right window regulator motor

(a) Disconnect negative battery cable, and turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the rear right window regulator motor connector R-002.

(c) Using ohm band of multimeter, check resistance between R-002 (1) and R-002 (2).

Multimeter Connection	Condition	Specified Condition
R-002 (1) - R- 002 (2)	Always	⩽ 1 Ω



(d) Apply 12 V voltage to both terminals of rear right window regulator motor connector R-002, and observe if the regulator motor moves.

NG → **Replace rear right window regulator motor.**

OK → **Replace BCM.**

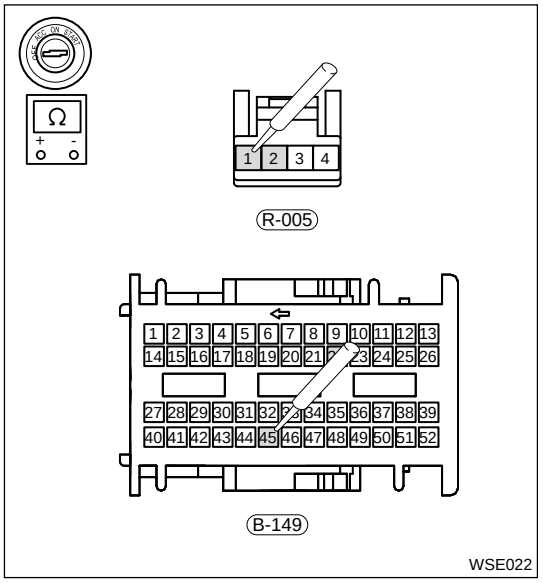
5	Check control circuit of rear right door glass regulator

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect rear right door glass regulator switch R-005 and BCM connector B-149.

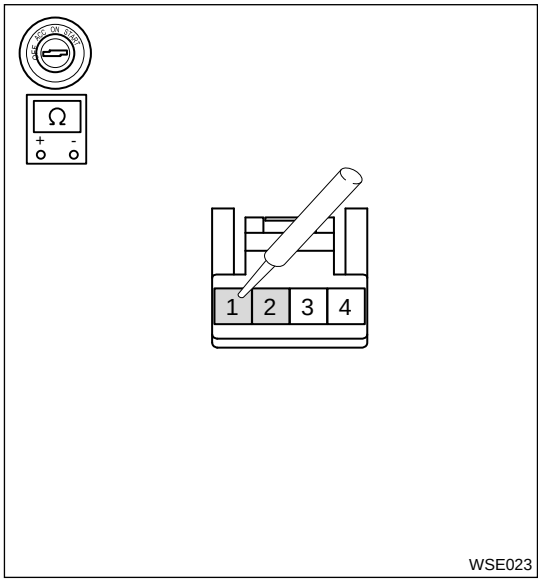
(c) Using ohm band of multimeter, check for continuity between R-005 (1) and B-149 (45), and R-005 (2) and B-149 (22).

Multimeter Connection	Condition	Specified Condition
R-005 (1) - B- 149 (45)	Always	⩽ 1 Ω
R-005 (2) - B- 149 (22)		⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between R-005 (1) and ground, R-005 (2) and ground to check for short circuit to ground.

Multimeter Connection	Condition	Specified Condition
R-005 (1) - Ground	Always	∞
R-005 (2) - Ground	Always	∞



(e) Using ohm band of multimeter, check for continuity between R-005 (1) and power supply (+), R-005 (2) - power supply (+) to check for short circuit to power supply.

Multimeter Connection	Condition	Specified Condition
R-005 (1) - battery (+)	Always	∞
R-005 (2) - battery (+)	Always	∞

NG → **Replace wire harness and connector.**

OK

6	**Check front left door glass regulator switch assembly (which controls rear right glass regulator circuit)**

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
(b) Remove the front left door power regulator switch F-008.
(c) Using ohm band of multimeter, measure resistance between F-008 (4) and F-008 (7).

Multimeter Connection	Condition	Specified Condition
F-008 (4) - F-008 (7)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

(d) Check glass regulator switch for stuck and damage.

NG → **Replace front left door glass regulator switch.**

OK →

7	Check rear right door power glass regulator switch

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
(b) Check glass regulator switch for stuck and damage.
(c) Remove the rear right door power glass regulator switch R-005.
(d) Using ohm band of multimeter, measure resistance between R-005 (1) and R-005 (2).

Multimeter Connection	Condition	Specified Condition
R-005 (1) - R- 005 (2)	Manual DOWN	≈ 332 Ω
	Automatic DOWN	≈ 0 Ω
	Manual UP	≈ 3000 Ω
	Auto UP	≈ 1500 Ω

(e) Check glass regulator switch for stuck and damage.

NG → **Replace rear right door glass regulator switch.**

OK →

8	Reconfirm DTCs

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Turn ENGINE START STOP switch to “ON”.
(d) Use diagnostic tester (the latest software) to read the DTCs stored in body control system again.

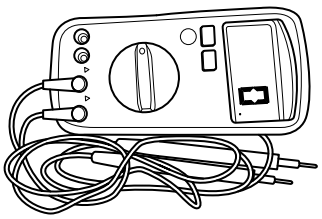
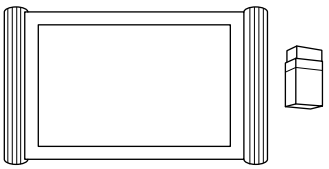
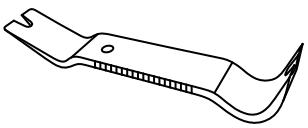
NG → **Replace Body Control Module (BCM).**

OK	System operates normally.

5 On-Vehicle Service

5.1 Tools

■ General Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001
Interior Crow Plate	 S00020

5.2 Jam Protection Learning

Jam protection learning

■ Jam protection canceling conditions

System will cancel jam protection function in following conditions:

(1) When jam protection occurs twice continuously (window does not raise to top).

(2) Control module will cut power regardless of work or non-work status.

(3) Window position calculation judged by system exceeds limit value (Including over 15 times of window up/down not fully closed operations).

(4) If there is obstacle as window closes within 10 seconds for first jam protection rollback, jam protection function will be activated again, and window will reverse automatically. At this time, only manual window UP function operates. Window provides maximum closing force within 10 seconds, to make window be closed smoothly in some extreme cases. Please make sure there is no obstacle during closing, avoiding personal injury.

■ **Jam protection function manual learning (jam protection module initialization)**

(1) During normal use of window regulating system, such as entering "jam protection canceling" condition without auto window UP (jam protection function), jam protection window regulating system resumes to multiple functions by using manual learning.

Make sure there is no obstacle in window range during learning, manual learning steps are as follows:

- Turn ENGINE START STOP switch to ON mode.
- Operate window glass to raise until reaching top manually and lock it for 2 seconds.
- Release the switch.
- Operate window glass to go down until reaching bottom manually and keep it lock for 2 seconds.
- Release the switch.
- Try the auto window UP function.
- If window cannot close automatically, please repeat the above steps to set.
- It is necessary to perform diagnostic tester learning when replacing door regulating system related mechanisms (such as glass regulator, glass run etc.), to make sure system parameters can be updated. After completing learning, clear the fault codes using diagnostic tester.

(2) Perform setting with smart key remote one-button window up function. Lower the window to the bottom, then raise it to the top. Window can be closed normally and setting is successful.

5.3 Replacement of Front Left Door Power Glass Regulator Switch

■ **Removal**

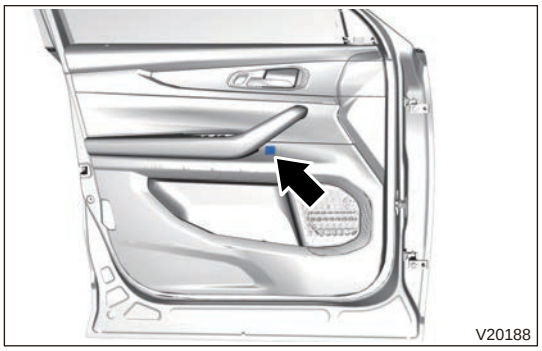
Hint
• **Be sure to wear safety equipment to prevent accidents, when removing front left door glass regulator switch.** • **Appropriate force should be applied when removing front left door glass regulator switch. Be careful not to operate roughly.** • **Try to prevent front door inner protector assembly from being scratched, when removing front left door glass regulator switch.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

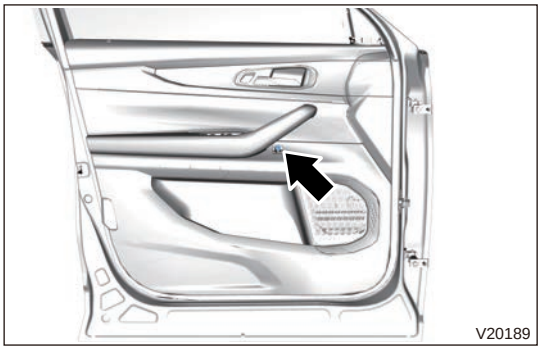
(2) Disconnect the negative battery cable.

(3) Using an interior crow plate, carefully remove front door triangular block assembly.

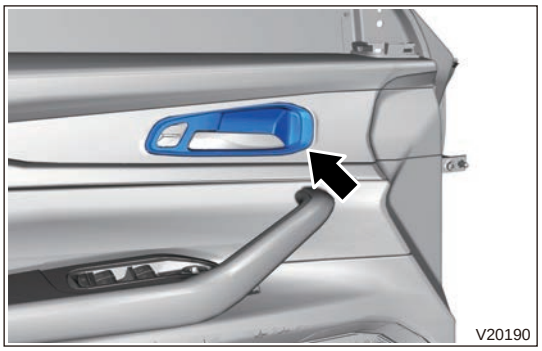
(4) Using an interior crow plate, carefully pry off front door protector block cover.



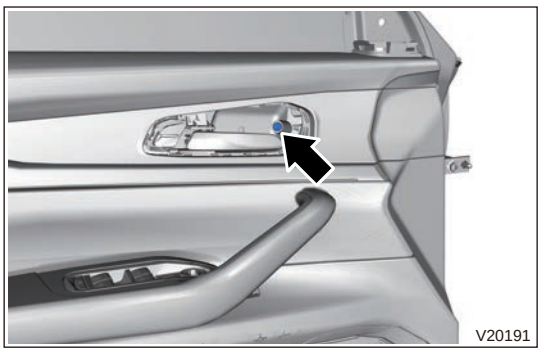
(5) Remove fixing bolt from the rear side of front door protector block cover.



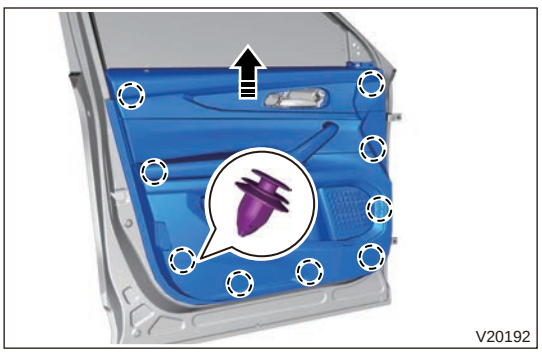
(6) Remove the front door protector and disconnect the central control switch connector.



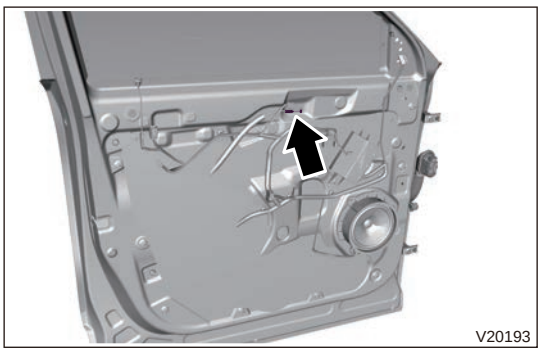
(7) Remove fixing bolt from the rear side of front door protector.



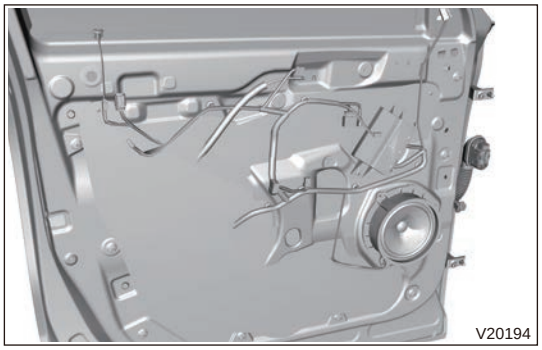
(8) Using an interior crow plate, carefully pry off clips on front door inner protector assembly, and loosen front door inner protector assembly in direction of arrow as shown in illustration.



(9) Disengage front door inside handle cable from front door inside handle.

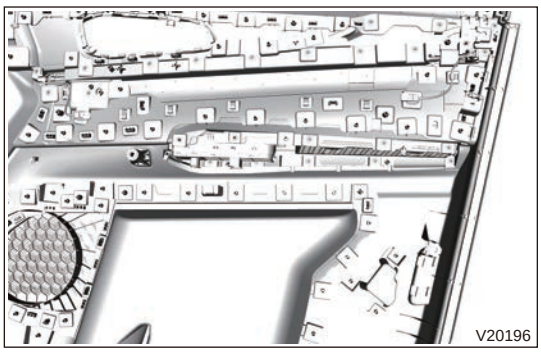


(10) Disconnect ambient light connector, anti-theft indicator light connector and regulator switch connector.

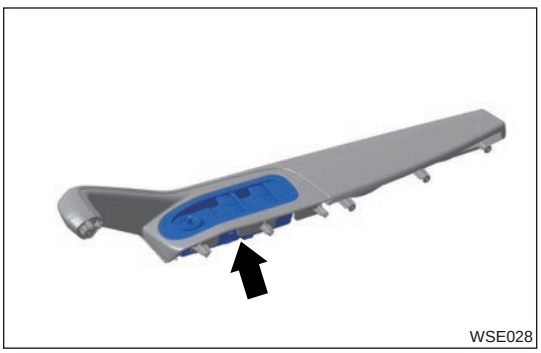


(11) Remove the front left door protector assembly.

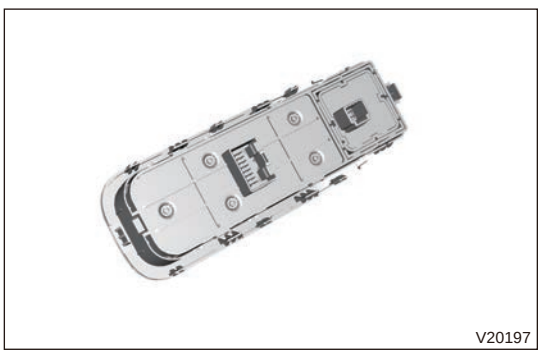
(12) Remove fixing screw from power glass regulator switch that fixed on door protector assembly.



(13) Separate the power glass regulator switch.

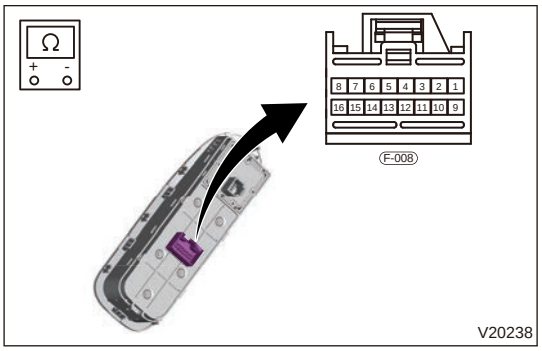


(14) Using a screwdriver wrapped with protective tape, detach claws from front left door glass regulator switch assembly and remove front left door glass regulator switch.



■ Inspection

(1) Using a digital multimeter, check for continuity between terminals of front left door glass regulator switch according to table below.



Component	Multimeter Connection	Switch Condition	Specified Condition
Front left door glass regulator switch	1 - 7	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	1 - 7	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω
Front right door glass regulator switch	2 - 7	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	2 - 7	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω
Rear left door glass regulator switch	3 - 7	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	3 - 7	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω
Rear right door glass regulator switch	4 - 7	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	4 - 7	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω

If result is not as specified, replace front left door glass regulator switch.

■ Installation

Caution
• **Check if front left door glass regulator switch can be operated normally after installation.**

(1) Install power glass regulator switch to proper position of door protector handle.

(2) Install fixing screw to door protector handle.

Tightening torque: 1.5 ± 0.5 N·m

(3) Install door protector handle to proper position of door protector, and install fixing bolt.

Tightening torque: 1.5 ± 0.5 N·m

(4) Connect ambient light connector, anti-theft indicator light connector and regulator switch connector.

(5) Install front door inside handle cable to front door inside handle.
(6) Install front door inner protector to proper position of body sheet metal and fasten the clip.
(7) Install fixing bolt to rear side of front door protector.

Tightening torque: 5 ± 1.0 N·m

(8) Install front door protector and connect central control switch connector.
(9) Install fixing bolt to rear side of front door protector block cover.

Tightening torque: 5 ± 1.0 N·m

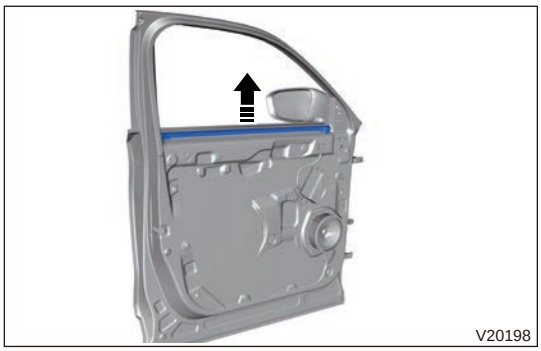
(10) Install the front door protector block cover.
(11) Install the front door triangular block assembly.
(12) Connect the negative battery cable.

5.4 Replacement of Front Door Inner Weather Bar

■ Removal

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front door inner weather bars.** • **Appropriate force should be applied when removing front door inner weather bars. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing front door inner weather bars.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left door inner protector assembly.
(4) Using an interior crow plate, remove front door inner weather bar from slot in direction of arrow.



■ Installation

(1) Install front door inner weather bar to proper position of door.
(2) Install the front left door inner protector assembly.
(3) Connect the negative battery cable.

5.5 Replacement of Front Door Outer Weather Bar

■ Removal

Caution

- **Be sure to wear safety equipment to prevent accidents, when removing front door outer weather bars.**
- **Appropriate force should be applied when removing front door outer weather bars. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing front door outer weather bars.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

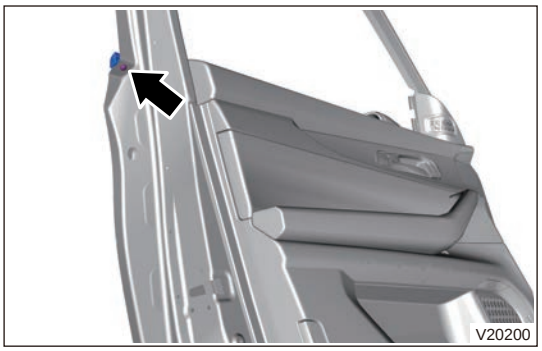
(3) Remove the front door inner triangular block assembly.


V20199

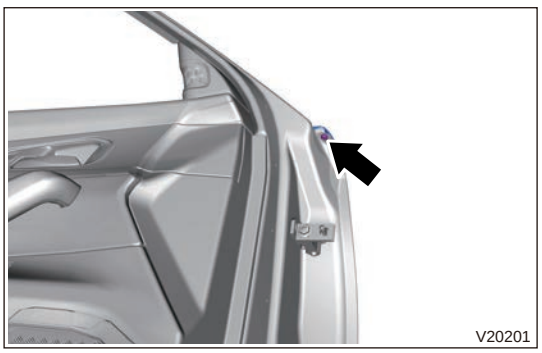
(4) Remove 1 fixing screw from front left triangular block assembly.

(5) Using a interior crow plate, carefully pry off front left triangular block assembly.

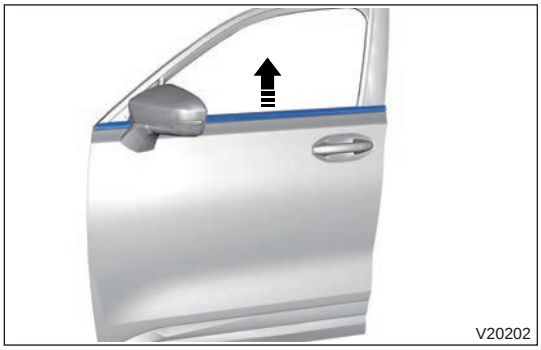
(6) Remove 1 fixing screw from left side of front left door outer weather bar.


V20200

(7) Remove 1 fixing screw from right side of front left door outer weather bar.


V20201

(8) Using an interior crow plate, remove front door outer weather bar from slot in direction of arrow.



■ **Installation**

(1) Install front door outer weather bar to proper position of door.
(2) Install 2 fixing screws to front left door outer weather bar.

Tightening torque: 1.5 ± 0.5 N·m

(3) Install the front left triangular block assembly.
(4) Install 1 fixing screw to front left triangular block assembly.

Tightening torque: 1.5 ± 0.5 N·m

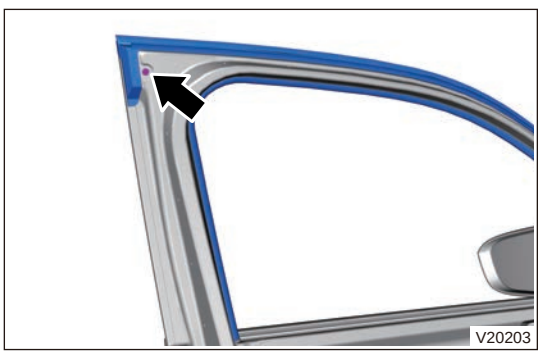
(5) Install the front door inner triangular block assembly.
(6) Connect the negative battery cable.

5.6 Replacement of Front Door Upper Glass Run

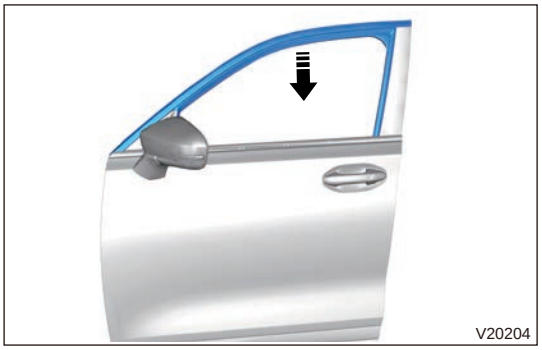
■ **Removal**

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing upper glass run.** • **Appropriate force should be applied when removing upper glass run. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing upper glass run.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left door inner protector assembly.
(4) Remove the front left door weather bar.
(5) Remove the front door glass assembly.
(6) Remove 1 fixing screw from front door upper glass run.



(7) Remove front left door upper glass run from slot in direction of arrow as shown in illustration.



■ **Installation**

(1) Install upper glass run to proper position of door.
(2) Install 1 fixing screw to front door upper glass run.
Tightening torque: 1.5 ± 0.5 N·m
(3) Install the front door glass assembly.
(4) Install the front left door weather bar.
(5) Install the front left door inner protector assembly.
(6) Connect the negative battery cable.

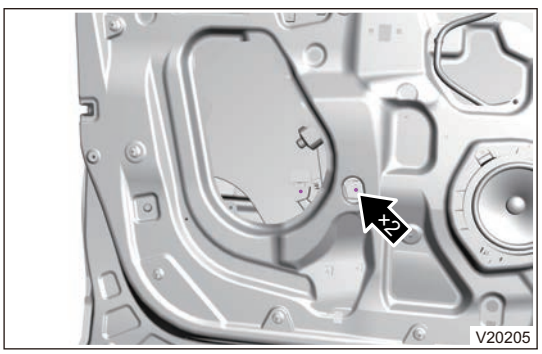
5.7 Replacement of Front Door Glass Assembly

■ **Removal**

Caution

- **Be sure to wear safety equipment to prevent accidents, when removing front door glass assembly.**
- **Appropriate force should be applied when removing front door glass assembly. Be careful not to operate roughly.**
- **Try to prevent window glass from dropping which will cause damage, when removing front door glass assembly.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left door inner protector assembly.
(4) Remove the front left door protective film assembly.
(5) Remove the front left door weather bar.
(6) Raise front door glass assembly to a proper position.
(7) Remove 2 fixing bolts from glass bracket and remove front left door glass assembly.



■ **Installation**

(1) Install front door glass to proper position of door and install 2 fixing bolts to glass bracket.

Tightening torque: 7 ± 1 N·m

Caution
• **When it is installed in place, power on the regulator to operate it for two cycles. Check if glass runs smoothly.**

(2) Install the front left door weather bar.

(3) Install the front left door protective film assembly.

(4) Install the front left door inner protector assembly.

(5) Connect the negative battery cable.

5.8 Replacement of Front Door Glass Rear Lower Guide Rail Assembly

■ **Removal**

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front door glass rear lower guide rail assembly.** • **Appropriate force should be applied when removing front door glass rear lower guide rail assembly. Be careful not to operate roughly.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

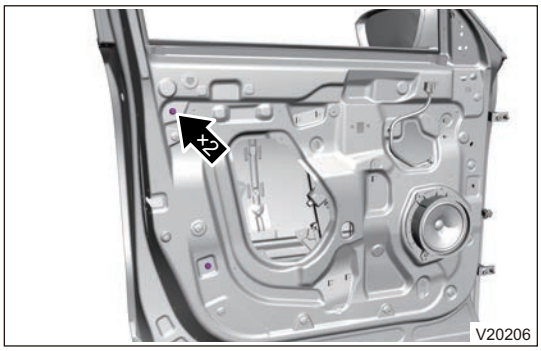
(3) Remove the front left door inner protector assembly.

(4) Remove the front left door protective film assembly.

(5) Remove the front left door weather bar.

(6) Remove the front left door glass assembly.

(7) Remove 2 fixing bolts from front door glass rear lower guide rail assembly.



■ **Installation**

Caution
Check guide rail before assembling. Direction of lower guide rail tongue should be parallel to guide rail body.

(1) Install front door glass rear lower guide rail assembly to proper position of vehicle body.

(2) Installation 2 fixing bolts of front door glass rear lower guide rail assembly.

Tightening torque: 7 ± 1 N·m

(3) Install the front left door glass assembly.

(4) Install the front left door weather bar.

(5) Install the front left door protective film assembly.

(6) Install the front left door inner protector assembly.

(7) Connect the negative battery cable.

5.9 Replacement of Front Door Power Glass Regulator

■ **Removal**

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front door power glass regulator.** • **Appropriate force should be applied when removing front door power glass regulator. Be careful not to operate roughly.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

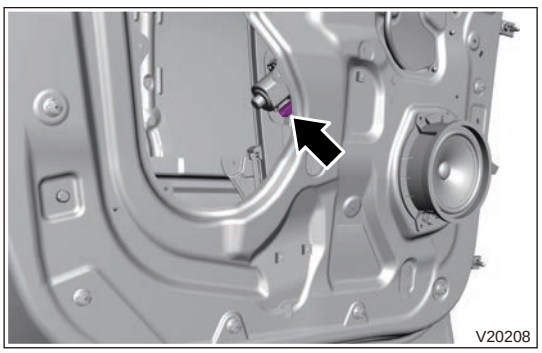
(3) Remove the front left door inner protector assembly.

(4) Remove the front left door protective film assembly.

(5) Remove the front left door weather bar.

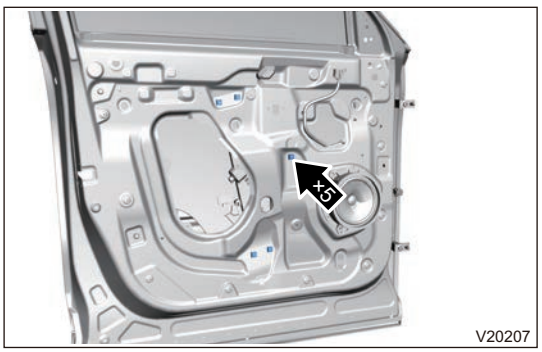
(6) Remove the front left door glass assembly.

(7) Disconnect the front left door power glass regulator connector.



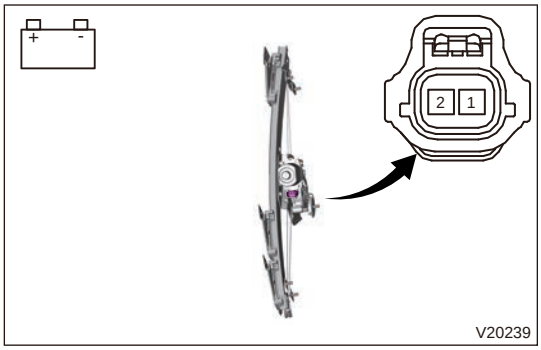
(8) Remove 5 fixing nuts from front left door power glass regulator, and remove front left door power glass regulator assembly.

Caution
Hold the glass regulator assembly with one hand when removing the last nut to avoid falling and damaging the motor.



■ **Inspection**

(1) Apply battery voltage to the terminals of power glass regulator motor connector, and check the operation of front door power glass regulator motor according to table below.



Battery positive (+)	Battery negative (-)	Specified Condition
1	2	UP smoothly
2	1	DOWN smoothly

If result is not as specified, replace power glass regulator.

■ **Installation**

Caution
After installing front door power glass regulator is installed, make sure that window glass can go up and down smoothly and freely without any vibration, chattering or shocking, etc.

(1) Install the power glass regulator to proper position of the door.

(2) Install 5 fixing nuts to front door power glass regulator.

Tightening torque: 9 ± 1.5 N·m

Caution
Hold the glass regulator assembly with one hand when installing the first nut to avoid falling and damaging the motor.

(3) Connect the front door power glass regulator connector.

(4) Install the front left door glass assembly.

(5) Install the front left door weather bar.

(6) Install the front left door protective film assembly.

(7) Install the front left door inner protector assembly.

(8) Connect the negative battery cable.

5.10 Replacement of Rear Left Door Power Glass Regulator Switch

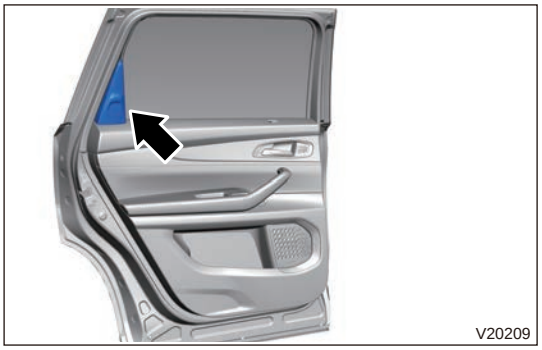
■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing power glass regulator switch.** • **Appropriate force should be applied when removing power glass regulator switch. Be careful not to operate roughly.** • **Try to prevent door inner protector assembly from being scratched, when removing power glass regulator switch.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear left door inside triangular block assembly.



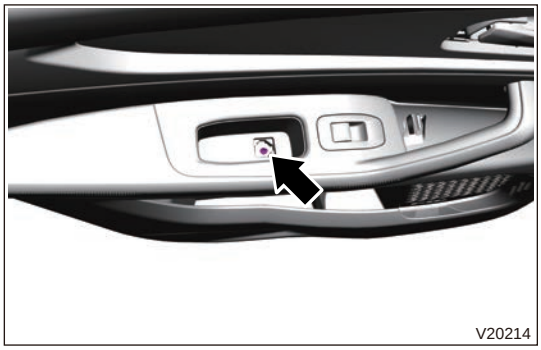
(4) Remove the rear left door protector block cover (middle).

(5) Remove the rear left door handle box block cover.

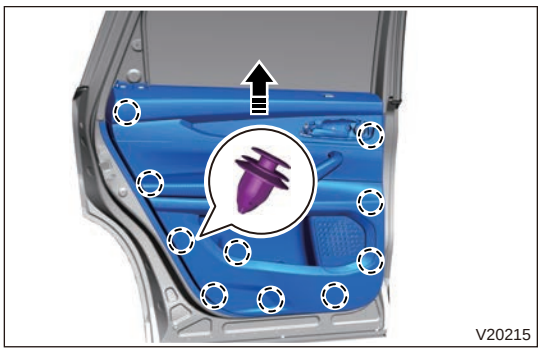
(6) Remove the rear left door front cover.

(7) Remove rear left door front cover and rear left door protector block cover (middle) rear fixing bolt.

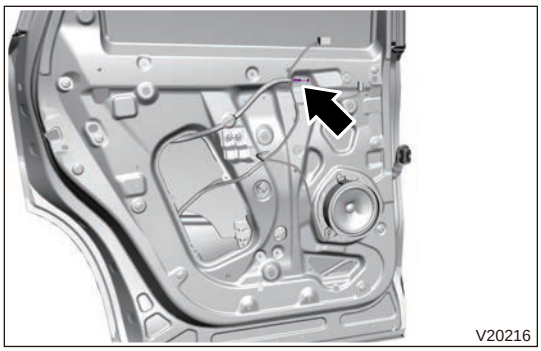
(8) Remove fixing screw from rear side of rear left door handle box block cover.



(9) Using an interior crow plate, pry up clips on rear door inner protector assembly, and remove rear door inner protector assembly in direction of arrow as shown in illustration.

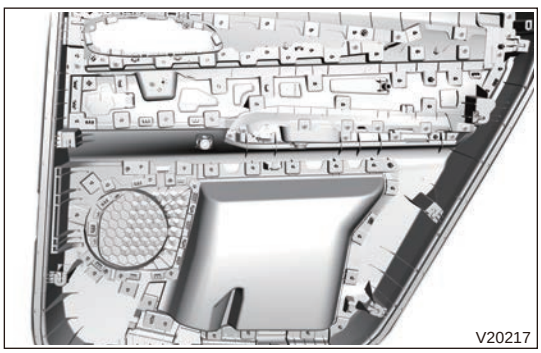


(10) Disengage rear door inside handle cable from rear door inside handle.



(11) Disconnect DOW, high pitched horn and glass regulator switch wire harness connector.

(12) Remove fixing screw from power glass regulator switch that fixed on door protector assembly.



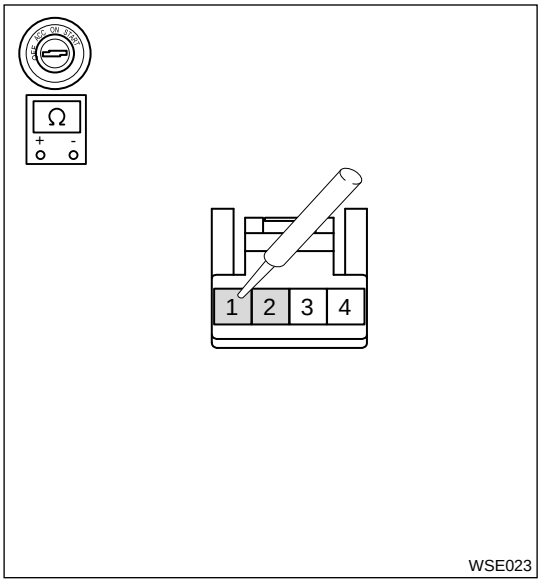
(13) Remove the fixing screws.

(14) Separate the power glass regulator switch.

(15) Using a screwdriver wrapped with protective tape, detach 4 claws from power glass regulator switch and remove the power glass regulator switch.

■ **Inspection**

(1) Using a digital multimeter, measure continuity between terminals of three power glass regulator switches according to table below.



Component	Multimeter Connection	Switch Condition	Specified Condition
Front right door glass regulator switch	2 - 1	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	2 - 1	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω
Rear left door glass regulator switch	2 - 1	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	2 - 1	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω
Rear right door glass regulator switch	2 - 1	Manual DOWN	≈ 332 Ω
		Automatic DOWN	≈ 0 Ω
	2 - 1	Manual UP	≈ 3000 Ω
		Auto UP	≈ 1500 Ω

If result is not as specified, replace power glass regulator switch.

■ **Installation**

Caution
Check if rear left door glass regulator switch can be operated normally after installation.

(1) Install power glass regulator switch to proper position of door protector handle.
(2) Install 2 fixing screws.

Tightening torque: 1.5 ± 0.5 N·m

(3) Install door protector handle to proper position of door protector, and install 16 fixing screws.

Tightening torque: 1.5 ± 0.5 N·m

(4) Install rear left door protector assembly to proper position of door and connect DOW, high pitched horn and glass regulator switch wire harness connector.
(5) Connect rear door inside handle cable to rear door inside handle.
(6) Align with the clip and press door protector firmly.
(7) Install the fixing screw to rear side of rear left door handle box block cover.

Tightening torque: 1.5 ± 0.5 N·m

(8) Install rear left door front cover and rear left door protector block cover (middle) rear fixing bolt.

Tightening torque: 5 ± 1.0 N·m

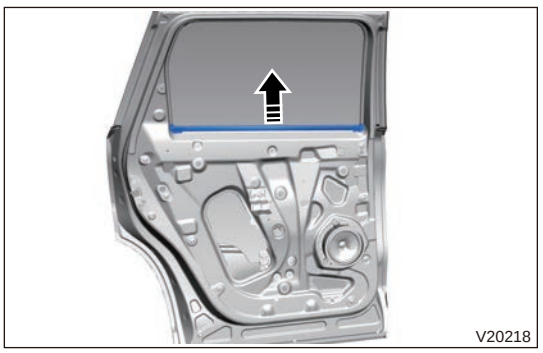
(9) Install the rear left door front cover.
(10) Install the rear left door handle box block cover.
(11) Install the rear left door protector block cover (middle).
(12) Install the rear left door inner triangular block assembly.
(13) Connect the negative battery cable.

5.11 Replacement of Rear Door Inner Weather Bar

■ Removal

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear door inner weather bars.** • **Appropriate force should be applied when removing rear door inner weather bars. Be careful not to operate roughly.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear left door inner protector assembly.
(4) Using an interior crow plate, remove rear door inner weather bar from slot in direction of arrow.



■ **Installation**

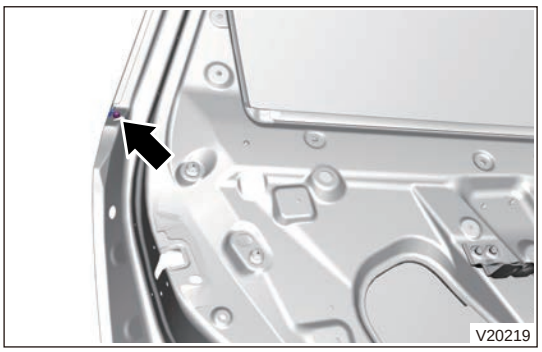
(1) Install rear door inner weather bar to proper position of door.
(2) Install the rear left door inner protector assembly.
(3) Connect the negative battery cable.

5.12 Replacement of Rear Door Outer Weather Bar

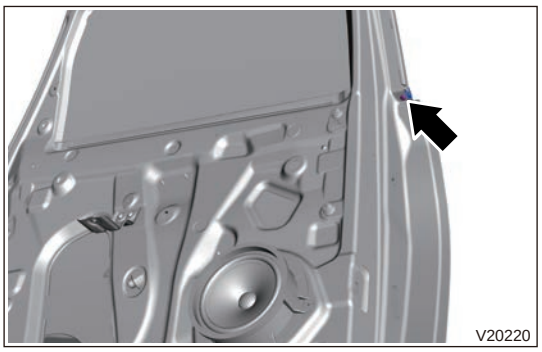
■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear door outer weather bars.** • **Appropriate force should be applied when removing rear door outer weather bars. Be careful not to operate roughly.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove 1 fixing screw from left side of rear door outer weather bar.



(4) Remove 1 fixing screw from right side of rear door outer weather bar.



(5) Using an interior crow plate, remove rear door outer weather bar from slot in direction of arrow.

■ **Installation**

(1) Install rear door outer weather bar to proper position of door.

(2) Install 1 fixing screw to right side of rear door outer weather bar.

Tightening torque: 1.5 ± 0.5 N·m

(3) Installation 1 fixing screw to left side of rear door outer weather bar.

Tightening torque: 1.5 ± 0.5 N·m

(4) Connect the negative battery cable.

5.13 Replacement of Rear Left Door Run

■ **Removal**

Warnings
• **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear left door inner protector assembly.

(4) Remove the rear left door glass assembly.

(5) Remove 2 fixing screws from rear left door run.

(6) Remove rear left door upper glass run from slot in direction of arrow as shown in illustration.

■ **Installation**

(1) Install rear left door upper glass run to proper position of door.
(2) Install 2 fixing screws to rear left door run.

Tightening torque: 1.5 ± 0.5 N·m

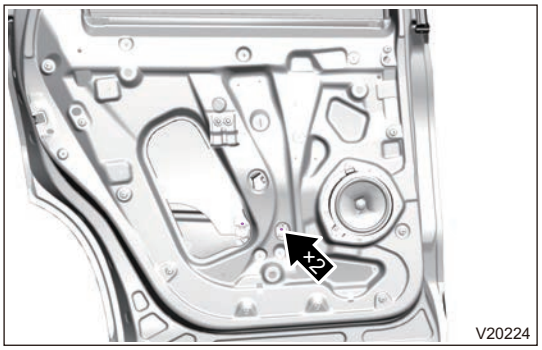
(3) Install the rear left door glass assembly.
(4) Install the rear left door frame weatherstrip.
(5) Install the rear left door inner protector assembly.
(6) Connect the negative battery cable.

5.14 Replacement of Rear Door Glass Assembly

■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear door glass assembly.** • **Appropriate force should be applied when removing rear door glass assembly. Be careful not to operate roughly.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear left door inner protector assembly.
(4) Remove the rear left door protective film assembly.
(5) Remove 2 fixing bolts from rear left door glass bracket.



(6) Remove the rear left door glass.

■ **Installation**

(1) Install rear left door glass assembly to proper position of door and install 2 fixing bolts to rear left door glass bracket.

Tightening torque: 7 ± 1 N·m

Caution
• **When it is installed in place, power on the regulator to operate it for two cycles. Check if glass runs smoothly.** • **Lower the glass to the bottom for the subsequent installation of B pillar cover plate.**

(2) Install the rear left door protective film assembly.
(3) Install the rear left door inner protector assembly.
(4) Connect the negative battery cable.

5.15 Replacement of Rear Door Power Glass Regulator

■ Removal

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear door power glass regulator.** • **Appropriate force should be applied when removing rear door power glass regulator. Be careful not to operate roughly.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and the ignition switch.

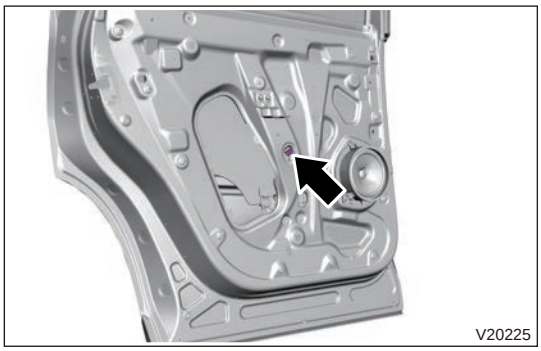
(2) Disconnect the negative battery cable.

(3) Remove the rear left door inner protector assembly.

(4) Remove the rear left door protective film assembly.

(5) Remove the rear left door glass assembly.

(6) Disconnect the rear door power glass regulator connector.


V20225

(7) Remove 5 fixing nuts from rear door power glass regulator.

Caution
Hold the glass regulator assembly with one hand when removing the last nut to avoid falling and damaging the motor.


V20226

(8) Remove the rear door power glass regulator.

■ Installation

(1) Install the rear door power glass regulator to proper position of door.

(2) Install 5 fixing nuts to rear door power glass regulator.

Tightening torque: 9 ± 1.5 N·m

Caution
• **Hold the glass regulator assembly with one hand when installing the first nut to avoid falling and damaging the motor.**

(3) Connect the rear door power glass regulator connector.

(4) Install the rear left door glass assembly.

(5) Install the rear left door protective film assembly.

(6) Install the rear left door inner protector assembly.

(7) Connect the negative battery cable.

5.16 Replacement of Front Windshield Assembly

■ Removal

Warnings

- **Be sure to wear safety equipment to prevent accidents, when removing front windshield assembly.**
- **Appropriate force should be applied when removing front windshield assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

(3) Remove the roof assembly.

Hint

It is not necessary to completely remove the roof assembly. Lower the front part of roof assembly, so that front windshield assembly can be removed.

(4) Remove the inside rear view mirror assembly.

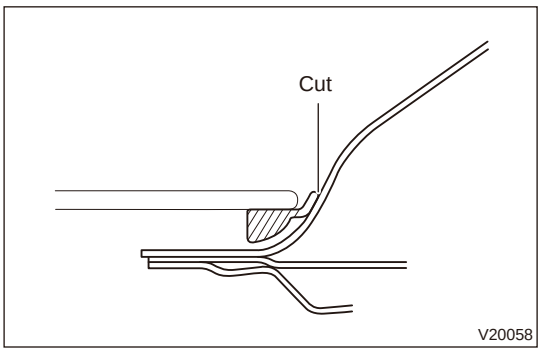
(5) Remove the wiper arm assembly.

(6) Remove the front windshield lower support assembly.

(7) Using a knife, cut off the adhesive.

Caution

Try to prevent body paint surface from being scratched, when cutting off the adhesive.

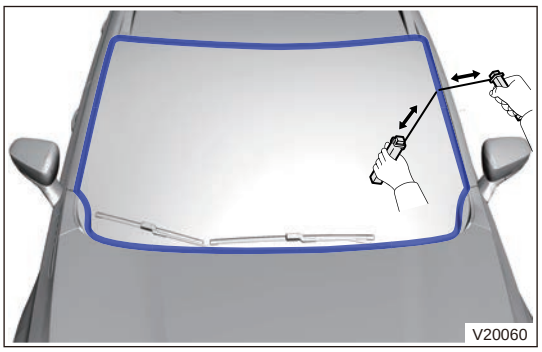


(8) Apply protective tape to the outer surface of body to prevent scratches.

Caution

To prevent instrument panel upper body assembly from being scratched, place a plastic sheet between piano wire and instrument panel upper body assembly.

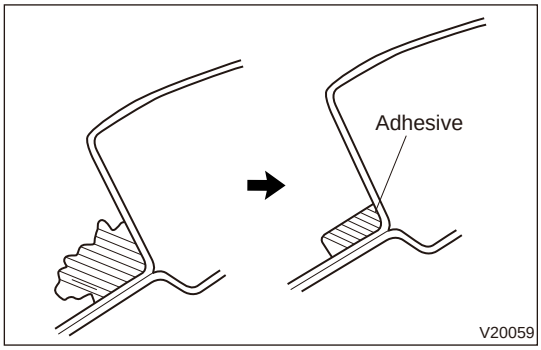
(9) Pass a piano wire through the seam between body and front windshield assembly. Tie wooden blocks or similar objects to both piano wire ends, cut off the adhesive by pulling the piano wire around front windshield assembly, and remove the front windshield assembly.



Caution

- **When removing front windshield assembly, an assistant is needed.**
- **When removing front windshield assembly, prevent it from dropping.**
- **Leave as much adhesive on the body as possible when cutting off the adhesive.**
- **When separating front windshield assembly from vehicle, be careful not to damage body paint, interior and exterior ornaments.**

(10) Clean the vehicle body. Using a knife, cut off any excess adhesive on the contact surface of vehicle body as shown in illustration.

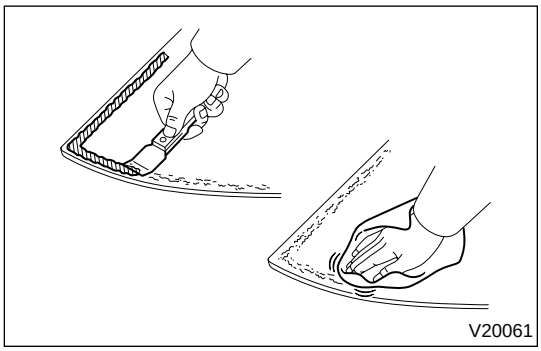


Caution
• **Try to prevent body paint surface from being scratched, when cutting off the adhesive.** • **Leave as much adhesive on the body as possible, when cutting off the adhesive.**

(11) Clean the contact surface of vehicle body with cleaner.

Hint
Even if all adhesive has been removed, cleaning of vehicle body would be necessary.

(12) Clean the removed glass. Using a scraper, remove the adhesive sticking to glass. Clean the outer edges of glass with cleaner.



Hint
• **DO NOT touch the glass after cleaning it.** • **Even if a new glass is used, it is necessary to clean it with glass cleaner.**

■ Installation

(1) Check for small cracks or bubbles exist around windshield, and appearance defects such as scratches on the surface. Check whether any assembly part is missed. Avoid installing an unqualified windshield glass on the vehicle.

(2) Wipe the primer area with alcohol cloth and width is 18 ≈ 20 mm.

(3) Apply sheet metal primer (A11-4105013A) to installation area and make sure application width is 9 ≈ 11 mm (edging size: 18 mm); Do not expose it in the air before applying sheet metal primer.

(4) Using cleaner (A11-4105017 accelerant), clean the area around gum application and make sure cleaning width is 14 ≈ 16 mm.

(5) Apply A11-4105015 windshield primer on the application position around front windshield. Make sure application width is 12 ≈ 14mm. Apply gum (A11-4105011) along application line, make sure the gum width is 8 ± 1 mm, height is 11.5 mm ± 1 mm, the height after being compressed is 5 mm, there is no gum leakage or fluid overflowing.

(6) Align dowel pins of front windshield with corresponding set holes separately for windshield installation on sheet metal of top panel. Install the windshield.

(7) Adjust glasses to left and right slightly, so as to make the clearance between glass and quarter meet the requirements of DTS; Use center positioning fixture as necessary.

(8) Slightly tap four sides of glass to install glass in place (height after being compressed is 5 mm) and apply tape (length of tape is 150 ≈ 200 mm) to prevent glass from sliding down.

(9) Check and repair the sealing of glass.

(10) Install the front windshield lower trim board assembly.

(11) Install the wiper arm assembly.

(12) Install the inside rear view mirror assembly.

(13) Install the roof assembly.

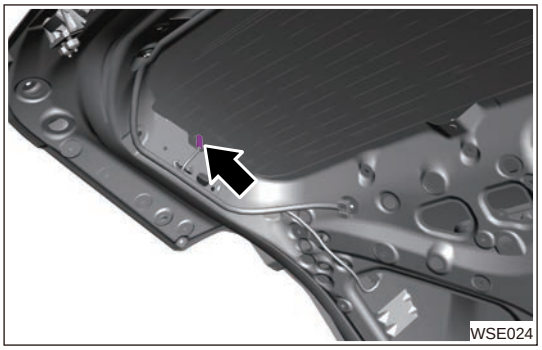
(14) Connect the negative battery cable.

5.17 Replacement of Rear Windshield Assembly

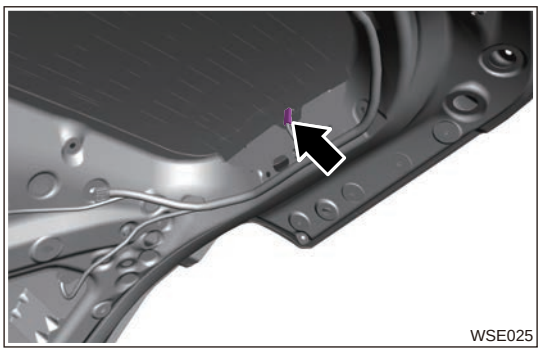
■ Removal

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear windshield assembly.** • **Appropriate force should be applied when removing rear windshield assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear door protector assembly.
(4) Remove the rear wiper arm assembly.
(5) Remove the rear wiper motor assembly.
(6) Remove the rear spoiler assembly.
(7) Remove the defroster wire harness assembly.
(8) Remove the left defroster connector.

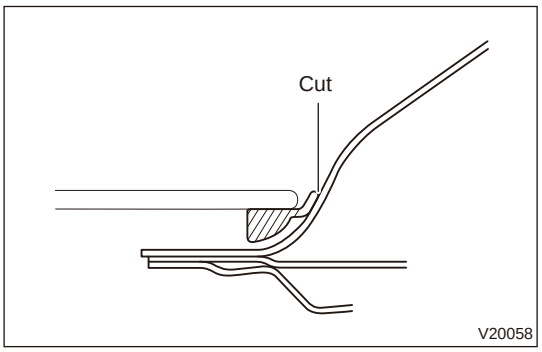

WSE024

(9) Remove the right defroster connector.


WSE025

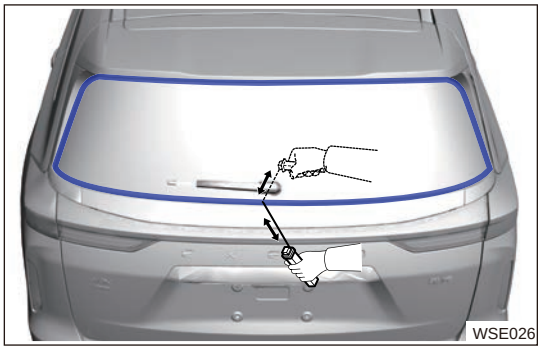
(10) Using a knife, cut off the adhesive.

Caution
• **Try to prevent body paint surface from being scratched, when cutting off the adhesive.**



V20058

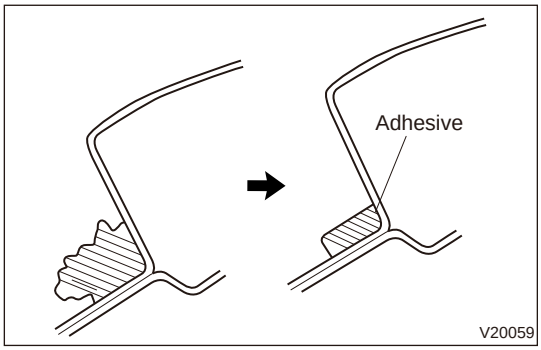
(11) Apply protective tape to the outer surface of body to prevent scratches. Pass a piano wire through the seam between vehicle body and rear windshield assembly. Tie wooden blocks or similar objects to both piano wire ends, cut off the adhesive by pulling the piano wire around rear windshield assembly, and remove the rear windshield assembly.



Caution

- **When removing rear windshield assembly, two persons are required.**
- **When removing rear windshield assembly, prevent it from dropping.**
- **Leave as much adhesive on the body as possible when cutting off the adhesive.**
- **When separating rear windshield assembly from vehicle, be careful not to damage body paint, interior and exterior ornaments.**

(12) Clean the vehicle body. Using a knife, cut off any excess adhesive on the contact surface of vehicle body as shown in illustration.



Caution

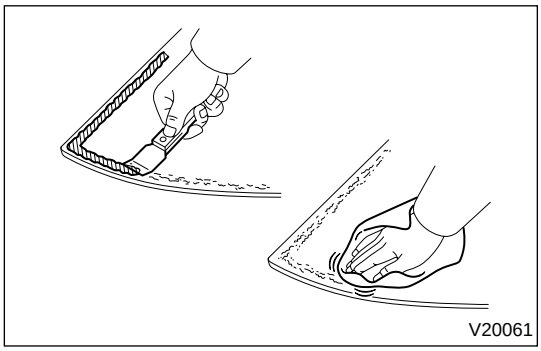
- **Try to prevent body paint surface from being scratched, when cutting off the adhesive.**
- **Leave as much adhesive on the body as possible, when cutting off the adhesive.**

(13) Clean the contact surface of vehicle body with cleaner.

Hint

- **Even if all adhesive has been removed, cleaning of vehicle body would be necessary.**

(14) Clean the removed glass. Using a scraper, remove the adhesive sticking to glass. Clean the outer edges of glass with glass cleaner.



Hint

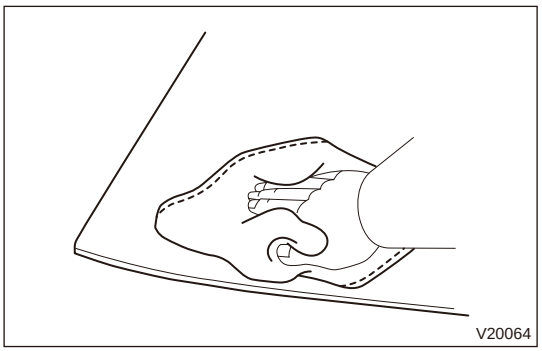
- **DO NOT touch the glass after cleaning it.**

■ **Assembly order:**

(1) Check for small cracks or bubbles exist around windshield, and appearance defects such as scratches on the surface. Check whether any assembly part is missed. Avoid installing an unqualified windshield glass on the vehicle.
(2) Wipe the primer area with alcohol cloth and width is 18 ≈ 20 mm.
(3) Apply sheet metal primer (A11-4105013A) to installation area and make sure application width is 9 ≈ 11 mm (edging size: 18 mm); Do not expose it in the air before applying sheet metal primer.
(4) Using cleaner (A11-4105017 accelerant), clean the area around gum application and make sure cleaning width is 14 ≈ 16 mm.
(5) Apply A11-4105015 windshield primer on the application position around rear windshield. Make sure application width is 12 ≈ 14mm. Apply gum (A11-4105011) along application line, make sure the gum width is 8 ± 1 mm, height is 11.5 mm ± 1 mm, the height after being compressed is 5 mm, there is no gum leakage or fluid overflowing.
(6) Align dowel pins of rear windshield with corresponding set holes separately for windshield installation on sheet metal of top panel. Install the windshield.
(7) Adjust glasses to left and right slightly, so as to make the clearance between glass and quarter meet the requirements of DTS; Use center positioning fixture as necessary.
(8) Slightly tap four sides of glass to install glass in place (height after being compressed is 5 mm) and apply tape (length of tape is 150 ≈ 200 mm) to prevent glass from sliding down.
(9) Apply tape separately on left and right side of rear windshield (length of tape is 150 ≈ 200 mm); Apply 2 tapes on rear windshield upper side (length of tape is 150 ≈ 200 mm).

■ **Installation**

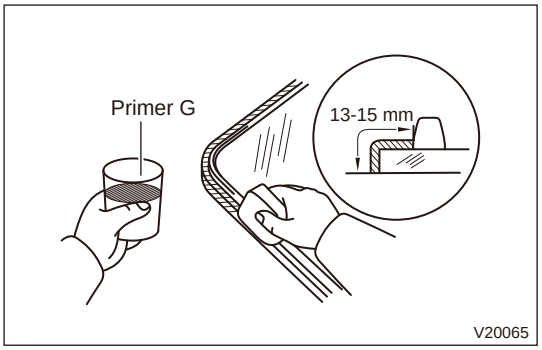
(1) Clean the contact surface of rear windshield. Remove any residue on the contact surface of rear windshield with a clean, lint-free cloth soaked with cleaner.



Hint

- **DO NOT touch the surface of rear windshield after cleaning it.**

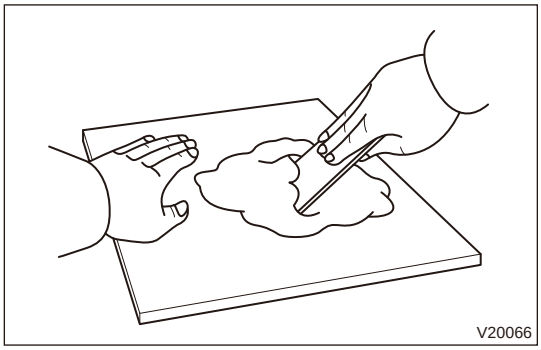
(2) Apply a coat of primer on the contact surface of rear windshield assembly. Using a brush, apply a coat of primer on the edge and contact surface of glass. Wipe off excess primer with a clean cloth before drying. Width of primer is 13 to 15 mm.



Hint

- **Allow primer to dry for at least 3 minutes.**
- **DO NOT apply primer to the adhesive.**
- **DO NOT apply too much primer.**
- **DO NOT keep any opened primer for later use.**

(3) Mix the adhesive. Using a solvent, thoroughly clean the mixing board and scraper. Using a scraper, thoroughly mix 500 g main adhesive and 75 g hardener on the mixing board.



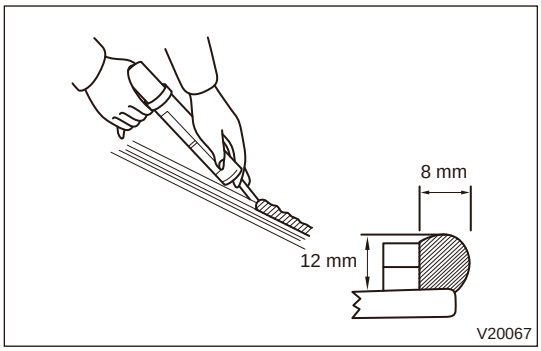
Hint
• **Adhesive should be mixed thoroughly within 5 minutes.**

(4) Apply the adhesive. Cut off the tip of cartridge nozzle and add adhesive. Install the cartridge to sealer gun.

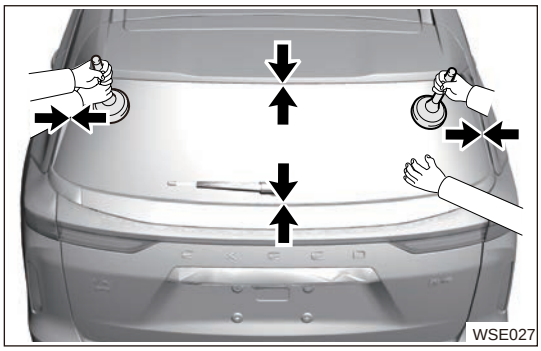
(5) Apply adhesive evenly to rear windshield assembly as shown in illustration.

Adhesive width: 8 mm

Adhesive height: 12 mm

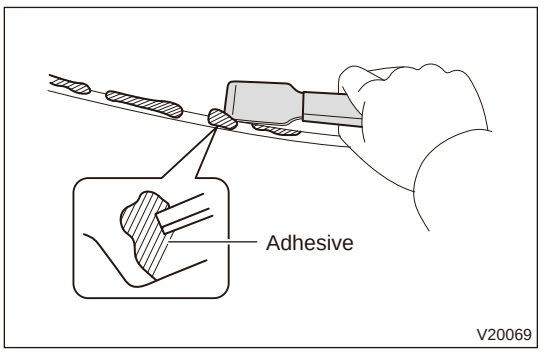


(6) Install the rear windshield assembly. Align the matchmarks on glass and vehicle body, and gently press in glass along the edge.



Hint
• **Check that upper-and-lower clearance and right-and-left clearance of rear windshield assembly are uniform, to ensure good fitting with weatherstrips all around.**

(7) Using a scraper, uniformly apply adhesive to the glass edge.



(8) Remove any excess or spilled adhesive with the scraper.

(9) Apply tape all the way around, and do not remove them until the adhesive hardens.

(10) Check and repair the sealing of glass.

Check the glass for leakage after adhesive has completely hardened.

If it leaks, seal the leaks by adding adhesive.

(11) Connect the negative battery cable.

5.18 Replacement of Sliding Roof Switch Assembly

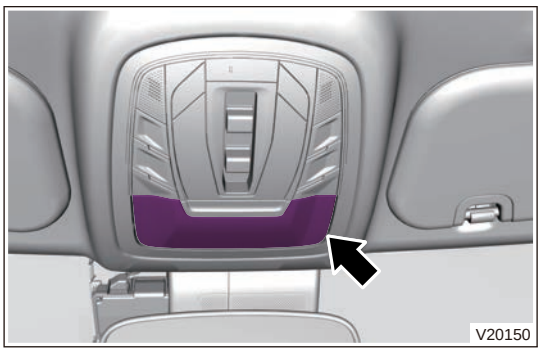
■ Removal

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sliding roof switch assembly.** • **Try to prevent interior from being scratched during operation, when removing sliding roof switch assembly.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

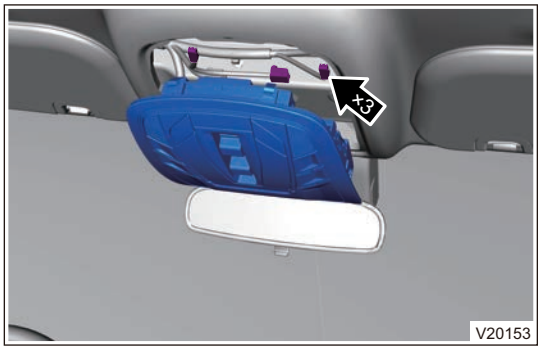
(3) Open the glasses box on front dome light as shown in illustration.



(4) Remove 2 fixing screws.

(5) Using an interior crow plate, careful pry off clips from sliding roof switch assembly.

(6) Disconnect each wire harness connector, and remove sliding roof switch assembly.



■ **Installation**

Caution
• **Connect connector in place and tighten fixing nut to specified torque, when installing sliding roof switch assembly.** • **Make sure that sliding roof switch functions properly, after installing sliding roof switch assembly.**

(1) Install sliding roof switch to proper position of roof and connect wire harness connector.
(2) Install the sliding roof switch.
(3) Install 2 fixing screws.

Tightening torque: 2.5 ± 0.5 N·m

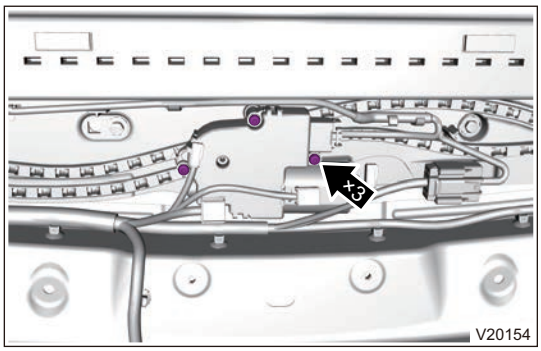
(4) Close the glasses box.
(5) Connect the negative battery cable.

5.19 Replacement of Sliding Roof Glass Motor

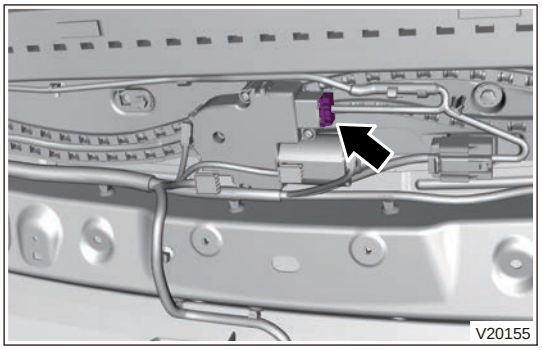
■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sliding roof glass motor.** • **Appropriate force should be applied, when removing sliding roof glass motor. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and the ignition switch.
(2) Disconnect the negative battery cable.
(3) Remove the roof.
(4) Remove 3 fixing screws from sliding roof glass motor assembly.



(5) Disconnect wire harness connector from sliding roof glass motor assembly.



(6) Remove the sliding roof glass motor assembly.

■ **Installation**

Caution
• **Connect connector in place and tighten fixing screw to specified torque, when installing sliding roof glass motor assembly.** • **After sliding roof glass motor is installed, there should be no abnormal noise and resistance when opening and closing the sliding roof glass.**

(1) Install sliding roof glass motor to proper position of sliding roof.

(2) Connect sliding roof glass motor assembly wire harness connector.

(3) Install 3 fixing screws to sliding roof glass motor assembly.

Tightening torque: 2.5 ± 0.5 N·m

(4) Install the roof.

(5) Connect the negative battery cable.

5.20 Replacement of Sun Visor Motor Assembly

■ **Removal**

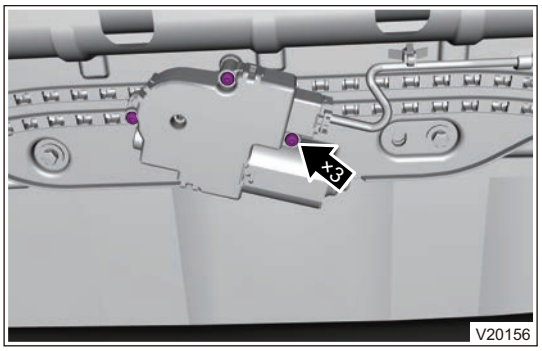
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sun visor motor assembly.** • **Try to prevent interior from being scratched during operation, when removing sun visor motor assembly.**

(1) Turn off all electrical equipment and the ignition switch.

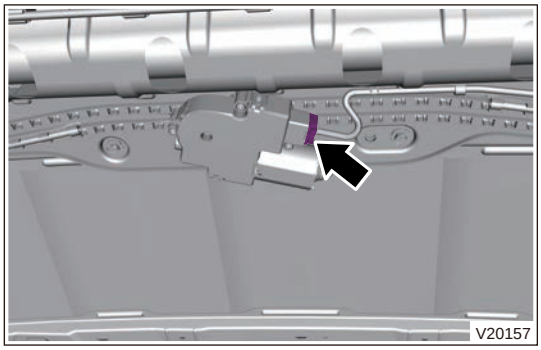
(2) Disconnect the negative battery cable.

(3) Remove the roof.

(4) Remove 3 fixing screws from sun visor motor assembly.



(5) Disconnect wire harness connector from sun visor motor assembly.



(6) Remove the sun visor motor assembly.

■ **Installation**

Caution
• **Connect connector in place and tighten fixing screw to specified torque, when installing sun visor motor assembly.** • **After sun visor motor is installed, there should be no abnormal noise and resistance when opening and closing the sun visor.**

(1) Install sun visor motor assembly to proper position of sliding roof.

(2) Connect the sun visor motor assembly wire harness connector.

(3) Install 3 fixing screws to sun visor motor assembly.

Tightening torque: 2.5 ± 0.5 N·m

(4) Install the roof.

(5) Connect the negative battery cable.

■ **Matching**

(1) Sunshade losing initial position

- Definition: Sunshade cannot be opened, closed normally or closed to a normal position and initial movement for sunshade cannot be performed after power off. When there is such problem in sunshade, movement process for sunshade will be disordered, and sunshade initial position is lost.

(2) Solution method

- Press and hold glass CLOSE button, when sliding roof glass reaches mechanical zero point and returns → sun visor reaches mechanical zero point and returns → sun visor opens and reaches full open position → sliding roof glass opens and reaches full open position → sliding roof glass closes and reaches full closed position → sun visor closes and reaches full closed position, reinitialization is forced to be completed, then normal condition resumes.

Caution
• **Make sure that power supply shall not be shut off during operation. Confirm that no hard objects (-various obstacles) that block running of sliding mechanism are in sliding roof guide rail and sunshade guide rail.** • **The sunshade of this model has no anti-pinch function. Pay attention to safety during operation to avoid accidents.**

5.21 Replacement of Sliding Roof Front Glass

■ Removal

Warnings

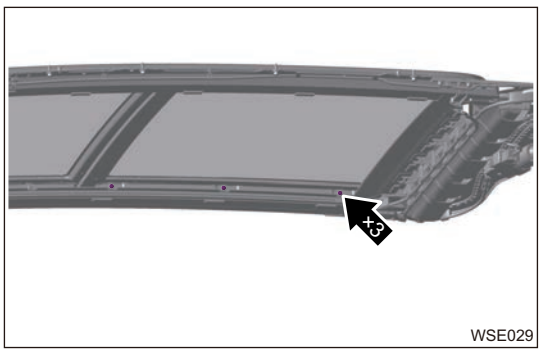
- **Be sure to wear safety equipment to prevent accidents, when removing sliding roof front glass.**
- **Appropriate force should be applied, when removing sliding roof front glass. Be careful not to operate roughly, to avoid damage to sliding roof glass.**
- **Before removing the sliding roof front glass, press the sliding roof switch to open sun visor to a proper position and adjust sliding roof glass to the maximum tilt status.**

(1) Turn off all electrical equipment and the ignition switch.

(2) Disconnect the negative battery cable.

(3) Remove the sliding roof weatherstrip.

(4) Remove 3 fixing bolts from left side of sliding roof front glass (use same method for right side).



(5) Jack front glass assembly to a certain height from bottom, and carefully remove sliding roof front glass assembly.

■ Installation

(1) Install front glass assembly to proper position of vehicle body.

(2) Install 3 fixing bolts to left side of sliding roof front glass (use same method for right side).

Tightening torque: 4.5 ± 0.5 N·m

(3) Install the sliding roof weatherstrip.

(4) Connect the negative battery cable.

5.22 Replacement of Sliding Roof Rear Glass

■ Removal

Warnings

- **Be sure to wear safety equipment to prevent accidents, when removing sliding roof rear glass.**
- **Try to prevent interior from being scratched during operation, when removing sliding roof rear glass.**

(1) Open the sun visor.

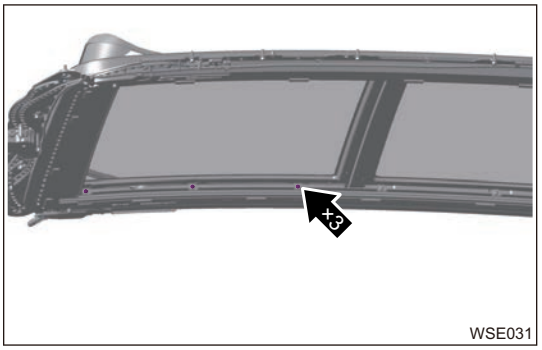
(2) Turn off all electrical equipment and ENGINE START STOP switch.

(3) Disconnect the negative battery cable.

(4) Remove the roof.

(5) Remove the sliding roof fixing bracket.

(6) Remove 3 fixing bolts from left side of sliding roof rear glass (use same method for right side).



(7) Remove the sliding roof rear glass.

■ **Installation**

(1) Install sliding roof rear glass to proper position of sliding roof.
(2) Install 3 fixing bolts to left side of sliding roof rear glass (use same method for right side).

Tightening torque: 4.5 ± 0.5 N·m

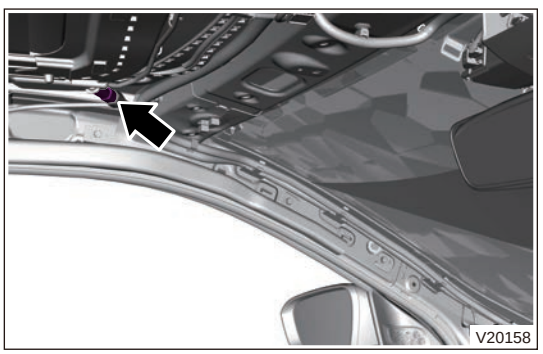
(3) Install the sliding roof fixing bracket.
(4) Install the roof assembly.
(5) Connect the negative battery cable.

5.23 Replacement of Sliding Roof Front Left Drain Hose

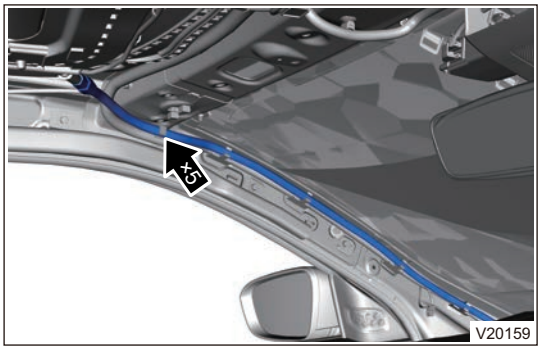
■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sliding roof front left drain hose.** • **Prevent interior from being scratched during operating, when removing sliding roof front left drain hose.**

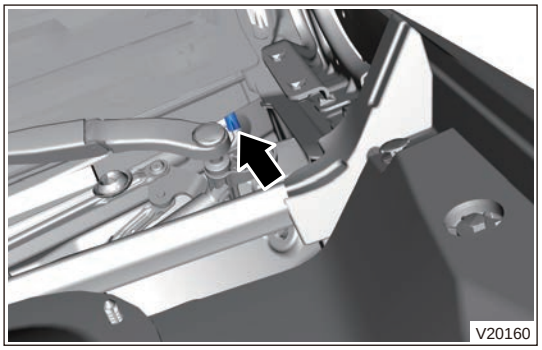
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front windshield lower support assembly.
(4) Remove the left A-pillar upper protector assembly.
(5) Remove the left B-pillar upper protector assembly.
(6) Remove the left C-pillar upper protector assembly
(7) Remove the roof assembly.
(8) Detach front left drain hose joint from drain outlet of sliding roof side.



(9) Detach front left drain hose from wire harness clip.



(10) Detach water drain valve of front left drain hose from body panel.



(11) Remove the sliding roof front left drain hose.

■ **Installation**

(1) Install sliding roof front left drain hose to proper position of body.
(2) Clamp water drain valve of front left drain hose to body panel.
(3) Clamp front left drain hose to wire harness clip.
(4) Insert front left drain hose joint into drain outlet of sliding roof side.
(5) Install the roof assembly.
(6) Install the left C-pillar upper protector assembly.
(7) Install the left B-pillar upper protector assembly.
(8) Install the left A-pillar upper protector assembly.
(9) Install the front windshield lower trim board assembly.
(10) Connect the negative battery cable.

5.24 Replacement of Sliding Roof Front Right Drain Hose

■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sliding roof front right drain hose.** • **Prevent interior from being scratched during operating, when removing sliding roof front right drain hose.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front windshield lower support assembly.
(4) Remove the left A-pillar upper protector assembly.
(5) Remove the left B-pillar upper protector assembly.

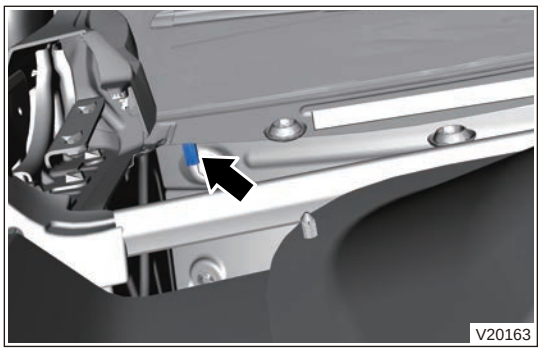
(6) Remove the left C-pillar upper protector assembly

(7) Remove the roof assembly.

(8) Detach front right drain hose joint from drain outlet of sliding roof side.

(9) Using an interior crow plate, carefully pry off front right drain hose clip.

(10) Detach water drain valve of front right drain hose from body panel.



(11) Remove the sliding roof front right drain hose.

■ Installation

(1) Install sliding roof front right drain hose to proper position of body.

(2) Clamp water drain valve of front right drain hose to body panel.

(3) Clamp front right drain hose clip to corresponding vehicle body in order.

(4) Insert front right drain hose joint into drain outlet of sliding roof side.

(5) Install the roof assembly.

(6) Install the left C-pillar upper protector assembly.

(7) Install the left B-pillar upper protector assembly.

(8) Install the left A-pillar upper protector assembly.

(9) Install the front windshield lower trim board assembly.

(10) Connect the negative battery cable.

5.25 Replacement of Sliding Roof Rear Drain Hose

■ Removal

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sliding roof rear drain hose.** • **Prevent interior from being scratched during operating, when removing sliding roof rear drain hose.** • **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

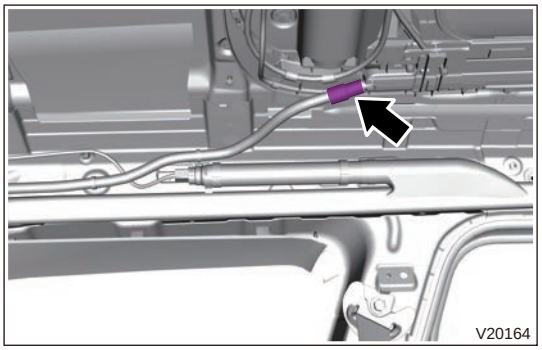
(3) Remove the left A-pillar upper protector assembly.

(4) Remove the left B-pillar upper protector assembly.

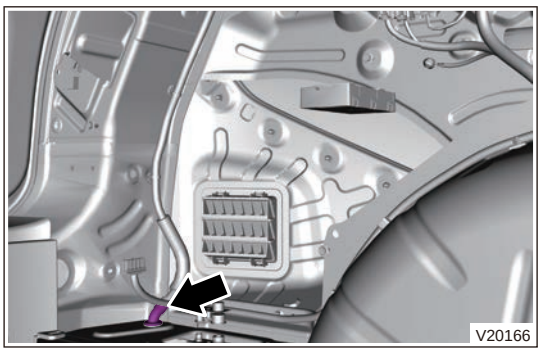
(5) Remove the left C-pillar upper protector assembly

(6) Remove the roof assembly.

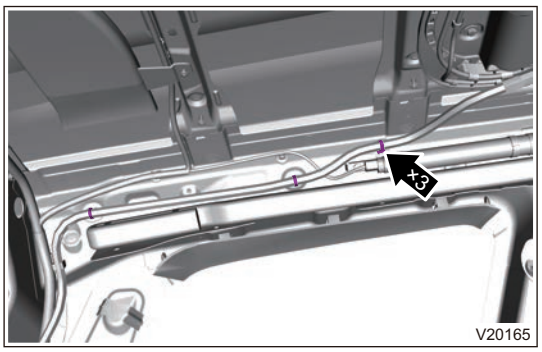
(7) Detach rear left drain hose joint from drain outlet of sliding roof side.



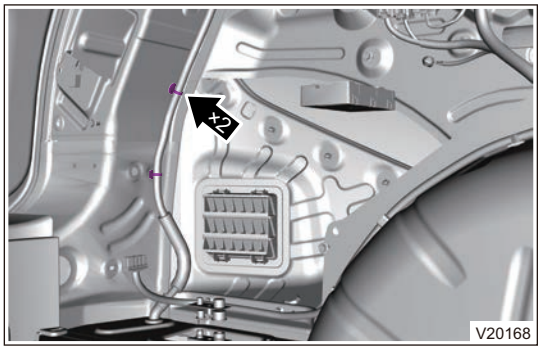
(8) Detach lower part of rear left drain hose from corresponding mounting hole on vehicle body.



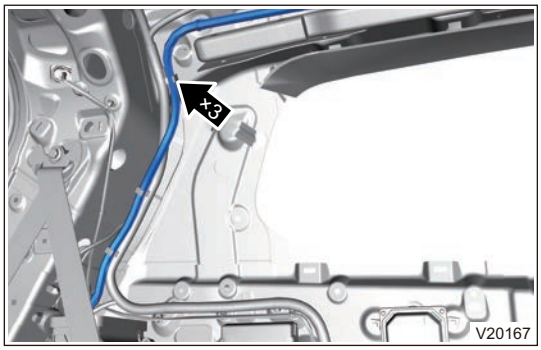
(9) Using an interior crow plate, carefully pry off rear left drain hose clip.



(10) Using an interior crow plate, carefully pry off rear left drain hose clip.



(11) Detach rear left drain hose from wire harness clip.



(12) Remove the rear left drain hose.

■ **Installation**

(1) Install rear left drain hose to proper position of vehicle body.
(2) Secure rear left drain hose to wire harness clip (After it is secured with wire harness clip, check if water hose is bent. If it is bent, it is necessary to smooth the water hose under the bending, and install it only after confirming that it is not bent).
(3) Clamp rear left drain hose clip to corresponding vehicle body in order.
(4) Insert rear left drain hose joint into drain outlet of sliding roof side.
(5) Clamp water drain valve of rear left drain hose to body panel.
(6) Install the roof assembly.
(7) Install the left C-pillar upper protector assembly.
(8) Install the left B-pillar upper protector assembly.
(9) Install the left A-pillar upper protector assembly.
(10) Connect the negative battery cable.

5.26 Replacement of Sliding Roof Assembly

■ **Removal**

Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing sliding roof assembly.** • **Try to prevent interior from being scratched during operation, when removing sliding roof assembly.** • **When removing sliding roof assembly, an assistant is needed to hold sliding roof fixing bracket. During operation, prevent the sliding roof fixing bracket from dropping, which may cause an accident.**

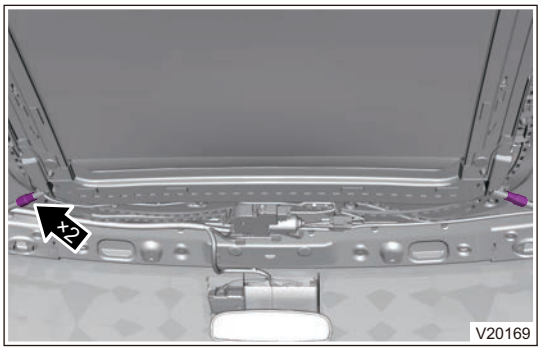
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

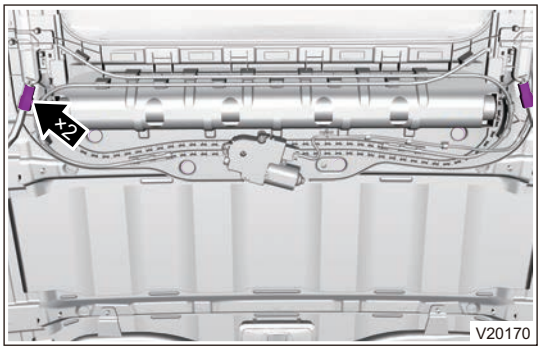
(3) Remove the interior front dome light assembly.

(4) Remove the roof assembly.

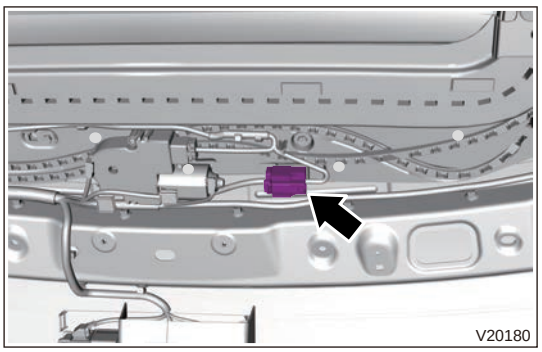
(5) Detach joints of front left drain hose and front right drain hose from drain outlet of sliding roof side.



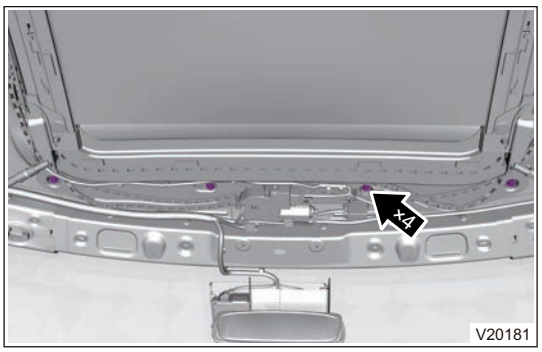
(6) Detach joints of rear left drain hose and rear right drain hose from drain outlet of sliding roof side.



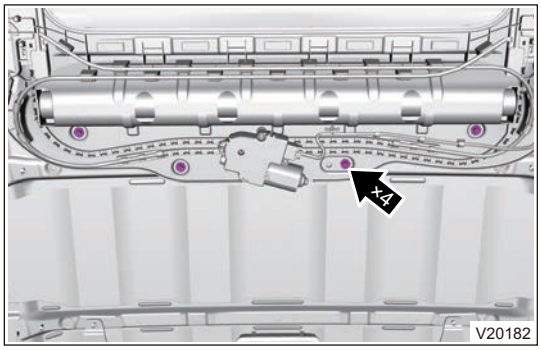
(7) Disconnect the sliding roof wire harness connector.



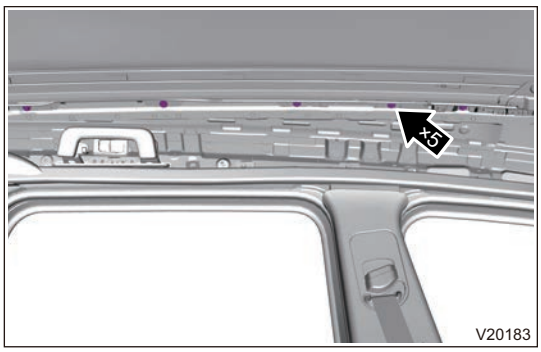
(8) Remove 4 fixing bolts between sliding roof assembly front side and roof.



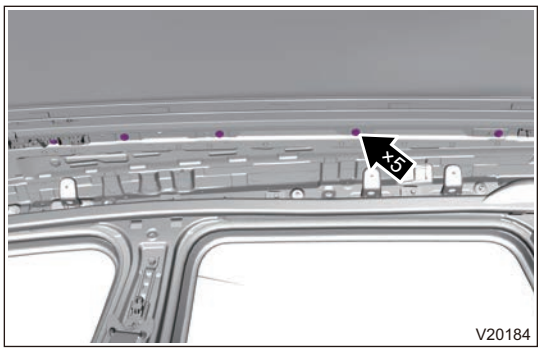
(9) Remove 4 fixing bolts between sliding roof assembly rear side and roof.



(10) Remove 5 fixing bolts between sliding roof assembly left side and roof.



(11) Remove 5 fixing bolts between sliding roof assembly right side and roof.



(12) Remove the sliding roof assembly.

■ Installation

Caution
When installing sliding roof fixing bracket, an assistant is needed to hold it. During operation, prevent the sliding roof fixing bracket from dropping, which may cause an accident.

(1) Put sliding roof on the auxiliary tool, and check if dowel pin is on sliding roof.
(2) Use auxiliary tool to push sliding roof to vehicle interior through front windshield entrance.
(3) Align sliding roof with roof opening. Raise it up and make sure left and right dowel pins are inserted into corresponding locating holes of sliding roof mounting plate. Be aware not to drop or deform sliding roof weatherstrip due to crush while raising the sliding roof.
(4) Hold the auxiliary tool in stationary. Tighten 4 diagonal fixing bolts first.

Tightening torque: 9 ± 1.5 N·m

(5) Loosen and remove the auxiliary tool.
(6) Install remaining 14 fixing bolts.

Tightening torque: 9 ± 1.5 N·m

(7) Connect the sliding roof wire harness connector.
(8) Insert left and right front drain hose joints into drain outlet of sliding roof side.
(9) Insert rear left and right drain hose joints into drain outlet of sliding roof side.
(10) Install the roof assembly.
(11) Install the interior front dome light assembly.
(12) Connect the negative battery cable.

■ Matching

(1) Sliding roof remote control function
   1) When ENGINE START STOP switch is OFF and all doors are closed, long press smart key unlock button to open panoramic sliding roof automatically.
   2) When ENGINE START STOP switch is OFF, all doors are closed and sliding roof is open, press and hold smart key lock button or enable smart key sensing lock function to close panoramic sliding roof automatically.
(2) Sliding roof losing initial position
   1) Definition: sliding roof cannot be opened, closed normally or closed to a normal position, and initial movement for sliding roof cannot be performed. When there is such problem in sliding roof, movement process for sliding roof will be disordered, and sliding roof initial position is lost.
(3) Solution method
   1) Press and hold glass CLOSE button, when sliding roof glass reaches mechanical zero point and returns → sun visor reaches mechanical zero point and returns → sun visor opens and reaches full open position → sliding roof glass opens and reaches full open position → sliding roof glass closes and reaches full closed position → sun visor closes and reaches full closed position, reinitialization is forced to be completed, then normal condition resumes.

11.11 BACKUP POWER SUPPLY AND WIRELESS CHARGING SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

(2) Be sure to wear safety equipment to prevent accidents, when removing auxiliary fascia console assembly.

1.2 Precautions

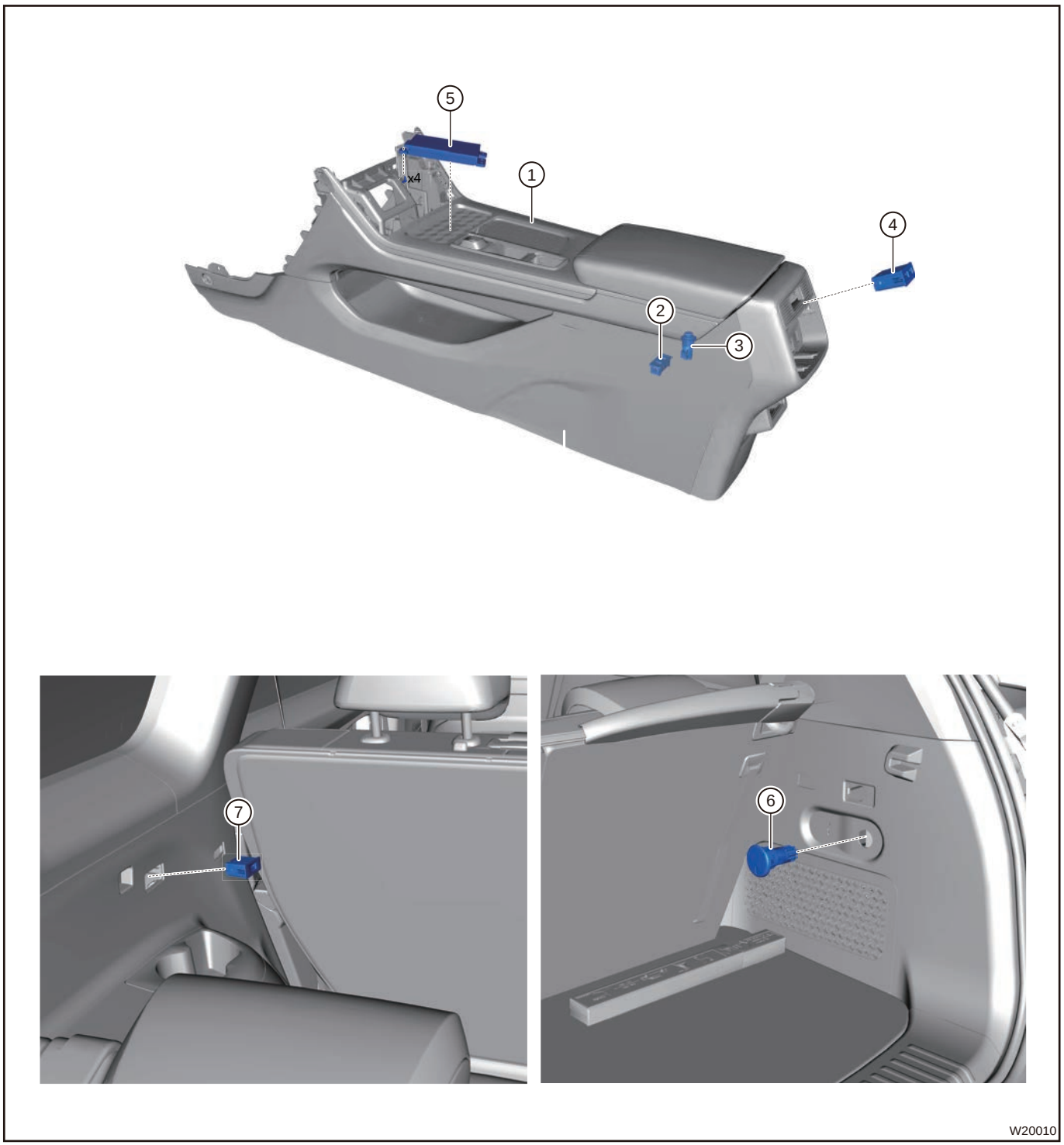
In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) When removing auxiliary fascia console assembly, operate carefully to avoid damaging it .

(2) Be sure to wear safety equipment to prevent accidents, when removing auxiliary fascia console assembly.

2 System Overview

2.1 System Components Diagram



1	Auxiliary Fascia Console Assembly	2	Multi-function Interface
3	Cigarette Lighter Assembly	4	USB Charging Module

5	Mobile Phone Wireless Charging Module	6	Rear Cigarette Lighter Assembly
7	Rear USB Charging Module		

This vehicle is equipped with two 12 V backup power sources, which is located in armrest box and on luggage compartment left protector assembly.Wireless charging adopts an electromagnetic induction technology with convenience, versatility, novelty and safety, so that you can have a better experience while driving.

2.2 Wireless Charging Usage Description

(1) Turn ENGINE START STOP switch to ON mode and place mobile phone in the wireless charging sensing area, then the wireless charging starts to operate, and the audio head unit displays a normal charging symbol; After charging is completed, audio head unit will display a charging completed symbol.

(2) Wireless charging may not work properly in the following conditions:

- The back of mobile phone is more than 8 mm away from wireless charging sensing area, and mobile phone cannot be charged.
- There is thick metal on back of mobile phone (such as 1 yuan coin, metal housing of mobile phone), mobile phone cannot be charged, and audio head unit displays a mark with exclamation mark.
- Wireless charging operation frequency is close to keyless entry working frequency, which is easy to interfere with each other; When door is open/closed, the vehicle will recognize whether the key is left in vehicle, the keyless entry starts to work. At this time, it's necessary to shield charging function; Wait for several seconds, the wireless charging function resumes.

Caution
If your mobile phone does not support the wireless charging function, it is recommended that you do not use the wireless charging paster. The quality of wireless charging paster in the market is uneven and easy to be damaged if used frequently (function failure, poor interface contact, identification failure in metal foreign objects, etc.).

(3) Phone forgetting reminder function

When ENGINE START STOP switch is switched to OFF mode and driver side door is opened, if mobile phone is placed in the wireless charging sensing area, the system will sound an alarm for 20 seconds and alarm stops if the phone is removed within 20 seconds.

Hint
• **Phone forgetting reminder function only supports the mobile phone with wireless charging function.** • **Phone forgetting reminder function needs to be set in the audio system.**

(4) For Wireless Charging System (CWC) function settings and status display item suggestions and signals, refer to signal list:

Level 1 Menu	Level 2 Menu	Selection Item	Note
Vehicle settings	Mobile phone wireless charging function	ON	IHU is set to ON by default, CWC will keep the wireless charging function ON until "OFF" signal is sent from IHU. With wireless charging function ON, CWC starts the wireless charging operation after mobile phone is detected in charging position and ACC signal is received.
		OFF	
	Phone forgetting reminder function	ON	Phone forgetting reminder function will keep ON until "OFF" signal is sent from
		OFF	

Level 1 Menu	Level 2 Menu	Selection Item	Note
			IHU. With forgetting reminder function ON, an alarm signal will be sent to DVD when forgetting reminder condition is detected, and no alarm is sent when forgetting reminder is off.
Display status		In charging	Three display statuses (no icon will be displayed on head unit when vehicle is not charged).
		Charging completed	
		Charging fault	
Forgetting reminder		Sending alarm signal	With mobile phone on CWC, CWC starts to count the time and sends alarm signal to IHU after ACC off signal and driver side door open signal are received by CWC, then head unit alarms. CWC stops sending alarm signal after 20s or if mobile phone is removed within 20s, then head unit stops alarming.
		Stopping alarm signal	

3 Diagnosis & Testing

3.1 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.2 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- When circuit signal is interrupt during detection, wiggle related wire harnesses and connectors.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.

- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.3 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.4 Diagnosis Procedure

Use following procedures to troubleshoot the system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Check if battery voltage is normal.

NG → **Replace battery**

OK

3	**Customer problem analysis**

Next

4	**Read DTCs**

History DTC → **Troubleshoot according to Intermittent DTC malfunction procedures**

Current DTC

5	**Repair according to Diagnostic Trouble Code (DTC) Chart**

Next

6	**Adjust, repair or replace**

Next

7	Conduct test and confirm malfunction has been repaired

Next

End

3.5 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B1B32-16	Power Supply Circuit Voltage Below Threshold
B1B33-17	Power Supply Circuit Voltage Above Threshold
B1B30-92	Foreign Matters Exist - Performance or Incorrect Operation
B1B31-98	Temperature Too High - Component or System Temperature Too High
U2501-88	CAN Bus Off
U0140-87	Lost Communication With BCM
U0248-87	Lost Communication With PEPS
U1300-55	Software Configuration Error - Not Configured

3.6 DTC Diagnosis Procedure

DTC	B1B32-16	Power Supply Circuit Voltage Below Threshold
DTC	B1B33-17	Power Supply Circuit Voltage Above Threshold

DTC	DTC Definition	Possible Cause
B1B32-16	Power Supply Circuit Voltage Below Threshold	• Disconnection or poor connection between battery and instrument panel after engine starting. • Power supply is not stable, and some loads may decrease suddenly. • Power supply is not stable, and load fails suddenly. • Instrument panel wire harness and connector fault.
B1B33-17	Power Supply Circuit Voltage Above Threshold	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Confirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the instrument panel wire harness connector I-040.

(c) Check if wire harnesses are worn, pierced, pinched or partially broken.

(d) Check for broken, bent, protruded or corroded terminals.

(e) Check if related connector pins are in good condition.

NG → **Repair or replace wire harness and connector.**

OK

2	**Check instrument panel power supply voltage**

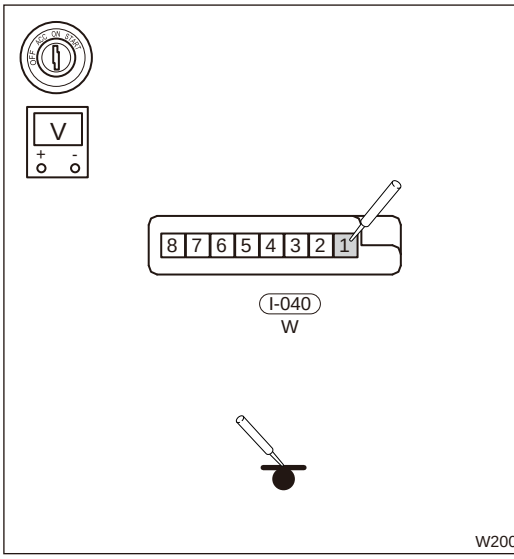
Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the instrument panel wire harness connector I-040.

(c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.

(d) Using a digital multimeter, check for voltage between the terminals of connector I-040 to check if there is an open in instrument panel power supply circuit according to the table below.



Multimeter Connection	Condition	Specified Condition
I-040 (1) (2) to ground	ENGINE START STOP switch “ON”	Not less than 12 V

NG → **Check if instrument panel fuse is burnt.**

OK

3	**Using a 21 W test lamp, test power supply voltage**

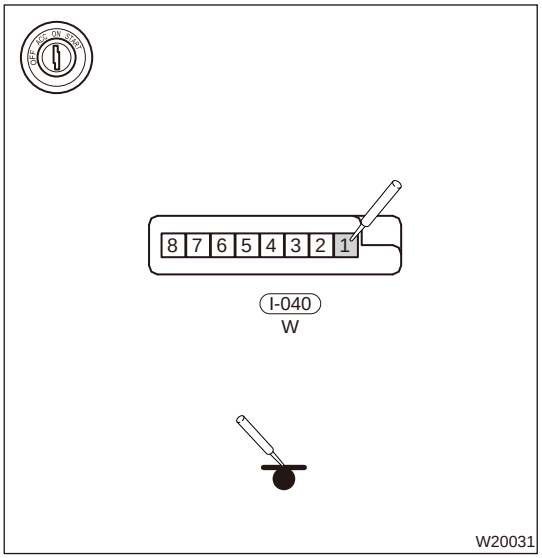
Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the instrument panel wire harness connector I-040.

(c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.

(d) Using a 21 W test lamp, check voltage between the terminals of connector I-040 to check if power supplying of instrument panel power supply voltage is normal according to the table below.



Multimeter Connection	Condition	Specified Condition
I-040 (1) (2) - Body ground	ENGINE START STOP switch "ON"	Test light comes on normally

NG → **Check or replace instrument panel wire harness or connector**

OK ↓

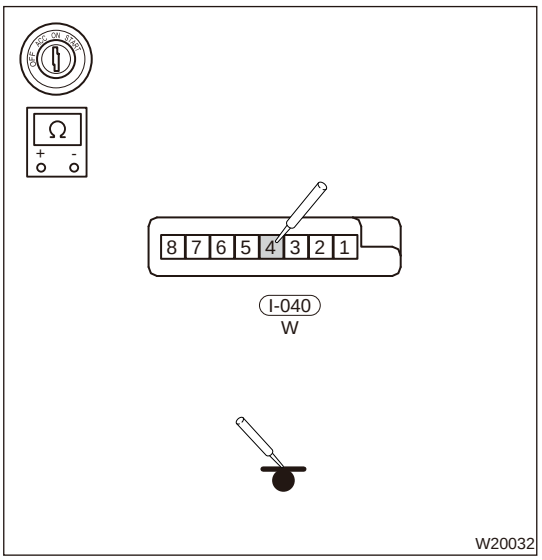
4	Check ground

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the instrument panel wire harness connector I-040.

(c) Measure resistance between terminal 4 of connector I-040 and ground and check if it is open.



Multimeter Connection	Condition	Specified Condition
I-040 (4) - Body ground	ENGINE START STOP switch "ON"	⩽ 1 Ω

NG → **Check and repair instrument panel ground wire harness and ground point.**

OK ↓

5	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect the negative battery cable.

(b) Use diagnostic tester to clear DTCs.

(c) Start the engine.

(d) Check if the same DTCs are still output.

NG	**Replace wireless charging module.**
OK	**System is normal**

DTC	**B1B30 - 92**	**Foreign Matters Exist - Performance or Incorrect Operation**
DTC	**B1B31 - 98**	**Component or System Temperature Too High**

DTC	DTC Definition	Possible Cause
B1B30 - 92	Foreign Matters Exist - Performance or Incorrect Operation	• Foreign matters exist between mobile phone and wireless charging. • Excessive charing time. • Wireless charging paster damaged. • Charging operation out of standard.
B1B31 - 98	Component or System Temperature Too High	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Confirm DTCs**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the instrument panel wire harness connector I-040.

(c) Check if wire harnesses are worn, pierced, pinched or partially broken.

(d) Check for broken, bent, protruded or corroded terminals.

(e) Check if related connector pins are in good condition.

NG	**Repair or replace wire harness and connector.**

OK

2	**Check for foreign matters**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.

(b) Disconnect the instrument panel wire harness connector I-040.

(c) Check for foreign matters between wireless charging module and mobile phone.

NG	**Remove foreign matters.**

OK

3	**Reconfirm DTCs**

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect the negative battery cable.

(b) Use diagnostic tester to clear DTCs.

(c) Start the engine.

(d) Check if the same DTCs are still output.

NG	**Replace wireless charging module.**
OK	**System is normal**

DTC	**U2501-88**	**CAN Bus Off**
DTC	**U0140-87**	**Lost Communication With BCM**
DTC	**U0248-87**	**Lost Communication With PEPS**
DTC	**U1300-55**	**Software Configuration Error - Not Configured**

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

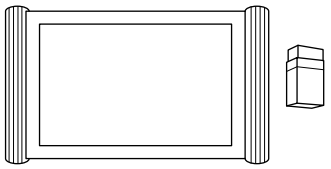
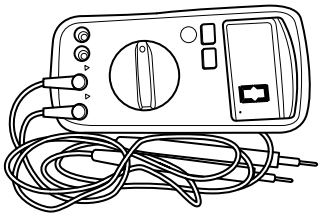
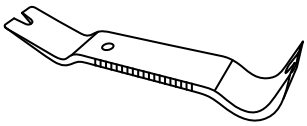
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Refer to CAN communication system for the above communication faults.**

4 On-Vehicle Service

4.1 Tools

Tool Name	Tool Drawing
Diagnostic Tester	 S00001
Digital Multimeter	 S00002
Interior Crow Plate	 S00020

4.2 Replacement of Front Backup Power Supply and Multi-function Interface

■ **Removal**

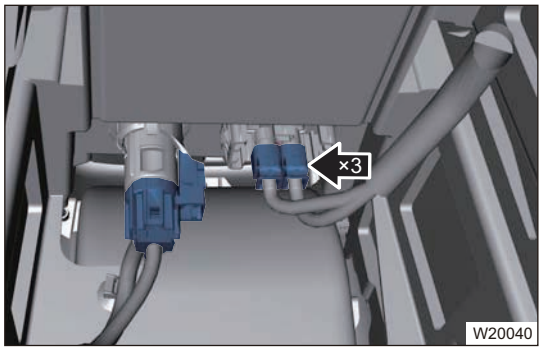
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing front backup power supply.** • **Appropriate force should be applied, when removing front backup power supply. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

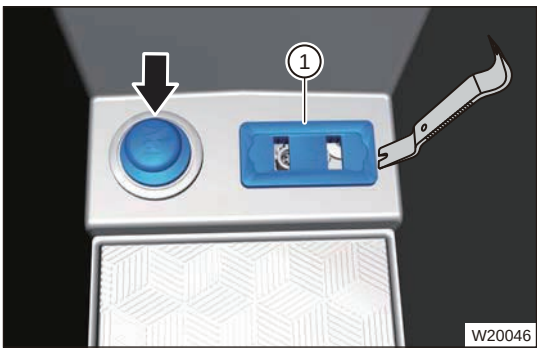
(2) Disconnect the negative battery cable.

(3) Remove the auxiliary fascia console body assembly.

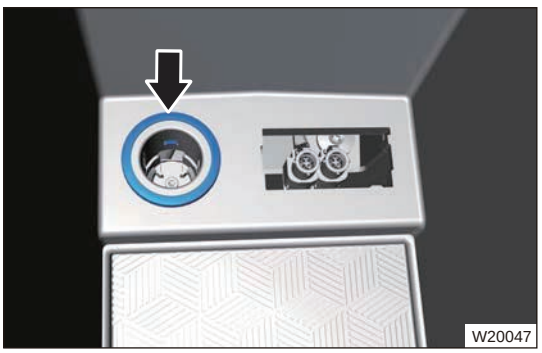
(4) Disconnect USB connector, backup power supply connector.



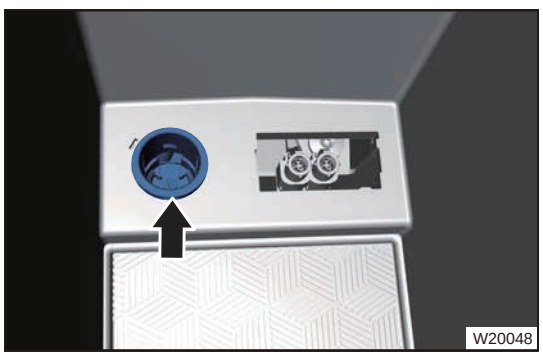
(5) Remove cigarette lighter block cover, and use interior crow plate to pry off multi-function interface (1).



(6) Remove the backup power supply mounting ring.



(7) Remove the cigarette lighter socket.



■ Installation

(1) Install the cigarette lighter socket.
(2) Install the backup power supply mounting ring.
(3) Install backup power supply block cover and multi-function interface.
(4) Connect USB connector, backup power supply connector.
(5) Install the auxiliary fascia console body assembly.

(6) Connect the negative battery cable.

(7) Press ENGINE START STOP switch and perform running test.

4.3 Replacement of USB Charging Module

■ Removal

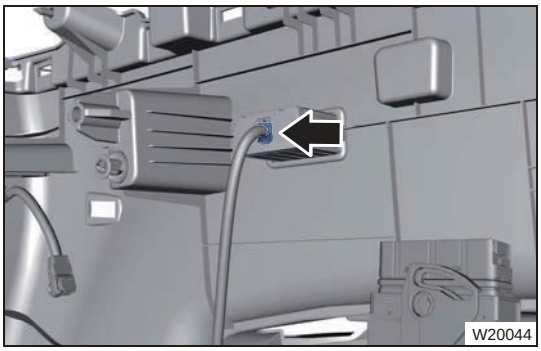
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing USB charging module.** • **Appropriate force should be applied, when removing USB charging module assembly. Be careful not to operate roughly.** • **Try to prevent auxiliary fascia console rear cover assembly from being scratched, when removing USB charging module assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

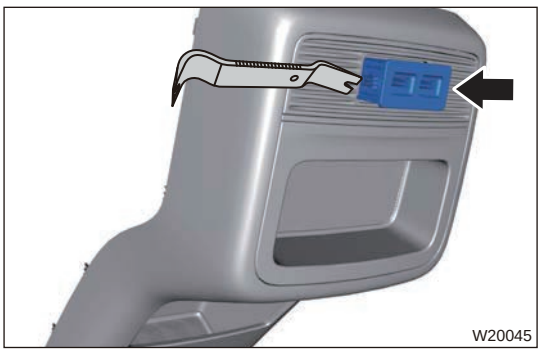
(2) Disconnect the negative battery cable.

(3) Using an interior crow plate, pry off auxiliary fascia console rear cover assembly.

(4) Disconnect the USB charging module connector.



(5) Remove the USB charging module with interior crow plate.



■ **Installation**

Caution
• **Check USB charging module for proper operation after installing USB charging module assembly.** • **When installing USB charging module, assemble it with USB charging module handle facing down and charging symptom at the lower side.**

(1) Install the USB charging module.
(2) Connect the USB charging module connector.
(3) Install the auxiliary fascia console rear cover assembly.
(4) Connect the negative battery cable.
(5) Turn the ENGINE START STOP switch to ON and conduct test.

4.4 Replacement of Rear USB Charging Module

■ **Removal**

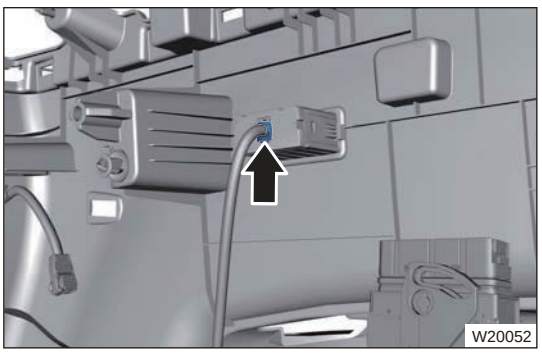
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear USB charging module assembly.** • **Appropriate force should be applied, when removing rear USB charging module assembly. Be careful not to operate roughly.** • **Try to prevent auxiliary fascia console rear cover assembly from being scratched, when removing rear USB charging module assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

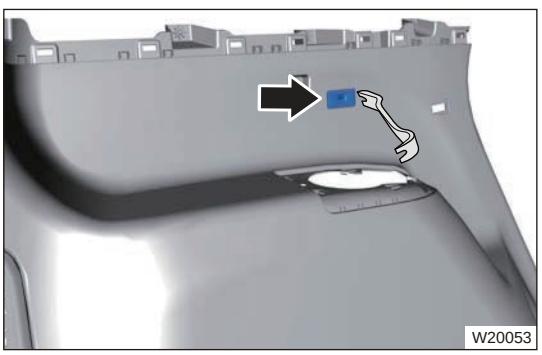
(2) Disconnect the negative battery cable.

(3) Remove the left luggage compartment protector assembly.

(4) Disconnect the rear USB charging module connector.



(5) Remove the rear USB charging module with interior crow plate.



■ **Installation**

Caution
• **Check rear USB charging module for proper operation after installing rear USB charging module assembly.** • **When installing rear USB charging module, assemble it with USB charging module handle facing down and charging symptom at the lower side.**

(1) Install the rear USB charging module.

(2) Connect the rear USB charging module connector.

(3) Install the left luggage compartment protector assembly.

(4) Connect the negative battery cable.

4.5 Replacement of Rear Backup Power Supply

■ **Removal**

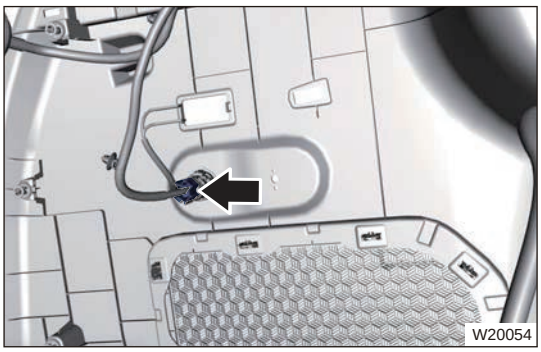
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing rear backup power supply.** • **Appropriate force should be applied, when removing rear backup power supply. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

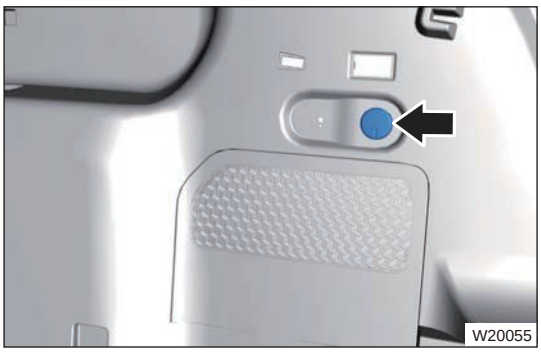
(2) Disconnect the negative battery cable.

(3) Remove the right luggage compartment protector assembly.

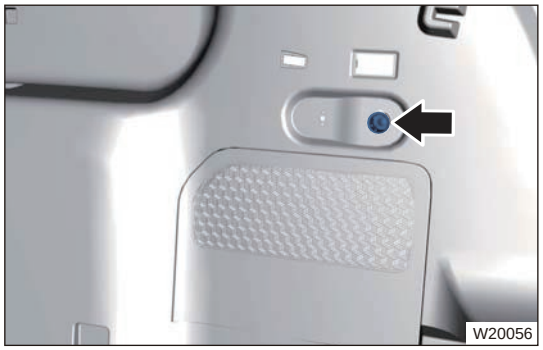
(4) Disconnect the rear backup power connector.



(5) Remove the luggage compartment right power supply block cover.



(6) Remove the rear backup power supply rear base assembly.



■ **Installation**

(1) Install the rear backup power supply rear base assembly to right luggage compartment protector assembly.

(2) Install the rear backup power supply block cover.

(3) Connect the rear backup power supply connector.

(4) Install the right luggage compartment protector assembly.

(5) Connect the negative battery cable.

(6) Press ENGINE START STOP switch and perform running test.

4.6 Replacement of Wireless Charging Module

■ **Removal**

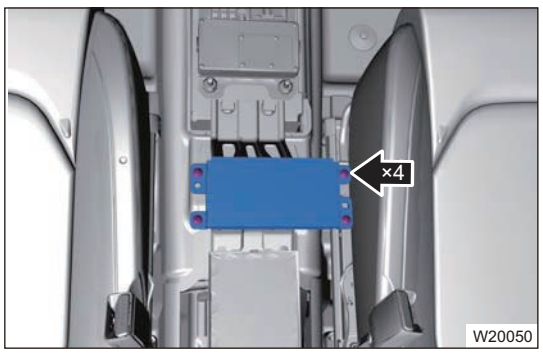
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing wireless charging module assembly.** • **Appropriate force should be applied, when removing wireless charging module assembly. Be careful not to operate roughly.** • **Try to prevent auxiliary fascia console assembly from being scratched, when removing wireless charging module assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

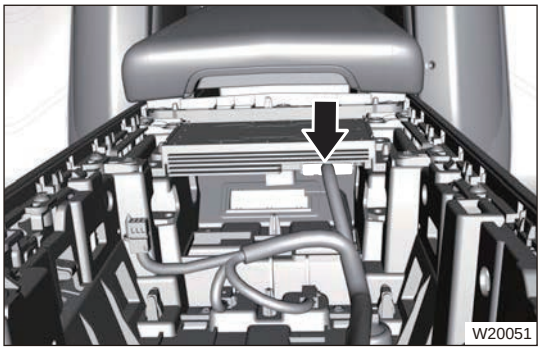
(2) Disconnect the negative battery cable.

(3) Remove the auxiliary fascia console trim panel assembly.

(4) Using a cross screwdriver, remove 4 fixing screws from wireless charging module.



(5) Disconnect the wireless charging module connector and remove wireless charging module assembly.



■ **Installation**

(1) Install wireless charging module assembly and connect wireless charging module connector.
(2) Tighten 4 bolts of wireless charging module.

Tightening torque: 1.5 ± 0.5 N·m

(3) Tighten the wireless charging module connector.
(4) Install the auxiliary fascia console trim panel assembly.
(5) Connect the negative battery cable.
(6) Connect diagnostic tester, read and clear DTCs.

11.12 WIPER AND WASHER

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

(2) Be sure to wear safety equipment to prevent accidents, when removing.

(3) Operate carefully to avoid damaging front/rear windshield to prevent accidents, when removing.

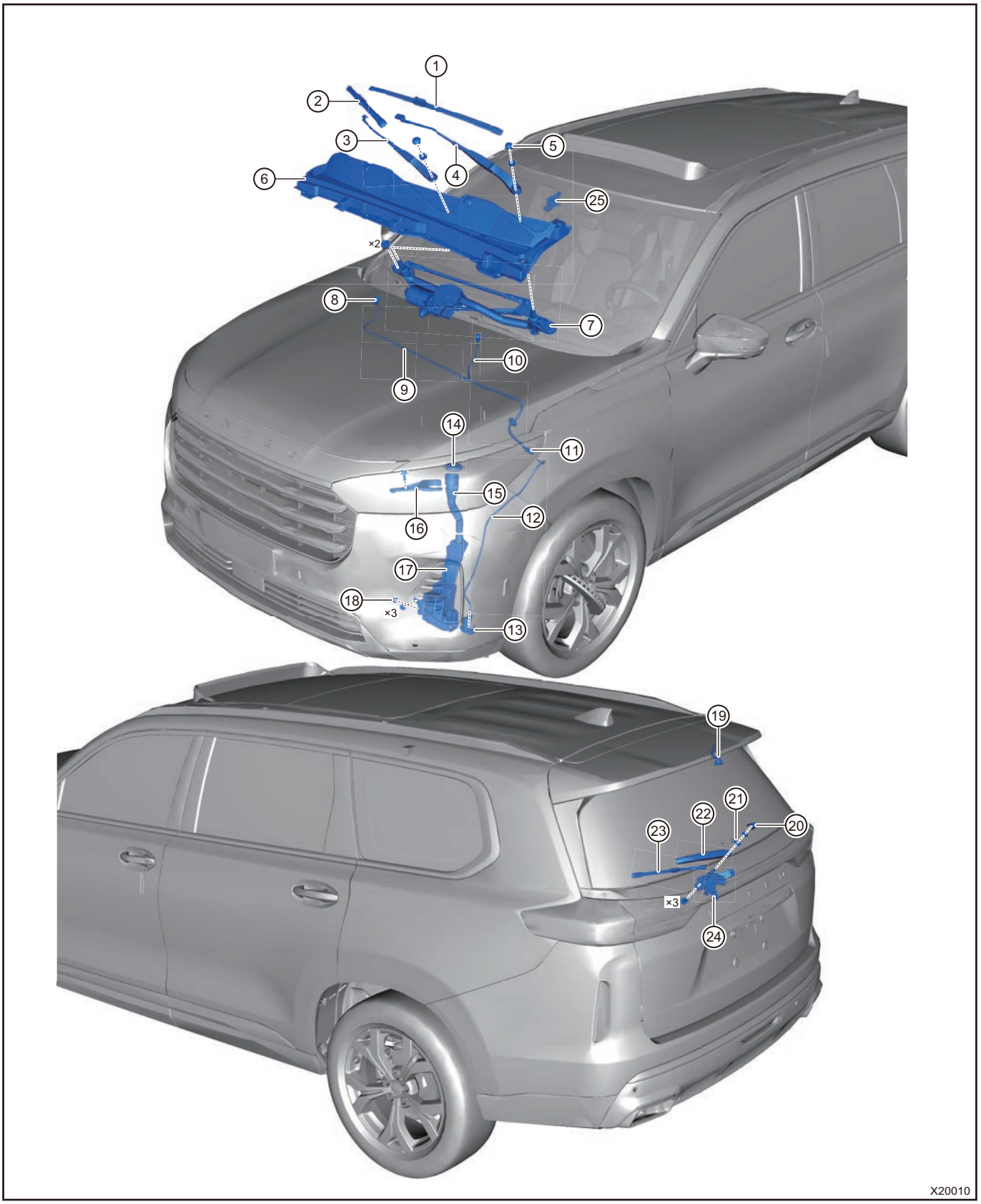
2 System Overview

2.1 System Description

Wiper and washer are important equipment for cleaning the front windshield assembly. which can operate only with ENGINE START STOP switch ON. Driver can control all operations of wiper and washer by moving switch control lever.

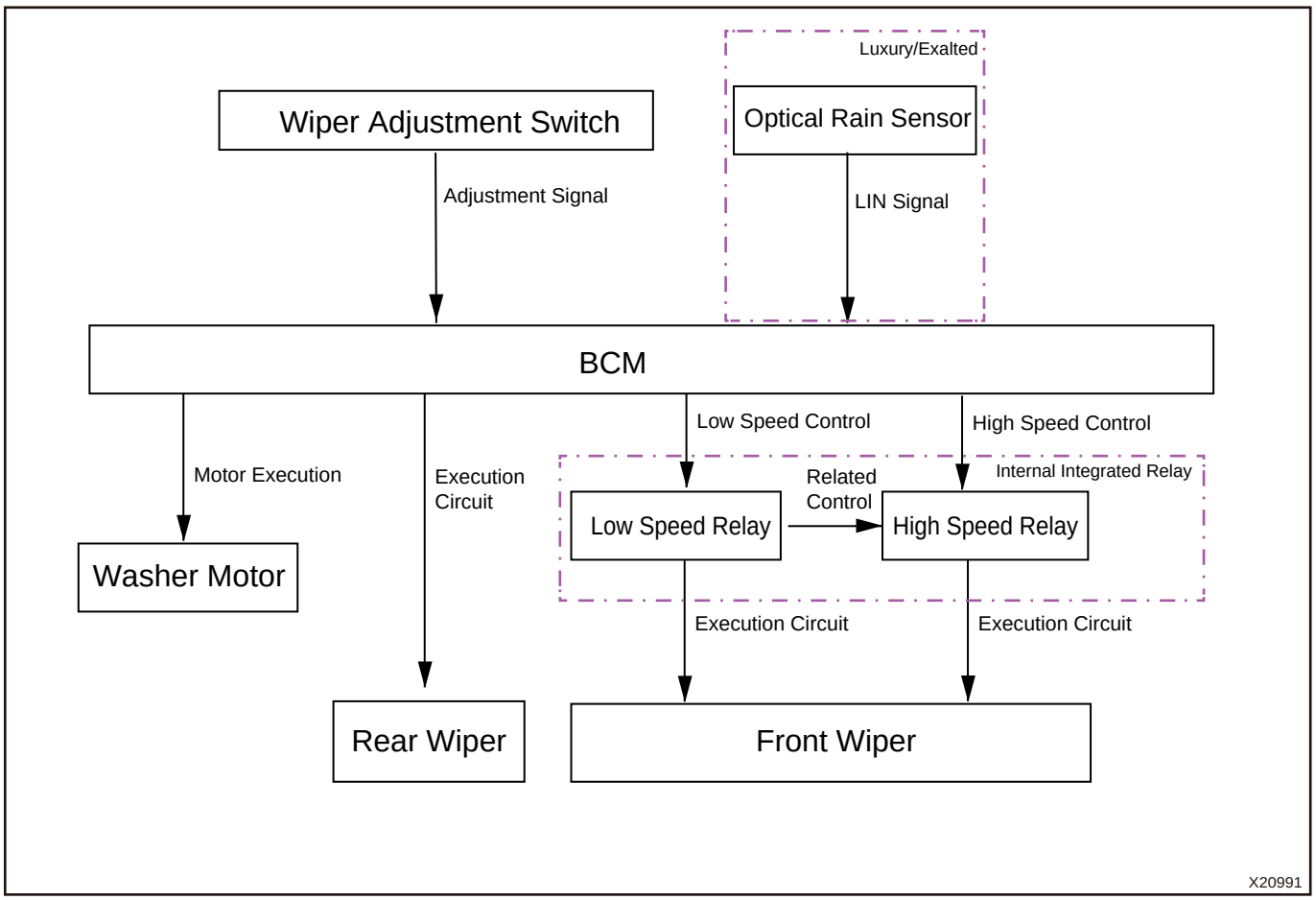
2.2 System Components Diagram

■ Front Wiper Assembly



1	Main Wiper Blade	2	Sub Wiper Blade
3	Sub Wiper Arm	4	Main Wiper Arm
5	Front Wiper Arm Trim Cap	6	Front Windshield Lower Support Assembly
7	Motor and Link Rod Assembly	8	Wiper Front Right Nozzle
9	Right Nozzle Washer Line	10	Left Nozzle Washer Line
11	Washer Line 1	12	Washer Line 2
13	Washer Pump	14	Washer Fluid Reservoir Filler Pipe Cover
15	Washer Fluid Reservoir Filler Pipe	16	Washer Fluid Reservoir Filler Pipe Mounting Bracket
17	Washer Reservoir Assembly	18	Washer Reservoir Fixing Nut
19	Rear Nozzle and Line Assembly	20	Wiper Output Shaft Trim Cap
21	Seal Ring	22	Rear Wiper Arm Assembly
23	Rear Wiper Blade Assembly	24	Rear Wiper Motor Assembly
25	Optical Rain Sensor	26	

2.3 System Schematic Diagram



- Wiper switch signal (front wiper high speed and low speed / rear wiper / washer motor / sensitivity) is transmitted to BCM via each dedicated line.

- The front low speed wiper is controlled by the BCM to turn on the low speed wiper relay, so as to control the operation of the low speed wiper.
- The front high speed wiper is controlled by the BCM to turn on the low speed and high speed wiper relays, so as to control the operation of the high speed wiper.
- After collecting the switch signal, the washer motor is directly controlled by the BCM. The motor is a two-way DC motor, and the control of front washer and rear washer is achieved by different positive and negative signals provided by the BCM.
- After collecting the switch signal, the rear wiper motor is directly controlled by the BCM.
- With switch in Auto, BCM receives LIN signal sent from rain sensor, and drives wiper to operate.

3 Diagnosis & Test

3.1 Problem Symptoms Table

⚠ Caution
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
Both front wiper and washer systems do not operate	Fuse
	Wiper switch assembly
	Washer pump
	BCM
	Wire harness or connector
Front wiper system does not operate in LO or HI	Wiper switch assembly
	Front wiper motor assembly
	BCM
	Wire harness or connector
Front wiper system does not operate	Fuse
	Wiper switch assembly
	Front wiper motor assembly
	BCM
	Wire harness or connector
Front wiper arm and blade do not return to original position when front wiper switch is turned off	Front wiper motor assembly
	BCM
	Wire harness or connector
Both rear wiper and washer systems do not operate	Fuse
	Wiper switch assembly
	Rear wiper motor assembly
	Washer pump
	BCM
	Wire harness or connector

Symptom	Possible Cause
Washer system does not operate	Nozzle assembly
	Wiper switch assembly
	Washer pump
	BCM
	Wire harness or connector

3.2 Diagnostic Help

(1) Connect PAD diagnostic tester (the latest software) with a Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.3 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Standard voltage: Not less than 12 V

NG → **Replace battery**

OK

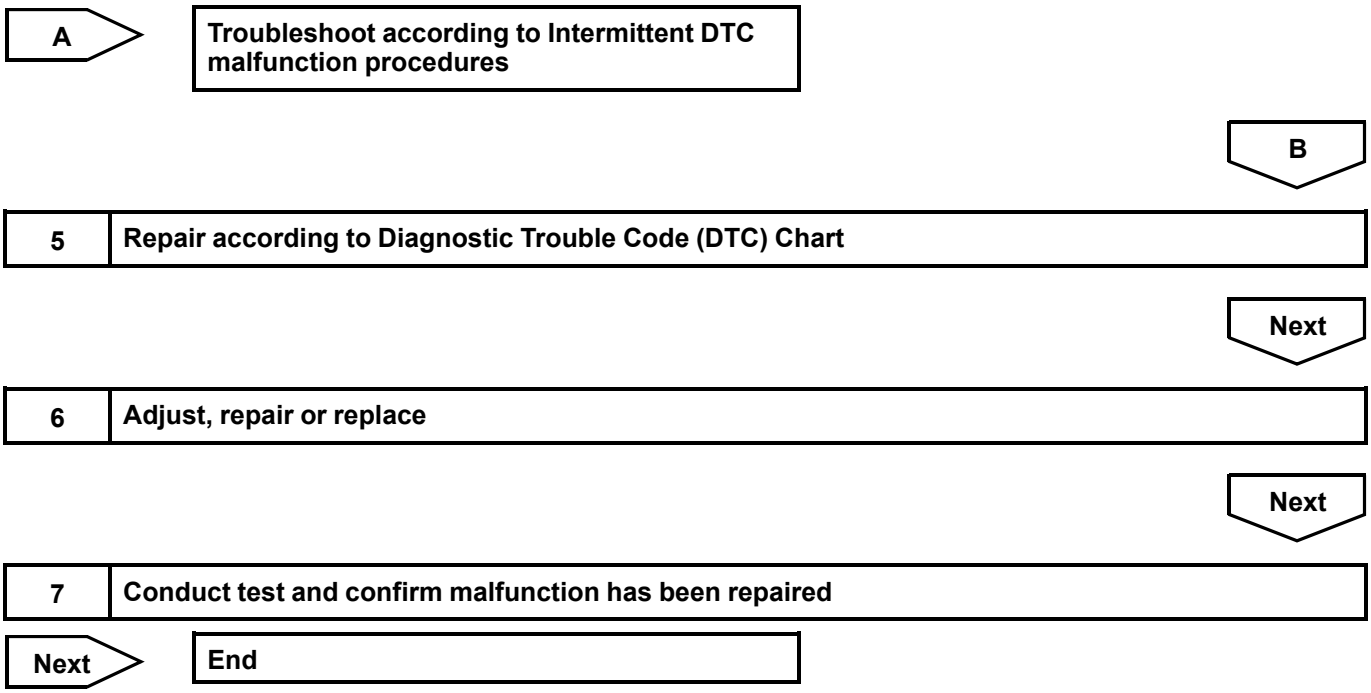
3	**Customer problem analysis**

Next

4	**Read DTCs**

Result

Result	Go to
History DTC	A
Current DTC	B



3.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- When circuit signal is interrupt during detection, wiggle related wire harnesses and connectors.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.6 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B101571	Rear Wiper Built-in Relay Stuck Failure	When output is OFF and ignition switch is OFF, output voltage ＞ 7V. (Deviation is within 10%, duration is more than 100 MS, software performs test once per 10 MS. Test for at lest 3 times before confirmation. Starts to test after 2 seconds. Load outputs regardless of key position when load operation condition is met.) It is stored as the current DTC.	Relay fault	1. Internal relay; 2. Check BCM.
B101671	Rear Washer Built-in Relay Stuck Failure			
B101771	Front Washer Built-in Relay Stuck Failure			
B102111	Front Wiper High/ Low Speed Relay Short to GND or Open	When output is off and ignition switch is OFF, output voltage is more than 7 V, and it is stored as current fault. (The error is less than 10%, the time of duration is more than 100 MS, the software will detect once every 10MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will be output as long as operating conditions of load are met.)	Relay or wire harness fault	1. Check wire harness connector; 2. Relay; 3. Check BCM.
B102511	Front Wiper Enable Relay Short to GND or Open			
B102112	Front Wiper High/ Low Speed Relay Short to Power Supply	Output current is more than 5A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.) and it is stored as current fault.		
B102512	Front Wiper Enable Relay Short to Power Supply			

3.7 DTC Diagnosis Procedure

■ Front Wiper Enable Relay Short to Power Supply Failure

DTC	B1025-12	Front Wiper Enable Relay Short to Power Supply

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).

- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check the wiper relay**

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Remove the wiper relay and check wiper relay for damage.

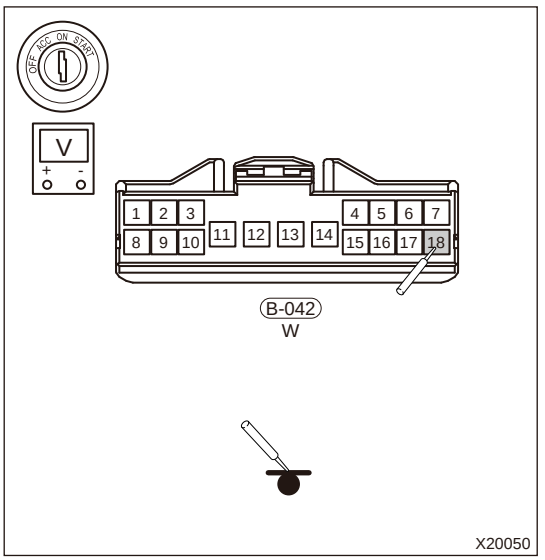
NG → **Replace the relay.**

OK

2	**Check wiper relay power supply voltage**

(a) Turn ENGINE START STOP switch to ON. Turn on front wiper switch.
(b) Using a digital multimeter, check if voltage between connector terminal B-042 (18) and ground is normal according to table below.

Multimeter Connection	Specified Condition
B-042 (18) to Ground	Not less than 12 V



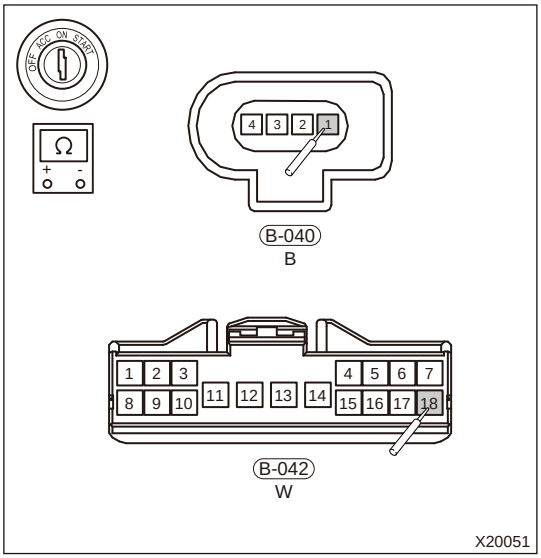
NG → **Repair or replace related wire harness.**

OK

3	**Check the wiper circuit wire harness**

(a) Using a digital multimeter, measure the resistance between connector B-042(18) and B-040(1) wire harness according to table below. Check if it is normal.

Multimeter Connection	Condition	Specified Condition
B-042 (18) to B-040 (1)	Always	⩽ 1 Ω



NG → **Check or replace wire harness or connector.**

OK

4	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

NG → **Replace BCM module.**

OK → **System operates normally.**

■ Washer Relay Stuck Failure

DTC	B1017-71	Front Washer Relay Stuck
DTC	B1016-71	Rear Washer Relay Stuck

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

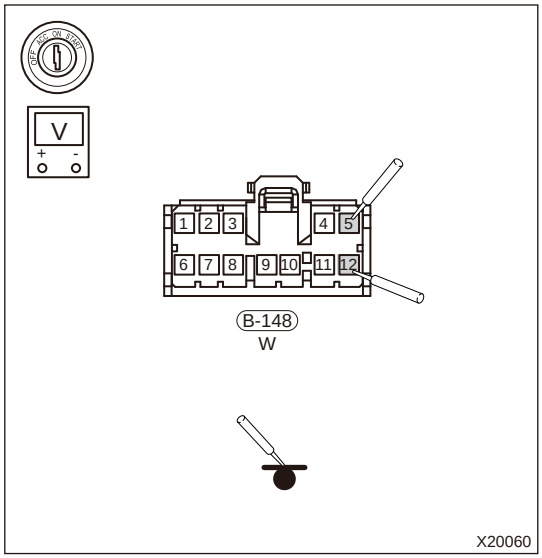
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check washer control circuit output voltage

(a) Turn ENGINE START STOP switch to ON position.

(b) Using a multimeter, check output voltage of front washer circuit and rear washer circuit according to table below.

Multimeter Connection	Condition	Specified Condition
B-148 (5) to body ground	Turn off front washer switch	0 V
B-148 (12) to body ground	Turn off rear washer switch	0 V



NG	**Replace BCM with a new one.**
OK	**Check washer motor and wire harness.**

■ Rear Wiper Control Relay Stuck Malfunction

DTC	B1015-71	Rear Wiper Control Relay Stuck

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

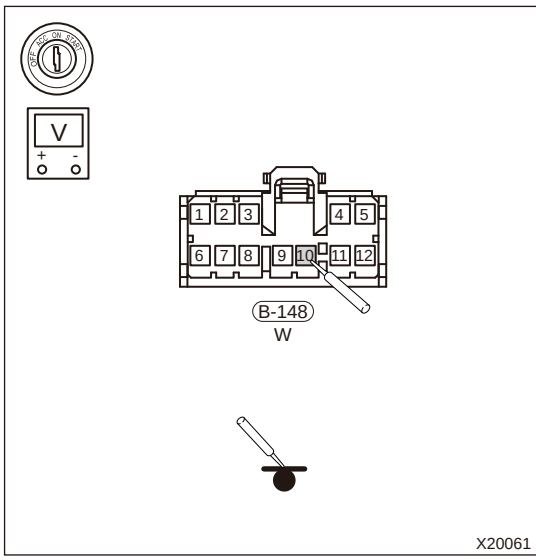
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check output voltage of rear wiper control circuit**

(a) Turn ENGINE START STOP switch to ON position.

(b) Using a multimeter, check output voltage of rear washer circuit according to table below.

Multimeter Connection	Condition	Specified Condition
B-148 (10) to body ground	Turn off rear wiper switch	0V



OK	Check the rear wiper motor and wire harness.
NG	Replace BCM with a new one.

■ **LIN Communication Timeout between BCM and Rain Sensor**

DTC	U1008-87	LIN Communication Timeout between BCM and Rain Sensor

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check rain sensor connector

(a) Check if optical rain sensor connector is infirmly connected or poorly contacted.

NG	Check the rear wiper motor and wire harness.

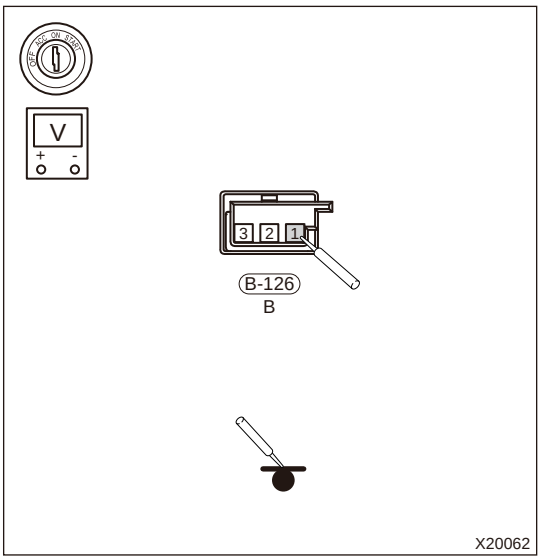
OK

2	Check optical rain sensor power supply voltage

(a) Turn ENGINE START STOP switch to ON position.

(b) Check optical rain sensor terminal B-126 (1) and power supply voltage of body ground.

Multimeter Connection	Condition	Specified Condition
B-126 (1) to body ground	ENGINE START STOP switch ON	Not less than 12 V



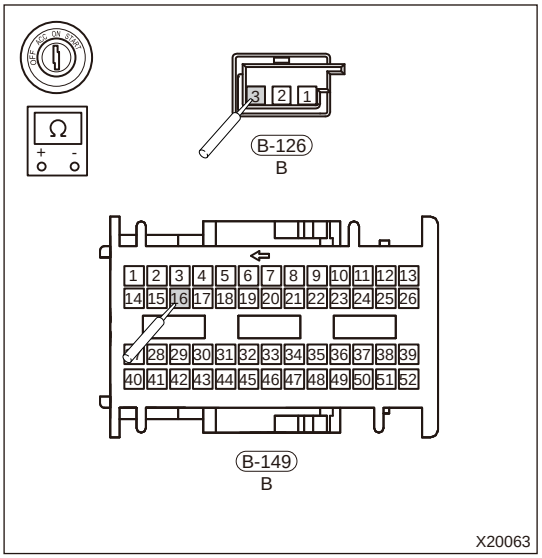
NG	Check wire harness between B-126 (1) and instrument panel fuse and relay box.

OK

3	Check wire harness between rain sensor B-126 (3) and connector B-149 (1).

(a) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-126 (3) and B-149 (16)	ENGINE START STOP switch OFF	⩽ 1 Ω



NG → **Replace or repair wire harness**

OK

4	Check the rain sensor

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Install new rain sensor and check if malfunction still exists.

NG → **Check wire harness between rain sensor and BCM.**

OK

5	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Turn ENGINE START STOP switch to ON.
(c) Using a diagnostic tester, read ECU DTC.
(d) Check if DTC still exists.

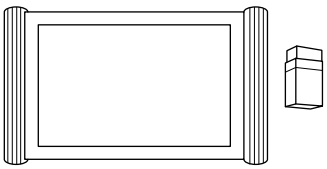
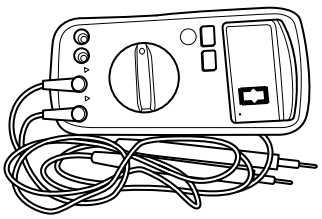
NG → **Replace with a new BCM to check if fault reoccurs.**

OK → **System is normal**

4 On-Vehicle Service

4.1 Tools

■ General Tools

Tool Name	Tool Drawing
Digital Multimeter	 RCH0001006
X-431 PAD Diagnostic Tester	 RCH0002006

4.2 Replacement of Wiper Switch Assembly

■ Removal

Hint

- **Be sure to wear safety equipment to prevent accidents, when removing wiper switch assembly.**
- **Appropriate force should be applied, when removing wiper switch assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing wiper switch assembly.**

(1) Turn off all electrical equipment and the ignition switch.

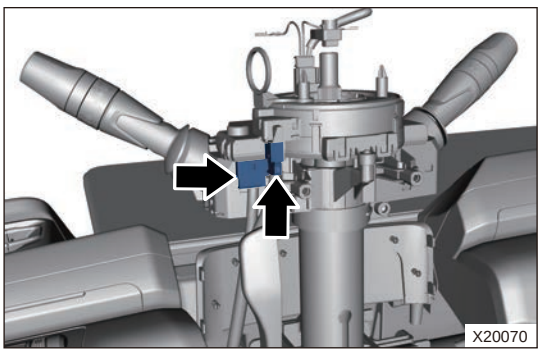
(2) Disconnect the negative battery cable.

(3) Remove the driver airbag.

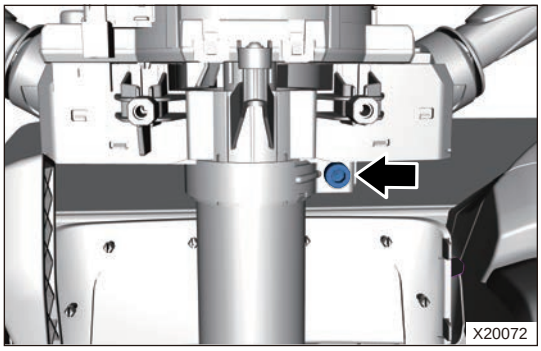
(4) Remove the steering wheel.

(5) Remove the combination switch cover assembly.

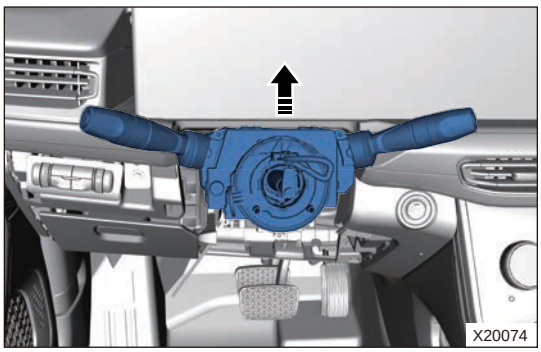
(6) Disconnect wiper switch connector and angle sensor connector.


X20070

(7) Loose 1 fixing screw of SCM module.



(8) Remove wiper switch assembly (integrated on SCM module) from steering column in the direction of arrow.



■ **Installation**

Caution
• **Always install correctly according to specified operating instructions.** • **Check that horn operates normally after installation.** • **Check SRS warning light after installation, and make sure that supplemental restraint system operates normally.**

(1) Install SCM module with coil spring to steering column.

(2) Install and tighten fixing screw of coil spring.

Installation torque: 6 ± 0.5 N·m

(3) Connect SCM module wire harness connector and angle sensor connector.

(4) Install the combination switch cover assembly.

(5) Install the steering wheel assembly.

(6) Install the driver airbag.

4.3 Replacement of Front Wiper Blade Assembly

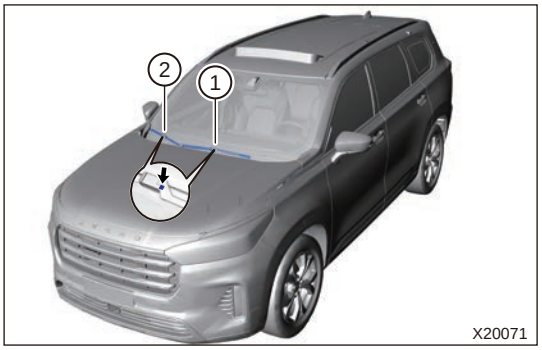
■ **Removal**

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front wiper blade assembly.** • **Appropriate force should be applied when removing front wiper blade assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch, move up wiper switch rapidly on the right side of steering wheel.

(2) Disconnect the negative battery cable.

(3) As shown in illustration, press the button in the direction of arrow, slightly pull it outwards to remove front wiper main blade (1) and front wiper sub blade (2).



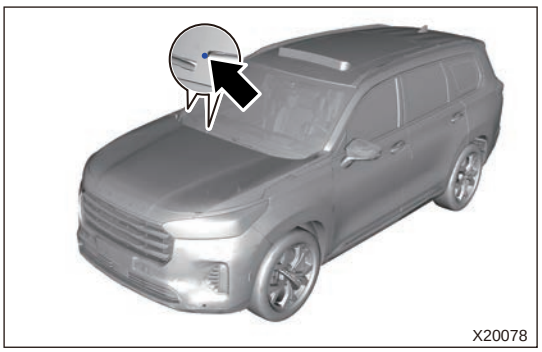
■ **Installation**

Caution
• **Always operate carefully to prevent other components from being damaged, when installing front wiper arm assembly.** • **Be sure to tighten fixing nuts to specified torque, when installing front wiper arm assembly.** • **Check front wiper arm assembly for proper operation after installation.**

(1) Place the wiper arm in vertical position.

(2) Insert wiper blade into slot of wiper arm, then pull it securely. It is installed in place until a click sound is heard.

(3) Pay attention to locating points on front windshield assembly during installation. Wiper arm blade should be pressed against locating points.



4.4 Replacement of Front Wiper Arm Assembly

■ **Removal**

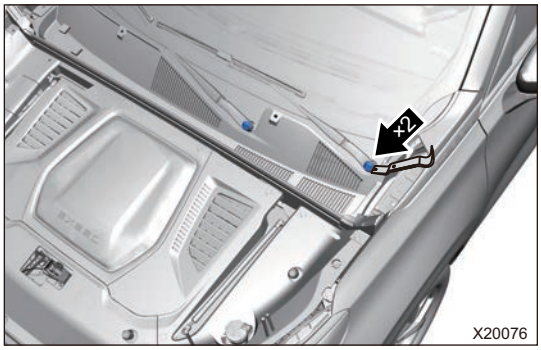
Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front wiper arm assembly.** • **Appropriate force should be applied, when removing front wiper arm assembly. Be careful not to operate roughly.** • **Try to prevent front windshield assembly from being scratched, when removing front wiper arm assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

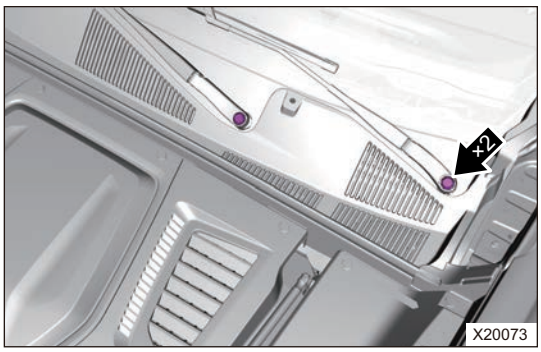
(2) Open the engine hood.

(3) Disconnect the negative battery cable.

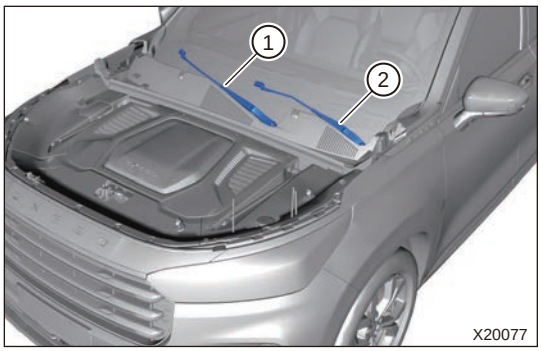
(4) Using an interior crow plate, remove the front wiper arm trim cap.



(5) Remove 2 fixing nuts from front wiper arm assembly.



(6) Remove front main wiper arm (1) and front sub wiper arm (2).



■ Installation

Hint:
Adjust front wiper arm assembly to proper position when installing.

Caution
• **Always operate carefully to prevent other components from being damaged, when installing front wiper arm assembly.** • **Be sure to tighten fixing nuts to specified torque, when installing front wiper arm assembly.** • **Check front wiper arm assembly for proper operation after installation.**

(1) Install front main wiper arm and front sub wiper arm in order.
(2) Install 2 fixing nuts to front wiper arm assembly.

Installation torque: 24 ± 2 N·m

(3) Secure front wiper arm trim cap to nut.

4.5 Replacement of Front Wiper Motor and Link Rod Assembly

■ Removal

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing front wiper motor assembly.** • **Appropriate force should be applied, when removing front wiper motor assembly. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing front wiper motor assembly.**

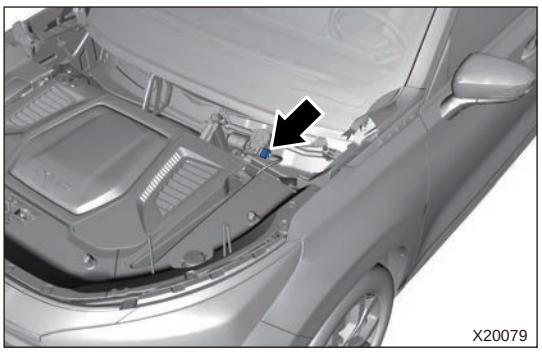
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

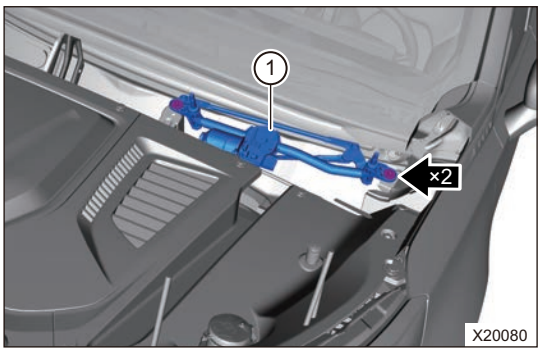
(3) Remove front wiper arm and blade assembly.

(4) Remove the front windshield lower support assembly.

(5) Disconnect connector from wiper motor and link rod assembly.



(6) Remove 2 fixing bolts from wiper motor and link rod assembly and then remove wiper motor and link rod assembly (1).



■ Inspection

(1) Check the wiper link rod.

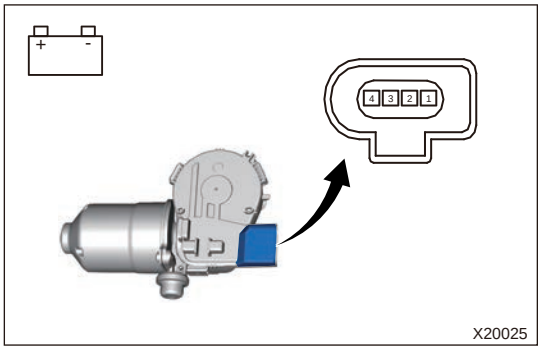
1) Check pivot for looseness or falling off, link rod for deformation or breakage, and shaft sleeve for sticking. Replace the wiper link rod if necessary.

(2) Check the front wiper motor assembly.

1) Check the LO operation.

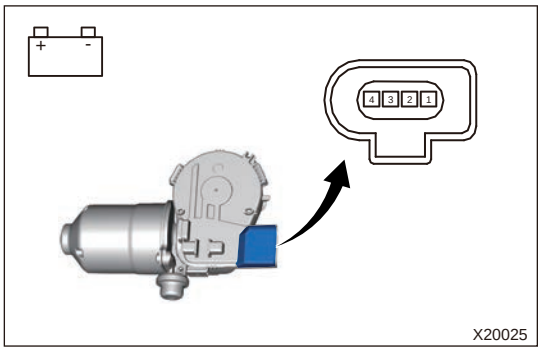
Measurement Condition	Specified Condition
Battery negative (-) → Terminal 4	Motor running at low speed (LO)
Battery positive (+) → Terminal 2	

If result is not as specified, replace front wiper motor assembly.



2) Check the HI operation.

Measurement Condition	Specified Condition
Battery negative (-) → Terminal 4	Motor running at low speed (HI)
Battery positive (+) → Terminal 1	



3) Check the auto reset function.
   - Connect positive (+) battery lead to terminal 2 or 1, and connect negative (-) battery lead to terminal 4. When motor runs at low speed (LO) or high speed (HI), disconnect battery positive (+) to stop front wiper motor at any position other than the original position.
   - Connect terminal 4 and terminal 3 with a lead and then connect another to middle of positive (+) battery, and connect negative (-) battery lead to terminal 2 to make motor operate to original position at low speed (LO) again.
   - Check whether the front wiper motor assembly can stop automatically after it operates to original position. OK: Motor operates to original position and stops automatically, that is, motor can reset automatically. If result is not as specified, replace front wiper motor assembly.

■ Installation

Caution

- **Always operate carefully to prevent other components from being damaged, when installing front wiper motor assembly.**
- **Adjust and make sure wiper motor and link rod are at original position, before installing front wiper motor assembly, otherwise, wiper system cannot operate normally.**
- **Install connector in place and tighten fixing bolts and nuts to the specified torque when installing front wiper motor assembly.**
- **Check wiper system for proper operation after installing front wiper motor assembly.**

(1) Place wiper motor and link rod assembly to its fixing position.

(2) Secure 2 fixing bolts connected between wiper motor and link rod assembly and vehicle body.

Tightening torque: 7 ± 1 N·m

(3) Connect wiper motor connector.

(4) Install the front windshield lower trim board assembly.

(5) Install the front wiper arm assembly.

(6) Install the negative battery cable.

(7) Turn the ENGINE START STOP switch to ON and performing running test.

4.6 Replacement of Front Nozzle Assembly

■ Removal

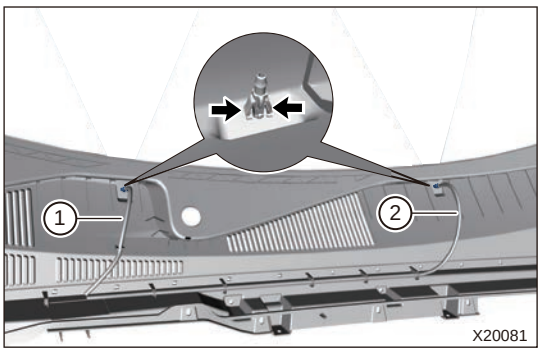
Warnings
• **Be sure to wear safety equipment to prevent accidents, when removing front nozzle assembly.** • **Appropriate force should be applied, when removing front nozzle assembly. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

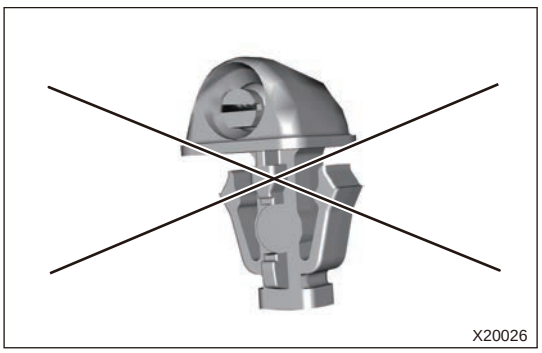
(3) Open the engine compartment cover.

(4) Using an interior crow plate, pry off front nozzle assembly from engine compartment cover and disconnect spray hose (1), (2).



■ Inspection

(1) Check front nozzle for blockage, deformation or damage. Replace front nozzle if necessary.



■ Installation

Caution
• **Always operate carefully to prevent components from being damaged, when installing front nozzle assembly.** • **Install washer line joints in place, when installing front nozzle assembly.** • **Check front nozzle for proper operation, after installing front nozzle assembly.**

(1) Connect spray hose to front nozzle assembly.
(2) Secure front nozzle assembly to engine compartment cover.

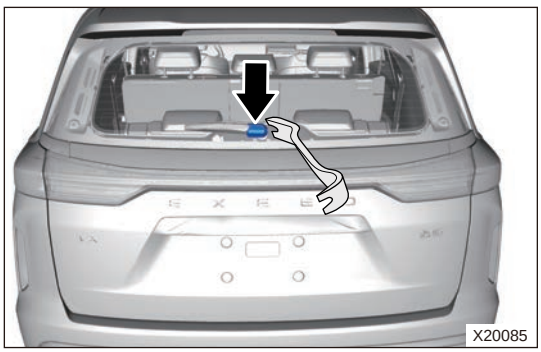
4.7 Replacement of Rear Wiper Arm Blade Assembly

■ Removal

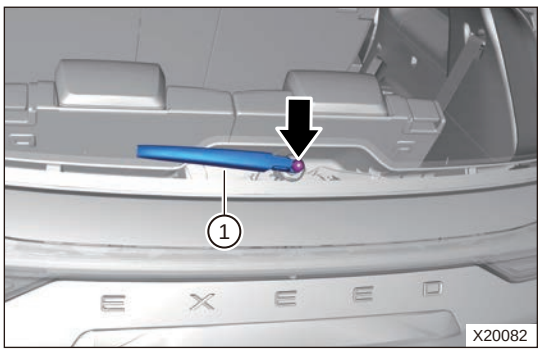
Warnings

- **Be sure to wear safety equipment to prevent accidents, when removing rear wiper arm blade assembly.**
- **Appropriate force should be applied, when removing rear wiper arm blade assembly. Be careful not to operate roughly.**
- **Try to prevent rear windshield assembly from being scratched, when removing rear wiper arm blade assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Use an interior crow plate to pry up trim cap.



(4) Remove fixing nut and rear wiper arm blade assembly (1).

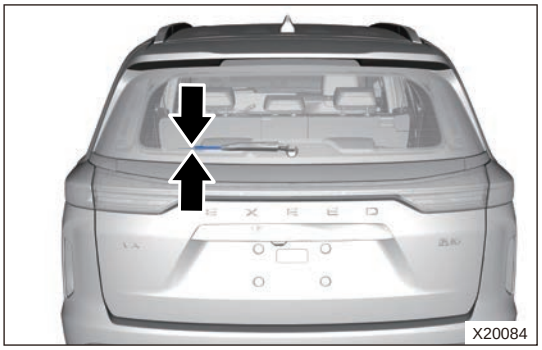


■ Installation

Warnings

- **Always operate carefully to prevent other components from being damaged, when installing rear wiper arm blade assembly.**
- **Be sure to tighten fixing nuts to specified torque, when installing rear wiper arm blade assembly.**
- **Check rear wiper arm blade assembly for proper operation, after installing rear wiper arm blade assembly.**

(1) Install rear wiper arm blade assembly to a proper position.



Caution
Blade end is located between the lowest electric heat wire and glass black edge.

(2) Install 1 fixing nut to rear wiper arm blade assembly.

Tightening torque: 10 ± 1.5 N·m

(3) Install the rear wiper arm trim cap.

4.8 Replacement of Rear Wiper Motor Assembly

■ Removal

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing rear wiper motor assembly.** • **Appropriate force should be applied when removing rear wiper motor assembly. Be careful not to operate roughly.** • **Try to prevent rear windshield assembly from being scratched, when removing rear wiper motor assembly.**

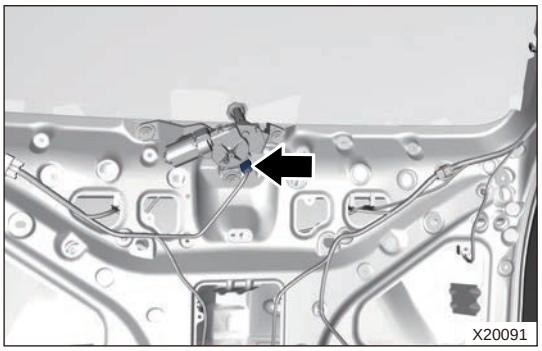
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

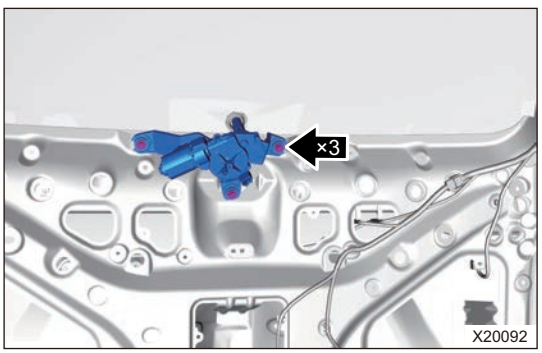
(3) Remove the rear wiper arm blade assembly.

(4) Remove the back door protector assembly.

(5) Disconnect the rear wiper motor assembly connector.



(6) Remove 3 fixing bolts from rear wiper motor assembly.

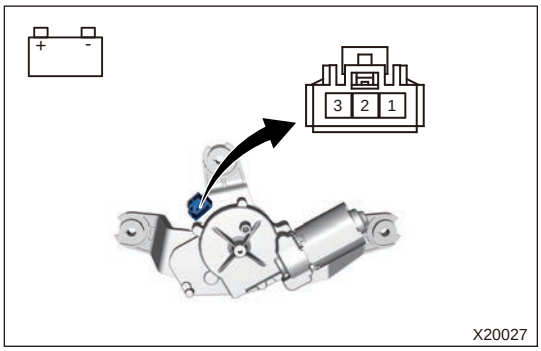


(7) Remove the rear wiper motor assembly.

■ **Inspection**

(1) Check the rear wiper motor assembly operation.

Measurement Condition	Specified Condition
Battery negative (-) → Terminal 3	Motor runs normally
Battery positive (+) → Terminal 1	



If result is not as specified, replace rear wiper motor assembly.

(2) Check the auto reset function.

- Connect negative (-) battery lead to terminal 3, and connect positive (+) battery lead to terminal 1. Disconnect positive (+) battery lead when motor is operating to stop rear wiper motor on a position except for automatic stop position.
- Connect positive (+) battery lead to terminal 1, and connect negative (-) battery lead to terminal 2 in order to run motor again.
- Check that motor can return to original position automatically.

If result is not as specified, replace rear wiper motor assembly.

■ **Installation**

Caution
• **Always operate carefully to prevent other components from being damaged, when installing rear wiper motor assembly.** • **Be sure to tighten fixing nuts to specified torque, when installing rear wiper motor assembly.** • **Check wiper arm assembly for proper operation, after installing rear wiper motor assembly.**

(1) Install and fasten 3 bolts those secure rear wiper motor assembly to vehicle.

Tightening torque: 7 ± 1 N·m

(2) Connect and fasten rear wiper motor connector.

(3) Install the back door protector assembly.

(4) Install the rear wiper arm blade assembly.

(5) Install the negative battery cable.

4.9 Replacement of Washer Pump Assembly

■ **Removal**

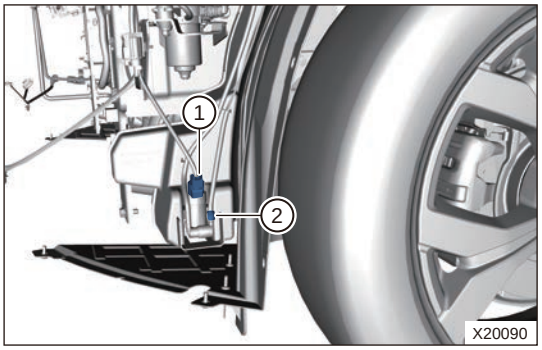
Caution
• **Be sure to wear safety equipment to prevent accidents, when removing washer pump assembly.** • **Appropriate force should be applied, when removing washer pump assembly. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing washer pump assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

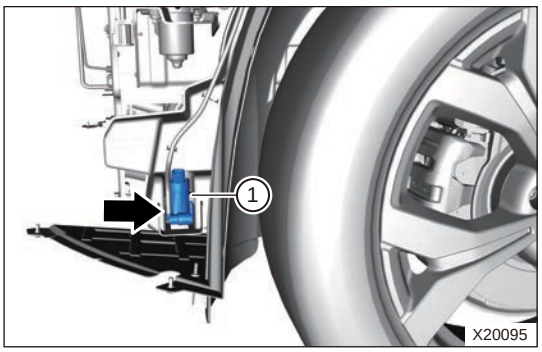
(2) Disconnect the negative battery cable.

(3) Remove the front bumper assembly.

(4) Disconnect washer pump connector (1), and disconnect joint (2) between rear washer line and washer pump.



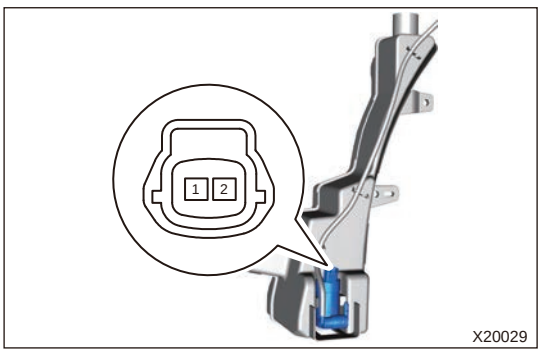
(5) Disconnect joint between front washer line and washer pump, and remove washer pump assembly (1).



■ Inspection

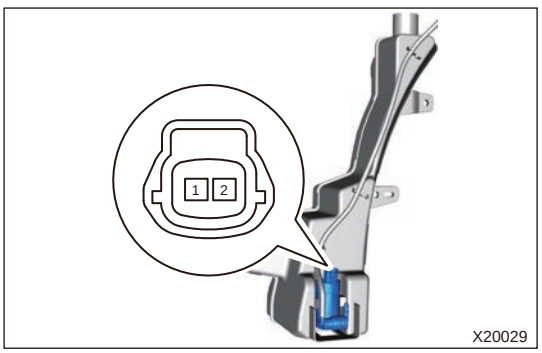
(1) Fill washer fluid reservoir assembly with washer fluid.

(2) Connect positive (+) battery lead to terminal 1 of washer pump, and connect negative (-) battery lead to terminal 2.



(3) Check that washer fluid flows out of front washer pump.
If result is not as specified, replace the washer pump assembly.

(4) Connect positive (+) battery lead to terminal 1 of washer pump, and connect negative (-) battery lead to terminal 2.



(5) Check that washer fluid flows out of rear washer pump.
If result is not as specified, replace the washer pump assembly.

■ **Installation**

Caution
• **Always operate carefully to prevent components from being damaged, when installing washer pump assembly.** • **Install washer line joint in place, when installing washer pump assembly.** • **Check washer system for proper operation, after installing washer pump assembly.**

(1) Secure the washer pump assembly.

(2) Connect joint between rear washer line and washer pump and joint between front washer line and washer pump.

(3) Connect the front and rear washer pump connectors.

(4) Install the front bumper assembly.

(5) Connect the negative battery cable.

(6) Turn the ENGINE START STOP switch to ON and performing running test.

4.10 Replacement of Washer Fluid Reservoir Assembly

■ **Removal**

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing washer fluid reservoir assembly.** • **Appropriate force should be applied, when removing washer fluid reservoir assembly. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing washer fluid reservoir assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

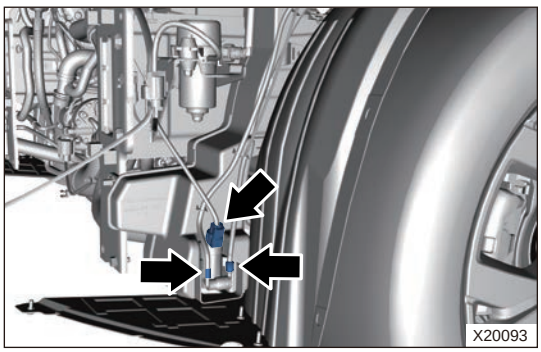
(3) Remove the engine compartment trim cover assembly.

(4) Remove the front bumper assembly.

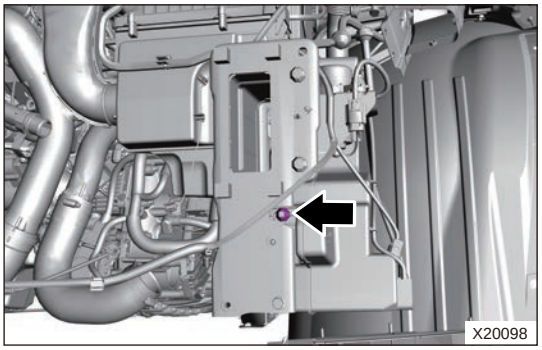
(5) Remove the front left wheel assembly.

(6) Remove the front left wheel house protector assembly.

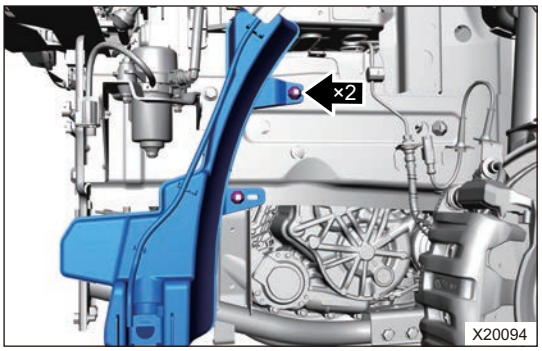
(7) Disconnect washer pump front/rear spraying pipe and connector, and remove spraying pipe from washer fluid reservoir.



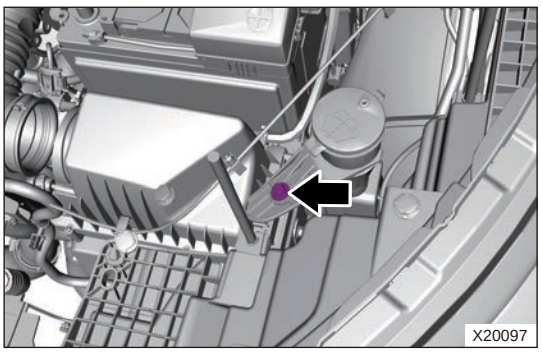
(8) Remove the washer reservoir fixing bolt.



(9) Remove 2 fixing bolts from rear side of the washer reservoir.



(10) Remove 1 fixing bolt from washer fluid reservoir filler pipe mounting bracket, and remove the washer fluid reservoir assembly.



■ Inspection

(1) Check washer fluid reservoir assembly for leakage, deformation or damage. Replace washer fluid reservoir assembly if necessary.

(2) Check internal and external sides of washer fluid reservoir for dirt. Remove dirt or replace washer fluid reservoir assembly if necessary.

(3) Check grommet for damage. Replace grommet if necessary.

■ Installation

Caution
• **Always operate carefully to prevent components from being damaged, when installing washer fluid reservoir assembly.** • **Tighten fixing bolts to specified torque, when installing washer fluid reservoir assembly.** • **Install washer line joint in place when installing washer fluid reservoir assembly.**

(1) Install washer fluid reservoir assembly, install and tighten 3 nuts between washer fluid reservoir assembly and vehicle body.

Tightening torque: 4 ± 1 N·m

(2) Install and tighten 1 fixing bolt to washer fluid reservoir filler pipe mounting bracket.

Tightening torque: 6 ± 1 N·m

(3) Connect the washer pump connector.

(4) Install the washer pump front/rear spraying pipe.

(5) Install the front left wheel house protector assembly.

(6) Install the front left wheel assembly.

(7) Install the front bumper assembly.

(8) Install the engine compartment trim cover assembly.

(9) Connect the negative battery cable.

(10) Turn the ENGINE START STOP switch to ON and performing running test.

4.11 Replacement of Front Washer Line Assembly

■ **Removal**

Caution
• **Be sure to wear safety equipment to prevent accidents, when removing washer line assembly.** • **Appropriate force should be applied, when removing washer line assembly. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing washer line assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the front windshield lower support assembly.

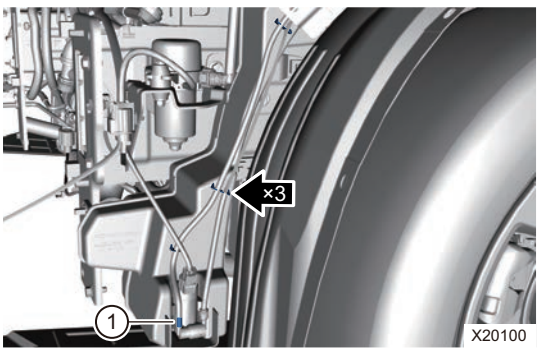
(4) Remove the front nozzle assembly.

(5) Remove the front bumper assembly.

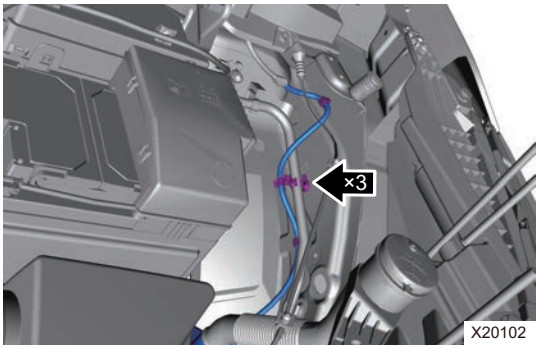
(6) Remove the front left wheel assembly.

(7) Remove the front left wheel house protector assembly.

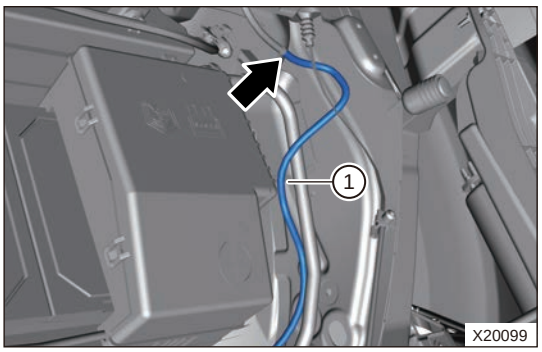
(8) Disconnect joint (1) between front washer line and front washer pump, and disconnect 3 fixing clips from washer reservoir.

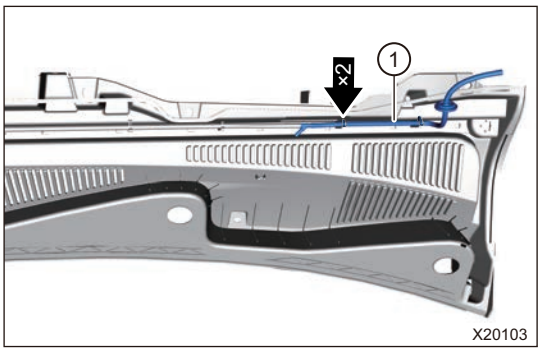


(9) Remove 3 fixing clips from washer line on the inner side of wing, and remove washer line 2.

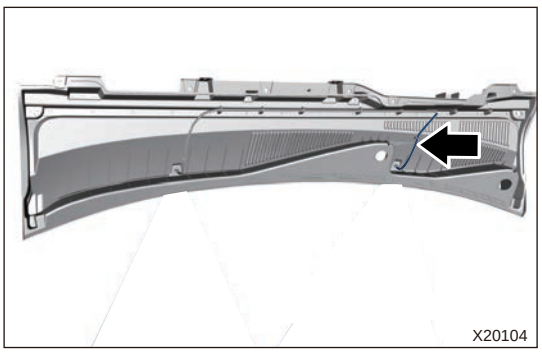


(10) Disconnect connection between washer line 2 and washer line 1, and remove washer line 1.

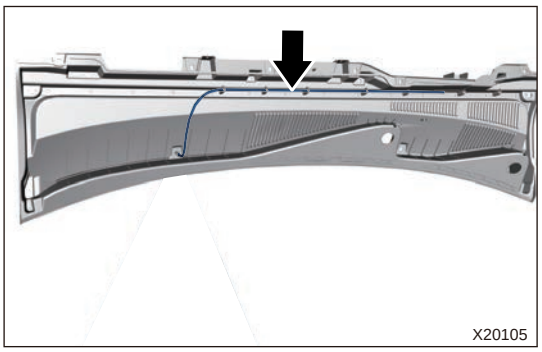




(11) Disconnect 2 fixing clips from front washer nozzle pipe with three way rubber plug assembly and remove front washer nozzle pipe with three way rubber plug assembly (1). Disconnect left nozzle pipe assembly and remove it.



(12) Disconnect right nozzle pipe assembly and remove it.



■ **Installation**

Caution
• **Always operate carefully to prevent components from being damaged, when installing washer line assembly.** • **Install washer line joint in place, when installing washer line assembly.** • **Check washer system for proper operation, after installing washer line assembly.**

(1) Install the right nozzle pipe assembly.

(2) Install the left nozzle pipe assembly.

(3) Install the front washer nozzle pipe with three way rubber plug assembly.

(4) Connect washer line 2 and washer line 1.

(5) Install washer line 2 and secure 3 fixing clips.

(6) Install joint (1) between front washer line and front washer pump, and secure 3 fixing clips on washer reservoir.

(7) Install the front left wheel house protector assembly.

(8) Install the front left tire assembly.

(9) Install the front nozzle assembly.

(10) Install the front windshield lower trim board assembly.

(11) Install the front bumper assembly.

(12) Connect the negative battery cable.

(13) Turn the ENGINE START STOP switch to ON and performing running test.

4.12 Replacement of Optical Rain Sensor Assembly

■ **Removal**

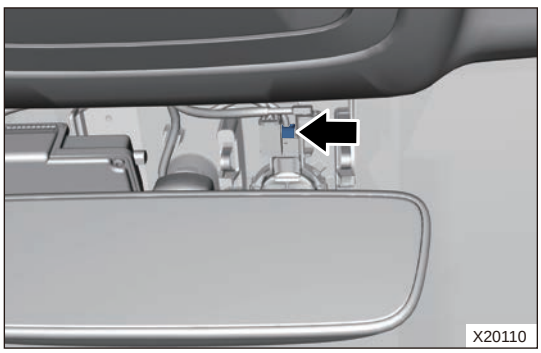
Caution
• **Be sure to wear safety equipment to prevent accidents, when removing optical rain sensor assembly.** • **Appropriate force should be applied, when removing the optical rain sensor assembly. Be careful not to operate roughly.** • **Try to prevent front windshield assembly from being scratched, when removing optical rain sensor assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

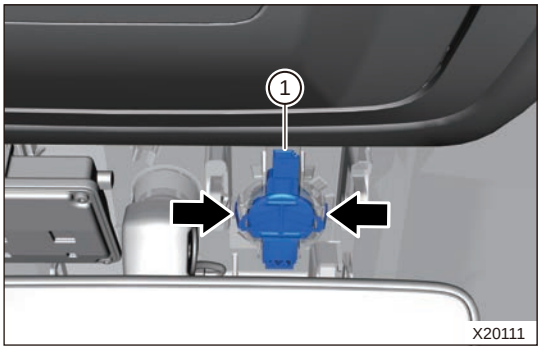
(2) Disconnect the negative battery cable.

(3) Remove the driving recorder assembly.

(4) Disconnect the optical rain sensor assembly connector.



(5) Press optical rain sensor fixing clip and remove optical rain sensor assembly.



■ Installation

Caution
• **Always operate carefully to prevent other components from being damaged, when installing optical rain sensor assembly.** • **Install the sensor in place when installing optical rain sensor assembly.**

(1) Install optical rain sensor assembly to proper position and tighten fixing clip.

(2) Install the optical rain sensor assembly connector.

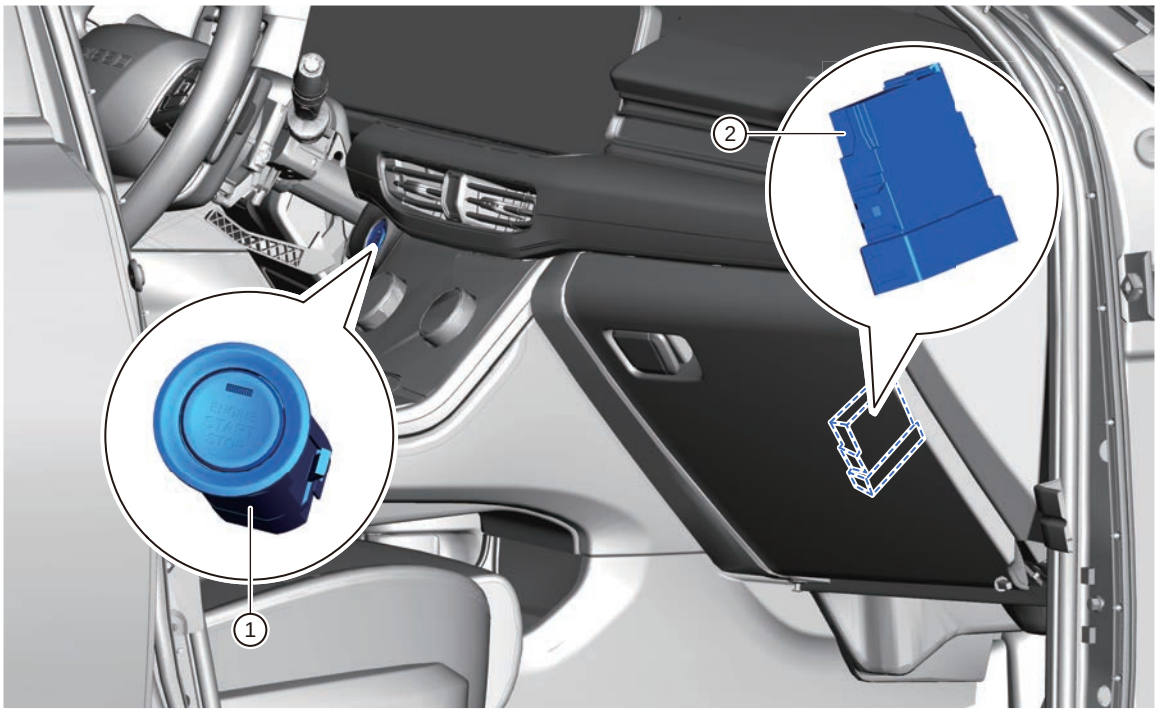
(3) Install the driving recorder assembly.

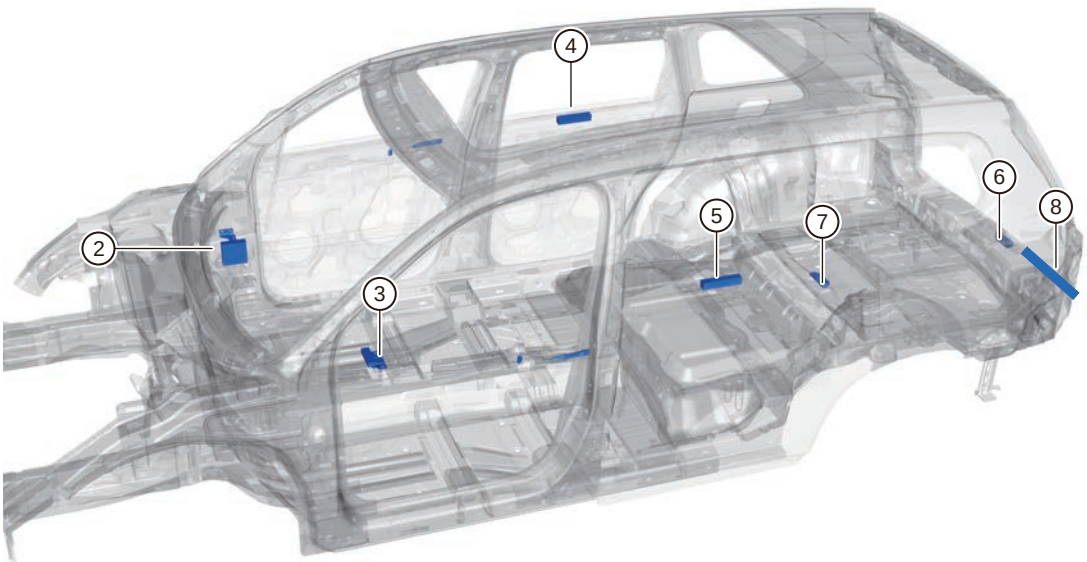
(4) Install the negative battery cable.

11.13 PEPS SYSTEM

1 System Overview

1.1 Description



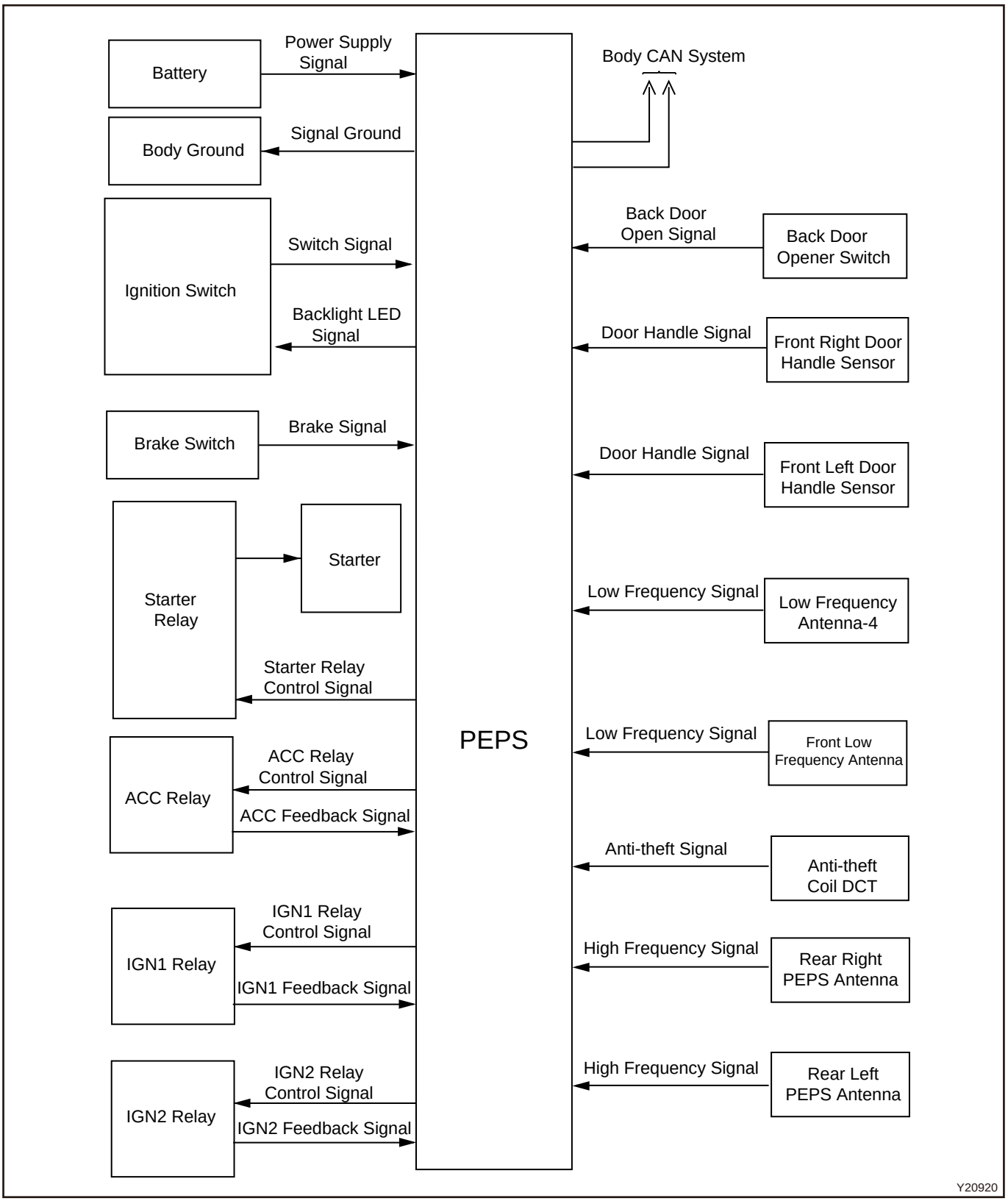


Y20010

1	ENGINE START STOP Switch	2	PEPS Module
3	Front Interior Low Frequency Antenna	4	High Performance Antenna
5	High Performance Antenna	6	Back Door Release Switch
7	Rear Interior Low Frequency Antenna	8	Rear Low Frequency Antenna (on Rear Bumper Crossmember Body)

PEPS system consists of PEPS controller, ENGINE START STOP switch, built-in low frequency antennas (A total of 3 low frequency antennas and 2 high performance antennas are equipped in vehicle to detect key position), immobilizer coil for back up starting, front left/right door handle sensor (front left/right door handle), back door microswitch and remote controller (also called smart key).

1.2 System Principle



- Passive Entry & Passive Start (PEPS) verifies that the user is legitimate through low frequency signal and high frequency signal communication transmission between vehicle and key. In this way, the matching operation between user and vehicle through mechanical key is avoided.

- The verification method is to send a random number request of 125 kHz low frequency from the vehicle to the remote control carried by the user after detecting the relevant instructions of the user, and then the remote control sends an encrypted radio frequency response signal of 433 MHz to the vehicle for matching. After matching, the relevant action request of the user is executed.

1.3 Key Management

■ Key Learning and Erasing

Number of Key

No.	Description
1	Key management, which can support up to 4 keys to learn

Key Learning

No.	Description
1	Command of learning a key: Learn keys to PEPS through diagnostic tester.
2	Command of learning 2 keys: Learn 2 keys to PEPS through diagnostic tester. Learn 2 keys instructions for the production line new key learning process. For learning old keys, add them one by one through the "-Learn a key" command

(1) When learning a key, PEPS reads the key ID through IMMO, and ensure that the key and the front antenna are within 5 cm.

(2) The process of learning a key is as follows:

<table>
<tr><th>Step</th><th colspan="3">Start learning for 1 key</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">Is the number of keys learned less than 4?</td><td>No</td><td>End, the diagnostic tester feedback key learning number exceeds the maximum number or battery voltage is not in the learning range.</td></tr>
<tr><td>Yes</td><td>Next</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">Place the key close to the key icon on the lower part of the instrument cluster (-within 5cm from the IMMO antenna).</td><td>No</td><td>Place the key near the antenna.</td></tr>
<tr><td>Yes</td><td>Next</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">Click the diagnostic tester to learn how to operate a key. PEPS stores key information and feedback the success of key learning.</td><td>No</td><td>Trying time is more than 2 times; End, diagnostic tester reports no key found or invalid key.</td></tr>
<tr><td>Yes</td><td>Next</td></tr>
<tr><td>4</td><td colspan="3">PEPS stores key related information and feedback on key learning success.</td></tr>
</table>

When PEPS does not learn the key, or learned key has been cleared. When two keys are learned through diagnosis, PEPS wakes up the key by silently recognizing the wakeup ID:0x0F0F0F0F inside the key, the key end receives the corresponding wakeup VID, and when the field strength is greater than the set threshold value, the high frequency replies the corresponding IMMO ID. After receiving the corresponding IMMO ID, PEPS wakes up the corresponding key through the IMMO ID. If the IMMO ID only with two keys is received, PEPS automatically completes the learning process of the two keys.

When PEPS has learned one key and executes the instruction to learn two keys, PEPS wakes up through VID and receives the IMMO ID feedback of one key, then it learns that key. If no IMMO ID feedback is detected or more than one IMMO ID is detected, the learning fails and the current learning process exits.

When PEPS has learned two or more keys and learned two keys through the diagnostic tester, the VID stored in PEPS will wake up the key, the key end will receive the corresponding woke VID, and when the field strength is greater than the set threshold value, the high frequency will reply the corresponding IMMO ID. If PEPS detects two IMMO IDs and both IMMO IDs are stored in PEPS, the feedback learning succeeds. Otherwise, the feedback learning fails.

When two keys are learned, when VID is awakened, if high frequencies reply at the same time, the feedback information of keys cannot be received, resulting in key learning failure. Therefore, during the learning of two keys, when the key receives the LF demand corresponding to the learning of two keys, it will respond at high frequency after random delay. The random time is as follows: 0, T, 2T, 3T, T is greater than the minimum time for key high frequency recovery.

Key Erasing

No.	Description
1	If you need to clear the keys (for reasons such as lost keys), you need to clear all the keys first, and then re-learn the existing keys (or add new keys). To accomplish this, perform the selected diagnostic tester PEPS special function operation. The instruction of learning two keys is mainly used for PEPS without learning, and the key is the new key, which can be carried out. And the instruction of learning a key, both old and new key can be used.

■ **Remote Function**

Remote Operation Mode

No.	Description
1	Single press: Trigger time of lock/unlock button is 50ms-2000ms, and the trigger time of back door button is 50ms-1500ms.
2	Long press: Trigger time of lock/unlock button is more than 2000ms, and the trigger time of back door button is more than 1500ms.
3	Double press: Button is triggered twice continuously within 1.5 seconds (only the lock button has this function).

Remote Function

No.	Description
1	Remote locking: OFF, operate lock button on remote controller, PEPS needs to send remote lock command.
2	Remote unlocking: OFF, operate unlock button on remote controller, PEPS needs to send remote unlock command.
3	Remote back door opening: When the remote back door button is operated for more than 1.5 seconds, PEPS needs to send the remote back door opening command.
4	Remote searching vehicle: OFF, operate remote lock button continuously within 1.5 seconds, PEPS needs to send remote searching vehicle command.

No.	Description
5	Remote window up: OFF, long press remote lock button for more than 2 seconds, PEPS sends Global close command.
6	Remote window down: OFF, long press remote unlock button for more than 2 seconds, PEPS sends Global open command.

(1) Remote locking function

1) Enabled conditions: PDU is in OFF or remote mode.
2) Trigger conditions: RKE lock command received from valid point (single press).
3) Execution action:
   i. PEPS sends three frames (0x404), (0x404) RKECmd = 0x01 (all doors lock). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms;
   ii. The FOB ID in 0x155 is updated to the key ID currently in use (key index1/key index2/key index3).

(2) Remote unlocking function

1) Enabled conditions: PDU is in OFF or remote mode.
2) Trigger conditions: RKE unlock command received from valid point (single press).
3) Execution action:
   i. PEPS sends three frames (0x404), (0x404) RKECmd = 0x03 (all doors unlock). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms;
   ii. The FOB ID in 0x155 is updated to the key ID currently in use (key index1/key index2/key index3).

(3) Remote opening back door

1) Enabled conditions: None
2) Trigger conditions: Long press back door button for more than 1.5 seconds (long press).
3) Execution action:
   i. When back door button is pressed, PEPS sends three frames (0x404) RKECmd = 0x08 (luggage compartment stops). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms;
   ii. After 1.5 seconds of pressing button continuously, first send three frames (0x404) RKECmd = 0x04 (luggage compartment unlocks). Then it sends three frames (0x404) RKECmd=0x00, period is 40ms;
   iii. After detecting key releasing, first send three frames (0x404) RKECmd = 0x07 (Global stop). Then it sends three frames (0x404) RKECmd=0x00, period is 40ms;
   iv. FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3). The FOB ID in 0x155 is updated to the key ID currently in use (key index1/key index2/key index3).

(4) Remote car location

1) Enabled conditions: PDU is in OFF or remote mode.
2) Trigger conditions: Operate the remote lock button twice continuously within 1.5 seconds (press twice continuously).
3) Execution action:
   i. PEPS sends three frames (0x404), (0x404) RKECmd = 0x01 (all doors lock). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms;
   ii. When button is pressed for second time, first send three frames (0x404) RKECmd=0x09 (Vehicle search). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms.
   iii. FOB ID in 0x155 periodically indicates key ID (key index1/key index2/key index3)

(5) Remote window up

1) Enabled conditions: PDU is in OFF or remote mode.
2) Trigger conditions: Long press remote lock button for more than 2 seconds (long press).
3) Execution action:

i. PEPS sends three frames (0x404), (0x404) RKECmd = 0x01 (all doors lock). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms;

ii. Send three frames (0x404) RKECmd = 05 (Global closing) after 2 seconds. Then it sends three frames (0x404) RKECmd=0x00, period is 40ms;

iii. After detecting key releasing, first send three frames (0x404) RKECmd = 0x07 (Global stop). Then it sends three frames (0x404) RKECmd=0x00, period is 40ms;

iv. FOB ID in 0x155 periodically indicates key ID (key index1/key index2/key index3)

(6) Remote window down

1) Enabled conditions: PDU is in OFF or remote mode

2) Trigger conditions: Long press remote lock button for more than 2 seconds (long press)

3) Execution action:

i. PEPS sends three frames (0x404) RKECmd = 0x03 (all doors unlock). Then it sends three frames (0x404) RKECmd=0x00, the period is 40ms;

ii. Send three frames (0x404) RKECmd = 06 (Global opening) after 2 seconds. Then it sends three frames (0x404) RKECmd=0x00, period is 40ms;

iii. After detecting key releasing, first send three frames (0x404) RKECmd = 0x07 (Global stop). Then it sends three frames (0x404) RKECmd=0x00, period is 40ms;

iv. FOB ID in 0x155 periodically indicates key ID (key index1/key index2/key index3)

Key Strategy

No.	Description
1	The maximum trigger time of the key is 20 seconds to prevent the battery from being fed due to the key sticking.
2	The key and PEPS controller have the synchronization function. When the rolling code of key exceeds the rolling code 512 stored in PEPS, remote control needs to be operated again to achieve the synchronization of the rolling codes. Remote control function recovers automatically. The key and PEPS controller have the synchronization function. When the rolling code of key exceeds the rolling code 512 stored in PEPS, remote control needs to be operated again to achieve the synchronization of the rolling codes. Remote control function recovers automatically.

1.4 Key Searching

■ Searching for Front Left Door Outside Key

No.	Description
1	Power gear position is in OFF or remote mode, front left door closes. In locked state, trigger the left PE to unlock, and search for the left outside key.
2	Power gear position is in OFF or remote mode, four doors close. Trigger the left PE to lock, and search for the left outside key.
3	Power gear position is not in OFF or in non-remote mode, trigger the left PE to lock, and search for the left outside key.

■ **Searching for Front Right Door Outside Key**

No.	Description
1	Power gear position is in OFF or remote mode, front right door closes. In locked state, trigger the right PE unlock area, and search for the right outside key
2	Power gear position is in OFF or remote mode, four doors close. Trigger the right PE lock area, and search for the right outside key.
3	Power gear position is not in OFF or in non-remote mode, trigger right PE to lock, and search for the right outside key.

■ **Searching for Key in Outside Area of Back Door**

No.	Description
1	Press back door button, find key in outside area of back door.

■ **Searching for Key in All Areas in Vehicle**

No.	Description
1	Press back door button, find key in outside area of back door.
2	State of five doors changes, find the key in vehicle.
3	Not in R, brake input is valid, find the key in vehicle.
4	In R gear, vehicle speed exceeds 4 km/h for first time , find the key in vehicle.
5	PE lock request, find the key outside the vehicle after the execution of the car keys.
6	Fortifying deactivation state changes to fortifying state, find the key in vehicle.

Note: For performing PS to find the key, including the following: After finding the legal key through the low frequency, the valid time of the legal key is 5 seconds. Even if the key is not in the car within 5 seconds, SSB can be triggered to perform the operation of turning ignition on. If it is within 5 seconds. If PS is triggered to look for the key again within 5 seconds and the car key is found, the valid time of 5 seconds will be re-timed; if no legal key is found, the valid time of 5 seconds will be cleared.

■ **Key Searching for Backup IMMO**

No.	Description
1	SSB is triggered. If the key in vehicle is not found through LF, IMMO is triggered to find the key.
2	State of five doors changes, key is not found by low frequency, trigger IMMO to find the key.
3	Non-RUN, brake is valid, key is not found by low frequency, trigger IMMO to find the key.
4	RUN, vehicle speed exceeds 4 km/h for first time, key is not found by low frequency, trigger IMMO to find the key.

IMMO function is the backup function of key, mainly in order to prevent the key battery from being lit up and exhausted, it is impossible to find the legal key in the vehicle through the low frequency.When the IMMO

searches for the key, the key must be placed within 5cm of the front IMMO antenna. If the distance is too far, the key will not be found.Process for PS to find the key is as follows:

Step	Trigger PS operation		
1	PEPS drives the indoor antenna to look for keys at low frequencies	/	NEXT
2	Whether key is found in vehicle	NO (Try less than 2 times)	Refer to step 1
		NO (Try more than 2 times)	Next
		YES	End, key in vehicle is valid, and valid time is 5 seconds
3	PEPS find the key in vehicle by IMMO	/	NEXT
4	Whether key is found in vehicle	NO (Try less than 2 times)	Refer to step 3
		NO (Try more than 2 times)	End, PEPS can not find the key, and it sends No valid key Prompt: Transponder start prompt
		YES	End, key in vehicle is valid, and valid time is 10 seconds

Note: For performing PS operation, including FR.KS.014, FR.KS.015, FR.KS.016, when finding the key by triggering IMMO, legal key is found, and legal valid time is 10 seconds.

1.5 Keyless Entry Function

■ PE Lock Status

Step	Trigger the door handle PE locking area		
1	PEPS drives to find the outside antenna	/	NEXT
2	Whether PEPS finds the key in vehicle	YES	Next
		NO	Refer to step 7
3	Whether power gear position is in OFF, whether four doors are closed	Power gear position is in OFF, four doors are not closed	PEPS does not perform any action. End
		Power supply is not OFF	PEPS sends Doorlock 1 alarm
		YES	Next
4	Whether the BCM is in anti-theft state	YES	PEPS sends PE locking signal
		NO	Next
5	PEPS perform the search for the key in vehicle	/	NEXT
6	Whether PEPS finds the key in vehicle	YES	PEPS sends Doorlock3 alarm

Step	Trigger the door handle PE locking area		
		NO	PEPS sends PE locking signal
7	Whether power gear position is in OFF, whether four doors are closed	NO	PEPS does not perform any action
		YES	Next
8	Whether the BCM is in anti-theft state	YES	PEPS does not perform any action
		NO	Next
9	PEPS perform the search for the key in vehicle	/	NEXT
10	Whether PEPS finds the key in vehicle	YES	PEPS sends Doorlock 3 alarm
		NO	PEPS does not perform any action

■ **PE Unlock Status**

Step	Trigger the door handle PE unlocking area		
1	Whether the front door is open	NO	Next
		YES	PEPS does not perform any action
2	PEPS drives to find the outside antenna	/	NEXT
3	Whether PEPS finds the key in vehicle	NO	PEPS does not perform any action
		YES	Next
4	Whether power gear position is in OFF	YES	Next
		NO	PEPS does not perform any action. End
5	Whether the BCM is in locking state	NO	PEPS does not perform any action. End
		YES	PEPS sends PE unlocking signal

■ **Left Door PE Locking**

No.	Description
1	OFF, there is a legal key outside left door, no key in vehicle, four doors are closed, trigger left door handle locking area, PEPS sends PE locking request.
2	OFF, there is a legal outside right door, no key in vehicle, four doors are closed, trigger left door handle locking, PEPS does not respond to the PE locking request.

(1) 1

1) Enabled conditions:

i. Power gear position is in OFF;

ii. Close all four doors;

iii. There is a legal key outside left door, no legal key in vehicle.

2) Trigger conditions: Trigger left door handle PE locking area.

3) Execution action:

i. PEPS sends three frames (0x404) PassiveEntryLockCmd = 0x01 (Lock). Then it sends three frames (0x404) PassiveEntryLockCmd = 0x01 (No command), the period is 40ms;

ii. FOB ID in 0x155 periodically indicates key ID (key index1/key index2/key index3)

When triggering PE locking area, if feedback by BCM is arm state, PEPS will not find the key in vehicle. When triggering PE locking area, if feedback by BCM is non disarm state, PEPS will find the key in vehicle. If the key in vehicle is found, PE locking will not be performed.

(1) 2

1) Enabled conditions:

i. Power gear position is in OFF;

ii. Close all four doors;

iii. There is a legal key outside right door, no legal key in vehicle;

2) Trigger conditions: Trigger left door handle PE locking area.

3) Execution action: PEPS does not respond to the PE locking request.

■ Right Door PE Locking

No.	Description
1	OFF, there is a legal key outside right door, no key in vehicle, four doors are closed, trigger right door handle locking area, PEPS sends PE locking request.
2	OFF, there is a legal outside right door, no key in vehicle, four doors are closed, trigger right door handle locking, PEPS does not respond to the PE locking request.

(1) 1

1) Enabled conditions:

i. Power gear position is in OFF;

ii. Close all four doors;

iii. There is a legal key outside right door, no legal key in vehicle.

2) Trigger conditions: Trigger right door handle PE locking area.

3) Execution action:

i. PEPS sends three frames (0x404) PassiveEntryLockCmd = 0x01 (Lock). Then it sends three frames (0x404) PassiveEntryLockCmd = 0x01 (No command), the period is 40ms;

ii. FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3).

(1) 2

1) Enabled conditions:

i. Power gear position is in OFF;

ii. Close all four doors;

iii. There is a legal key outside left door, no legal key in vehicle.

2) Trigger conditions: Trigger right door handle PE locking area.

3) Execution action: PEPS does not respond to the PE locking request.

■ **Left Door PE Unlocking**

No.	Description
FR.PE.005	OFF, lock state is locked, front left door is closed, there is legal key outside left door. Trigger left door handle unlocking area, PEPS sends PE unlocking request.
FR.PE.006	OFF, lock state is locked, front left door is closed, there is legal key outside right door. Trigger right door handle unlocking area, PEPS does not respond to the PE unlocking request.
FR.PE.007	Within 3 seconds of RKE locking and PE locking, PEPS does not respond to PE unlocking function.

(1) FR.PE.005

1) Enabled conditions:
   i. Power gear position is in OFF;
   ii. The lock state feedback by BCM is lock state;
   iii. There is legal key outside the left door;
   iv. Left door is not open.
2) Trigger conditions: Trigger left door handle PE unlocking area.
3) Execution action:
   i. PEPS sends three frames (0x404) passively entry locking command = 0x01 (unlocking). Then it sends three frames (0x404) passively entry locking command=0x00 (No command)
   ii. The period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3)

When triggering left PE to unlock, if other three doors are open, PEPS is still unlocked correctly corresponding to PE.If the legal key is near the left door, trigger the right door handle PE locking and unlocking areas, PEPS does respond to PE locking and unlocking command; Similarly, if the valid key is near the right door, it triggers left door handle PE locking and unlocking areas, and PEPS does not respond to the PE locking and unlocking command.Generally when and after PE locking, customers are used to pulling the door handle to confirm whether the door is locked. Inner side of handle is PE unlocking area, and the following policies are applied: PE unlocking is not allowed within 3 seconds after PE locking or RKE locking.

■ **Right Door PE Unlocking**

No.	Description
FR.PE.008	OFF, lock state is locked, front left door is closed, there is legal key outside left door. Trigger left door handle unlocking area, PEPS sends PE unlocking request.
FR.PE.009	OFF, lock state is locked, front left door is closed, there is legal key outside right door. Trigger right door handle unlocking area, PEPS does not respond to the PE unlocking request.
FR.PE.010	Within 3 seconds of RKE locking and PE locking, PEPS does not respond to PE unlocking function.

(1) FR.PE.008

1) Enabled conditions:
   i. Power gear position is in OFF;
   ii. The lock state feedback by BCM is lock state;
   iii. There is legal key outside the right door;
   iv. Right door is not open.
2) Trigger conditions: Trigger right door handle PE unlocking area.

3) Execution action:

i. PEPS sends three frames (0x404) passively entry locking command = 0x01 (unlocking). Then it sends three frames (0x404) passively entry locking command=0x00 (No command)

ii. The period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3)

■ **Back Door PE Unlocking**

No.	Description
FR.PE.011	OFF/ACC/ON/RUN, when there is legal key outside back door, trigger back door button; When there is legal key outside back door, PEPS sends PE luggage compartment opening command.
FR.PE.012	When PEPS does not learn the key, trigger the back door key input. Regardless of whether there is a valid key outside the back door, PEPS will send PE luggage compartment opening command.

(1) FR.PE.011

1) Enabled conditions: Power gear position is in OFF/ACC/ON/RUN

2) Trigger conditions: Trigger back door button input

3) Execution action: PEPS first sends (0x155) luggage compartment switch = pressed, and trigger finding key in low frequency at the same time. If legal key is found, it will send PassiveEntryTrunkCmd = luggage compartment opening (three frames). The period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3). If no legal key outside the vehicle is found, back door PE luggage compartment opening command will not be sent.

(2) FR.PE.012

1) Enabled conditions:

i. Power gear position is in OFF/ACC/ON/RUN;

ii. PEPS has not learned the key.

2) Trigger conditions: Trigger back door button input

3) Execution action: PEPS first sends (0x155) luggage compartment switch = pressed, and sends PassiveEntryTrunkCmd = luggage compartment opening (three frames) at the same time. The period is 40ms.

When PEPS is reset or powered on, it reads the learning key state from the EEPROM to determine whether it is necessary to consider whether there is a key outside the car when performing the PE luggage compartment opening process. In consideration of the security of opening back door, PEPS follows the following policy: After powering off or resetting, PEPS performs keyless opening PE luggage compartment process when it reads the correct unlearned key data from the EEPROM. If the data is not read or the key has been learned, PE luggage compartment opening process will be performed only if there is a valid key.

■ **PE Button**

No.	Description
FR.PE.013	Power gear position is in OFF, no legal key outside the vehicle, trigger door handle PE function. If it is triggered for 10 times continuously, legal key is still not found, trigger PE input again after network sleeps, network can be awakened only after the legal key is detected.
FR.PE.014	Power gear position is in OFF. In the locked state of vehicle, if luggage compartment button is pressed for 10 consecutive times and the legal key outside the vehicle is not found, the network will not wake up immediately when the luggage compartment button is triggered again after the network sleeps, and the network will wake up only when the legal key is found.

No.	Description
FR.PE.015	Power gear position is in OFF. When the whole vehicle is unlocked, luggage compartment button input can wake up the network, and it will trigger the search for key at the same time.
FR.PE.016	When entering the protected state, PEPS will update the corresponding CAN message, indicating that the current mode is protected, and indicating that the TGW should actively wake up the network after the next Bluetooth connection.
FR.PE.017	The left door handle input, right door handle input, and back door button input are counted for 10 protection times respectively. When performing PE function on one side and finding the legal key outside the vehicle, the current PE input for 10 protection times is counted again.

1.6 Active Polling Function

■ Key Active Searching Function

No.	Description
FR.POLL.001	The Polling area can be divided into the following areas according to functional requirements: 1. Unlocking area; 2. Locking area; 3. Courtesy light on area; 4. Courtesy light off area; 5. Back door opening area; 6. Back door opening retraction area.
FR.POLL.002	Key active searching is divided into quick searching and slow searching, slow searching consumption of the current is small, quick searching consumption of the current is large, slow searching consumption of the current is small. The quick searching definition searches once for 1 second, and slow searching definition searches once for 2 seconds. When the smart key enters the area that can be sensed by PEPS, PEPS will automatically switch search in raising frequency, and search once at 500ms.
FR.POLL.003	The Polling time is defined as 7 days. The 7-day Polling time will be re-initialized only when the power gear position is switched to RUN, and the poling time starts to be counted after powering off.
FR.POLL.004	PEPS static current consumes when Polling is working.

(1) FR.POLL.001

1) Poling area description:

i. Unlocking area: Defined outside the vehicle, within the boundary of unlocking area, calibration is carried out according to 1.3m in vertical direction of door antenna;

ii. Locking area: Outside the locking area boundary, perform stay away from locking when all keys leave this area, calibration is carried out according to 2.5m in vertical direction of door antenna;

iii. Courtesy light on area: Within courtesy light on area boundary, calibration is carried out according to 3m in vertical direction of door;

iv. Courtesy light off area: Outside of courtesy light off area boundary, calibration is carried out according to maximum distance of all sensing at low frequency, vertical door antenna distance is about 3.7 m;

v. Back door opening area: Defined outside the vehicle, calibration is carried out according to 0.5m in vertical direction of rear bumper antenna;

vi. Back door opening retraction area: Between the boundary of back door opening area and boundary of back door opening retraction area, the boundary of back door retraction area is demarcated according to the 1.2m vertical defense line of rear bumper antenna. It is mainly used to activate back door opening prompt function, and used to open back door after the owner reverses.

2) FR.POLL.002

i. Frequency and time of PEPS Polling are defined as follows:

Searching type	Polling hours	Polling weeks	Key increases the frequency cycle in sensing area	Note
Quick searching	Less than or equal to 2 days	1000ms	500ms	Polling time starts when powering off from RUN
Slow searching	3 to 7 days	2000ms	500ms	
Stop searching	More than 7 days	/	/	

3) FR.POLL.003

i. The total time of Polling is 7 days. When the power gear position is switched to RUN, Polling time would be re-initialized, start timing again when power gear position is switched to non-RUN.

The 7-day Polling time will be re-initialized if the following conditions are met:

- Power gear position is switched to RUN
- PEPS powers on again

ii. 7-day Polling time will start if the following conditions are met:

- Power gear position is switched to OFF/ACC/IGN ON from RUN
- PEPS powers on again, and power gear position is not RUN

4) FR.POLL.004

i. Courtesy light works, PEPS will drive the left and right door antennas and back door antenna at the same time. For the quick finding polling cycle is 1000ms, the theoretical working time is 18.7ms.The increased theoretical average working current is 14.96mA.

ii. For slow searching, Polling cycle is 2000ms, the theoretical working time is 18.7ms, and the increased theoretical average working current is: 7.48mA.

iii. The polling time of quick searching is 2 days, and the polling time of slow searching is 5 days. The average statistics of quick searching and slow searching are calculated to increase the static power within 30 days as follows:

- Quick searching: 0.998mA
- Slow searching: 1.25mA
- For Polling function, average increased static current within 30 days is: 2.248mA.

■ **Stay Away form Locking**

No.	Description
FR.POLL.005	WAL Polling Abort->WAL Preparation 0: • OFF, Polling and key positioning time did not timeout, four doors and back door are closed, the anti-theft state changed from arm to disarm, and PEPS entered WAL Preparation 0 state • OFF, Polling and key positioning time did not timeout, anti-theft state is disarm, four doors and back door change from not closed fully to fully closed, PEPS enters WAL Preparation 0 state
FR.POLL.006	WAL Polling Abort->WAL Preparation 1:

No.	Description
	• OFF, Polling time and key positioning time did not timeout, BCM four doors and back door are ON, the anti-theft state changed from not in to disarm, and PEPS entered WAL Preparation 1 state • OFF, Polling time and key positioning time did not timeout, back door is open, feedback of back door is closing state at the same time, the anti-theft state feedback by BCM is Disarm, BCM feedbacks four doors state changes from not close fully to close fully, PEPS enters WAL Preparation 1 state • OFF, Polling time and key positioning time did not timeout, four doors are closed, back door is open, feedback of back door is closing state at the same time, the anti-theft state changed from arm to disarm, and PEPS enters WAL Preparation 1 state
FR.POLL.007	WAL Preparation 0-> WAL Polling Abort PEPS enters WAL Polling Abort state when any of following conditions is met: • Power gear position is switched to non-OFF (Non-remote mode); • Back door is open; • Any of four doors is open; • Anti-theft state changes to arm state; • Key is found in vehicle; • No key found within the locking area boundaries
FR.POLL.008	WAL Preparation 1-> WAL Polling Abort PEPS enters WAL Polling Abort state when any of following conditions is met: • Power gear position is switched to non-OFF (Non-remote mode); • Any door is open; • Back door is open and PLG feedback is not closing: • Anti-theft state changes to arm state; • No legal key is found within locking border area (-including interior of vehicle) • PLG feedbacks Closing state exceeds 15 seconds
FR.POLL.009	WAL Preparation 1-> WAL Preparation 2 PEPS enters WAL Preparation 2 state when the following conditions are met simultaneously: • Power supply state is OFF; • Four doors are closed • Anti-theft state is disarm • Polling time did not timeout; • The key positioning time is timeout; • Back door is closed, key is located within the border of the locking area at the same time
FR.POLL.010	WAL Preparation 2-> WAL Polling Abort PEPS enters WAL Polling Abort state when any door following conditions is met: • Power gear position is switched to non-OFF

No.	Description
	• Any door is open • Back door is open • Anti-theft state changes to arm state • Key in the vehicle is detected
FR.POLL.011	WAL Preparation 2-> WAL Wait leaving polling PEPS enters WAL Wait leaving Polling mode when the following conditions are met: • Key not in the vehicle is detected, WALConditions is valid at the same time
FR.POLL.012	WAL Preparation 0-> WAL Wait leaving polling PEPS enters WAL Wait leaving Polling mode when the following conditions are met simultaneously: • WALConditions condition is valid • Key is located in area far away from locking area and outside of vehicle.
FR.POLL.013	WAL Wait leaving polling-> WAL Polling Abort PEPS enters WAL Polling Abort when any of following conditions is met: • WALAbortConditions condition is valid; • Key is located in area far away from locking area boundary; • Key is located in area far away from locking area boundary for more than 1 minute; • No key information was located for more than 3 seconds.

WALConditions is valid and following conditions must be met simultaneously:

- Power gear position is in OFF;
- All doors are closed;
- Back door is closed;
- The anti-theft state feedback by BCM is disarm state;
- Key location for 1 minute, and there is no timeout;
- There is no timeout of polling for 7 days.

WALAbortConditions are valid When, any of following conditions is met:

- Power gear position is in non-OFF (Non-remote mode);
- Any door is open;
- Back door is open;
- The anti-theft state feedback by BCM is ARM state.

(1) Description of each WAL state:

1) WAL Polling Abort: Far away from locking suspension state, in which PEPS will not perform location key functions far away from locking.
2) WAL Preparation1: When back door is open, operate back door to close. During closing of back door without closing fully, PEPS will locate the keys near the car, including inside.
3) WAL Preparation2: When back door changes from closing to closed, PEPS will locate whether there is a key in the car.
4) WAL Preparation0: Trigger conditions such as door opening to close, anti-theft from arm to disarm, and enter the transient state. In this state, PEPS will locate the state of keys inside and outside the car.

5) WAL Wait leaving polling: Activate WAL and determine the car has no keys and is away from the state where there is a key within the border of locking area. In this state, PEPS will track the external key to determine if it has moved away from the lockingarea or disappeared.

(2) FR.POLL.005

WAL Polling Abort->WAL Preparation 0:

1) Enabled conditions:
   i. Power gear position is in OFF;
   ii. The key positioning time is not more than 1 minute;
   iii. There is no timeout of polling for 7 days.
2) Trigger conditions:
   i. Back door is closed, and BCM is disarm state, four doors change from non fully closed state to fully closed state;
   ii. Four doors are closed fully, back door is closed, it is detected that feedback state of BCM changes from arm to disarm;
   iii. Four doors are closed fully, feedback of BCM is disarm state, it is detected that back door changes from open to closed, and no PLG feedback closing was detected in the open state.
3) Execution action:
   i. PEPS enters WAL Preparation 0 state:
   ii. PEPS perform the search for the keys in and out the vehicle.

(3) FR.POLL.006

WAL Polling Abort->WAL Preparation 1:

1) Enabled conditions:
   i. Power gear position is in OFF;
   ii. Close all four doors;
   iii. Feedback of back door by BCM is open state;
   iv. The anti-theft state feedback by BCM is disarm state;
   v. There is no timeout of polling for 7 days.
2) Trigger conditions: It is detected that feedback back door state by PLG changes from non closing to closing
3) Execution action:
   i. PEPS enters WAL Preparation1 state;
   ii. Find out if there's a legal key in or out of vehicle.

   Back door is a power back door. During closing the back door, if the key leaves the locking area and the back door is not completely closed, WAL function may not be triggered when you wait until back door is closed to determine whether there is a key nearby the car. Therefore, a process state of closing the back door is defined to optimize the solution to the problem that WAL cannot be executed when the key leaves during closing back door.

(4) FR.POLL.007

WAL Preparation 0-> WAL Polling Abort:

1) Enabled condition: PEPS is in WAL Preparation 0 state.
2) Trigger conditions:
   i. The legal key is located in the vehicle;
   ii. Locate the vehicle outside of locked area without a valid key within the boundary.
   iii. Power gear position is switched to non-OFF (Non-remote mode);
   iv. Any door is open;
   v. Back door is open;
   vi. Anti-theft state changes to arm state.
3) Execution action:
   i. PEPS enters WAL Polilng Abort state;
   ii. Stop the positioning key function of polling away from locking.

(5) FR.POLL.008

WAL Preparation 1-> WAL Polling Abort:

1) Enabled condition: PEPS is in WAL Preparation 1 state.
2) Trigger conditions:
   i. Key is not located in area far away from locking area (including inside);
   ii. Door is open;
   iii. Feedback of back door by BCM is open, and feedback of back door by PLG is non closing state;
   iv. Closing state feedback by PLG exceeds for 15 seconds;
   v. Power state is switched to non-OFF (Non-remote mode);
   vi. The anti-theft state feedback by BCM is arm state.
3) Execution action:
   i. PEPS enters WAL Polilng Abort state;
   ii. Stop the positioning key function of polling away from locking.

(6) FR.POLL.009

WAL Preparation 1-> WAL Preparation 2:

1) Enabled conditions:
   i. PEPS is in WAL Preparation 1 state:
   ii. WALConditions is valid.
2) Trigger conditions: BCM feedback state changes from Open to closed.
3) Execution action:
   i. PEPS enters WAL Preparation 2 state:
   ii. PEPS locates that key is in vehicle.

(7) FR.POLL.010

WAL Preparation 2-> WAL Polling Abort:

1) Enabled condition: PEPS is in WAL Preparation 2 state.
2) Trigger conditions:
   i. Power gear position is switched to non-OFF;
   ii. Any door is open;
   iii. Back door is open;
   iv. Anti-theft state changes to arm state;
   v. The key is located in the vehicle;
3) Execution action:
   i. PEPS enters WAL Polilng Abort state;
   ii. Stop the positioning key function of polling away from locking.

(8) FR.POLL.011

WAL Preparation 2-> WAL Wait leaving polling：

1) Enabled conditions:
   i. PEPS is in WAL Preparation 2 state:
   ii. WALConditions is valid.
2) Trigger conditions: PEPS locates that key is not in vehicle.
3) Execution action:
   i. WAL Wait leaving polling;
   ii. Locate and track the outside key.

(9) FR.POLL.012

WAL Preparation 0-> WAL Wait leaving polling：

1) Enabled conditions:
   i. PEPS is in WAL Preparation 0 state:

ii. WALConditions is valid.

2) Trigger condition: Locate the vehicle outside of locked area with a valid key within the boundary.

3) Execution action:

i. PEPS enters WAL Wait leaving polling state;

ii. Locate and track the outside key.

(10) FR.POLL.013

WAL Wait leaving polling-> WAL Polling Abort：

1) Enabled condition: PEPS is in WAL Wait leaving polling state.

2) Trigger conditions:

i. Power gear position is switched to non-OFF;

ii. Any door is open;

iii. Back door is open;

iv. Feedback by BCM is arm state;

v. It is located that the last key in area far away from the locking area;

vi. Key is located in area far away from locking area for more than 1 minute;

vii. The legal key is not located outside the vehicle within 3 seconds;

3) Execution action:

i. PEPS enters WAL Polling Abort state;

ii. Stop the positioning key function of polling away from locking;

iii. For meeting e|f|g trigger condition, PEPS first sends three frames 0x404: WALReq=0x01 (Lock). Then it sends three frames of information, 0x404：WALReq=0x00, the period is 40ms. FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3);

■ **Near Unlocking**

No.	Description
FR.POLL.014	APU Polling Abort->APU Polling Preparation->APU Hysteresis polling: PEPS enters APU Hysteresis polling state when the following conditions are met simultaneously: • Power gear position is in OFF • All doors are closed • Back door is closed • BCM anti-theft state changes from disarm to arm is detected
FR.POLL.015	APU Hysteresis polling ->APU Polling Abort PEPS enters APU Polling Abort state when any of following conditions is met • Power gear position is in non-OFF (Non-remote mode) • Any door is open • Back door is open • The anti-theft state feedback by BCM is disarm state • There is timeout of polling for 7 days • The key is located within the sensing area for more than 1 minute • The key is located in the vehicle
FR.POLL.016	APU Hysteresis polling ->APU Wait Approach polling: PEPS enters APU Wait Approach polling state when the following conditions are met: • No legal key is found within locking area

No.	Description
FR.POLL.017	APU Wait Approach polling-> APU Hysteresis polling: PEPS enters APU Hysteresis polling state when the following conditions are met • It is detected that key enters unlock boundary area
FR.POLL.018	APU Wait Approach polling->APU Polling Abort: PEPS enters APU Polling Abort state when the following conditions are met simultaneously • Power gear position is in non-OFF (Non-remote mode) • Any door is open • The anti-theft state feedback by BCM is disarm state • Back door is open • There is timeout of polling for 7 days • The key is located in the vehicle • The key is located within the sensing area for more than 1 minute

APU conditions are valid, the following conditions must be met simultaneously:

- Power gear position is in OFF;
- All doors are closed;
- Back door is closed;
- The anti-theft state feedback by BCM is arm state, back door is closed;
- There is no timeout of polling for 7 days.

APU Abort condition is valid, any of following conditions is met:

- Power gear position is in non-OFF (Non-remote mode);
- Any door is open;
- Back door is open;
- The anti-theft state feedback by BCM is disarm state;
- There is timeout of polling for 7 days;
- The key is located in the vehicle;
- Locate the legal key in the key sensing area outside the vehicle for more than 1 minute.

(1) Description of each APU state:

1) APU Polling Abort: Near unlocking suspension state, in which PEPS will not perform location key functions near unlocking
2) APU Polling Preparation: Suspended state, enter this state after entering APU Polling Abort state, which is used to detect if condition of APU is met.
3) APU Hysteresis polling: Locate whether there is a key far away from the locking area. If there is a key, APU unlocking function is prohibited. When all keys are located away from the locking area, the APU function of all keys will be released.
4) APU Wait Approach polling: Wait for the state of key entering the unlock area. If the first key is detected to enter the unlock area, APU unlocking is executed and the APU function of other keys is disabled.

(2) FR.POLL.014

APU Polling Abort->APU Polling Preparation->APU Hysteresis polling:

1) Enabled conditions:
   i. Power gear position is in OFF;
   ii. There is no timeout of polling for 7 days.
2) Trigger conditions:
   i. The four doors are closed, back door is closed, and the anti-theft state feedback by BCM changes from disarm to arm state;

ii. The four doors are closed, and the anti-theft state feedback by BCM is arm state, it detects that back door changes from open to closed state;

iii. Back door is closed, and the anti-theft state feedback by BCM is arm state, it detects that four doors change from non fully closed state to fully closed state.

3) Execution action:

i. PEPS enters APU Hysteresis polling state;

ii. PEPS performs locating whether there is a legal key away from the locking area;

iii. Start locating the key for 1 minute.

(3) FR.POLL.015

APU Hysteresis polling ->APU Polling Abort

1) Enabled condition: PEPS is in APU Hysteresis polling.

2) Trigger conditions:

i. Power gear position is switched to non-OFF (Non-remote mode);

ii. Any door is open;

iii. Back door is open;

iv. Anti-theft state feedback by BCM changes to disarm state;

v. There is timeout of polling for 7 days;

vi. The legal key is located in the vehicle;

3) Execution action:

i. PEPS enters APU Polling Abort state;

ii. PEPS suspends closing unlocking Poling function.

(4) FR.POLL.016

APU Hysteresis polling ->APU Wait Approach polling:

1) Enabled condition: PEPS is in APU Hysteresis polling.

2) Trigger condition: No legal key is found far away from the locking area.

3) Execution action:

i. PEPS enters APU Wait Approach polling state;

ii. PEPS will wait to track the location of key, waiting for it to enter and close unlocking area.

(5) FR.POLL.017

APU Wait Approach polling-> APU Hysteresis polling:

1) Enabled condition: PEPS is in APU Wait Approach polling state.

2) Trigger condition: It is detected that valid key has been detected entering the area near unlocking area.

3) Execution action:

i. PEPS enters APU Hysteresis polling state;

ii. PEPS performs APU function and sends three frames of information, 0x404: APUReq=0x01 (-unlocked). Then it sends three frames of information, (0x404) APUReq=0x00, the period is 40ms. FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3);

iii. PEPS disables APU function for subsequent keys entering the unlocking area.

(6) FR.POLL.018

APU Wait Approach polling->APU Polling Abort:

1) Enabled condition: PEPS is in APU Wait Approach polling state.

2) Trigger conditions:

i. Power gear position is switched to non-OFF (Non-remote mode);

ii. Any door is open;

iii. Back door is open;

iv. Anti-theft state feedback by BCM changes to disarm state;

v. There is timeout of polling for 7 days;

vi. The key is located in the vehicle;

vii. Time to locate the key in outside sensing area of vehicle is more than 1 minute.

3) Execution action:

i. PEPS enters APU Polling Abort state;

ii. PEPS suspends closing unlocking Poling function.

■ **Active Opening of Back Door**

No.	Description
FR.POLL.019	SATO Polling Abort->SATO Preparation->SATO Wait activation Polling PEPS enters SATO Wait activation Polling state from SATO Polling Abort when the following conditions are met simultaneously: • Power gear position is in OFF • All doors are closed • 3 Back door are closed • There is no timeout of polling for 7 days
FR.POLL.020	SATO Wait activation Polling-> SATO Polling Abort PEPS enters SATO Polling Abort state from SATO Wait activation Polling when any of following conditions is met • Power gear position is in non-OFF (Non-remote mode) • Any door is open • Back door is open • There is timeout of polling for 7 days • The key is located within the sensing area for more than 1 minute • The key is located in the vehicle
FR.POLL.021	SATO Wait activation Polling-> SATO Wait Approach polling PEPS enters SATO Wait Approach Polling state from SATO Wait activation Polling when the following conditions are met: • It is located that key leaves the welcoming on area
FR.POLL.022	SATO Wait Approach polling -> SATO Wait activation Polling PEPS jumps to SATO Leaving polling state from SATO Wait activation Polling when the following conditions are met: • It is detected that key enters welcoming on boundary area
FR.POLL.023	SATO Wait activation Polling-> SATO Leaving polling PEPS enters SATO Wait activation Polling state from SATO Wait Approach polling state when the following conditions are met: • If the key is detected to enter the back door opening area for a duration of more than 2 seconds, an alarm will be sent; if the back door opening command will be sent if it lasts for 3.2 seconds (for example, when the back door polling state is entered and the initial position of key is detected to be within the back door opening hysteresis zone, the back door active opening function of key will be prohibited until the

No.	Description
	key re-enters the hysteresis zone from outside of the hysteresis zone)
FR.POLL.024	SATO Leaving polling SATO -> Wait activation Polling PEPS enters Wait activation Polling state from SATO Leaving polling SATO state when the following conditions are met: • No legal key is found in back door opening hysteresis zone
FR.POLL.025	SATO Leaving polling SATO ->SATO Polling Abort PEPS enters SATO Polling Abort state from SATO Leaving polling SATO state when any of following conditions is met: • Power gear position is switched to non-OFF (Non-remote mode) • Any door is open • Back door is open • There is timeout of polling for 7 days • The legal key is in the vehicle The key is located in the key sensing area outside the vehicle for more than 1 minute
FR.POLL.026	SATO Leaving polling SATO -> SATO Wait Approach polling PEPS enters SATO Wait Approach polling state from SATO Leaving polling SATO state when the following conditions are met: • It is detected that key is not within courtesy light on area
FR.POLL.027	SATO Wait Approach polling ->SATO Polling Abort PEPS enters SATO Polling Abort state from SATO Wait Approach polling state when any of following conditions is met: • Power gear position is switched to non-OFF • 2 Any door is open • Back door is open • There is timeout of polling for 7 days

SATO Start conditions are valid, the following conditions must be met simultaneously:

- Power gear position is in OFF;
- All doors are closed;
- Back door is closed;
- There is no timeout of polling for 7 days.

SATO Abort conditions are valid, any of following conditions is met:

- Power gear position is in non-OFF (Non-remote mode);
- Any door is open;
- Back door is open;
- There is timeout of polling for 7 days;
- The key is located in the vehicle;
- Locate the legal key in the key sensing area outside the vehicle for more than 1 minute.

(1) Description of each SATO state:

1) SATO Polling Abort: Polling function of back door active opening is stopped, in this state, PEPS will not perform polling locating key function of back door.
2) SATO Polling Preparation: Suspended state, enter this state after entering SATO Polling Abort state, which is used to detect if condition of SATO is met.
3) SATO Wait activation polling: Wait for the key to enter the state of active opening area of back door. In the secondary state, there are two conditions: 1. When entering this state from APU Polling Abort state, if a key already exists in back door opening hysteresis zone, the active opening function of luggage compartment of the key is prohibited. The key needs to re-enter the hysteresis zone from outside the hysteresis zone, and the active opening function of back door can be activated. 2. When the state of APU Polling Abort enters this state, there is no legal key in back door opening hysteresis area, and key is detected to enter the back door opening area, function which key location back door active opening can be activated.
4) SATO Leaving polling: Track the state of key leaving the active opening area of back door. This state is mainly used to detect the polling state of key leaving the leaving area without leaving the welcoming area.
5) SATO Wait Approach Polling: Back door state after key leaves vehicle.

(2) FR.POLL.019

SATO Polling Abort->SATO Preparation->SATO Wait activation Polling

1) Enabled conditions:
   i. Power gear position is in OFF;
   ii. There is no timeout of polling for 7 days.
2) Trigger conditions:
   i. The four doors are closed, anti-theft state does not change, back door changes from open to closed state;
   ii. Back door is closed, anti-theft state does not change, four doors state feedback by BCM changes from non fully closed to fully closed;
   iii. The four doors are closed, back door is closed, and the anti-theft state feedback by BCM changes from disarm to arm state or from arm to disarm.
3) Execution action:
   i. PEPS enters SATO Wait activation Polling state;
   ii. PEPS disables back door active opening polling function of all keys
   iii. PEPS tracks the location of key.

   When it is detected that the smart key is opened from outside of back door opening retraction area to inside, PEPS enables back door active opening function of key (There are no other keys in the area before entering the retraction area).

(3) FR.POLL.020

SATO Wait activation Polling-> SATO Polling Abort

1) Enabled condition: PEPS is in SATO Wait activation Polling state.
2) Trigger conditions:
   i. Power gear position is switched to non-OFF (Non-remote mode);
   ii. Any door is open;
   iii. Back door is open;
   iv. The legal key is located in the vehicle;
   v. There is legal key within outside key sensing area for more than 1 minute.
3) Execution action:
   i. PEPS enters APU SATO Polling Abort state;
   ii. PEPS stops the polling function of back door.

(4) FR.POLL.021

SATO Wait activation Polling-> SATO Wait Approach polling

1) Enabled condition: PEPS is in SATO Wait activation Polling state.
2) Trigger condition: It is detected that key leaves the welcoming on area.

3) Execution action:
   i. PEPS enters SATO Wait Approach polling state;
   ii. Locate the key on the outside of vehicle, determine if it will reenter.

(5) FR.POLL.022

SATO Wait Approach polling -> SATO Wait activation Polling

1) Enabled condition: PEPS is in SATO Wait Approach polling state.
2) Trigger condition: It is detected that key enters the welcoming on area.
3) Execution action: PEPS enters SATO Wait activation Polling state.

(6) FR.POLL.023

SATO Wait activation Polling-> SATO Leaving polling

1) Enabled condition: PEPS is in SATO Wait activation Polling state.
2) Trigger condition: It is detected that key enters the back door opening area.
3) Execution action:
   i. PEPS will timing 2 seconds to monitor whether the key remains in the area. Within 2 seconds of timing, if it detects that the key leaves back door opening area, PEPS will stop timing for 2 seconds. Within 2 seconds of timing, if it detects that key is always in back door opening area, PEPS will send SATOReminder = 0x02 (Remind start) signal to BCM, prompting that back door will be open to customer.
   ii. Within 3.2 seconds, if PEPS detects that all keys have left the back door opening retraction area, PEPS will send SATOReminder = 0x01 (Remind Stop) signal, active opening back door function is still valid, when legal key enters SATO_Activation_Zone, SATO reminder function is activated again. Within 3.2 seconds, if the key is in back door opening retraction area, PEPS will send SATOReminder = 0x01 (Remind Stop) signal, at the same time, request that luggage compartment unlocks SATOReq = 0x01 (Request) actively at the same time, and update the FOB ID. Back door turns on, SATO Polling function will be disabled at this time.

When the back door polling is triggered by closing the door or anti-theft state changes, if the key is located within retraction area in the initial state, PEPS will not send any opening instruction and directly jump to SATO Leaving polling state.

PEPS interrupts the back door active opening process when the key is detected leaving the retraction area during the delay time of entering the back door opening area.

PEPS interrupts the back door active opening process when the key is detected leaving the retraction area when alarm is triggered during entering back door opening area, and it sends SATOReminder = 0x01 (Remind Stop) demand at the same time.

PEPS interrupts the back door active opening process by triggering the key back door button during the delay time of entering the back door opening area.

PEPS interrupts the back door active opening process by triggering the key back door button when alarm is triggered during entering back door opening area, and it sends SATOReminder = 0x01 (Remind Stop) demand at the same time. Enter the opening area again from outside the retraction hysteresis zone, which can trigger again without reactivating the back door polling function.

(7) FR.POLL.024

SATO Leaving polling SATO -> Wait activation Polling

1) Enabled condition: PEPS is in SATO Leaving polling SATO state.
2) Trigger condition: It is detected that key leaves back door opening retraction area, but still in welcoming area.
3) Execution action: PEPS enters Wait activation Polling state.

(8) FR.POLL.025

SATO Leaving polling SATO ->SATO Polling Abort

1) Enabled condition: PEPS is in SATO Leaving polling SATO state.
2) Trigger conditions:
   i. Power gear position is switched to non-OFF (Non-remote mode);
   ii. Any door is open;
   iii. Back door is open;

iv. The legal key is located in the vehicle;
v. There is legal key within outside key sensing area for more than 1 minute.

3) Execution action:
i. PEPS enters APU SATO Polling Abort state;
ii. PEPS stops the polling function of back door.

(9) FR.POLL.026
SATO Leaving polling SATO -> SATO Wait Approach polling

1) Enabled condition: PEPS is in SATO Leaving polling SATO state.
2) Trigger condition: No smart key is found within welcoming area.
3) Execution action:
i. PEPS enters SATO Wait Approach polling state;
ii. Locate the key on the outside of vehicle, determine if it will reenter.

(10) FR.POLL.02
SATO Wait Approach polling ->SATO Polling Abort

1) Enabled condition: PEPS is in SATO Wait Approach polling state.
2) Trigger conditions:
i. Power gear position is switched to non-OFF (Non-remote mode);
ii. Any door is open;
iii. Back door is open;
iv. There is timeout of polling for 7 days;
v. Locate the key is in outside sensing area for more than 1 minute.
3) Execution action:
i. PEPS enters APU SATO Polling Abort state;
ii. PEPS stops the polling function of back door.

■ **Courtesy Light**

No.	Description
FR.POLL.028	SWEL Polling Abort->Welcome Light Polling Preparation->Proximity leaving welcome polling PEPS enters Proximity leaving welcome polling state from Abort state when the following conditions are met: • PEPS detects that anti-theft state feedback by BCM changes from disarm to arm state
FR.POLL.029	Proximity leaving welcome polling -> WEL Polling Abort PEPS enters WEL Polling Abort state from Proximity leaving welcome polling when any of following conditions is met: • Power gear position is switched to non-OFF (Non-remote mode) • Any door is open • Back door is open • Anti-theft state changes from arm to disarm state • There is timeout of polling for 7 days • Locate the key is in outside sensing area for more than 1 minute • The key is located in the vehicle
FR.POLL.030	Proximity leaving welcome polling->Wait approach welcome light polling PEPS enters Wait approach welcome light polling state from Proximity leaving welcome polling state when the

No.	Description
	following conditions are met: (Send a request to turn off the courtesy light) • It is detected that key leaves the welcoming off area • Leaving the welcome area for 5 seconds at the same time
FR.POLL.031	Wait approach welcome light polling-> Proximity leaving welcome polling PEPS enters Proximity leaving welcome polling state from wait approach welcome light polling state when the following conditions are met (Send a request to turn on the courtesy light): • It is detected that key is in welcoming on area
FR.POLL.032	Wait approach welcome light polling-> WEL Polling Abort PEPS enters WEL Polling Abort state from Wait approach welcome light polling when any of following conditions is met: • Power state is switched to non-OFF (Non-remote mode) • Any door is open • Back door is open • Anti-theft state changes to disarm state • There is timeout of polling for 7 days

(1) Description of each WEL state:

1) WEL Polling Abort: Polling of courtesy light stops, courtesy light polling locating key will not work in this state.
2) Welcome Light Polling Preparation: Suspended state, it will enter this state after powering on, check if wel polling conditions are met.
3) Proximity leaving welcome light polling: Detect the state of the key leaving courtesy light off area. When it detects that the key is not in outside sensing area, it will jump to wait approach welcome light polling state. Immediately execute key tracking, keep away from the vehicle and turn off the courtesy light polling state.
4) wait approach welcome light polling: Key is not near the vehicle, PEPS can not sense smart key state. In this state, PEPS will track whether the key is close to the vehicle. If it is close to the vehicle, it will activate the function of courtesy light.

(2) FR.POLL.028

WEL Polling Abort->Welcome Light Polling Preparation->Proximity leaving welcome polling WAL Preparation 0-> WAL Wait leaving polling：

1) Enabled conditions:
   - Power gear position is in OFF;
   - There is no timeout of polling for 7 days.
2) Trigger conditions:
   i. The four doors are closed, back door is closed, and the anti-theft state feedback by BCM changes from disarm to arm;
   ii. The four doors are closed, and the anti-theft state feedback by BCM is arm state, it detects that back door changes from open to closed state;
   iii. Back door is closed, and the anti-theft state feedback by BCM is arm state, it detects that four doors change from non fully closed state to fully closed state.
3) Execution action:
   i. PEPS enters Proximity leaving welcome polling state;

ii. Locate and track the outside key.

(3) FR.POLL.029

Proximity leaving welcome polling -> WEL Polling Abort

1) Enabled condition: PEPS is in Proximity leaving welcome polling state.
2) Trigger conditions:
   i. Power gear position is switched to non-OFF;
   ii. Any door is open;
   iii. Back door is open;
   iv. Anti-theft state feedback by BCM changes from arm to disarm state;
   v. The legal key is located the vehicle;
   vi. Locate the legal key outside the vehicle for more than 1 minute;
   vii. There is timeout of polling for 7 days.
3) Execution action:
   i. PEPS enters WEL Polling Abort g state;
   ii. PEPS stops the polling function of courtesy light.

(4) FR.POLL.030

Proximity leaving welcome polling->Wait approach welcome light polling

1) Enabled condition: PEPS is in Proximity leaving welcome polling state.
2) Trigger condition: It is detected that key leaves the welcoming OFF area for more than 5 seconds.
3) Execution action:
   i. PEPS enters Wait approach welcome light polling state;
   ii. PEPS performs turning off courtesy light function and sends three frames of information first, 0x404: PEPS_WELControl=0x01 (Light OFF Request). Then it sends three frames of information, 0x404: PEPS_WELControl=0x00, the period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3).

(5) FR.POLL.031

Wait approach welcome light polling-> Proximity leaving welcome polling

1) Enabled condition: PEPS is in Wait approach welcome light polling state.
2) Trigger condition: It is detected that key enters the welcoming on area.
3) Execution action:
   i. PEPS enters Proximity leaving welcome polling state;
   ii. PEPS performs turning on courtesy light request, and sends three frames of information first, 0x404: PEPS_WELControl=0x02 (Light ON Request). Then it sends three frames of information, 0x404: PEPS_WELControl=0x00, the period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3).

(6) FR.POLL.032

Wait approach welcome light polling-> WEL Polling Abort

1) Enabled condition: PEPS is in Wait approach welcome light polling state.
2) Trigger conditions:
   i. Power gear position is switched to non-OFF;
   ii. Any door is open;
   iii. Back door is open;
   iv. Anti-theft state feedback by BCM changes from arm to disarm state;
   v. There is timeout of polling for 7 days.
3) Execution action:
   i. PEPS enters WEL Polling Abort g state;
   ii. PEPS stops the polling function of courtesy light.

■ **Polling Function for Locating Key Times Out**

No.	Description
FR.POLL.033	It is considered that if the key is in area where PEPS can sense it, working long hours can cause the key to consume power quickly. Therefore, the following strategy should be adopted: If the key is in vehicle outside sensing area for more than 1 minute, PEPS will turn off all Polling functions.

(1) FR.POLL.033

1) Enabled conditions: PEPS can be in either WEL Polling, SATO Polling or APU Polling state.
2) Trigger condition: The smart key is within welcoming closing border area, and the time exceeds 1 minute.
3) Execution action: PEPS turns off the Polling function.

(2) When PEPS is in Polling suspended state, Polling function can be restored if any of the following conditions is met. Which Polling function works depends on the current working conditions, see the trigger conditions of each Polling for details.

1) Anti-theft state changes;
2) Open and close four doors again;
3) Open and close back door again.

1.7 Remote Function

■ **Remote Authentication Management**

No.	Description
FR.RMM.001	The authentication process starts when PEPS receives a remote start request
FR.RMM.002	After the authentication is passed, PEPS sets the corresponding authentication state to PASS; if the authentication is not passed, the authentication state is set to Fail
FR.RMM.003	If PEPS does not receive the authentication feedback or the authentication feedback is incorrect, PEPS will feedback the message PEPS_RemoteCtrlFailReason = 0x13 'Telematics authen failed '.

(1) FR.RMM.001

1) Enabled conditions:
   i. PEPS has learned the key;
   ii. The transport mode is invalid.
2) Trigger conditions: a start request of TGW_EngineStart_Request = 1 Engine start request sent by TGW is received.
3) Execution action: PEPS sends a TeleImmoResp request to TGW to start the authentication process.

(2) 0x412 signal sent by TGW is processed. 0x412 is defined as an event-based packet. TGW does not actively send the default value after sending three frames of request packets. After receiving the request signal from TGW, PEPS will reset all the following signals after 400 ms if TGW does not send.

(3) Before the remote startup request is authenticated, PEPS checks whether the following conditions are met. If the following conditions are not met, no authentication is performed, and STAT_ RemoteSecurityValid=0x01 (Fail) is fed.

1) PEPS has learned (key has learned);
2) PEPS detects the transport mode sent by BCM (0x152) STAT_TransportMode!= 0 x01 (active).

(4) FR.RMM.002

1) When authentication is passed, STAT_RemoteSecurityValid = 0x02 Pass,STAT_RemoteControl = Remote Mode.
2) When authentication is not passed, STAT_RemoteSecurityValid = 0x01 Fail and STAT_ RemoteControl = Normal Mode at the same time.
3) When in initial condition of powering on, STAT_RemoteSecurityValid = 0x00 Default.

(5) FR.RMM.003

1) When PEPS receives a remote start request from TGW, it will initiate authentication. If no authentication feedback or incorrect authentication feedback is received from PEPS, PEPS reports PEPS_RemoteCtrlFailReason = 0x13 'Telematics authen failed.

■ **Remote Starting**

No.	Description
FR.RSS.001	After receiving the remote start request, PEPS will first make the following judgments. When the following start conditions are met, PEPS will switch to ON and make the judgment of the condition of ON when the authentication is passed: • PEPS has learned; • 2. Remote configuration is valid; • No fault in IG1 output; • No fault in start output; • Operating voltage is within a range of 9 to 16 V; • Power gear position is in OFF; • Brake is not depressed; • Number of remote start times is less than 2 times • SSB1 not pressed; • SSB2 not pressed • Engine hood is closed • Anti-theft state is not Alarm (it is in Prearm or secured state) • No BCM node timeout was detected • The key is not in the vehicle
FR.RSS.002	When the FR.RSS.001 condition is not met, PEPS sends the CAN signal PEPS_RemoteCtrlFailReason to report the failure reason.
FR.RSS.003	If PEPS does not receive the authentication feedback or the authentication feedback is incorrect, PEPS will feedback the message PEPS_RemoteCtrlFailReason = 0x13 'Telematics authen failed '.
FR.RSS.004	If the condition of FR.RSS.004 is met, and the remote authentication is passed, PEPS is switched to ON, and the time is extended for 1 second to judge whether the condition of ON is met: • TCU feedback is in P gear • Vehicle speed is lower than 5km/h • PT output is valid • EPB is not released, i.e. EPBSts=Applied When the above judgment conditions of ON are met simultaneously, PEPS sends 0x405: SSBStart = Start to EMS to request to turn on ignition switch, and sends a total of 3 frames of start request signals

No.	Description
FR.RSS.005	When FR.RSS.005 conditions are not met, PEPS powers off automatically, and sends STAT_ RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode; In addition, PEPS sends the CAN signal PEPS_RemoteCtrlFailReason to report the failure cause
FR.RSS.006	In remote mode, if the power switch is switched to ON for more than two times, the remote start is prohibited and an error message is displayed indicating that the number of start times is exceeded. After the number of start times is exceeded, it can resume by powering on of normal PDU.
FR.RSS.007	In remote mode, when the power gear position is switched, PEPS updates the gear signal above CAN according to the actual gear output, namely: In remote OFF mode, STAT_Terminal=OFF; in remote ACC mode, STAT_Terminal=ACC; in remote ON mode or RUN mode, STAT_Terminal=ON; in remote ignition mode, STAT_Terminal= start
FR.RSS.008	During remote ignition, PEPS receives the EMS signal EngineState == Activation starter powerstage, and enters the start state and timing for 15 seconds. If the ignition does not succeed within 15 seconds, PEPS will automatically power off. And it sends STAT_ RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode.PEPS_RemoteCtrlFailReason = 0x1F
FR.RSS.009	Within 15 seconds of ignition timing, engine RUN state is detected and PEPS enters the RUN state. At the same time, the time is timed for 15 minutes. After 15 minutes, PEPS automatically powers off and sends STAT_RemoteSecurityValid == Default.STAT_ RemoteControl = Normal mode. PEPS_ RemoteCtrlFailReason = 0x16
FR.RSS.010	After the PEPS is switched to the remote RUN, the timer starts. The PEPS will automatically power off after a maximum of 15 minutes. Considering that it cannot exceed 15 minutes, the actual internal timing of PEPS is carried out according to 14 minutes
FR.RSS.011	In remote RUN mode, if the remote start condition is not met, PEPS automatically powers off and sends STAT_ RemoteSecurityValid = Default, STAT_RemoteControl = Normal mode. In addition, PEPS sends the CAN signal PEPS_RemoteCtrlFailReason to report the failure cause
FR.RSS.012	When engine is running in remote mode, PEPS receives engine stopping request of TGW (TGW_ EngineStop_Request = 0x1 Engine stop requset), PEPS will power off, and it sends STAT_ RemoteSecurityValid = Default， STAT_RemoteControl = Normal mode
FR.RSS.013	When engine is running in remote mode, depress the brake pedal, no legal key is found in vehicle, PEPS will power off, and the same time it will send STAT_ RemoteSecurityValid = Default， STAT_RemoteControl

No.	Description
	= Normal mode and PEPS_RemoteCtrlFailReason = 0x22 No Valid fob found as the feedback
FR.RSS.014	When engine is in RUN mode in remote mode, remote re-conditions are met, feedback state of BCM is not in anti-theft state at the same time, depress the brake pedal, legal key is found in vehicle, PEPS changes to normal PDU state, power state keeps in RUN mode, and it will send STAT_RemoteSecurityValid = Default, STAT_RemoteControl = Normal mode
FR.RSS.015	For key processing in remote mode, it is equivalent to OFF in normal mode, that is, no matter what gear of remote mode, remote control, PE and Polling functions are equivalent to the processing condition of normal OFF
FR.RSS.016	When PEPS enters remote mode, PEPS sends 5A8:320a 14 (continuous) signal; When PEPS exits remote mode, PEPS sends 5A8:320A 15 (sends 3 frames) signal
FR.RSS.018	After entering the remote RUN mode, if BCM feedback is disarm state, when entering the car with the legal key and stepping on the brake, PEPS will automatically return to the normal mode and maintain the current RUN state, realizing seamless switchover

(1) FR.RSS.001

1) Before PEPS receives the remote start request sent by TGW, it will first judge whether the pre-start condition is satisfied in the OFF. If yes, it will switch to the ON and make some conditions judgment in the ON. The ignition will start only after the ON condition is also satisfied. The pre-start judgment condition of OFF is the first step before the start, and the judgment conditions are as follows:

   i. PEPS has learned;
   ii. Remote configuration is valid;
   iii. No fault in IG1 output;
   iv. No fault in start output;
   v. Operating voltage is within a range of 9 to 16 V;
   vi. SSB1 not pressed;
   vii. SSB2 not pressed;
   viii. Engine hood is closed;
   ix. Anti-theft state is not Alarm state;
   x. No BCM node timeout was detected;
   xi. The key is not in the vehicle.

   If any of the above conditions is not met, the pre-start condition is not met, and PEPS cannot switch to ON for the subsequent start condition judgment and ignition start.

(2) FR.RSS.002

1) PEPS received a start request from TGW TGW_EngineStart_Request=0x1 before learning: Engine start request, PEPS feedbacks PEPS_RemoteCtrlFailReason = 09 PEPS not learn, STAT_RemoteSecurityValid=1 fail, no authentication.
2) When PEPS remote mode is set to invalid, a start request from TGW is received. TGW_EngineStart_Request=0x1: Engine start request, PEPS feedbacks PEPS_RemoteCtrlFailReason= 0x4 Teleoption not set， STAT_RemoteSecurityValid=1 fail, no authentication.
3) When receiving STAT_TransportMode = 0x01 Active of BCM, start request TGW_EngineStart_Request=0x1 from TGW was received: Engine start request, PEPS feedbacks PEPS_RemoteCtrlFailReason=0x1A，STAT_RemoteSecurityValid=1 fail, no authentication.

4) Power supply is not in OFF, start request TGW_EngineStart_Request=0x1 from TGW was received: Engine start request, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x02 Termial NOT OFF.
5) Legal key is in vehicle, start request TGW_EngineStart_Request=0x1 from TGW is received: Engine start request, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x08 Key in the car.
6) Anti-theft state is not Prearm or secured, start request TGW_EngineStart_Request=0x1 from TGW is received: Engine start request, PEPS feedbacks problem PEPS_RemoteCtrlFailReason = 0x0E, ATWS state not armed.
7) Any of four doors is not closed, PEPS feedbacks problem PEPS_RemoteCtrlFailReason = 0x07 Any door opened(4 door).
8) Back door is not closed, PEPS feedbacks problem PEPS_RemoteCtrlFailReason = 0x1E, luggage compartment opens.
9) The engine hood is open, PEPS feedbacks problem PEPS_RemoteCtrlFailReason = 0x1D Hood is open.
10) Brake pedal is depressed, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x0D Brake is pressed.
11) SSB is depressed, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x12.
12) BCM node timeout, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x0A communication error.
13) Voltage is not in 9 to 16 V, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x03 Voltage out of range.
14) Remote request to ON is more than 2 times, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x26 exceed max engine start times.

(3) FR.RSS.005

1) Power gear position is switched to ON in remote mode, it detects that vehicle speed is more than 5 km/h, PEPS powers off, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode and feedbacks PEPS_RemoteCtrlFailReason = 0x6 Vehicle is moving.
2) When switching to ON, P signal is not detected within 1 second, and PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x11p Position failure.
3) When switching to ON, EMS anti-theft authentication fails to be detected, STAT_EMSReleased = Engine locked, PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x14 EMS auth failed.
4) When switching to ON, EMS message is not received within 1 second, and PEPS feedbacks PEPS_RemoteCtrlFailReason = 0x15 EMS no response.
5) Power gear position is switched to ON, EPB signal EPBSts=Applied is not received by PEPS after 1 second, PEPS powers off, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks PEPS_RemoteCtrlFailReason = 0x20 EPB not in paking state.
6) Power gear position is switched to ON, output is invalid after 1 second, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks PEPS_RemoteCtrlFailReason = 0x2C PT relay output failure.

(4) FR.RSS.011

1) Engine running time is more than 15 minutes, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks problem PEPS_RemoteCtrlFailReason = 0x16.
2) SSB is pressed, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks PEPS_RemoteCtrlFailReason = 0x12.
3) Vehicle speed is more than 5km/h, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks problem PEPS_RemoteCtrlFailReason = 0x6.
4) It detects that water temperature is too high, WarningMessageID_IPC = 2B, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks PEPS_RemoteCtrlFailReason = 0x2A.
5) Braking is valid, BCM is in anti-theft state, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks problem PEPS_RemoteCtrlFailReason = 0x21.
6) After engine is running, detection is delayed for 30 seconds, it detects that oil pressure is low, WarningMessageID_IPC = 7, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. It feedbacks problem PEPS_RemoteCtrlFailReason = 0x2B.

7) When detecting that the engine state changes from RUN to Stopped, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode.
8) TGW_EngineStop_Requset = 1 Engine stop request is received, PEPS powers off automatically, and sends STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode.
9) When engine is in RUN mode in remote mode, remote re-conditions are met, feedback state of BCM is not in anti-theft state at the same time, depress the brake pedal, legal key is not found in vehicle, PDU switches to OFF, and it feedbacks STAT_RemoteSecurityValid == Default, STAT_RemoteControl = Normal mode. And it feedbacks PEPS_RemoteCtrlFailReason = 0x22 No valid fob found at the same time.

■ **Remote Unlocking/Locking**

■ **Remote Locking**

No.	Description
FR.LK.001	Pre-judgment conditions for remote locking: • Remote function configuration is valid • Power gear position is in OFF (Non-remote mode) or remote mode • PEPS has learned the key • Power supply voltage is in a range of 9-16V • BCM node not off
FR.LK.002	Pre-judgment conditions for remote locking are met, PEPS receives TGW_Door_Lock_Request = 0x01 sent from TGW when the four doors, back door and engine hood are closed. PEPS feedbacks PEPS_RemoteLockingStatus = Received(in progress), and three frames (0x404), (0x404)RKECmd = 0x01 (all doors lock) are sent at the same time. Then it sends three frames of information (0x404) RKECmd=0x00, the period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3), keep previous state. Lock state changes to lock after 1 second, it feedbacks PEPS_RemoteLockingStatus = 0x02 (Succeed), if lock state feedback is unlock after 1 second, it feedbacks PEPS_RemoteLockingStatus = 0x03 (Failed)
FR.LK.003	PEPS receives TGW_Door_Lock_Request = 0x01 sent by TGW, if unlocking conditions are not met, PEPS reports the specific failure cause through PEPS_RemoteCtrlFailReason.

(1) FR.LK.003

1) When TGW sends TGW_Door_Lock_Request = Door lock, power gear position is in non-OFF (Non-remote mode), PEPS sends PEPS_RemoteCtrlFailReason=0x02 (Terminal NOT OFF), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.
2) When TGW sends TGW_Door_Lock_Request = Door lock, PEPS does not perform learning, PEPS sends PEPS_RemoteCtrlFailReason=0x09 (PEPS NOT LEARN), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.
3) When TGW sends TGW_Door_Lock_Request = Door lock, Remote/Bluetooth configuration invalid, PEPS sends PEPS_RemoteCtrlFailReason=0x04 (TeleOption not set), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.
4) When TGW sends TGW_Door_Lock_Request = Door lock, power supply is not within the range of 9 to 16 V, PEPS sends PEPS_RemoteCtrlFailReason=0x03 (Voltage out of range), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.
5) When TGW sends TGW_Door_Lock_Request = Door lock, PEPS loses communication with BCM, PEPS sends PEPS_RemoteCtrlFailReason=0x0A (Communication error), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.

6) When TGW sends TGW_Door_Lock_Request =Door lock, any door is open (four doors), PEPS sends PEPS_RemoteCtrlFailReason=0x07 (Any door opened), and it feedbacks PEPS_ RemoteLockingStatus = Failed at the same time.

7) When TGW sends TGW_Door_Lock_Request =Door lock, back door is open, PEPS sends PEPS_ RemoteCtrlFailReason=0x1E (luggage compartment opens), and it feedbacks PEPS_ RemoteLockingStatus = Failed at the same time.

8) When TGW sends TGW_Door_Lock_Request = Door lock, engine hood opens, PEPS sends PEPS_ RemoteCtrlFailReason=0x1D (Hood open), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.

■ **Remote Unlocking**

No.	Description
FR.ULK.001	Pre-judgment conditions for remote unlocking: • Remote function configuration is valid • Power gear position is in OFF (Non-remote mode) or remote mode • PEPS has learned the key • Power supply voltage is in a range of 9-16V • BCM node not off
FR.ULK.002	Pre-judgment conditions for remote unlocking are met, PEPS receives TGW_Door_Lock_Request = 0x02 sent by TGW. PEPS feedbacks PEPS_ RemoteLockingStatus = Received(in progress), and three frames (0x404), (0x404)RKECmd = 0x03 (all doors unlock) are sent at the same time. Then it sends three frames of information (0x404) RKECmd=0x00, the period is 40ms; FOBID in 0x155 periodically indicates key ID (key index1/key index2/key index3), keep previous state. Lock state changes to unlock after 1 second, it feedbacks PEPS_RemoteLockingStatus = 0x02 (Succeed), if lock state feedback is lock after 1 second, it feedbacks PEPS_RemoteLockingStatus = 0x03 (Failed)
FR.ULK.003	PEPS receives TGW_Door_Lock_Request = 0x02 sent by TGW, if unlocking conditions are not met, PEPS reports the specific failure cause through PEPS_ RemoteCtrlFailReason.

(1) FR.ULK.003

1) When TGW sends TGW_Door_Lock_Request = Door unlock, power gear position is in non-OFF (Non-remote module), PEPS sends PEPS_RemoteCtrlFailReason=0x02 (Terminal NOT OFF), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.

2) When TGW sends TGW_Door_Lock_Request = Door unlock, PEPS does not perform learning, PEPS sends PEPS_RemoteCtrlFailReason=0x09 (PEPS NOT LEARN), and it feedbacks PEPS_ RemoteLockingStatus = Failed at the same time.

3) When TGW sends TGW_Door_Lock_Request = Door unlock, Remote/Bluetooth configuration invalid, PEPS sends PEPS_RemoteCtrlFailReason=0x04 (TeleOption not set), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.

4) When TGW sends TGW_Door_Lock_Request = Door unlock, power supply is not within the range of 9 to 16 V, PEPS sends PEPS_RemoteCtrlFailReason=0x03 (Voltage out of range), and it feedbacks PEPS_RemoteLockingStatus = Failed at the same time.

5) When TGW sends TGW_Door_Lock_Request = Door unlock, PEPS loses communication with BCM, PEPS sends PEPS_RemoteCtrlFailReason=0x0A (Communication error), and it feedbacks PEPS_ RemoteLockingStatus = Failed at the same time.

1.8 Bluetooth Enter and Start Function

■ Bluetooth Authentication

No.	Description
FR.BLE.001	Bluetooth authentication process is the same as the remote authentication flow and authentication algorithm. In PEPS and TGW authentication, PEPS acts as the primary authentication node and actively initiates authentication.
FR.BLE.002	When PEPS initiates authentication, PEPS sends 0x325 for authentication and TGW 0x328 for authentication data. After PEPS determines that the authentication is successful, it sends STAT_ BTKeySecurityValid=Pass
FR.BLE.003	When STAT_BTKeySecurityValid = NOT passed is met, STAT_BLEKeyLocalization is start area. When the braking input is valid when detected in OFF, it will authenticate with TGW. After the authentication is passed, it will set STAT_BTKeySecurityValid=Pass and time it for 1 minute. It will remain valid for 1 minute. If it times out in 1 minute or the TGW node is lost, the authentication update fails.
FR.BLE.004	Power gear position is in OFF, when STAT_ BTKeySecurityValid = NOT passed is met, STAT_ BLEKeyLocalization is start area. SSB input is valid, authentication of PEPS and TGW will be performed. After authentication is passed, power gear position is switched to ACC. After that, STAT_ BTKeySecurityValid=Pass is always valid until state of front left door changes or TGW node times out
FR.BLE.005	Power gear position is in ACC, when STAT_ BTKeySecurityValid = NOT passed is met, STAT_ BLEKeyLocalization is start area. SSB input is valid, authentication of PEPS and TGW will be performed. After authentication is passed, power gear position is switched to ON
FR.BLE.006	When STAT_BTKeySecurityValid = Not pass is met, Bluetooth position feedback is in the STAT_ BTKeyLocalization, which is start area and brake input is valid, PEPS will initiate authentication actively
FR.BLE.007	STAT_BLEKeyLocalization is start area, operate brake or SSB at the same time, if PEPS does not learn, PEPS does not conduct the authentication process, it feedbacks STAT_BTKeySecurityVali=0x01 (failed), then sends problem PEPS_RemoteCtrlFailReason = 0x09 (-PEPS not learnt).
FR.BLE.008	32B: STAT_BLEKeyLocalization is start area, operate brake or SSB at the same time, configuration is transport mode. PEPS does not perform the authentication process. If this function is disabled, it feedbacks STAT_BTKeySecurityVali=0x01 (failed), then sends problem PEPS_RemoteCtrlFailReason = 0x1A (-Transport mode).
FR.BLE.009	When in initial state, STAT_BTKeySecurityValid= default, if authentication is passed, it indicates STAT_

No.	Description
	BTKeySecurityValid = Success, if authentication is not passed, it indicates STAT_BTKeySecurityValid = Failed
FR.BLE.010	When authentication is valid, and Bluetooth feedback STAT_BLEKeyLocalization is start area. If SSB is operated to power on or depress brake to perform pre-authentication, PEPS does not issue the authentication again. When the authentication is invalid, the SSB is operated or the brakes are applied, and the authentication is initiated again
FR.BLE.011	For Bluetooth key, there is no need for anti-theft authentication when PE unlocks or locks; When performing the PS operation, authentication is required. Only after the authentication is passed, the Bluetooth key can be used to power on, power off, or start
FR.BLE.012	After the Bluetooth key is powered on to ACC, the authentication will be considered valid all the time, which is equivalent to ID2 function of smart key. When the state of front left door changes or TGW node times out, the authentication will be invalid, and the Bluetooth key can be considered valid only after re-authentication. PEPS will only issue authentication when the Bluetooth key is in the start area
FR.BLE.013	Bluetooth key function is equivalent to ordinary smart key function, when TGW feedbacks that Bluetooth key in the start area, and authentication is passed, it can be used for normal PS operation, as well as seamless switching between remote mode and normal mode, logic is equivalent to ordinary smart key
FR.BLE.014	In remote RUN mode, PEPS sends STAT_ RemoteSecurityValid = Pass and STAT_ BTKeySecurityValid = Default. Enter the vehicle via Bluetooth key at this time, and depress the brake pedal at the same time, find the legal Bluetooth key in the vehicle, PEPS exits remote mode, at the same time it indicates STAT_RemoteSecurityValid = Default and STAT_BTKeySecurityValid = Pass
FR.BLE.015	In remote RUN mode, PEPS sends RemoteSecurityValid = Pass and STAT_ BTKeySecurityValid = Default. Enter the vehicle via Bluetooth key at this time, and depress the brake pedal at the same time, legal Bluetooth key is not found in the vehicle, PEPS should exit remote mode and return to ON
FR.BLE.016	The Bluetooth authentication succeeds, the remote start condition is met, and PEPS receives the start request. PEPS sends STAT_RemoteSecurityValid = Pass
FR.BLE.017	When in OFF, 32B: STAT_BLEKeyLocalization is start area, brake is not depressed, operate SSB switch input. When authentication is not passed, it feedbacks authentication failure, PEPS can not switch to ACC, and it feedbacks PEPS_RemoteCtrlFailReason =0x13 (-Telematic authentication failure) at the same time

No.	Description
FR.BLE.018	When in OFF, 32B: STAT_BLEKeyLocalization is start area, brake is depressed, operate SSB switch input. When authentication is not passed, it feedbacks authentication failure, PEPS can not start and keep in OFF, and it feedbacks PEPS_RemoteCtrlFailReason =0x13 (Telematic authentication failure) at the same time
FR.BLE.019	32B: STAT_BLEKeyLocalization is start area, operate SSB switch or depress brake, Bluetooth authentication is not passed. PEPS sends 5A8:32 0D 14 (for 10 seconds) to instrument cluster. Bluetooth key authentication failure alarm is displayed, and the alarm is reset after sending 32 0D 15 (sending 3 frames)

■ **Bluetooth Key Entry**

No.	Description
FR.BLE.020	Bluetooth key active unlocking function is equivalent to remote unlocking, TGW sends the same signal request to PEPS, PEPS does not distinguish between remote unlocking or Bluetooth unlocking, all the logic is the same
FR.BLE.021	Power gear position is in OFF, lock feedback is locked, the left door is closed, left door handle PE Unlock is triggered, no legal smart key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (Unlock). After sending 3 frames (0x404) passively entry locking command = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state
FR.BLE.022	Power gear position is in OFF, lock feedback is locked, the right door is closed, right door handle PE Unlock is triggered, no legal smart key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (Unlock). After sending 3 frames (0x404) passively entry locking command = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state
FR.BLE.023	In remote mode, lock feedback is locked, the left door is closed, left door handle PE Unlock is triggered, no legal smart key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (Unlock). After sending 3 frames (0x404) passively entry locking command = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state.
FR.BLE.024	In remote mode, lock feedback is locked, the right door is closed, right door handle PE Unlock is triggered, no legal smart key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (Unlock). After sending

No.	Description
	3 frames (0x404) passively entry locking command = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state.
FR.BLE.025	Power gear position is in OFF, all doors are closed, left door handle PE Unlock is triggered, no legal smart key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (lock). After sending 3 frames (0x404) PassiveEntrylockCmd = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state
FR.BLE.026	Power gear position is in OFF, all doors are closed, right door handle PE Unlock is triggered, no legal smart key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (lock). After sending 3 frames (0x404) PassiveEntrylockCmd = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state
FR.BLE.027	In remote mode, all doors are closed, left door handle PE Unlock is triggered, no legal Save key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (lock). After sending 3 frames (0x404) PassiveEntrylockCmd = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state
FR.BLE.028	In remote mode, all doors are closed, right door handle PE Unlock is triggered, no legal Save key, TGW feedbacks Bluetooth key is Access area, PEPS sends 3 frames (0x404) passive entry locking command = 0x01 (lock). After sending 3 frames (0x404) PassiveEntrylockCmd = 0x00 (No command), period is 40 ms; The FOBID in 0x155 periodically indicates the key ID (key index1/key index2/key index3), keep the previous key state
FR.BLE.029	Power mode is ACC/ON/RUN, there is a legal Bluetooth key feedback on the Access side, while all doors close, trigger the PE locking area, the signal PEPS_ sound warning =0x01 (Door lock1) in the PEPS CAN message 0x155 (sending for 3 seconds),Meanwhile, CAN message PEPS_BluetoothKeyWarn = 0x01 (Door Lock warning1) in CAN message 0x42B
FR.BLE.030	Power gear position is in OFF, the vehicle is in fortifying deactivation mode, there is a smart key in vehicle, the Bluetooth key is located in the Access area, trigger the PE lock input, the signal PEPS_ sound warning =0x03 (-Door lock3) in the PEPS CAN message 0x155. At the same time CAN message 52B and message 0x42B send CAN message PEPS_BluetoothKeyWarn = 0x03 (Door Lock warning3)

No.	Description
FR.BLE.031	Power gear position is in OFF, the vehicle is in fortifying deactivation mode, there is a smart key in vehicle, the Bluetooth key is located not in the Access area, trigger the PE lock input, PEPS CAN signal in message 0x155 PEPS_ Sound warning =0x03 (Door lock3)
FR.BLE.032	When in remote mode, the vehicle is in fortifying deactivation mode, there is a smart key in vehicle, the Bluetooth key is located in the Access area, trigger the PE lock input, the signal PEPS_ is heard Audio warning =0x03 (Door lock3) in the PEPS CAN message 0x155. At the same time CAN message 52B and message 0x42B send CAN message PEPS_BluetoothKeyWarn = 0x03 (Door lock warning3)
FR.BLE.033	When in remote mode, the vehicle is in fortifying deactivation mode, there is a smart key in vehicle, the Bluetooth key is located not within the Access area, trigger the PE lock input, PEPS CAN signal in message 0x155 PEPS_ Sound warning =0x03 (Door lock3)
FR.BLE.034	Power gear position is in OFF, the lock is in any state, back door is in any state, STAT_BLEKeyLocalization = Access area. When the key is effective, EEPS sends luggage compartment switch =Press, and sends PassiveEntryTrunkCmd = luggage compartment opens simultaneously (3 frames)
FR.BLE.035	Power gear position is in ACC, the lock is in any state, back door is in any state, STAT_BLEKeyLocalization = Access area. When the key is effective, EEPS sends luggage compartment switch =Press, and sends PassiveEntryTrunkCmd = luggage compartment opens simultaneously (3 frames)
FR.BLE.036	Power gear position is in ON, the lock is in any state, back door is in any state, STAT_BLEKeyLocalization = Access area. When the key is effective, EEPS sends luggage compartment switch =Press, and sends PassiveEntryTrunkCmd = luggage compartment opens simultaneously (3 frames)
FR.BLE.037	Power gear position is in RUN, the lock is in any state, back door is in any state, STAT_BLEKeyLocalization = Access area. When the key is effective, EEPS sends luggage compartment switch =Press, and sends PassiveEntryTrunkCmd = luggage compartment opens simultaneously (3 frames)
FR.BLE.038	When in remote mode, the lock is in any state, back door is in any state, STAT_BLEKeyLocalization = Access area. When the key is effective, EEPS sends luggage compartment switch =Press, and sends PassiveEntryTrunkCmd = luggage compartment opens simultaneously (3 frames)

1.9 Alarm and Prompt

No. Description	Description
FR.WR.001	No valid key Prompt; Transponder start prompt (01): • If no legal key (including IMMO) is found during SSB operation, the No Valid Key Prompt is triggered
FR.WR.002	Park position prompt for terminal transition: (02) • When the power gear position is shifted from RUN to ACC, or from ON to ACC, or from Crank to ACC, and vehicle speed is less than 4 km/h, and no P gear signal is detected within 2 seconds, PEPS sends a signal to shift into P gear
FR.WR.003	Shift to P/N for start reminding (03): • Depress the brake, operate SSB switch, switch power gear to ON and no P/N gear signal is detected within 1000 ms (or when the power gear position is in ON, the brake is applied to operate SSB and the gear is not in P/N), and vehicle speed is less than 4 km/h, PEPF sends a warning to switch to P/N gear
FR.WR.004	Press pedal for start reminding (04): • OFF → ACC → IGN → OFF → ACC within 1-minute), brake is not applied, PEPS sends P sends the brake pedal start prompt
FR.WR.005	Fob low battery indication (5): • When the power gear position is shifted from ON/RUN to OFF, and anti-theft state is fortifying deactivation mode. Recently detected key signal by PEPS indicates low battery power, then when switching to OFF, it will send the remote control battery low alarm
FR.WR.006	Key Out/Leave Vehicle Reminder (06): • Power state is ACC/ON/RUN, door state changes (-including back door). PEPS does not find the key in vehicle and the Bluetooth key is not in the start area, then it will send the key leaving the car alarm (the door state change delay is 1000 ms to check whether the key is in the start area).
FR.WR.007	SSB failure warning (08): • If duration time of SSB1 or SSB2 input signal exceeds for 120 seconds, PEPS will send SSB failure warning alarm
FR.WR.008	IMMO authentication failure warning (09): • Within 1500 ms of switching power gear to ON, PEPS does not detect STAT_EMSReleased = Released sent by EMS or receive STAT_EMSReleased = Locked, PEPS will send Immo authentication failed alarm
FR.WR.009	Warning message for remote mode (0x0A): • When PEPS is in remote mode and engine is in RUN state, PEPS alarms 5A8:32 10 14 ((-continuous) until PEPS exits remote mode

No. Description	Description
FR.WR.010	TGW Bluetooth Authentication Failure (0x0D): • When STAT_BLEKeyLocalization is start area, operate SSB to power on or start, authentication of PEPS and TGW will be performed. PEPS sends a TGW Bluetooth authentication failure when authentication fails or TGW replies busy or TGW does not reply within the specified time
FR.WR.011	Warning message for factory mode (0x0F): • When PEPS is in factory mode, if the power gear position is switched to ON (non-RUN), PEPS will send an alarm signal to the instrument cluster, indicating that the current mode is factory mode, and time is 300 seconds. After 300 seconds, when vehicle speed is less than 5 km/h, the engine is in STOP state and PEPS sends an alarm to the instrument cluster and timing for 13 seconds at the same time. After timing timeout, it will be powered OFF automatically. If it is in P gear, it will be powered OFF; if it is not in P gear, it will be powered OFF to ACC, and powered OFF when in P gear.
FR.WR.012	Auto power down reminder : (0x10) • After 300 seconds in factory mode, PEPS enters the waiting power off state for 13 seconds. In this state, PEPS will send an automatic power off alarm
FR.WR.013	Key Left in Vehicle Warning (0x11): • When Door Lock Warning3 alarms, PEPS sends a warning signal WarningMessageID_PEPS = 0x11 to IPC at the same time
FR.WR.014	Door Lock Warning1-Terminal left at non-off position: • The power gear position is in non-OFF (and not in remote mode), there is a legal key outside the vehicle, which triggers the door handle locking area, and PEPS sends Trigger DoorLockWarn1 system alarm
FR.WR.015	Door Lock Warning3 -Key left inside car: • The power gear position is in OFF (or remote mode), all doors are closed, vehicle is in non-fortified condition, there is a legal key outside the vehicle, which triggers the door handle locking area, and PEPS sends Trigger DoorLockWarn3 system alarm

(1) FR.WR.001

1) Battery voltage is 9 to 16 V, no legal key and trigger SSB (valid ID2 does not triggered), send warning signal 0x5A8：32 01 14 (sending for 10 seconds).
2) Power gear position is in ACC/ON, front left door state changes, ID2 is invalid, operate SSB switch, send warning signal 0x5A8：32 01 14 (sending for 10 seconds).
3) When the alarm is triggered, the legal key in the car is found, and the alarm reset signal 0x5A8:32 01 15 is sent (3 frames are sent).
4) When the alarm is triggered, anti-theft state becomes non fortifying deactivation mode, and the alarm reset signal 0x5A8:32 01 15 is sent (3 frames are sent).
5) When the alarm is triggered for 10 seconds, alarm reset signal 0x5A8:32 01 15 is sent (3 frames are sent).
6) If the key is not learned, SSB will be triggered and the alarm reset signal will not be sent.

Hint:
For sending 5A8 signal, 14 means alarm signal set, that is, trigger alarm, 15 means alarm signal reset, that is, cancel alarm.

(2) FR.WR.002

1) ON, vehicle speed is less than 4, gear is not in P, operate SSB and send alarm signal 0x5A8：32 02 14 (sending for 10 seconds).
2) RUN, vehicle speed is less than 4, gear is not in P, operate SSB and send alarm signal 0x5A8：32 02 14 (sending for 10 seconds).
3) Switches from Crank to ACC, vehicle speed is less than 4, gear is not in P and send alarm signal 0x5A8：32 02 14 (sending for 10 seconds).
4) When the alarm is triggered for 10 seconds, alarm reset signal 0x5A8:32 02 15 is sent (3 frames are sent).
5) When the alarm is in P, alarm reset signal 0x5A8:32 02 15 is sent (3 frames are sent).
6) When the alarm is triggered, vehicle speed is more than 4km/h, and the alarm reset signal 0x5A8:32 02 15 is sent (3 frames are sent).
7) When the alarm is triggered, gear position is switched to non-ACC position, alarm reset signal 0x5A8:32 02 15 is sent (3 frames are sent).

(3) FR.WR.003

1) Depress the brake, TCU gear is in non P/N position, operate SSB, after switching to ON, wait 1000 ms. Detection is not P/N, and the speed is less than 4 km/h, send alarm signal 0x5A8:32 03 14 (-sending for 10 seconds).
2) Power gear position is in ON, depress the brake to start, not in P/N position, and vehicle speed is less than 4 km/h, send alarm signal 0x5A8:32 03 14 (sending for 10 seconds).
3) When the alarm is triggered, power gear position is switched to ACC or RUN, alarm is canceled, send alarm signal 0x5A8：32 03 15 (3 frames are sent).
4) When the alarm is triggered, gear position is switched to P/N position, alarm reset signal 0x5A8:32 03 15 is sent (3 frames are sent).
5) When the alarm times out for 10 seconds, alarm reset signal 0x5A8: 32 03 15 is sent (3 frames are sent).
6) When the alarm is triggered, vehicle speed is not less than 4km/h, and the alarm reset signal 0x5A8:32 03 15 is sent (3 frames are sent).

(4) FR.WR.004

1) After the current ignition is completed, switch to OFF->ACC->ON->OFF->ACC within 1 minute, do not depress the brake, send the alarm signal 0x5A8: 32 04 14 (sending for 10 seconds).
2) When the alarm is triggered, current gear position is switched to non-ACC position, alarm reset signal 0x5A8: 32 04 15 is sent (3 frames are sent).
3) When the alarm is triggered for 10 seconds, alarm reset signal 0x5A8: 32 04 15 is sent (3 frames are sent).
4) When the alarm is triggered, depress the brake to cancel alarm, power gear position is switched to ON-> OFF->ACC again within 1 minute, no alarm signal is sent.
5) When the alarm is triggered and times out for 10 seconds. If the power gear position is switched to ON->OFF->ACC again within 1 minute, the alarm signal 0x5A8: 32 04 14 is sent (sending for 10 seconds).
6) When the alarm is triggered, switch to ON to cancel alarm. If the power gear position is switched to OFF->ACC again within 1 minute, the alarm signal 0x5A8: 32 04 14 is sent (sending for 10 seconds).
7) When the alarm is triggered, timeout or switch to non-ACC mode to cancel the alarm, switch to ACC mode after 1 minute, no alarm signal is sent.

(5) FR.WR.005

1) When switch from ON to OFF, the anti-theft state is fortifying deactivation mode, the recently received remote control signal indicates low battery power (including PE, RKE, PS command signals), alarm signal 0x5A8:32 05 14 is sent (sending for 10 seconds).
2) When switch from RUN to OFF, the anti-theft state is fortifying deactivation mode, the recently received remote control signal indicates low battery power (including PE, RKE, PS command signals), alarm signal 0x5A8:32 05 14 is sent (sending for 10 seconds).

3) When the alarm times out for 10 seconds, alarm reset signal 0x5A8: 32 05 15 is sent (3 frames are sent).
4) When the alarm is triggered, signal of alarm reset 0x5A8: 32 05 15 (3 frames are sent) is received when the low battery level flag is cleared.
5) When the alarm is triggered, power gear position is switched to non-OFF position, alarm reset signal 0x5A8: 32 05 15 is sent (3 frames are sent).
6) When the alarm is triggered, anti-theft state becomes non fortifying deactivation mode, and the alarm reset signal 0x5A8: 32 05 15 is sent (3 frames are sent).

(6) FR.WR.006

1) Power gear position is in ACC/ON/RUN, any door operates, no key is found in vehicle (including IMMO), and Bluetooth key is not in start area or Access area (Bluetooth configuration is valid), PEPS sends alarm signal 0x5A8:32 06 14 (sending for 10 seconds).
2) All doors are closed, and vehicle speed is less than 4km/h, no legal key is found in vehicle (including IMMO), Bluetooth key is not in start area or Access area, PEPS sends PEPS_ sound warning = 0x6: Key leave (sending for 3 seconds) to BCM. PEPS sends PEPS_BTKeyWarning = 0x06 (sending for 3 seconds) to TGW (1 second delay to judge Bluetooth).
3) When the 5A8 alarm is sent, the legal key in the car is detected, and the alarm reset signal 0x5A8:32 06 15 is sent (3 frames are sent).
4) When BCM and TGW alarms are sent, the legal key in the car is detected, or Bluetooth key is in start area or Access area, PEPS sends PEPS_sound warning = 0x0 to BCM, and sends PEPS_ BTKeyWarning = 0x0 to TGW.
5) When vehicle speed exceeds 4km/h for the first time, the search for car keys (including IMMO) is triggered. If no legal keys are found in the car and Bluetooth is not in the start area or Access area, PEPS sends an alarm signal 0x5A8:320614 (sending for 10 seconds).
6) When 5A8 alarm is sent, If gear position is switched to non-OFF or Crank position, PEPS sends alarm reset signal 0x5A8: 32 06 15 (3 frames are sent).
7) When BCM and TGW alarms are sent, if gear position switches to OFF or Crank, PEPS sends PEPS_sound warning = 0x0 to BCM, and sends PEPS_BTKeyWarning = 0x0 to TGW.
8) When 5A8 alarm times out for 10 seconds, PEPS sends alarm reset signal 0x5A8: 32 06 15 (3 frames are sent).
9) When 5A8 alarm is sent, smart key in vehicle is detected or Bluetooth key is in start area or Access area, EPS sends alarm reset signal 0x5A8: 32 06 15 (3 frames are sent).
10) When sending BCM and TGW alarms timed out for 3 seconds, PEPS sends PEPS_sound warning = 0x0, PEPS_BTKeyWarning = 0x0.
11) When Bluetooth configuration is invalid, the alarm sent to TGW and Bluetooth related functions are invalid.

(7) FR.WR.007

1) If the valid time of SSB1 or SSB2 input exceeds 120 seconds, PEPS sends an alarm signal 0x5A8 32 08 14 (sending for 10 seconds).
2) When the alarm times out for 10 seconds, PEPS sends an alarm signal 0x5A8 32 08 15 (3 frames are sent).
3) When the alarm is triggered, when both SSB1 and SSB2 are recovered, fault are cleared, PEPS sends alarm reset signal 0x5A8 32 08 15 (3 frames are sent).

(8) FR.WR.008

1) Power gear position is switched to ON (OFF/ACC->ON), the received feedback of EMS is Locked, PEPS sends alarm signal 0x5A8: 32 09 14 (sending for 10 seconds).
2) Within 1500 ms after power gear position is switched to ON, the received feedback of EMS is not Release, PEPS sends alarm signal 0x5A8: 32 09 14 (sending for 10 seconds).
3) When the alarm is triggered for 10 seconds, PEPS sends alarm reset signal 0x5A8: 32 09 15 (3 frames are sent).
4) When the alarm is triggered, the received feedback of EMS is not Release, PEPS sends alarm reset signal 0x5A8: 32 09 15 (3 frames are sent).
5) When the alarm is triggered, power gear position is switched to non-ON position, alarm reset signal 0x5A8: 32 09 15 is alternator sent (3 frames are sent).

(9) FR.WR.009

1) PEPS enters remote mode, and engine is in RUN, PEPS continuously sends an alarm signal 0x5A8: 32 0A 14.
2) When PEPS exits from remote mode, PEPS sends alarm reset signal 0x5A8: 32 0A 15 (3 frames are sent).

(10) FR.WR.010:

1) Power gear position is in OFF, STAT_BLEKeyLocalization is start area, operate SSB switch (-regardless of brake), PEPS and TGW authentication are not passed, PEPS sends alarm signal 0x5A8 32 0D 14 (sending for 10 seconds).
2) Power gear position is in ACC, STAT_BLEKeyLocalization is start area, operate SSB switch (-regardless of brake), PEPS and TGW authentication are not passed, PEPS sends alarm signal 0x5A8 32 0D 14 (sending for 10 seconds).
3) When the alarm times out for 10 seconds, PEPS sends alarm reset signal 0x5A8 32 0D 15 (3 frames are sent).
4) When the alarm is triggered, the re-authentication is passed, and PEPS sends alarm reset signal 0x5A8 32 0D 15 (3 frames are sent).

(11) FR.WR.011:

1) In factory mode, power gear position is switched to ON (non-RUN), vehicle speed is less than 5km/h, PEPS starts IGN_ON_BatterySavingTimer (300s) and synchronously sends the alert message 5A8 32 0F 14.
2) In factory mode, power gear position is switched to ON (non-RUN), vehicle speed is less than 5km/h, after timing of IGN_ON_BatterySavingTimer (300s) is completed, PEPS sends alarm reset message 5A8 32 0F 15 (reset for Warning message for factory mode).
3) Within 300 seconds of timing, if the vehicle speed exceeds 5 km/h is detected, PEPS sends an alarm reset message 0x5A8 32 0F 15 (3 frames are sent).
4) In factory mode, with IG ON, vehicle speed changes from more than 5km/h to less than 5km/h, resend the alarm 5A8 32 0F 14, and time for 300 seconds again.
5) In factory mode, switch to ON from RUN, resend the alarm 5A8 32 0F 14, and time for 300 seconds again.
6) In factory mode, with ON, within 13 seconds timing, it is detected that effective time of input of hazard warning light 0x355 exceeds for 3 seconds, resend the alarm 5A8 32 0F 14, and time for 300 seconds again.
7) In factory mode, within 300 seconds timing, it is detected that effective time of input of hazard warning light 0x355 (100 ms) exceeds for 3 seconds, time for 300 seconds again and send alarm 5A8 32 0F 14.

(12) FR.WR.012:

1) PEPS sends alarm message 5A8 32 0F 15 (reset for Warning message for factory mode), and send alarm message 0x5A8 32 10 14 (Auto Power down Reminder) at the same time (sending for 10 seconds).
2) When the alarm times out for 10 seconds is completed, PEPS sends an alarm signal 0x5A8 32 10 15 (3 frames are sent).
3) During sending alarm, if it is detected that effective time of input of hazard warning light 0x355 (100 ms) exceeds for 3 seconds, PEPS sends alarm reset signal 0x5A8 32 10 15 (3 frames are sent).

(13) FR.WR.013:

1) Power gear position is in OFF, legal key is in vehicle, four doors are closed, not in anti-theft state, left PE locking is triggered, PEPS sends alarm signal 0x5A8：32 11 14 (sending for 60 seconds).
2) Power gear position is in OFF, legal key is in vehicle, four doors are closed, not in anti-theft state, right PE locking is triggered, PEPS sends alarm signal 0x5A8：32 11 14 (sending for 60 seconds).
3) Power gear position is in OFF, legal key is in vehicle, four doors are closed fully, left PE locking is triggered, PEPS will not send alarm.
4) Power gear position is in OFF, legal key is in vehicle, four doors are closed fully, right PE locking is triggered, PEPS will not send alarm.
5) When 5A8 alarm times out for 60 seconds, PEPS sends alarm reset signal 0x5A8: 32 11 15 (3 frames are sent).
6) When 5A8 alarm is sent, vehicle speed is more than 4km/h, PEPS sends alarm reset signal 0x5A8: 32 11 15 (3 frames are sent).

7) When 5A8 alarm is sent, if a door has been opened, the alarm time will change to 10 seconds (if the remaining time before opening is more than 10 seconds, alarm time will change to 10 seconds; if the remaining time is less than 10 seconds, the time will be smaller than 10 seconds). After 10 seconds, Reset will be sent.
8) When 5A8 alarm is sent, power gear position is switched to non-OFF position, PEPS sends alarm reset signal 0x5A8: 32 11 15 (3 frames are sent).
9) When instrument cluster alarm is sent, BCM state changes to arm state, PEPS sends alarm reset signal 0x5A8: 32 11 15 (3 frames are sent).

(14) FR.WR.014:

1) Power gear position is in ACC/ON/RUN, legal key is in left side of vehicle, left door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x01 (Door lock1).
2) Power gear position is in ACC/ON/RUN, legal key is in right side of vehicle, right door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x01 (Door lock1).
3) Power gear position is in ACC/ON/RUN, legal key is in right side of vehicle, left door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
4) Power gear position is in ACC/ON/RUN, legal key is in left side of vehicle, right door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
5) Power gear position is in OFF, legal key is in left side of vehicle, no key is in vehicle, left door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
6) Power gear position is in OFF, legal key is in right side of vehicle, no key is in vehicle, right door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
7) Power gear position is in ACC/ON/RUN, no legal key is in left side of vehicle, left door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
8) Power gear position is in ACC/ON/RUN, no legal key is in right side of vehicle, right door handle locking area is triggered, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
9) When Door Lock Warning1 is triggered, power gear position is switched to OFF or alarm times out for 3 seconds, stop sending alarm signal.

(15) FR.WR.015:

1) Power gear position is in OFF, all doors are closed, and current anti-theft state STAT_ATWS=0x01 (-unsecured), legal key is in vehicle, left door handle locking area is triggered (Whether there's a legal key outside the car or not), PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x03 (Door lock3).
2) Power gear position is in OFF, all doors are closed, and current anti-theft state STAT_ATWS=0x01 (-unsecured), legal key is in vehicle, right door handle locking area is triggered (Whether there's a legal key outside the car or not), PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x03 (Door lock3).
3) Power gear position is in OFF, all doors are closed, and current anti-theft state is STAT_ATWS!=0x01, legal key is in vehicle, left/right door handle locking area is triggered (Whether there's a legal key outside the car or not), PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
4) Power gear position is in OFF, any door is open, and current anti-theft state is STAT_ATWS=0x01, legal key is in vehicle, left/right door handle locking area is triggered (Whether there's a legal key outside the car or not), PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
5) Power gear position is in ACC/ON/RUN, all doors are closed, and current anti-theft state is STAT_ ATWS=0x01 (unsecured), legal key is in vehicle, left/right door handle locking area is triggered (-Whether there's a legal key outside the car or not). When there is legal key in front of outside vehicle: PEPS CAN signal in message 0x155 PEPS_ Sound warning =0x01 (Door lock1), no legal key outside the vehicle: PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
6) When PEPS_Sound warning = 0x03, any door is open, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).
7) When PEPS_Sound warning = 0x03, switch power gear to non-OFF, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).

8) When PEPS_Sound warning = 0x03, alarm times out for 3 seconds, switch power gear to non-OFF, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).

9) When PEPS_Sound warning = 0x03, anti-theft state becomes non fortifying deactivation mode, PEPS CAN signal in message 0x155 PEPS_ Sound warning = 0x00 (No warning).

1.10 Start and Stop Function/ESS

Start and stop function is mainly completed by EMS. PEPS determines the current PDU state according to the received state of StartStopState and EngineState. (When the ESS function is configured, you need to determine the StartStopState state signal. When no ESS function is configured, you only need to determine the EngineState state).

No.	Description
FR.ESS.001	When the current power gear position is in OFF, the PDU is in OFF state regardless of the state of EngineState and StartStopState
FR.ESS.002	When the current power gear position is ACC, the PDU is in ACC state regardless of the state of EngineState and StartStopState
FR.ESS.003	When the current power gear position is in ON, EngineState of EMS is 0x03 (Engine Running) or 0x04 (Engine run in limp home mode), and PDU is in RUN
FR.ESS.004	When the current power gear position is in ON, and switches to ON for delay of 100 ms, it is detected that StartStopState is 0x02/0x03/0x04/0x05/0x06, and PDU is in RUN
FR.ESS.005	When the current power gear position is in ON, EngineState is not 0x04 or 0x05, and StartStopState is not 0x02/0x03/0x04/0x05/0x06 at the same time, and PDU is in ON
FR.ESS.006	When start conditions are met, PEPS sends start request. Within 25 seconds, EMS state changes from non-RUN to 0x02 is received, and PDU switched to start gear
FR.ESS.007	When start conditions are met, PEPS sends start request. Within 25 seconds, EMS state changes from non-RUN to RUN is received, then changes to 0x02, and PDU switched to RUN when RUN is received. When the engine state changes to 02, it will not change to start gear
FR.ESS.008	When the ESS configuration is invalid, the StartStopState state is not considered in the RUN state of EMS
FR.ESS.009	Start and stop state mainly affects the state of SSB indicator. Considering the start and stop state, when the PDU is judged to be in RUN mode, SSB indicator is not ON; when the PDU is judged to be in ON mode, the yellow indicator is ON

1.11 Mileage Backup

No.	Description
FR.ODO.001	Mileage Backup: The mileage received by PEPS SENT from IPC is greater than the mileage stored in PEPS (-greater than 10 km), and the CRC of mileage passes. VIN OF IPC at the same time: IPC_9(0x462) and VIN of PEPS: If PEPS_2(0x442) is same, PEPS will update the backup mileage when power gear is switched to OFF from ON
FR.ODO.002	PEPS only makes the mileage judgment when the power is ON, and only when the power is switched to OFF, it will be judged and store passed mileage in EEPROM
FR.ODO.003	The tolenrance defined in the mileage backup is 10km

1.12 Wireless Charging Enabled

The frequency of PEPS to find the key through LF is 125 KHz, while the frequency used for wireless charging is near this frequency band. In the process of finding the key, if the wireless charging function is effective, it may lead to the failure of finding the key. Therefore, if it is necessary to find the key when it is not OFF, PEPS will send a hard Disable signal to the CWC node through CAN, and the CWC will temporarily disable the wireless charging function.

No.	Description
FR.CWC.001	Power gear position is non-OFF. When PEPS control needs to find the keys in the car or outside the car through the low frequency antenna, PEPS first sends WirelessChargingDisable =Disable, and 50 ms later drives the low frequency antenna to find the keys. When the PEPS controller does not need to find the key, the PEPS sends WirelessChargingDisable = Default
FR.CWC.002	In remote mode, PEPS should always send WirelessChargingDisable = Disable regardless of whether PEPS performs a key search

(1) FR.CWC.001

1) Power gear position is in OFF, searching for key is triggered, PEPS sends WirelessChargingDisable = Default.
2) Power gear position is in OFF, searching for key is not triggered, PEPS sends WirelessChargingDisable = Default.
3) When power gear position is in ACC/ON/RUN, searching for key is triggered, and configuration is valid, PEPS sends WirelessChargingDisable = Disable. Drive the antenna after 50 ms to find the key.
4) When power gear position is in ACC/ON/RUN, searching for key is not triggered, PEPS sends WirelessChargingDisable = Default.
5) CWC is a configuration function. When the CWC configuration is invalid, PEPS sends WirelessChargingDisable = Default.

(2) FR.CWC.002

1) In remote mode, when CWC function configuration is valid, PEPS always sends WirelessChargingDisable = Disable.
2) In remote mode, when CWC function configuration is invalid, PEPS always sends WirelessChargingDisable = Default.

1.13 Transport Mode

The transport mode is mainly used for vehicle transport and will shield some functions to achieve the purpose of reducing static current.

No.	Description
FR.TM.001	Electric PEPS detects the transport mode sent by BCM, PEPS will mask the following functions: • RKE function • PE function • PS function (IMMO is not shielded) • Remote starting function • Bluetooth key function • Polling function
FR.TM.002	To reduce the static current, PEPS turns off the capacitive switch when entering transport mode
FR.TM.003	When exiting remote mode, PEPS will automatically restore all functions without resetting or other operations
FR.TM.004	When entering the transportation mode, normal PS function cannot be started. At this time, the smart key can be placed close to the IMMO antenna, and vehicle can be powered on and started through IMMO function

1.14 Factory Mode

The factory mode is the special mode before the EOL is offline. It is used to prevent lack of power for battery turning on during production line. After entering factory mode, switch power supply to ON, if there is no other operation such as ignition, it will be automatically powered off to OFF after a period of time.

No.	Description
FR.FM.001	The factory mode can only be entered through the diagnosis configuration. If you want to exit the factory mode, you need to exit the factory mode through diagnosis.
FR.FM.002	When PEPS is in factory mode, if the power gear position is switched to ON (non-RUN), PEPS will send an alarm signal to the instrument cluster, indicating that the current mode is factory mode, and time is 300 seconds. After 300 seconds, when vehicle speed is less than 5 km/h, the engine is in STOP state and PEPS sends an alarm to the instrument cluster and timing for 13 seconds at the same time. After timing timeout, it will be powered OFF automatically. If it is in P gear, it will be powered OFF; if it is not in P gear, it will be powered OFF to ACC, and powered OFF when in P gear.

No.	Description
FR.FM.003	PEPS will stop the timer and disable the automatic power-off function if the power switch is changed to another gear or vehicle speed exceeds 5 or the engine starts or the diagnostic exits the factory mode during the 300s of time ON
FR.FM.004	When in factory mode, if PEPS detects that the hazard warning light sent by BCM is held down for more than 3s within the 300s or 13s timing time in ON mode, it will be timed again for 300s

1.15 Key Disabled

No.	Description
FR.FD.001	When the anti-theft state is received from the fortifying deactivation mode to non fortifying deactivation mode, PEPS will delay for 1 second, and then check whether there is a legal key in the car. If the legal key is detected and the key is not the lock key triggered before, all functions of key (including PE, RKE, PS, IMMO) will be disabled. If the detected keys in the car include the keys operated before, the keys in the car are not disabled (anti-theft state: 0/2/3/4/5 not in anti-theft state: 1)
FR.FD.002	When entering the fortifying state, PEPS should test the car for three consecutive times with an interval of 1 second. If a legal key is found in the car, the key will be disabled
FR.FD.003	Bluetooth keys disable smart keys
FR.FD.004	Smart keys disable Bluetooth keys
FR.FD.005	PEPS will release the disabled key when the anti-theft state becomes fortifying deactivation

(1) FR.LP.001

1) Power state is in OFF, four doors are closed, anti-theft state is changed from fortifying deactivation state to the anti-theft state. After 1 second, if a valid key is detected in the car and the key is not the one triggered before, the car key is disabled.
2) Power gear position is in OFF, four doors are closed, anti-theft state is changed from fortifying deactivation state to the anti-theft state. After and the 1 second, if a valid key is detected in the car and the key is not the one Operation before, the car key is not disabled.
3) Power gear position is in OFF, four doors are closed, anti-theft state is changed from fortifying deactivation state to the anti-theft state. After 1 second, if a valid key is detected in the car and the legal key includes the key of previous operation, vehicle key is not disabled.

(2) FR.LP.003

1) Anti-theft state is changed from fortifying deactivation state to the anti-theft state. In addition, if the last operated key is detected to be Bluetooth key, PEPS driver finds the car key and the smart key, and Bluetooth key is not in the start area, all functions of the smart key in the car will be disabled.
2) When normal smart key is disabled, PEPS sends 0x42B PEPS_BTKeyWraning = 0x7 key FOB deactivated (sending for 3 seconds).

(3) FR.LP.004

1) Anti-theft state is changed from fortifying deactivation state to the anti-theft state. In addition, if the last operated key is detected to be smart key, PEPS driver finds the car key, when vehicle smart key is found, and operated key is not in vehicle, all functions of the smart key in the car will be disabled.

2) When Bluetooth key is in start area or access area, and operated key is not in vehicle, PE and PS functions of Bluetooth key are disabled, active unlocking function will not be disabled.

3) When Bluetooth key is disabled, PEPS sends 0x42B PEPS_BTKeyWraning = 0x8 BluetoothKey deactivated (sending for 3 seconds).

4) When Bluetooth key and smart key are disabled at the same time, PEPS sends 0x42B PEPS_ BTKeyWraning = 0x8 key fob deactivated (sending for 3 seconds).

1.16 Mislocking Prevention

No.	Description
FR.LP.001	Power gear position is in OFF, lock is locked. When detecting all doors are closed (excluding back door), PEPS detects the key in vehicle. If valid key is detected or the Bluetooth key is found in the start area, PEPS will send the key reminder unlock command = Unlock request to unlock, and send PEPS_Sound warning = Unwanted door lock alarm to BCM, send PEPS_ BTKeyWarning = 0x04 Key Reminder(Unwanter door lock) to TGW
FR.LP.002	Power gear position is in OFF, lock is unlocked. When all doors are detected to be closed and the lock state becomes locked within 500ms delay, PEPS will search for the key. If the key is found in vehicle and the Bluetooth key is not in the start area, PEPS will send the key reminder unlock command = Unlock to request unlock. Send PEPS_Sound warning = Unwanted door lock (sending for 3 seconds) for BCM, send PEPS_ BTKeyWarning = 0x04 Key Reminder(Unwanter door lock) to TGW
FR.LP.003	Power gear position is in OFF, TransportMode == OFF, PEPSSts == Learnt, anti-theft state is non fortifying deactivation state. Four doors are closed, back door is open. When PEPS detects that back door is turning on from off, PEPS will detect the key in vehicle. If the legal key is found in vehicle or Bluetooth key is in start area, PEPS will send PassiveEntryTrunkCmd = Yes, and also send PEPS_Sound warning = Unwanted trunk lock, PEPS_BTKeyWarning = Trunk Reopen warning
FR.LP.004	If PEPS detects a door opening within 500ms after sending the PE locking command and then closes the car, PEPS will send a key reminder unlock demand = Unlock to request to unlock no matter if there is legal key in vehicle. (After the PE locking command is issued, the door will be opened immediately, the door may be open, but lock state feedback is the door is locked. Close the door at this time. If the key cannot be found due to abnormal interference, the key may be locked in the car)

Hint:
Considering that BCM cannot unlock within 200ms after the lock action, PEPS will delay 500ms when sending the key reminder unlock command = Unlock request.

(1) FR.LP.001

1) Power gear position is in OFF, lock is locked, last door of four doors is closed, there is a legal key in the car, and Bluetooth key is not in the start area. PEPS sends 3 frames 0x404: Key reminder unlock command = 0x01 (unlock), and 3 frames key reminder unlock command = 0x00 (No command); Also in 0x155 PEPS_ Sounding warning =0x04 (Key Reminder/Next Door Lock) (Sending for 3 seconds,

clearing after that), PEPS_BTKeyWarning = 0x04 Key Reminder(Unwanter door lock) in 0x42B is sent (Sending for 3 seconds, clearing after that).

2) Power gear position is in OFF, lock is locked, last door of four doors is closed, and Bluetooth key is in the start area, there is no smart key. PEPS sends 3 frames 0x404: Key reminder unlock command = 0x01 (unlock), and 3 frames key reminder unlock command = 0x00 (No command); Also in 0x155 PEPS_ Sounding warning =0x04 (Key Reminder/Next Door Lock) (Sending for 3 seconds, clearing after that), PEPS_BTKeyWarning = 0x04 Key Reminder(Unwanter door lock) in 0x42B is sent (- Sending for 3 seconds, clearing after that).
3) When PEPS_Sound warning = 0x04, PEPS_BTKeyWarning = 0x04, any door is open, PEPS sends PEPS_Sound warning = 0x00, PEPS_BTKeyWarning = 0x00.
4) When PEPS_Sound warning =0x04, PEPS_BTKeyWarning = 0x04, alarms timed out for 3 seconds, PEPS sends PEPS_Sound warning =0x00, PEPS_BTKeyWarning = 0x00.

(2) FR.LP.002

1) Power gear position is in OFF, lock is unlocked, last door of four doors is closed, there is a legal key in the car, or Bluetooth key is in the start area. In addition, the locking state becomes locked within 500ms after the door is closed. PEPS sends 3 frames 0x404: Key reminder unlock command = 0x01 (unlock), and 3 frames key reminder unlock command = 0x00 (No command); Also in 0x155 PEPS_ Sounding warning =0x04 (Key Reminder/Next Door Lock) (Sending for 3 seconds, clearing after that), PEPS_BTKeyWarning = 0x04 Key Reminder(Unwanter door lock) in 0x42B is sent (Sending for 3 seconds, clearing after that).
2) When PEPS_Sound warning = 0x04, PEPS_BTKeyWarning = 0x04, any door is open, PEPS sends PEPS_Sound warning = 0x00, PEPS_BTKeyWarning = 0x00.
3) When PEPS_Sound warning =0x04, PEPS_BTKeyWarning = 0x04, alarms timed out for 3 seconds, PEPS sends PEPS_Sound warning =0x00, PEPS_BTKeyWarning = 0x00.

1.17 Function Setting

No.	Description
FR.SET.001	Following functions of PEPS support online configuration: • Stay away from locking and close to unlocking • Courtesy light function • Back door automatic opening function • Bluetooth PE entry function
FR.SET.002	Active entry & exit： • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgApuOption= 0x01, cfgWalOption=0x01; received IHU: Set_ PollingEntry = 0x0 of 0x402; feedback of PEPS is 0x40A: STAT_PollingEntry=0x0(Enable) • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgApuOption= 0x01, cfgWalOption=0x01; received IHU: Set_ PollingEntry = 0x1 of 0x402; feedback of PEPS is 0x40A: STAT_PollingEntry=0x1(Disable) • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgApuOption= 0x01, cfgWalOption=0x01; received IHU: Set_ PollingEntry = 0x2/0x03 of 0x402 ; feedback of PEPS is 0x40A: STAT_PollingEntry, keep previous state • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x00, feedback of PEPS is 0x40A: STAT_PollingEntry=0x1(Disable) • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgApuOption=

No.	Description
	0x00, cfgWalOption=0x00, feedback of PEPS is 0x40A: STAT_PollingEntry=0x1(Disable)
FR.SET.003	Easy open: • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgSatoOption= 0x01, cfgSatoReminderOption=0x01; received IHU: Set_SATOPolling= 0x0 of 0x402, feedback of PEPS is 0x40A: STAT_SATOPolling=0x0(Enable with reminder) • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgSatoOption= 0x01, cfgSatoReminderOption=0x01; received IHU: Set_SATOPolling= 0x1 of 0x402, feedback of PEPS is 0x40A: STAT_SATOPolling=0x1(Disable) • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgSatoOption= 0x01, cfgSatoReminderOption=0x01; received IHU: Set_SATOPolling= 0x2/0x3 of 0x402, feedback of PEPS is 0x40A: STAT_SATOPolling, keep previous state • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x00, feedback of PEPS is 0x40A: STAT_SATOPolling=0x1(Disable) • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgSatoOption= 0x00, cfgSatoReminderOption=0x00, feedback of PEPS is 0x40A: STAT_SATOPolling=0x1(Disable)
FR.SET.004	Bluetooth PE control： • When configuration item FD00 in PEPS is set to cfgT-boxOption=0x01, cfgBTVariant=0x01; received IHU: Set_BTKeyPassiveEntry = 0x02 of 0x402, feedback of PEPS is 0x40A: STAT_ BTKeyPassiveEntry=0x02(Enable) • When configuration item FD00 in PEPS is set to cfgT-boxOption=0x01, cfgBTVariant=0x01; received IHU: Set_BTKeyPassiveEntry = 0x00 of 0x402, feedback of PEPS is 0x40A: STAT_ BTKeyPassiveEntry=0x00(Disable) • When configuration item FD00 in PEPS is set to cfgT-boxOption=0x01, cfgBTVariant=0x01; received IHU: Set_BTKeyPassiveEntry = 0x01/0x03 of 0x402, feedback of PEPS is 0x40A: STAT_ BTKeyPassiveEntry, keep previous state • When configuration item FD00 in PEPS is set tocfgT-boxOption=0x00, feedback of PEPS is 0x40A: STAT_BTKeyPassiveEntry=0x00(Disable) • When configuration item FD00 in PEPS is set tocfgT-boxOption=0x00, cfgBTVariant=0x00, feedback of PEPS is 0x40A: STAT_ BTKeyPassiveEntry=0x00(Disable)
FR.SET.005	Set to default： • PEPS receives IHU: 0x402: Set_ToDefault=0x0 (Set_Vehicle_to_default), feedback of PEPS is 0x40A: STAT_PollingEntry=0x1(Disable), STAT_

No.	Description
	SATOPolling=0x0(Enable with reminder), STAT_ BTKeyPassiveEntry=0x00(Disable) • PEPS receives IHU: 0x402: Set_ToDefault=0x04 (Set_All_to_default), feedback of PEPS is 0x40A: STAT_PollingEntry=0x1(Disable)，STAT_ SATOPolling=0x0(Enable with reminder)，STAT_ BTKeyPassiveEntry=0x00(Disable) • Power resumes, feedback of PEPS is 0x40A: STAT_ PollingEntry=0x1(Disable)，STAT_SATOPolling= 0x0(Enable with reminder)，STAT_ BTKeyPassiveEntry=0x00(Disable) • Received BCM configuration is transport mode, feedback of PEPS is 0x40A: STAT_PollingEntry= 0x1(Disable), STAT_SATOPolling=0x1(Disable), STAT_BTKeyPassiveEntry=0x00(Disable), polling function turns off
FR.SET.006	• When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgWelLightOnOption=0x01, received BCM: STAT_ WelcomeLightEnable= 0x0(Enable) of 0x315, PEPS turns welcoming function on • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgWelLightOnOption=0x01, received BCM: STAT_ WelcomeLightEnable= 0x1(Disable) of 0x315, PEPS turns welcoming function off • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x01, cfgWelLightOnOption=0x01, received BCM: STAT_ WelcomeLightEnable= 0x2/03 of 0x315, PEPS keep the previous state, function of courtesy light does not change • When configuration item FD00 in PEPS is set to cfgPollingFunctionOption=0x00 or cfgWelLightOnOption=0x01; Regardless of what configuration the BCM sends, PEPS courtesy light function is always off
FR.SET.007	If no online configuration of IHU or BCM is received after power resumes, default PEPS configuration is as follows (FD00 configuration item needs to be enabled): • Courtesy light function turns on • Stay away from locking and close to unlocking function turns on • Back door automatic ON function turns on • Bluetooth PE entry function turns on

1.18 Other Functions

No.	Description
FR.Other.001	FOBID management: • FOBID is sent periodically. When PE unlocking, WAL, APU, SATO, RKE unlocking and RKE trunk are executed, PEPS will update the FIBID to ID of current operation, and PS operation will not be updated

FR.Other.002	STAT_PEPSAuthentification: • When the PS authentication key is valid, this signal is set to 1. When the key authentication is invalid or the authentication times out, the signal is reset to zero.
FR.Other.003	Battery Voltage Measurement： • PEPS CAN signal (0x155) PowerCircuitVoltage feedbacks battery voltage in real time
FR.Other.004	Auto Terminal OFF for Battery Saving： • Switch PDU from OFF to ACC and keep in this gear for more than 3600 seconds, PEPS will power off automatically. • During emergency shutdown, switch the power gear to ACC and wait over 3600 seconds. If P gear is detected or the gear in memory is P gear, PEPS should power off automatically.
FR.Other.005	When Polling function is not turned on by PEPS, static current is less than 3 mA.

(1) FR.Other.001

1) PEPS sends PassiveEntryLockCmd = lock and FOBID is updated to key ID of the current operation.
2) PEPS sends passive access locking command = unlock and FOBID is updated to key ID of the current operation.
3) PEPS sends PassiveEntryTrunkCmd = trunk and FOBID is updated to key ID of the current operation.
4) PEPS sends RKECmd = 0x1: Door locks/0x3: Door unlocks/0x8: Trunk stop /0x9:Vehicle search and FOBID is updated to key ID of the current operation.
5) PEPS sends key reminder unlocking command = unlock and FOBID is updated to key ID of the current operation.
6) PEPS sends PEPS_WELControl = on and FOBID is updated to key ID of the current operation.
7) PEPS sends APUReq = unlock and FOBID is updated to key ID of the current operation.
8) PEPS sends WALReq = lock and FOBID is updated to key ID of the current operation.
9) PEPS sends SATOReq = request and FOBID is updated to key ID of the current operation.
10) PEPS sends SATOReminder = remind to start and FOBID is updated to key ID of the current operation.
11) FOBID is not updated when PS operation is performed (brake depressing, SSB operation, etc.).
12) When valid ID is sent by FOBID, power resumes, PEPS sends FOBID=0x0.

(2) FR.Other.002

1) Brake is valid, legal key is found and set signal to 1.
2) SSB valid, legal key is found by LF and set signal to 1.
3) SSB valid, legal key is found by IMMO and set signal to 1.
4) ID2 is valid and set signal to 1.
5) PE is triggered to find the car key, and the car has a legal key, set signal to 1.
6) RKE is triggered to find the car key, and the car has a legal key, set signal to 1.
7) Authentication key has timed out, signal has been cleared.

2 System Components

2.1 Key

■ Overview

A vehicle is normally configured with two keys, up to four keys. The key includes smart key and mechanical key, it has three keys, specifically for: Lock key, unlock key and key which opens back door.

■ Function

This key not only has the function of high frequency transmitting, but also has the function of low frequency receiving. Therefore, in addition to the RKE function, PE and PS functions are closely related to each other.

- RKE mode: The key operates like an ordinary key. When the switch button is pressed, it will send a high frequency signal with verification code to the vehicle to ask the vehicle to lock/unlock/open back door/find the car. As long as the key button is pressed, the key will send RF signal, but when the button has been pressed for more than 20 seconds, the key will stop sending RF signal.
- PE, PS modes: When a low frequency trigger signal from a matching vehicle is received within the range of the low frequency antenna, the key responds with a high frequency signal with a verification code.
- Low battery mode: At this point, the key must be placed at the bottom of cup holder near the backup antenna. In this case, the LF transponder embedded in PEPS_ECU is able to authenticate using keys in transponder mode.
- The key will transmit the "low battery" information through RF signal, so as to notify the user in time that the battery needs to be replaced.
- Key button ID: Different functions of RKE are distinguished by remote button ID. The following key IDs are defined as shown in table below:

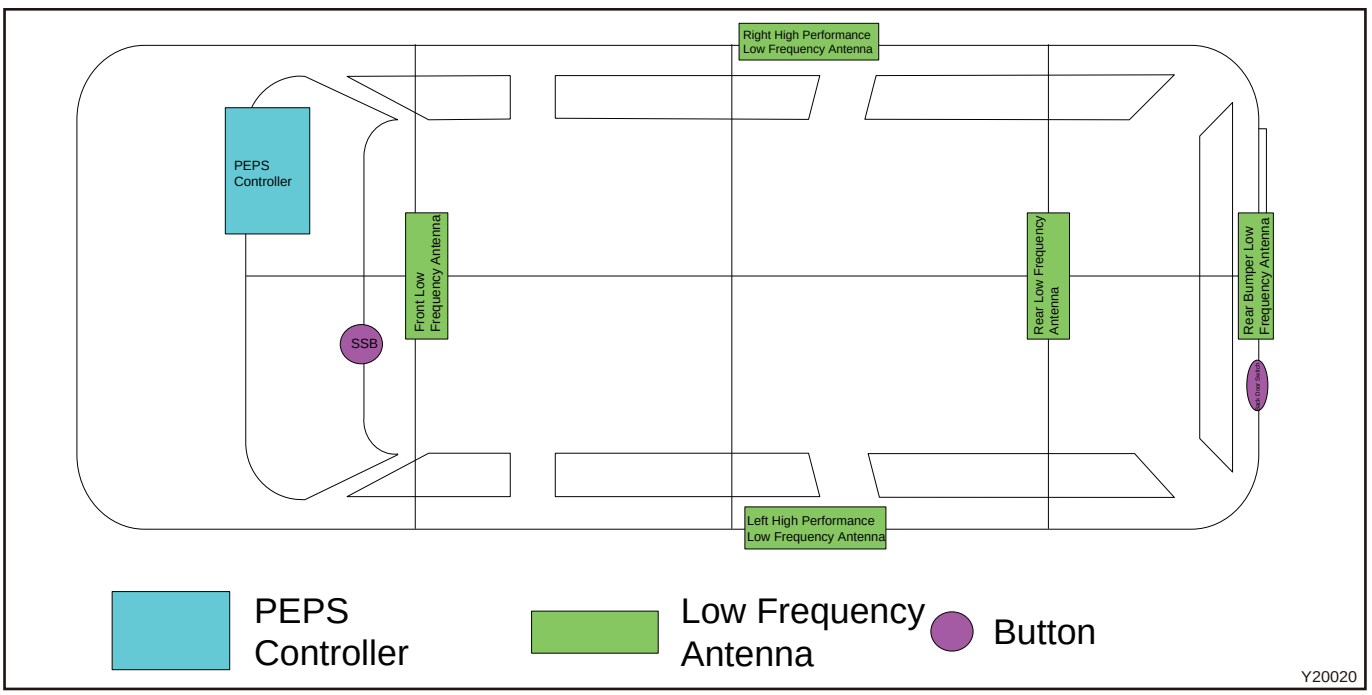
Function	Button ID	Note
Remote locking	0x02	\
Remote unlocking	0x04	\
Remote back door	0x01	\
Remote car location	0x08	Operate the lock button twice within 1.5 seconds

After the remote control button is pressed, corresponding high frequency signal will be sent, and the specific logical judgment will be executed by the PEPS terminal according to the specific customer demands.

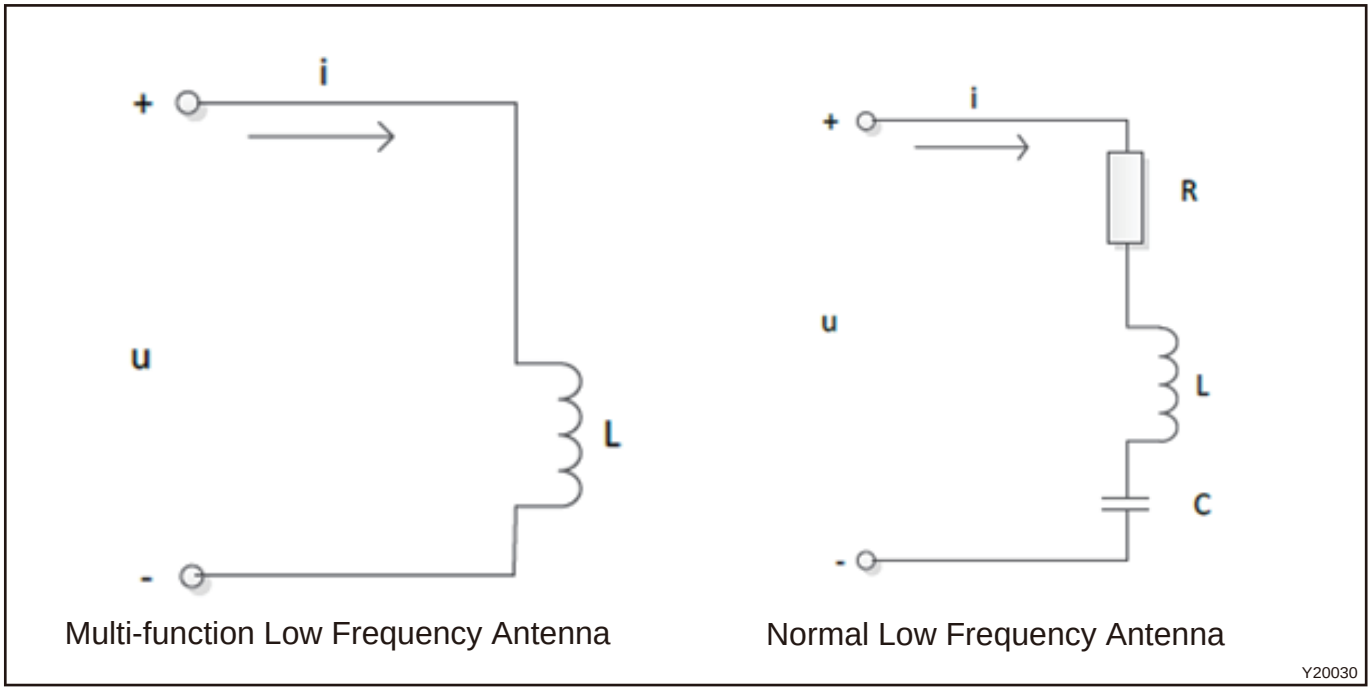
2.2 Low Frequency Antenna

■ Overview

Low frequency antenna is divided into interior low frequency antenna and rear bumper antenna and door high performance low frequency antennas on both sides. There are two interior low frequency antennas in the M36T real vehicle. The front row is multifunctional low frequency antenna, and rear row is ordinary low frequency antenna. The antenna arrangement of whole vehicle is shown in the figure below:



- Low frequency antenna is a winding inductor. For both the multifunctional low frequency antenna and the ordinary low frequency antenna, it depends on whether the resonant capacitor is matched inside the antenna. Internal schematic diagram is as follows:



- For multifunctional low frequency antenna, matching capacitor inside the antenna is matched inside PEPS, and the dedicated IMMO multiplexing channel is used for driving, so that functions of IMMO and ordinary low frequency antenna can be realized by multiplexing.

■ Function

- Interior low frequency antenna: Interior low frequency antenna is used to find the car key, determine whether to meet the conditions of keyless entry, keyless start according to whether there is a key in the car. Interior low frequency antenna can produce a magnetic field around it, the key in the magnetic field in different areas wakes up by using high frequency signal to feedback different field strength (different interior low frequency antenna will detect different field strength). Combining with the real vehicle interior scope and field strength feedback by key, it will calibrate a field strength threshold value in detail. When the field strength of key feedback is greater than threshold value, the key is determined to be inside the car; when the field strength of key feedback is less than threshold value, the key is determined to be outside the car.
- Interior front antenna can also be used for learning keys. Learn to distinguish between two, learn two keys and learn one key. For learning two keys, IMMO function of front antenna will not be used. Learning of two keys can be completed only through high and low frequency interaction at the same time. For the instruction of learning one key, it is necessary to use IMMO to read the key ID first, and then complete the learning through high and low frequency interaction.
- Rear bumper antenna: Rear bumper antenna is used to find the key within the coverage of rear bumper antenna to determine whether it meets the conditions of keyless opening of back door. It works on the same principle as interior low frequency antenna.
- Door high performance low frequency antennas on both sides: Door antenna looks for the key within the coverage of door antenna on both sides of vehicle to determine whether it meets the conditions of keyless entry. It works on the same principle as interior low frequency antenna. At the same time, antennas on both sides of door will assist in the positioning of indoor key.

2.3 SSB

■ Overview

SSB (Start Switch Button) is ENGINE START STOP switch, which is generally installed on driver cabin instrument panel. In addition, it is integrated with an ENGINE START STOP switch backlight indicator.

■ Function

SSB is used for keyless start function, not related to keyless entry function. By pressing SSB to request starting or turning off the engine, or changing vehicle power supply state.

2.4 Brake Pedal Switch

■ Overview

In addition to acting on the vehicle braking system, brake pedal is also equipped with a brake pedal switch, which is used to detect state of brake pedal to determine whether the brake is pressed down.

■ Function

- This switch is used to power the brake light when the brake pedal is depressed.
- For AT models, brake pedal switch is a feature of keyless start. The engine is allowed to start only when the brake pedal switch is pressed.

2.5 Gear Switch

■ Overview

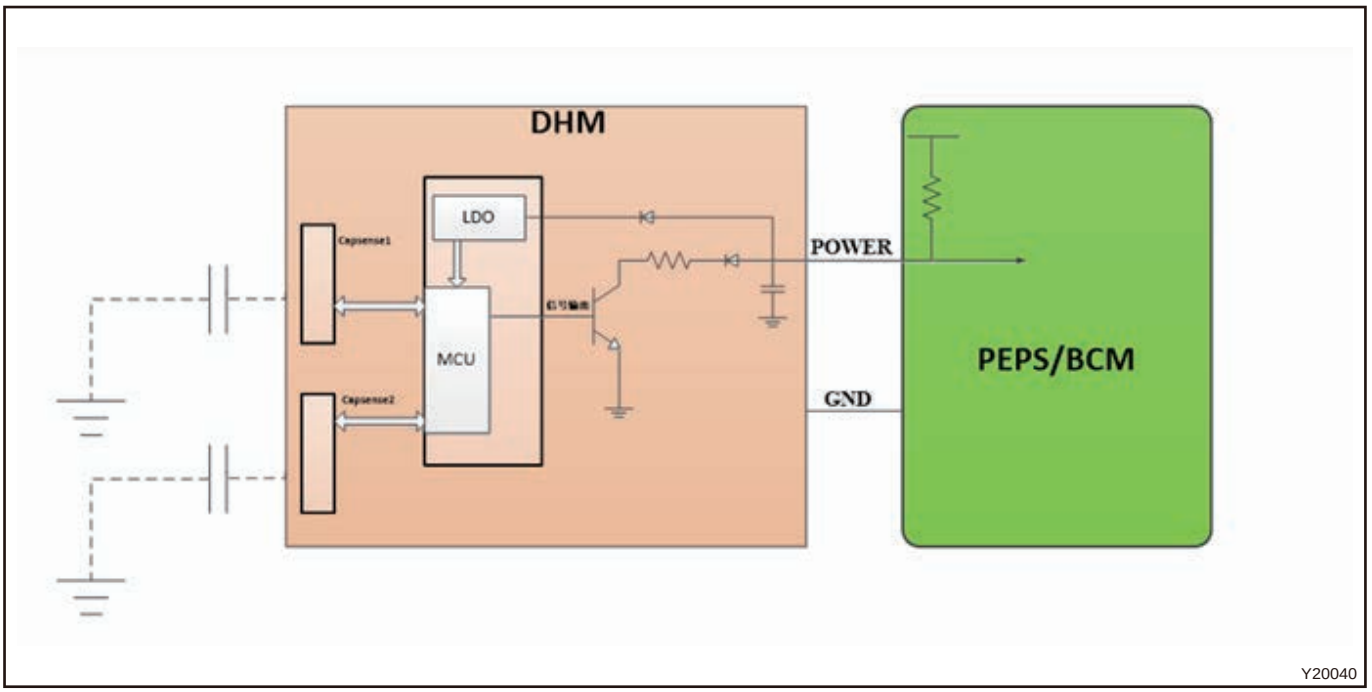
The gear signal is provided by TCU and is only allowed to start when the P or N gear is available.

■ Function

Message will be sent normally when TCU is in ON in general condition. In the judgment of P or N, PEPS shall wait for the power gear to reach ON before making the judgment. For a normal start from OFF, maximum waiting time is 1 second after PEPS automatically switches to ON. If no P or N gear is detected within 1 second, start cannot be started this time, and the start fails!

2.6 Capacitive Type Door Handle

■ Overview



Capacitive type door handle adopts a two-wire system. The principle block diagram is shown in the above figure. Voltage drop waveform on the power line is collected to identify whether it is unlocked or locked.

■ Function

Door handle unlock and lock function: The door handle sensor is a two-wire system, which can decompose unlocking and locking by defining a single-wire protocol.

3 DIAGNOSIS & TESTING

3.1 Problem Symptoms Table

Symptom	Suspected Area
Remote controller fails	Remote controller battery is weak
	There is remote control signal interference

Symptom	Suspected Area
	Remote controller enters failure mode (it is necessary to exit)
	Code is lost (add old key)
	PEPS malfunction
	Wireless key malfunction
	BCM malfunction
Vehicle cannot enter fortifying mode	Four doors & two covers are abnormal
	Door lock malfunction
	BCM malfunction
Vehicle cannot be unlocked	Door lock malfunction
	PEPS malfunction
	BCM malfunction
Door handle sensor cannot enter fortifying mode and be unlocked	Smart key is not within range
	Open or sticking in microswitch
	Power supply is not in OFF state
	Four doors & two covers are abnormal
	Smart key in vehicle
	Smart key battery is low
Luggage compartment cannot be opened	Back door switch fails (open, water leakage or sticking)
	Back door lock malfunction
	PEPS malfunction
	Short or open in wire harness
	BCM malfunction
Vehicle cannot be started (PEPS) (starter runs)	Anti-theft verification does not pass
Vehicle cannot be started (PEPS) (starter does not run)	Gear position is not in P (DCT)
	Brake switch (DCT) is abnormal
	ENGINE START STOP switch malfunction
	Circuit or starter relay is abnormal
	Starter malfunction
	Start times limit is activated

3.2 Problem Repair (No DTC)

If PEPS system has problems, but no DTC is stored in PEPS system, this problem is called a problem without DTC. Problems without DTC for PEPS system are divided into following types:

(1) Indicator in instrument cluster does not come on or illuminates constantly (incorrect wire harness connection or indicator is damaged).

(2) Troubleshooting recommendation: Check corresponding components according to problem symptom, and troubleshoot following the vehicle repair manual.

3.3 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.

(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.

(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.

(4) Only use a digital multimeter to measure voltage of electronic system.

(5) Refer to any Technical Bulletin that may apply to this malfunction.

(6) Visually check related wire harness and connector.

(7) Check and clean all system grounds related to the latest DTCs.

(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
-
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

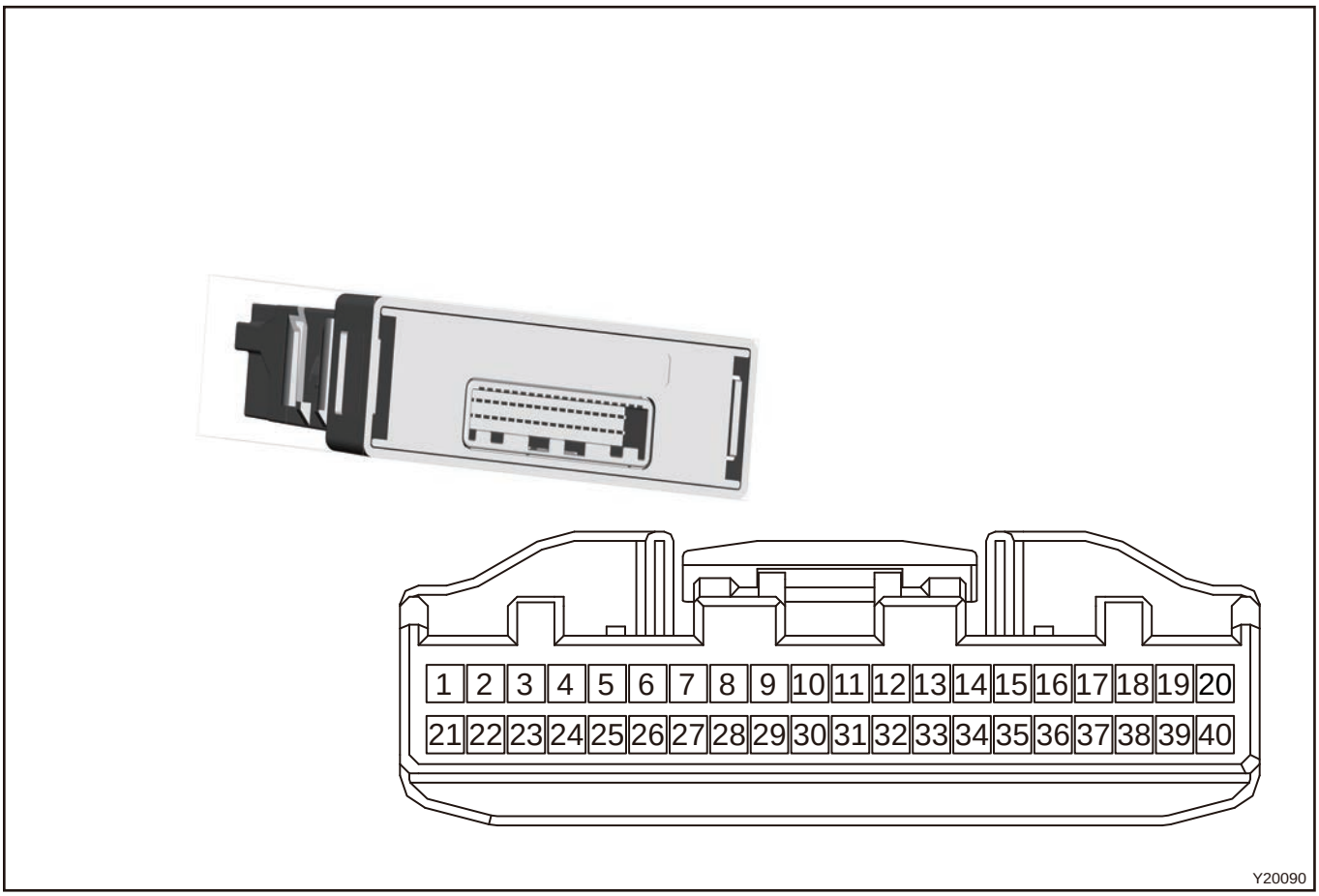
(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.6 PEPS Control Module Assembly Terminal List



Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	–	21	–
2	ACC relay feedback, high effective input	22	–
3	CAN-H	23	ENGINE START STOP switch indicator (white)
4	CAN-L	24	ENGINE START STOP switch indicator (green)
5	–	25	ENGINE START STOP switch backlight power supply output, high effective
6	Luggage compartment start button input	26	Brake switch
7	SW2 ENGINE START STOP switch 2	27	–
8	SW1 ENGINE START STOP switch 1	28	–
9	–	29	–
10	Driver side door handle antenna +	30	Driver side door handle antenna -

Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
11	Interior front antenna -/- IMMO antenna - (reusing antenna)	31	Interior front antenna +/- IMMO antenna + (reusing antenna)
12	Front passenger side door handle antenna +	32	Front passenger side door handle antenna -
13	Interior rear antenna +	33	Interior rear antenna -
14	Rear bumper antenna +	34	Rear bumper antenna -
15	Driver side door handle button or capacitive type door handle power supply terminal	35	Front passenger side door handle button or capacitive type door handle ground terminal
16	Front passenger side door handle button or capacitive type door handle power supply terminal	36	Driver side door handle button or capacitive type door handle ground terminal
17	IG1 relay feedback, high effective input	37	GND
18	IG1D relay drive (high)	38	IG2 relay feedback, high effective input
19	IG2D relay drive (high)	39	START relay drive, high effective output
20	Power supply, 5A fuse	40	ACC relay drive, high effective output

3.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B110044	PEPS Memory Fault
B110116	PEPS Supply Low Voltage
B110117	PEPS Supply High Voltage
B110200	Driver Side High Performance Antenna Failure
B110300	Passenger Side High Performance Antenna Failure
B110400	Internal Antenna Failure
B110500	Internal Antenna 2 Failure
B110600	Rear Bumper Antenna Failure
B110800	ENGINE START STOP Switch Malfunction
B120012	ACC Power Supply Output Failure
B120112	IG1 Power Supply Output Failure
B120212	IG2 Power Supply Output Failure
B120312	Start Circuit Output Failure

3.8 DTC Diagnosis Procedure

DTC	B110044	PEPS Memory Fault

DTC	DTC Definition	Possible Causes
B110044	PEPS Memory Fault	PEPS Module

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check for DTCs

(a) Using diagnostic tester, clear DTC and read DTC again.
(b) Check if DTC occurs again.

OK → **System is normal**

NG

2	Check if vehicle PEPS control is normal

(a) Using diagnostic tester, clear DTCs and read PEPS control module system DTCs again.
(b) Check if DTCs occur again.

OK → **Turn off vehicle power supply (disconnect the negative battery cable), then clear DTCs again**

OK → **Replace PEPS module**

DTC	B110116	PEPS Supply Low Voltage
DTC	B110117	PEPS Supply High Voltage

DTC	DTC Definition	Possible Causes
B110116	PEPS Supply Low Voltage	• Fuse • Wire harness connector • PEPS module
B110117	PEPS Supply High Voltage	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuse

(a) Check if fuse RF01 (5A) is blown.

NG → **Replace fuse**

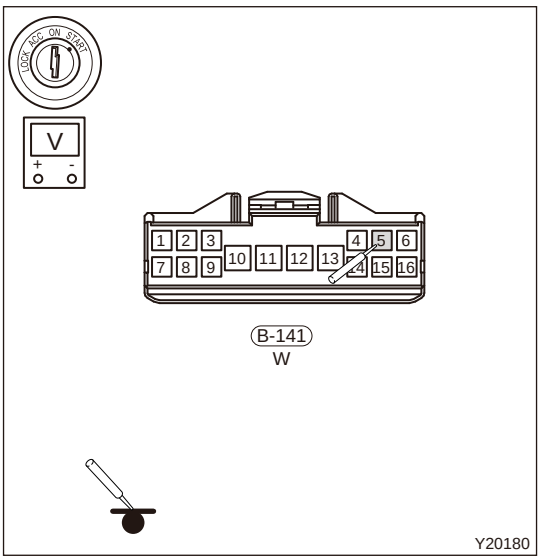
OK →

2	Check engine compartment fuse and relay box output voltage

(a) Turn ENGINE START STOP switch to ON.

(b) Check the voltage between terminal 5 of engine compartment fuse and relay box B-141 and ground. (When using digital multimeter)

Multimeter Connection	Condition	Normal Condition
B-141 (5) - Body ground	ON	9-16 V



NG → **Replace engine compartment fuse and relay box assembly.**

OK →

3	Check wire harness for open

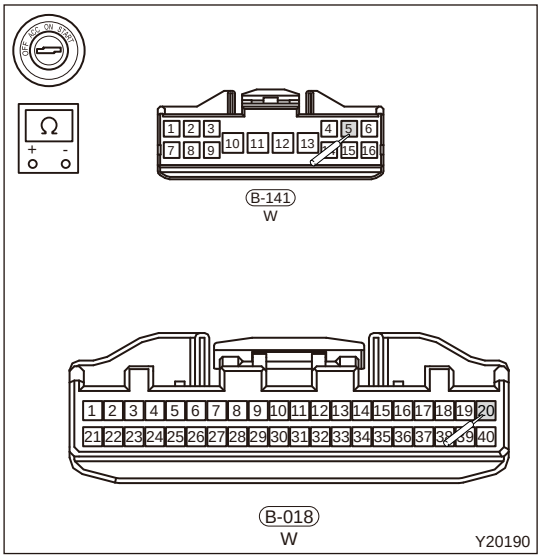
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect PEPS module connector B-018, engine compartment fuse and relay box connector B-141.

(d) Using ohm band of digital multimeter, measure if resistance between terminal (20) of connector B-018 and terminal (5) of connector B- 141 is normal to check wire harness for open.

Multimeter Connection	Condition	Normal Condition
B-018 (20) - B- 141 (5)	ON	⩽ 1 Ω



NG → **Handle and repair related wire harness**

OK

4	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace with a new PEPS module to check if fault reoccurs.**

OK → **Conduct test and confirm malfunction has been repaired.**

DTC	**B110200**	**Driver Side High Performance Antenna Failure**
DTC	**B110300**	**Passenger Side High Performance Antenna Failure**
DTC	**B110400**	**Internal Antenna Failure**
DTC	**B110500**	**Internal Antenna 2 Failure**
DTC	**B110600**	**Rear Bumper Antenna Failure**

DTC	DTC Definition	Possible Causes
B110200	Driver Side High Performance Antenna Failure	• Antenna failure • Wire harness connector • PEPS module
B110300	Passenger Side High Performance Antenna Failure	
B110400	Internal Antenna Failure	
B110500	Internal Antenna 2 Failure	

DTC	DTC Definition	Possible Causes
B110600	Rear Bumper Antenna Failure	

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:

- The following detection takes rear bumper antenna as an example.
- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check if PEPS module software configuration code is correct

(a) Using diagnostic tester to enter PEPS system.
(b) Read software configuration code and check if it is correct.

NG → **Input configuration code again and clear DTC**

OK

2	Measure resistance of rear bumper antenna

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the connector J-008 of rear bumper antenna.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.
(g) Using ohm band of digital multimeter, measure if resistance between terminals (1) and (2) of rear bumper antenna connector J-008 is normal.

Multimeter Connection	Condition	Specified Condition
J-008 (1) - J- 008 (2)	Always	≈ 10 KΩ

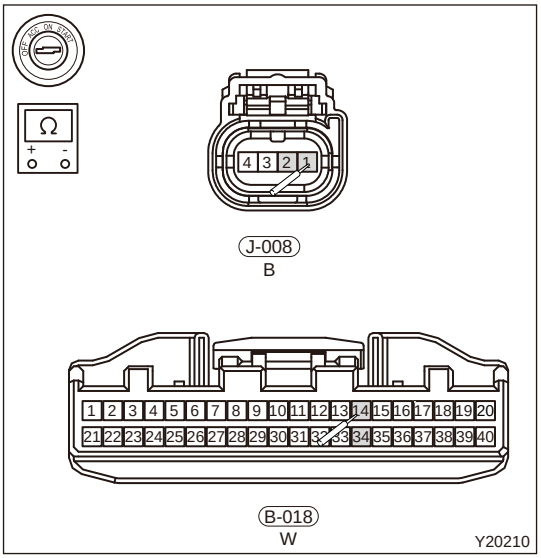
NG → **Replace bumper low frequency antenna**

OK

3	Check interior wire harness for open or short

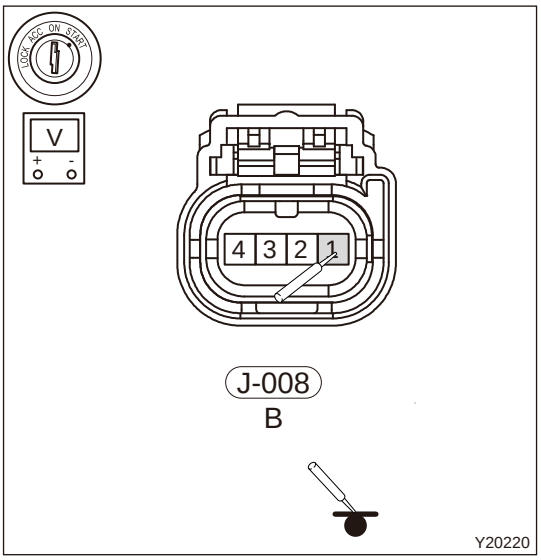
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect rear bumper antenna connector J-008 and PEPS module connector B-018.
(d) Check if wire harnesses are worn, pierced, pinched or partially broken.
(e) Check for broken, bent, protruded or corroded terminals.
(f) Check if related connector pins are in good condition.
(g) Measure continuity between terminals (1) and (2) of J-008 and terminals (14) and (34) of B-018 to check instrument panel wire harness for open.

Multimeter Connection	Condition	Specified Condition
J-008(1)-B- 018(14)	Always	⩽ 1 Ω
J-008(2)-B- 018(34)		



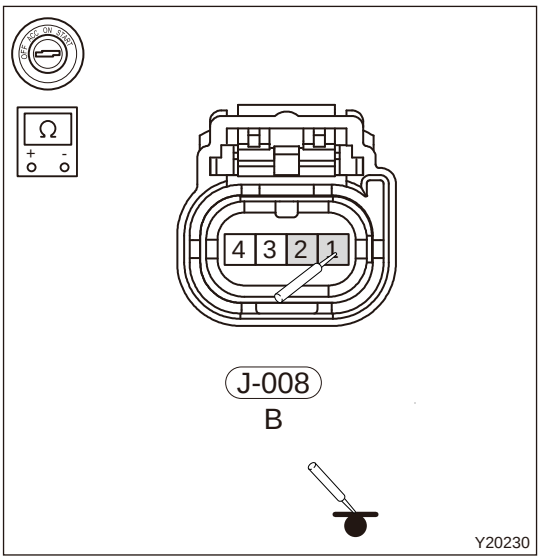
(h) Using a digital multimeter, check for voltage between terminal (1) of rear bumper antenna connector J-008 and body ground, to check whether the PEPS module has power output.

Multimeter Connection	Condition	Specified Condition
J-008 (1) - Body ground	Always	12 V



(i) Using ohm band of digital multimeter, check for continuity between terminals (1), (2) of J -008 and body ground to check instrument panel wire harness for short to ground.

Multimeter Connection	Condition	Specified Condition
J-008 (1) - Body ground	Always	No continuity
J-008 (2) - Body ground		



NG → **Repair or replace wire harness**

OK

4	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace PEPS module.**

OK → **Conduct test and confirm malfunction has been repaired.**

DTC	**B120012**	**ACC Power Supply Output Failure**
DTC	**B120112**	**IG1 Power Supply Output Failure**
DTC	**B120212**	**IG2 Power Supply Output Failure**
DTC	**B120312**	**Start Circuit Output Failure**

DTC	Description	Possible Causes
B120012	ACC Power Supply Output Failure	• Fuse • ACC relay • Wire harness connector • PEPS module
B120112	IG1 Power Supply Output Failure	
B120212	IG2 Power Supply Output Failure	
B120312	Start Circuit Output Failure	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuse

(a) Measure fuse RF47 (5A) in instrument panel fuse box with 21 W test light to check if test light comes on.

OK → **Turn off vehicle power supply (disconnect the negative battery cable) then turn on power supply again and clear DTC.**

NG

2	Check if fuse base jack is abnormal

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Remove fuse in instrument panel fuse box and check fuse base jack for excessive clearance.

NG → **Adjust fuse base jack**

OK

3	Adjust ACC relay

OK → **Replace ACC relay**

NG

4	Check if relay switch power supply is normal

(a) Unplug ACC relay (RRLY10) in instrument panel fuse box.

(b) Measure if power supply of ACC relay base No.30 jack is normal with 21 W test light or digital multimeter.

Multimeter Connection	Condition	Specified Condition
ACC relay base 30 - Body ground (digital multimeter)	Always	Not less than 12 V
ACC relay base 30 - Body ground (21 W test light)		ON

NG → **Replace wire harness**

OK

5	Short connect the ACC relay base jack control switch

(a) Use a wire to bridge joint jacks 87 and 30 of ACC relay base in instrument panel fuse box, and check engine compartment fuse and relay box for open.

NG → **Replace wire harness**

OK

6	Check ACC relay control power supply terminal

(a) Measure voltage between ACC relay base No.85 jack and body ground with 21 W test light or voltage band of digital multimeter.

Multimeter Connection	Condition	Specified Condition
ACC relay base 85 - Body ground (digital multimeter)	Always	Not less than 12 V
ACC relay base 85 - Body ground (21 W test light)		ON

NG → **Replace instrument panel fuse box assembly**

OK

7	Check ACC relay control ground terminal

(a) Disconnect the negative battery cable.

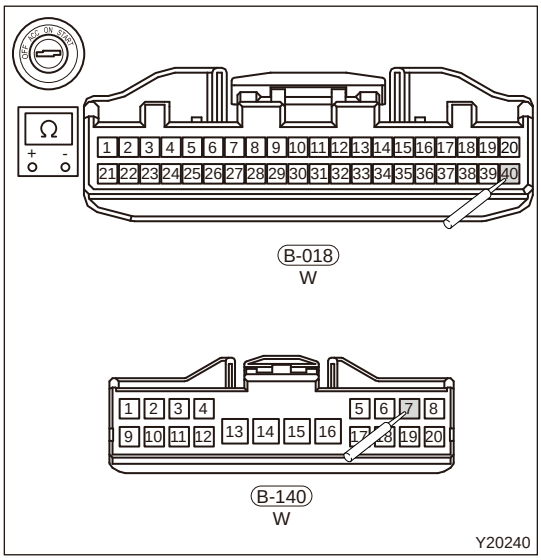
(b) Disconnect the PEPS module connector B-018.

(c) Check if wire harnesses are worn, pierced, pinched or partially broken.

(d) Check for broken, bent, protruded or corroded terminals.

(e) Check if related connector pins are in good condition.

(f) Using ohm band of digital multimeter, measure resistance of connecting cable between B-140 (7) and B-018 (40) of instrument panel fuse box.



Multimeter Connection	Condition	Specified Condition
B-140(7) — B- 018 (40)	Always	⩽ 1 Ω

NG → **Repair or replace wire harness**

OK

8	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace PEPS module**

OK → **Conduct test and confirm malfunction has been repaired.**

DTC	B110800	ENGINE START STOP Switch Malfunction

DTC	Description	Possible Causes
B110800	ENGINE START STOP Switch Malfunction	• ENGINE START STOP switch malfunction • Wire harness connector • PEPS control module

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Enter PEPS system and read related datastream

(a) Use the diagnostic tester to check the datastream transition activation state and the background light lighting state. To determine whether the ENGINE START STOP switch input is normal.

OK → **Turn off vehicle power supply (disconnect the negative battery cable), then clear DTC again**

NG

2	Check ENGINE START STOP switch

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Remove ENGINE START STOP switch and install with a new on, and perform running test.

OK → **Replace ENGINE START STOP switch**

NG

3	Check instrument cluster wire harness for open or short

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

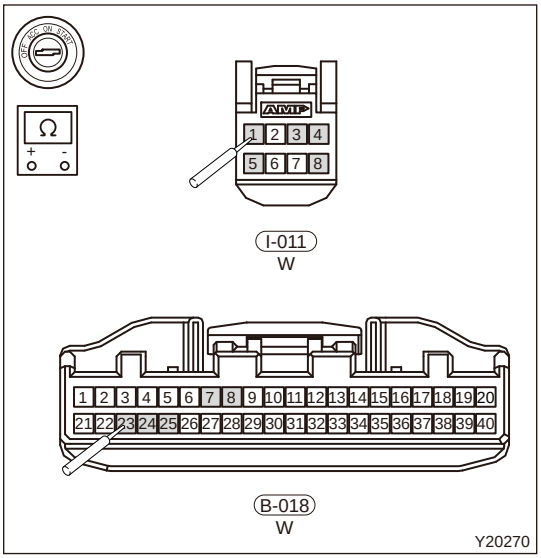
(c) Disconnect ENGINE START STOP switch connector I-011 and PEPS module connector B-018.

(d) Check if wire harnesses are worn, pierced, pinched or partially broken.

(e) Check for broken, bent, protruded or corroded terminals.

(f) Check if related connector pins are in good condition.

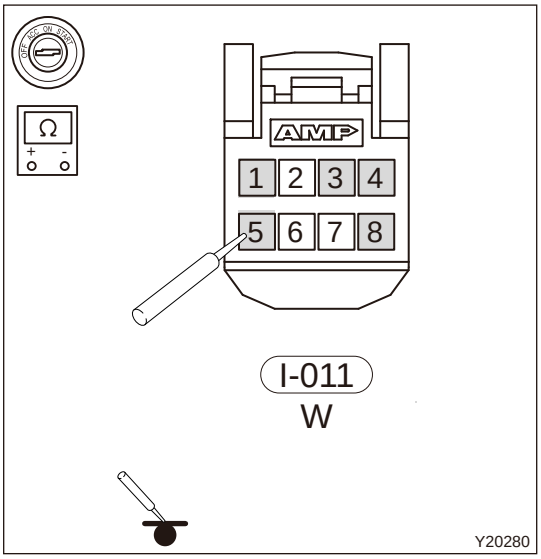
(g) Using ohm band of digital multimeter, measure resistance between connector I-011 of ENGINE START STOP switch and connector B-018 of PEPS module to check wire harness for open.



Multimeter Connection	Condition	Specified Condition
I-011(5) - B- 018 (23)	Always	⩽ 1 Ω
I-011(8) - B- 018 (24)	Always	⩽ 1 Ω
I-011(4) - B- 018 (25)	Always	⩽ 1 Ω
I-011(3) - B- 018(7)	Always	⩽ 1 Ω
I-011(1) - B- 018(8)	Always	⩽ 1 Ω

Use circuit diagram as a guide to perform the following inspection procedures:

(h) Using ohm band of digital multimeter, measure resistance between terminals of connector I-011 and body ground to check instrument panel wire harness for short to body ground.

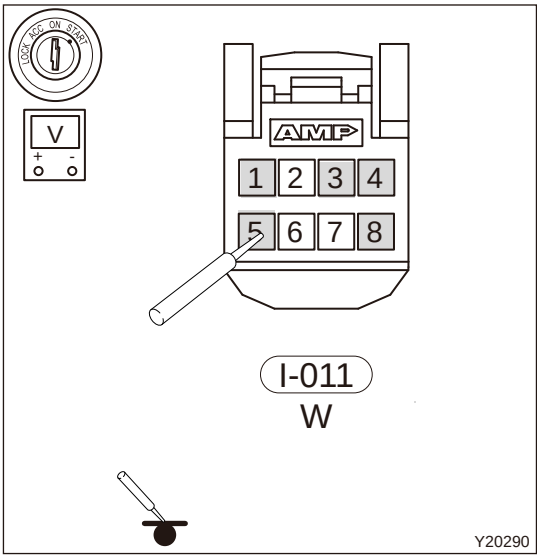


Multimeter Connection	Condition	Specified Condition
I-011 (5) - Body ground	Always	No continuity
I-011 (8) - Body ground	Always	No continuity
I-011 (4) - Body ground	Always	No continuity
I-011 (3) - Body ground	Always	No continuity
I-011 (1) - Body ground	Always	No continuity

Use circuit diagram as a guide to perform the following inspection procedures:

(i) Connect the negative battery cable, (confirm that connectors I-011 and B-018 are disconnected). Using DC voltage band of digital multimeter, measure voltage between terminal of connector I-011 and body ground to check instrument panel wire harness for short to power supply.

Multimeter Connection	Condition	Specified Condition
I-011 (5) - Body ground	Always	0 V
I-011 (8) - Body ground	Always	0 V
I-011 (4) - Body ground	Always	0 V
I-011 (3) - Body ground	Always	0 V
I-011 (1) - Body ground	Always	0 V



NG → **Replace wire harness**

OK

4	Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

(a) Connect diagnostic tester and clear DTCs.

(b) Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.

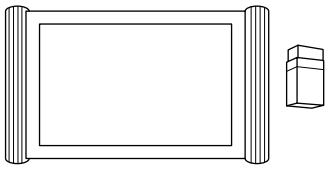
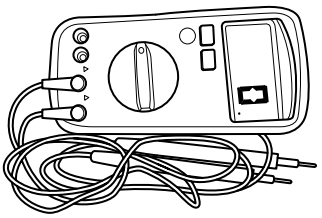
(c) Read the fault information and confirm that the fault has been solved.

NG → **Replace PEPS module**

OK → **Conduct test and confirm malfunction has been repaired.**

4 ON-VEHICLE SERVICE

4.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006

4.2 PEPS Control Module Assembly

■ **Removal**

CAUTION

- **DO NOT separate PEPS controller and fixing bracket at will, or clamping structure of controller will be damaged, unless controller malfunction is confirmed by troubleshooting result, it can be removed and cannot be reused.**
- **DO NOT replace PCB board of PEPS controller at will, or it cannot be traced back and may make abnormal sound.**
- **After replacing PEPS controller assembly, before performing key learning and anti-theft matching, do not press ENGINE START STOP switch at will if nor necessary, to prevent PEPS controller from being locked and causing vehicle power supply not to be turned on.**

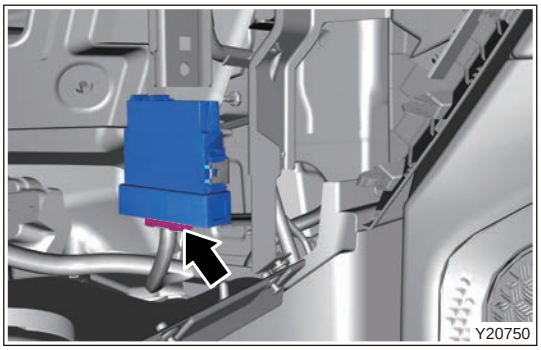
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable。

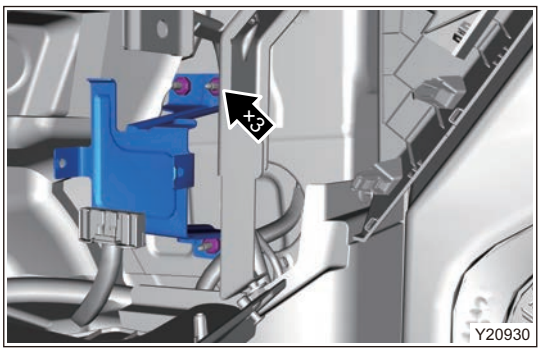
(3) Remove the glove box assembly.

(4) Remove the PEPS module.

(5) Disconnect the PEPS module connector.



(6) Remove 3 coupling bolts between PEPS module mounting bracket and instrument panel crossmember.



(7) Carefully remove the PEPS module and mounting bracket assembly.

■ Installation

Caution
• **DO NOT separate PEPS controller and fixing bracket at will, or clamping structure of controller will be damaged。** • **DO NOT replace PCB board of PEPS controller at will, or it cannot be traced back and may make abnormal sound.** • **After replacing PEPS controller assembly, before performing key learning and anti-theft matching, do not press ENGINE START STOP switch at will if nor necessary (it is set that keyless start can be performed for 50 times), to prevent PEPS controller from being locked and causing vehicle power supply not to be turned on.**

(1) Install 2 coupling bolts between PEPS module mounting bracket and instrument panel crossmember.

Torque: 7 ± 1 N·m

(2) Install the PEPS module connector.

(3) Install the glove box assembly.

(4) Connect the negative battery cable.

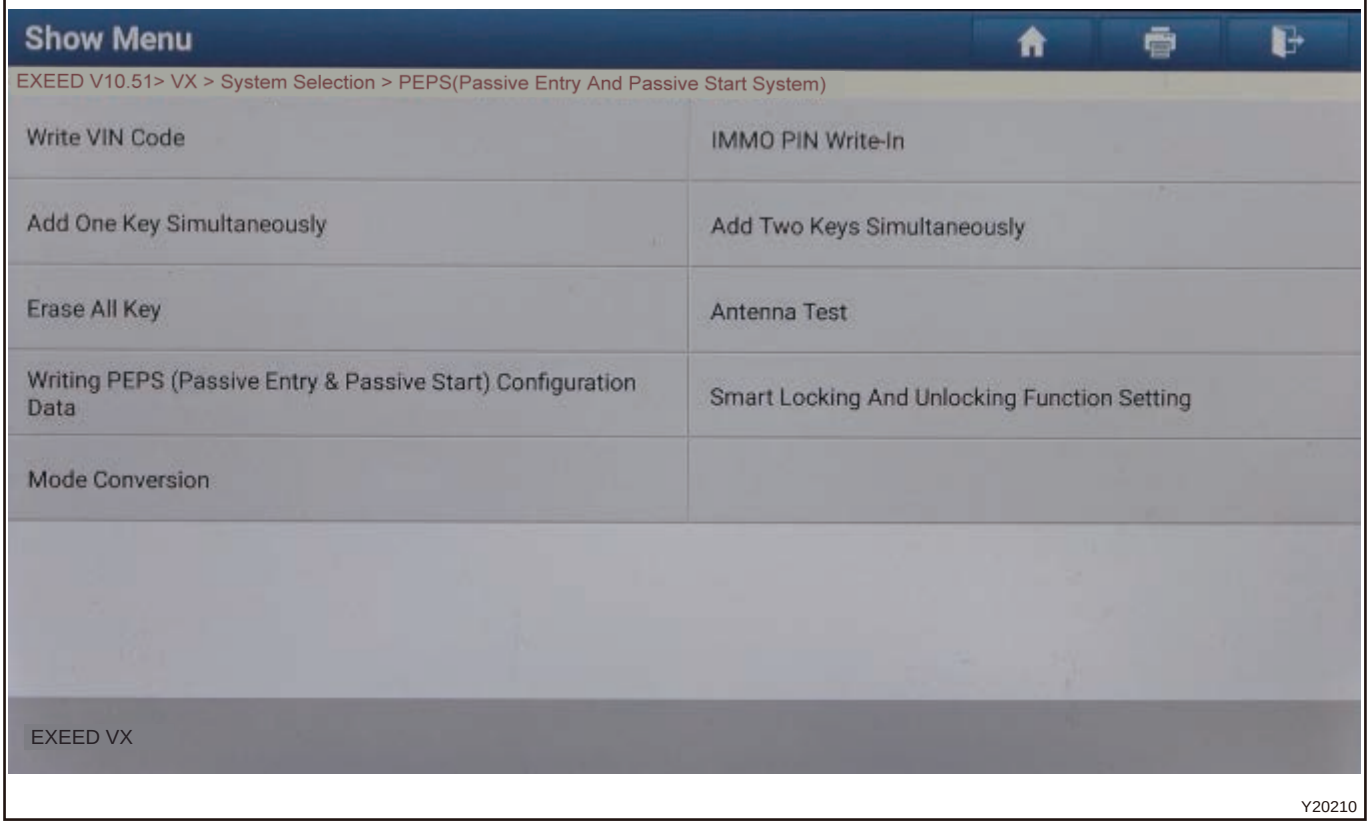
■ Anti-theft Matching

■ Save Configuration Data

(1) Click “PEPS (Passive Entry And Passive Start System)”.

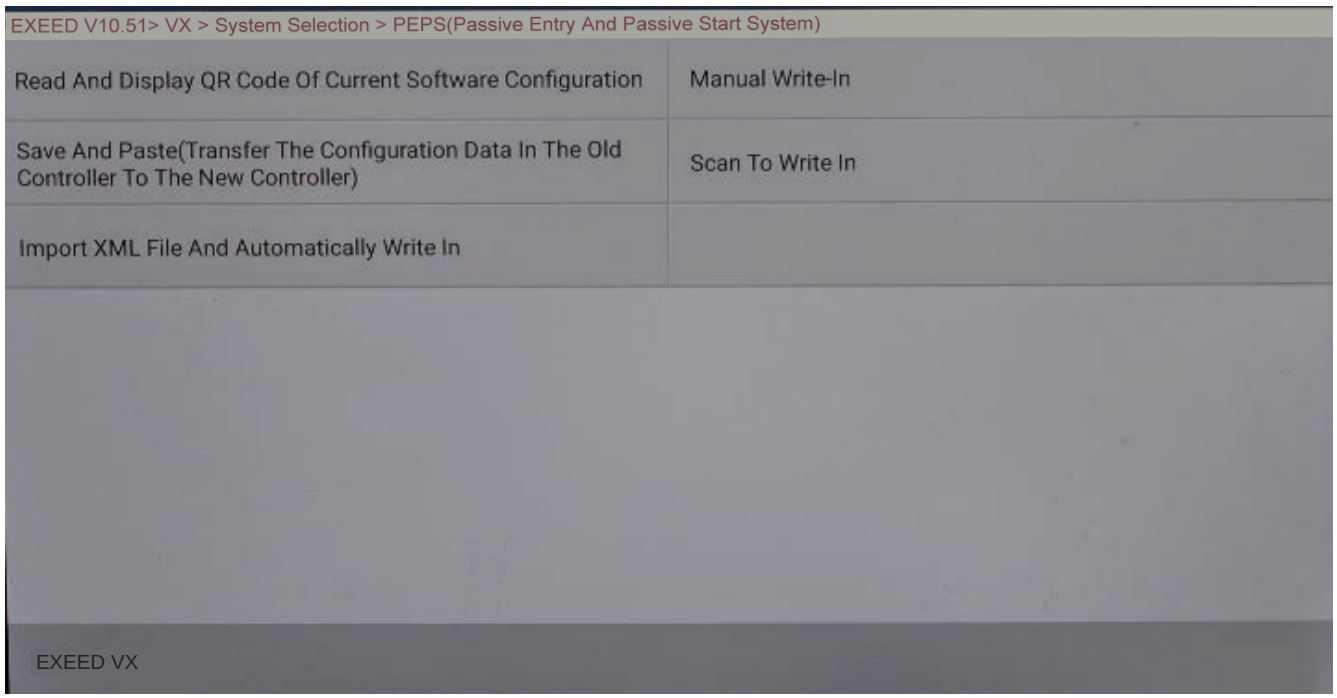
(2) Select and click “Special Function”.

(3) Click “Writing PEPS (Passive Entry & Passive Start) Configuration Data”.



Y20210

(4) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



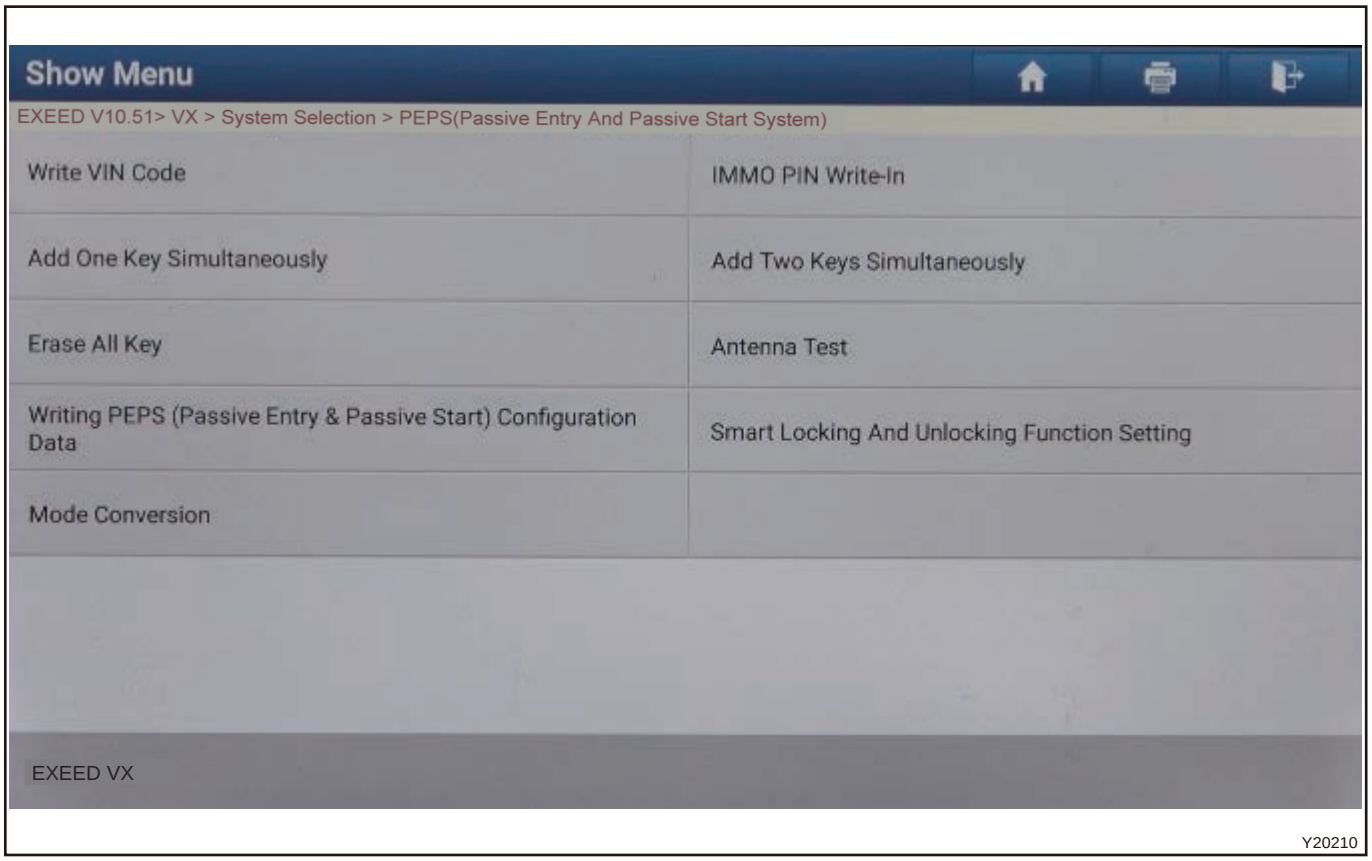
Y20220

(5) Click “Save The Old Controller Configuration Data”.

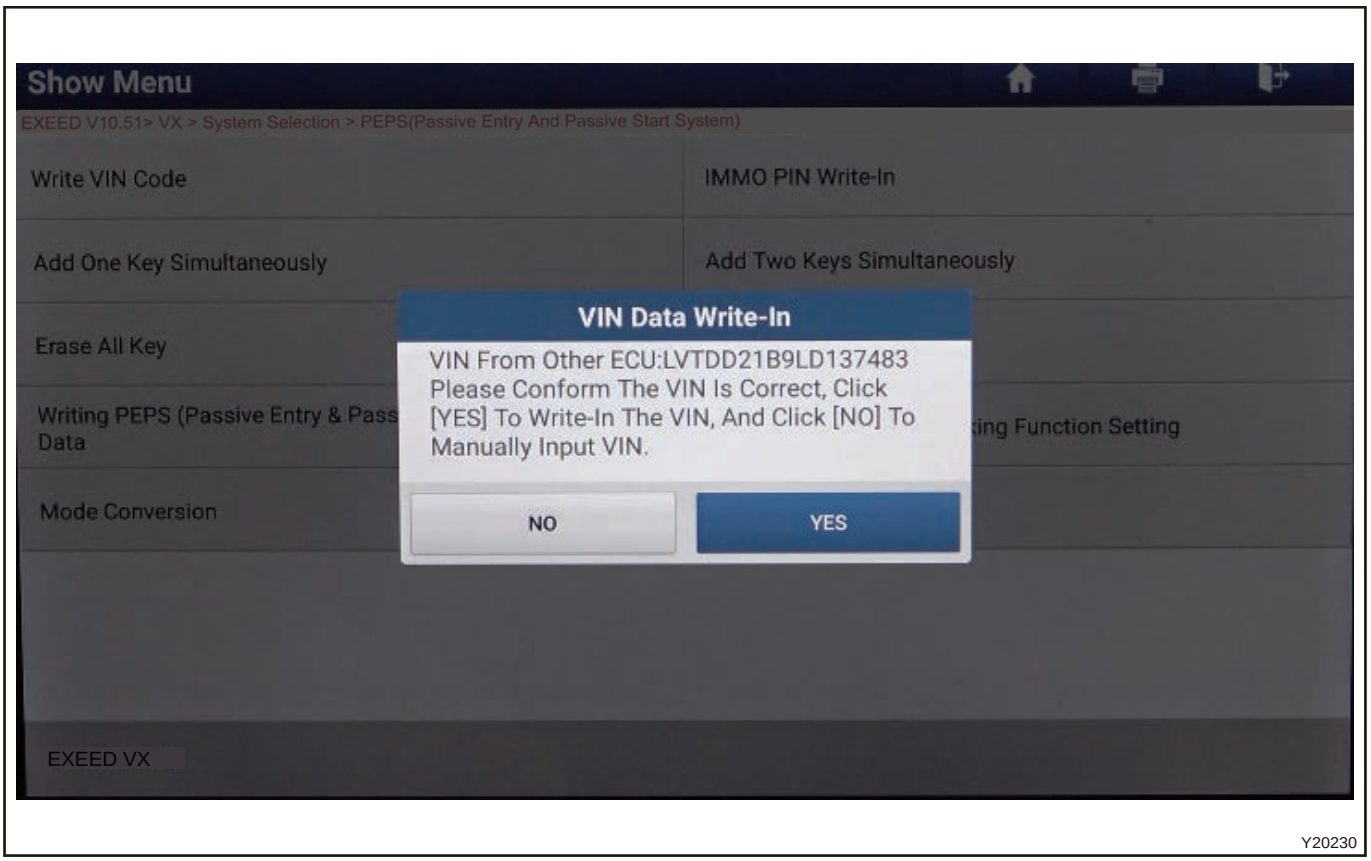
(6) The diagnostic tester interface shows “Read and Save Vehicle Configuration Code Successfully”.

■ Write VIN Code

(1) Select Special Function and click “Write VIN Code”.



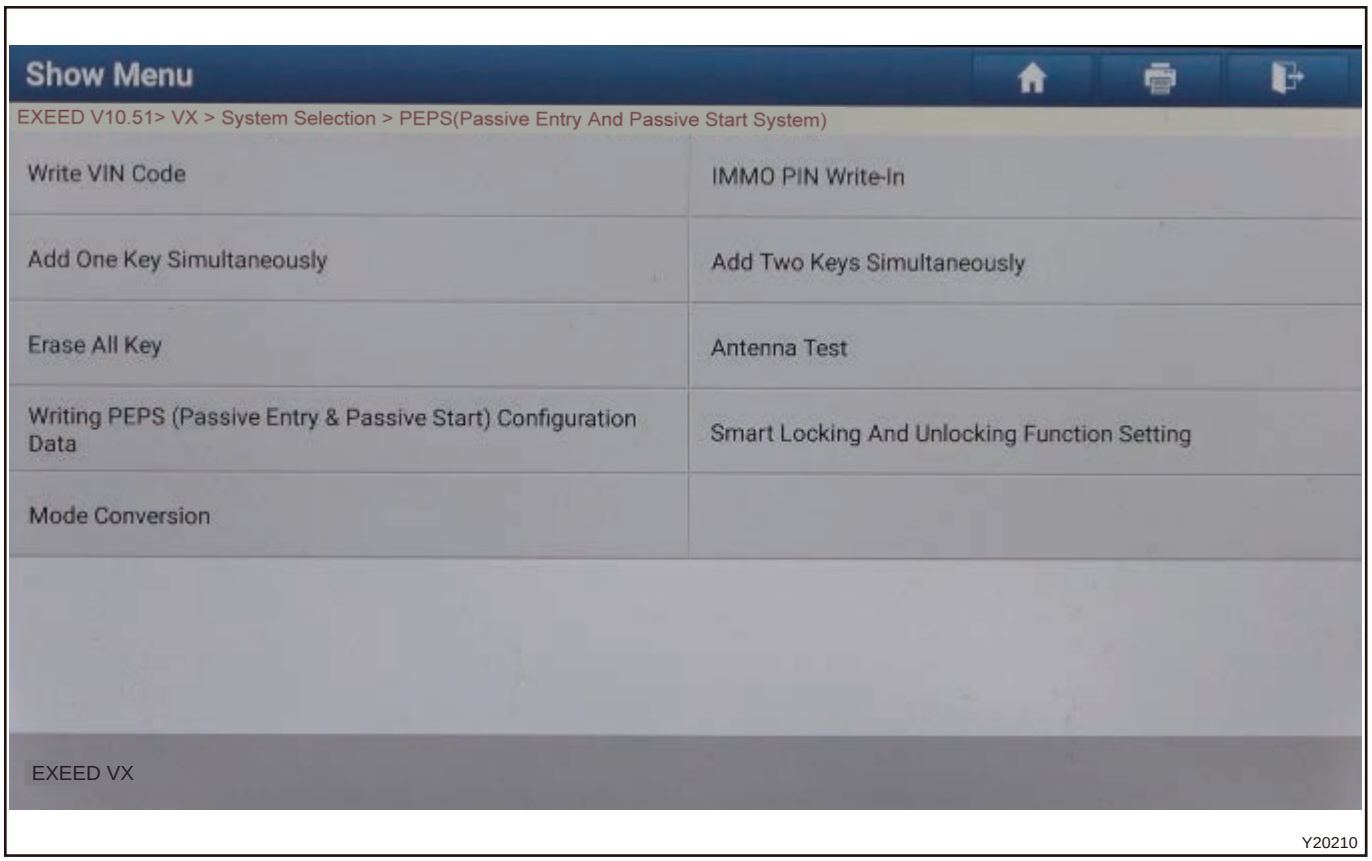
(2) Enter next screen, determine if VIN code is correct, if correct, click “OK”, if not, click “NO” to input manually.



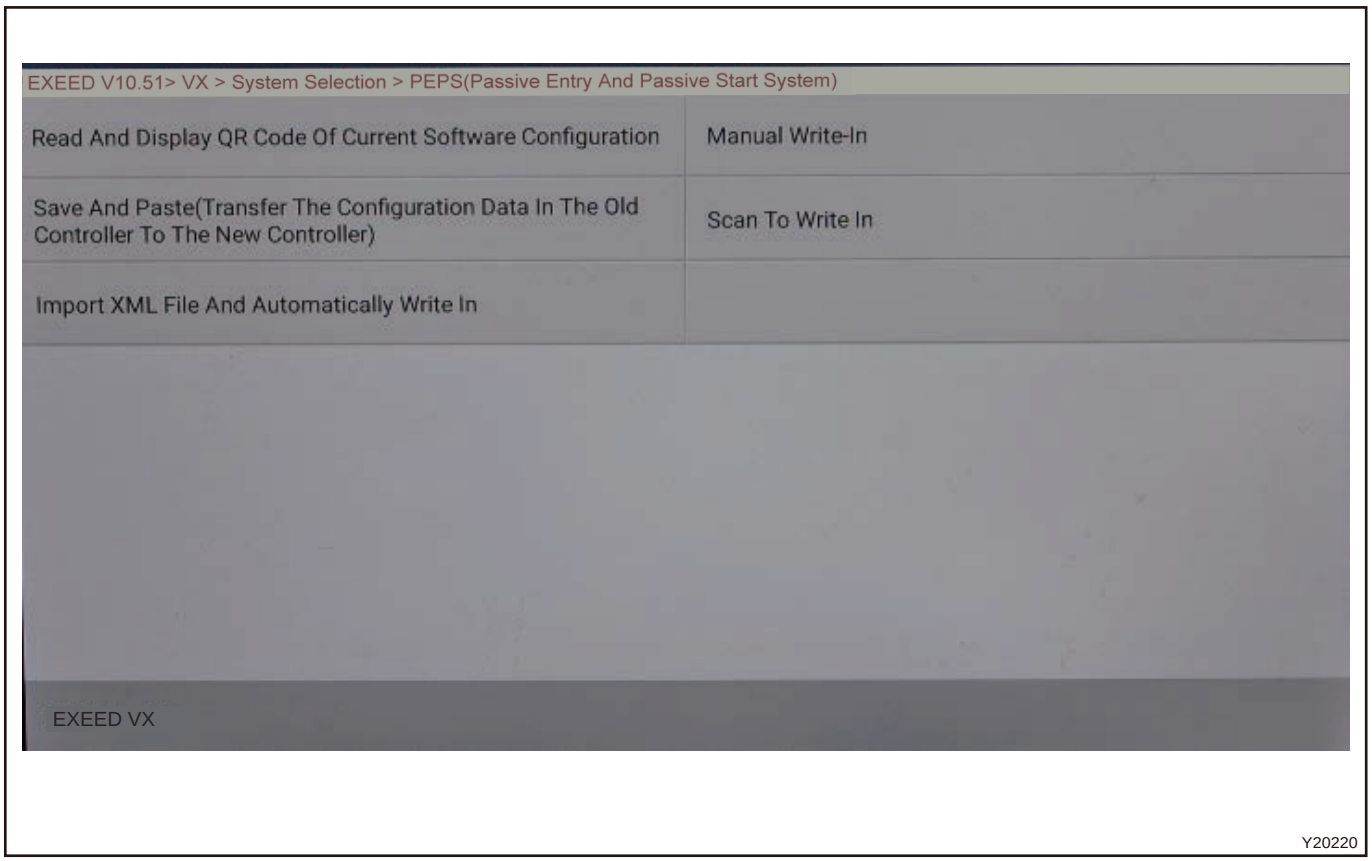
■ **Writing PEPS (Passive Entry & Passive Start) Configuration Data**

Caution
After refreshing PEPS module, match PEPS module.

(1) Click “Writing PEPS (Passive Entry & Passive Start) Configuration Data”.



(2) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



(3) Click “Write The Old Controller Configuration Data Into The New Controller”.

(4) The diagnostic tester interface shows “Enter 12-digit Repair Shop Code”.

(5) Click “OK” after input is completed.

(6) Click “YES” after confirming that repair shop code is correct again.

(7) The diagnostic tester interface shows “Saved Vehicle Configuration Code Last Time”. Click "Yes" after confirming that they are consistent.

(8) The diagnostic tester interface shows “Write Configuration Data Successfully”.

(9) Click “OK”.

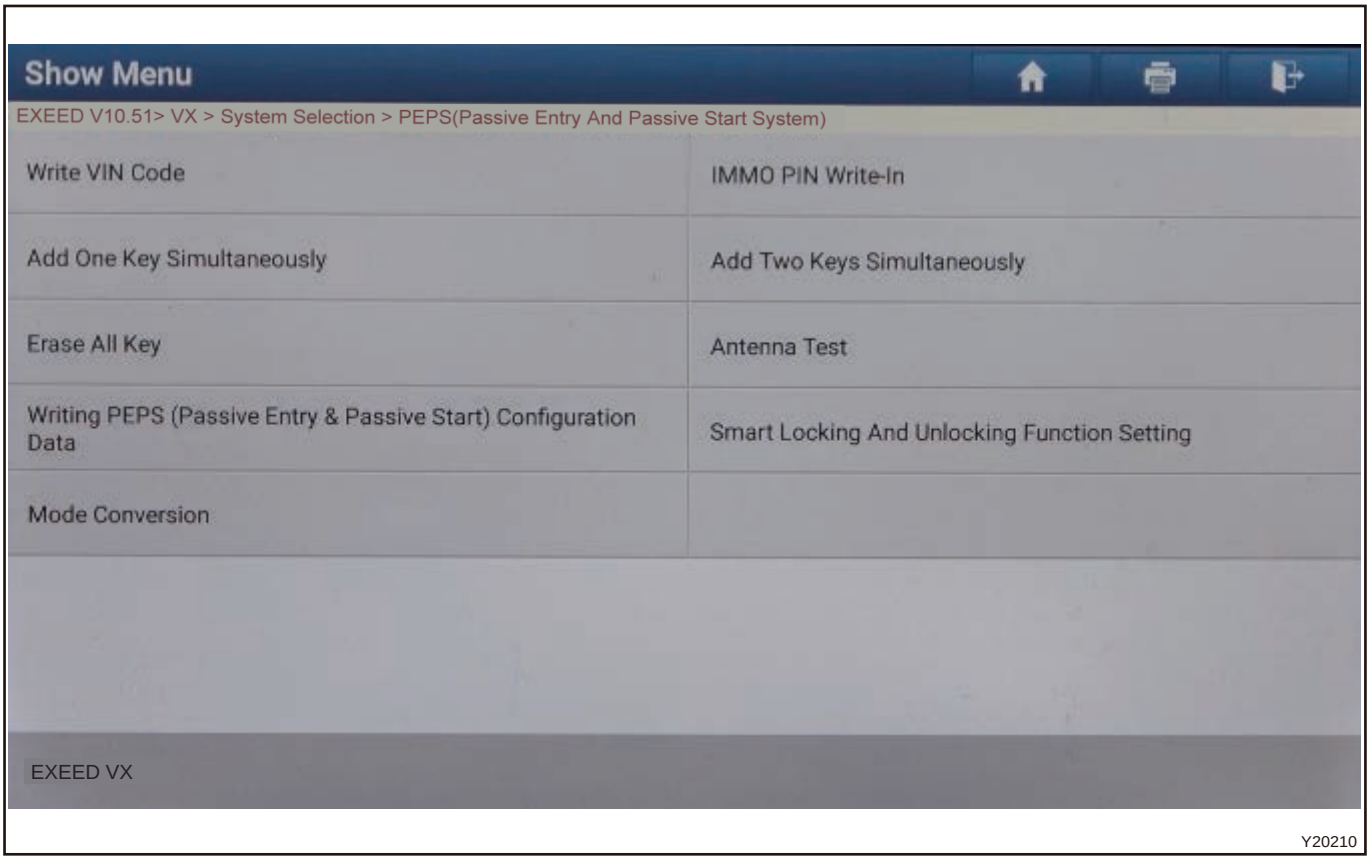
(10)

(11) Click “OK” when the diagnostic tester interface shows “Configuration Data Check is Valid”.

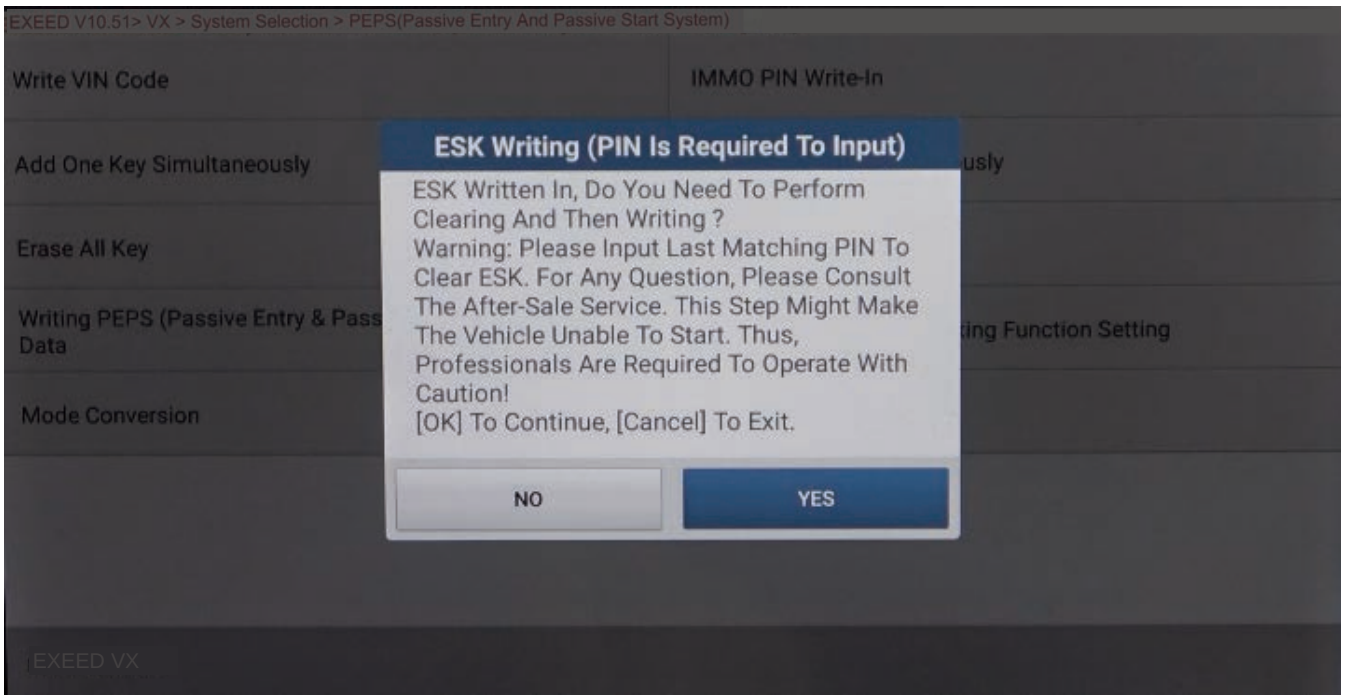
Caution
• **The first 5 digits of the 12-digit repair shop code are the dealer code (ERP), and the last 7 digits can be entered at will.** • **The correct vehicle configuration code must be entered, otherwise the normal functions of the vehicle will be affected, so please check again after entering it.**

■ ESK Writing (PIN Is Required To Input)

(1) Click “ESK Writing (PIN Is Required To Input)”.



(2) Read the prompts and click “YES”.



(3) The diagnostic tester interface prompts “Please Enter 8-Digit New Anti-theft Security Code (PIN)”.

(4) Click “OK” to enter next screen after entering.

(5) Verify if the entered PIN code is correct and click "OK".

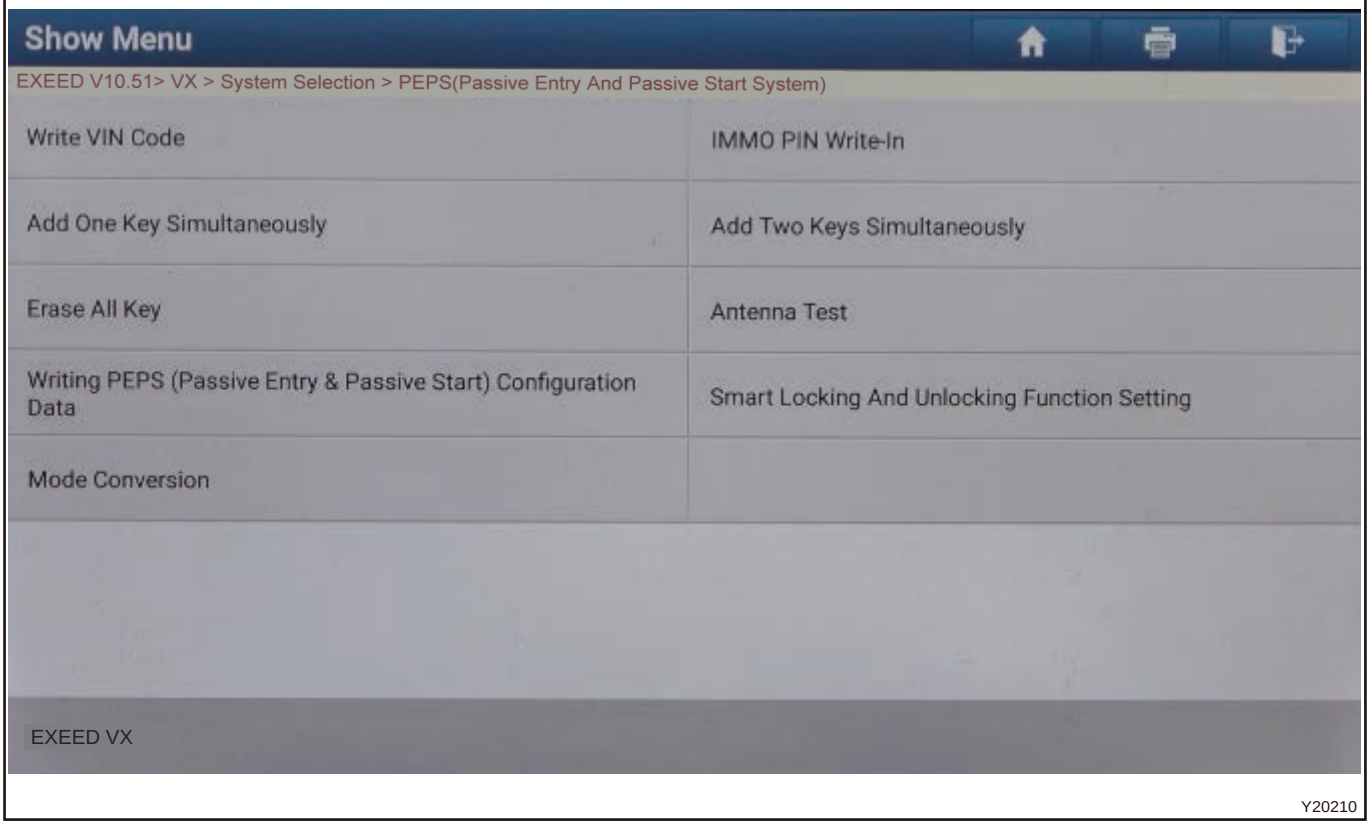
(6) The diagnostic tester interface prompts “ESK Writing Successfully”. Click “OK” to return.

Caution

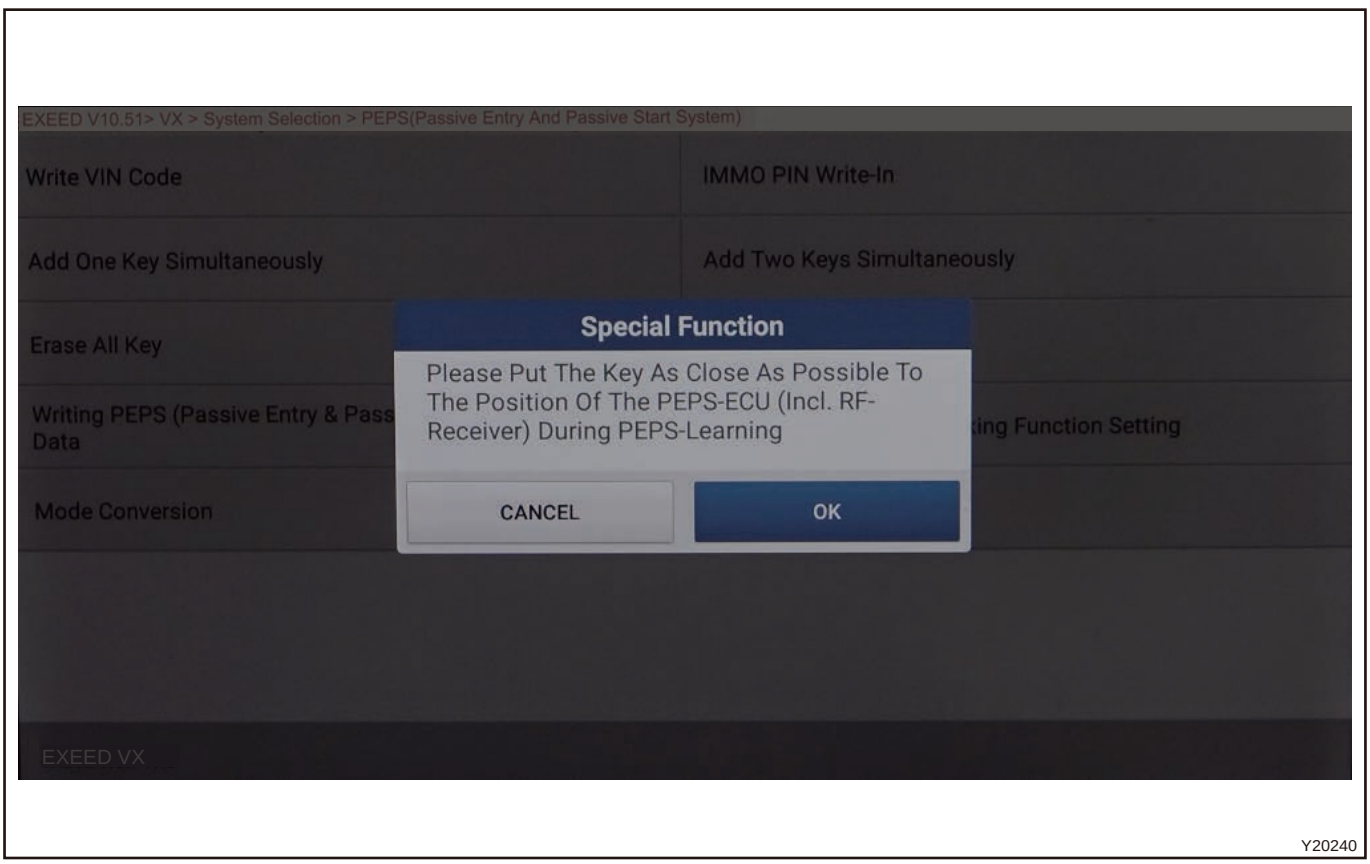
- **If ESK fails to write, disconnect battery negative and wait for a period of time before matching again.**
- **The entered PIN code must be the original vehicle PIN, if not sure, please consult the after-sales for inquiry. This step may accidentally lead to the vehicle can not start, professionals are required to operate with caution!**

■ Add a key

(1) Click “Add One Key Simultaneously”.



(2) The diagnostic tester interface prompts “Please Put The Key As Close As Possible To The Position Of The PEPE-ECU (Incl. RF-Receiver) During PEPS-Learning”.



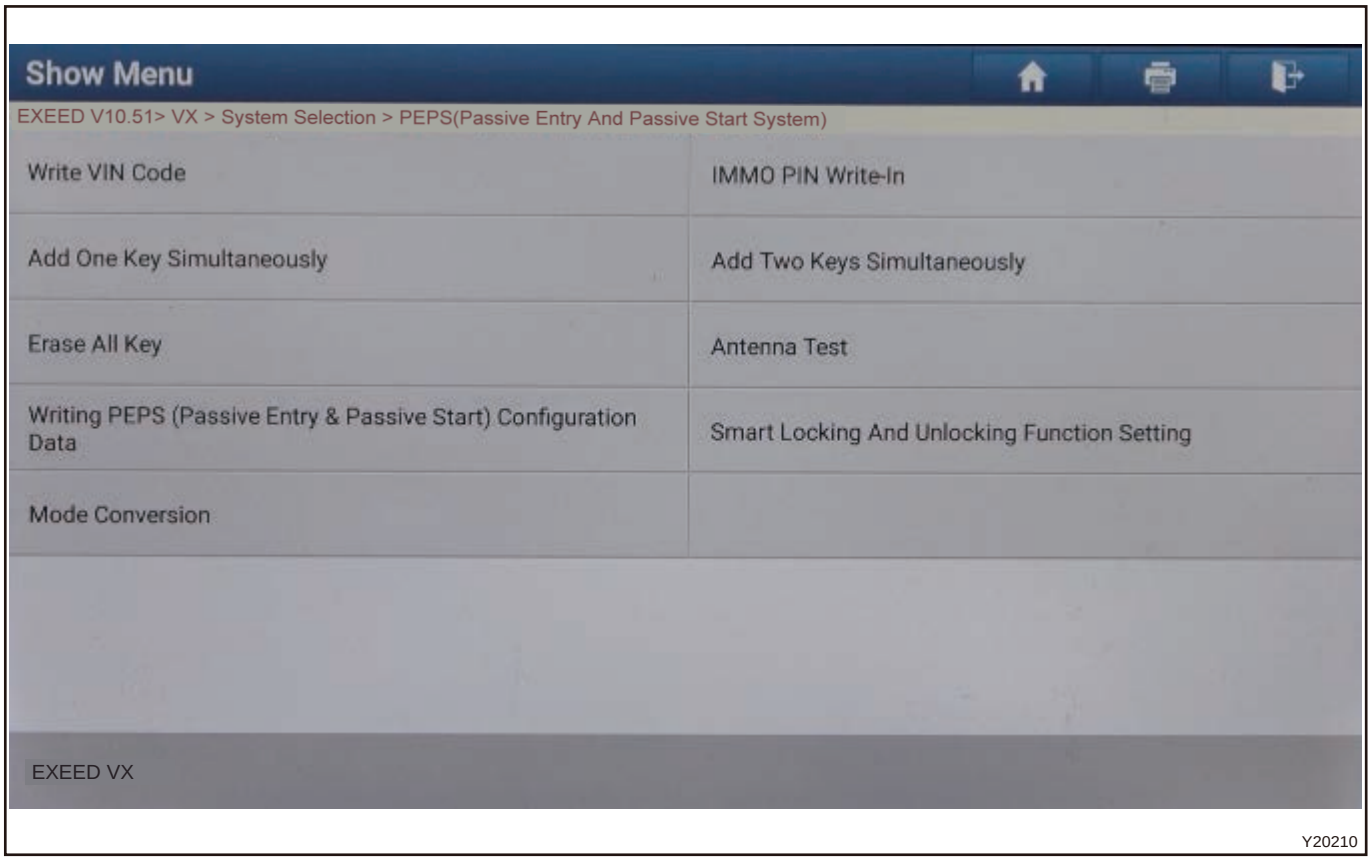
(3) Click “OK” when putting the key in position.

(4) The diagnostic tester interface prompts “Key Learning Successfully!”.

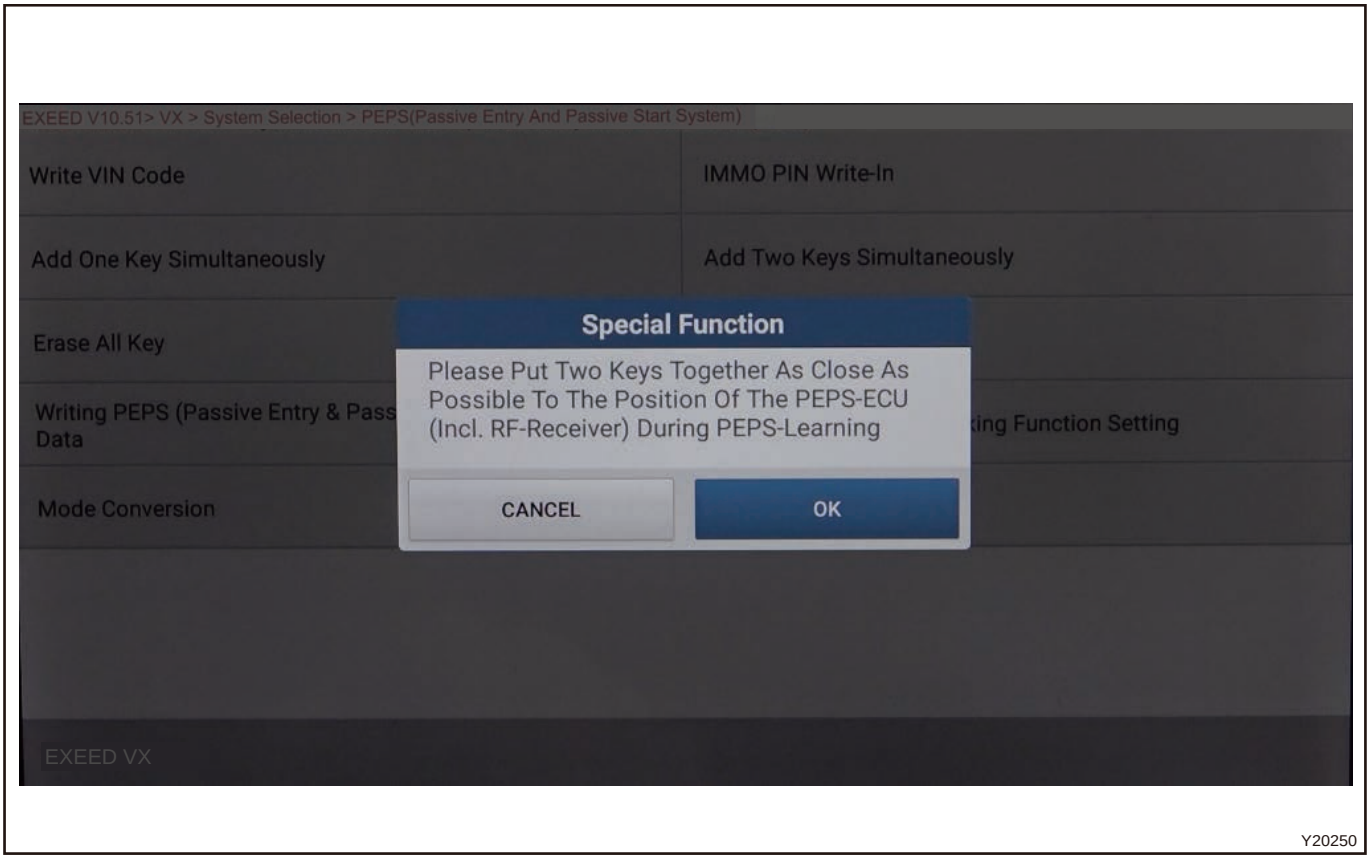
(5) Click “OK” to return.

■ **Add two keys simultaneously**

(1) Click “Add Two Keys Simultaneously”



(2) The diagnostic tester interface prompts “Please Put The Key As Close As Possible To The Position Of The PEPE-ECU (Incl. RF-Receiver) During PEPS-Learning”.



(3) Click “OK” when putting the key in position.

(4) The diagnostic tester interface prompts “Key Learning Successfully!”.

(5) Click “OK” to return.

4.3 Front Low Frequency Antenna

■ Removal

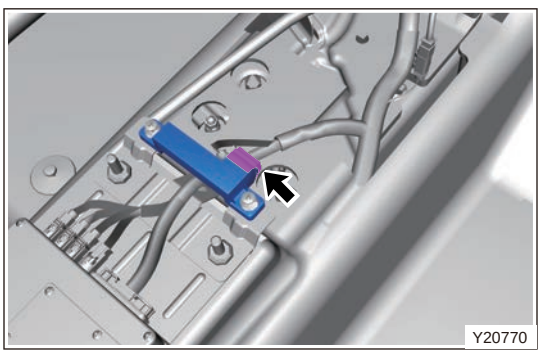
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

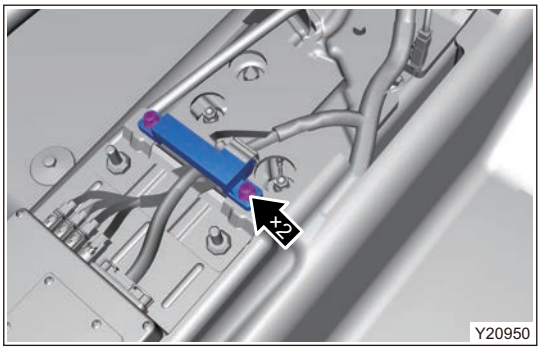
(3) Remove the auxiliary fascia console assembly.

(4) Remove the front low frequency antenna.

(5) Disconnect the connector from front low frequency antenna.



(6) Removal 2 fixing clips and front low frequency antenna.



■ **Installation**

(1) Install 2 fixing clips of front low frequency antenna.
(2) Connect the front low frequency antenna connector.
(3) Install the auxiliary fascia console assembly.
(4) Connect the negative battery terminal cable.

4.4 Rear Bumper Low Frequency Antenna

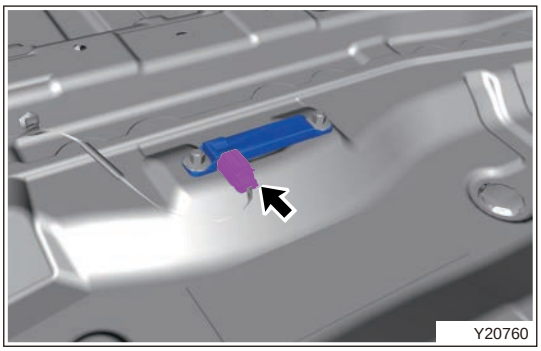
■ **Removal**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

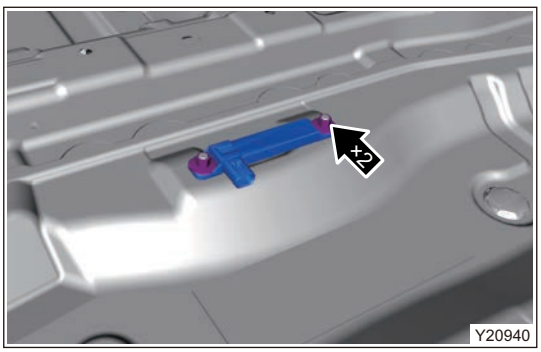
(2) Disconnect the negative battery cable.

(3) Remove the rear bumper assembly.

(4) Disconnect the connector from rear low frequency antenna.



(5) Removal 2 fixing plastic nuts and rear low frequency antenna.



■ **Installation**

(1) Install 2 fixing plastic nuts of rear low frequency antenna.

Torque: 1.5 N·m.

(2) Connect the rear bumper low frequency antenna connector.
(3) Install the rear bumper assembly.
(4) Connect the negative battery cable.

4.5 Rear Low Frequency Antenna

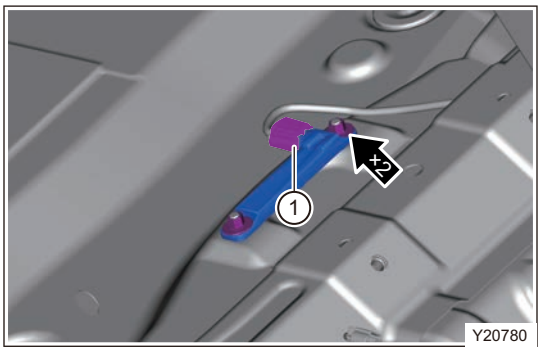
■ Removal

(1) Turn ENGINE START STOP switch to OFF.

(2) Disconnect the negative battery cable.

(3) Remove the second left seat assembly.

(4) Disconnect 2 fixing nuts from rear low frequency antenna connector.



(5) Remove the rear low frequency antenna.

■ Installation

(1) Install 2 fixing nuts of rear low frequency antenna.
(2) Connect the front low frequency antenna connector.
(3) Install the left second row seat assembly.
(4) Connect the negative battery terminal cable.

11.14 EXTERIOR LIGHTING SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Be sure to wear safety equipment to prevent accidents, when removing exterior lighting appliance.

(2) Appropriate force should be applied when removing exterior lighting appliance. Be careful not to operate roughly.

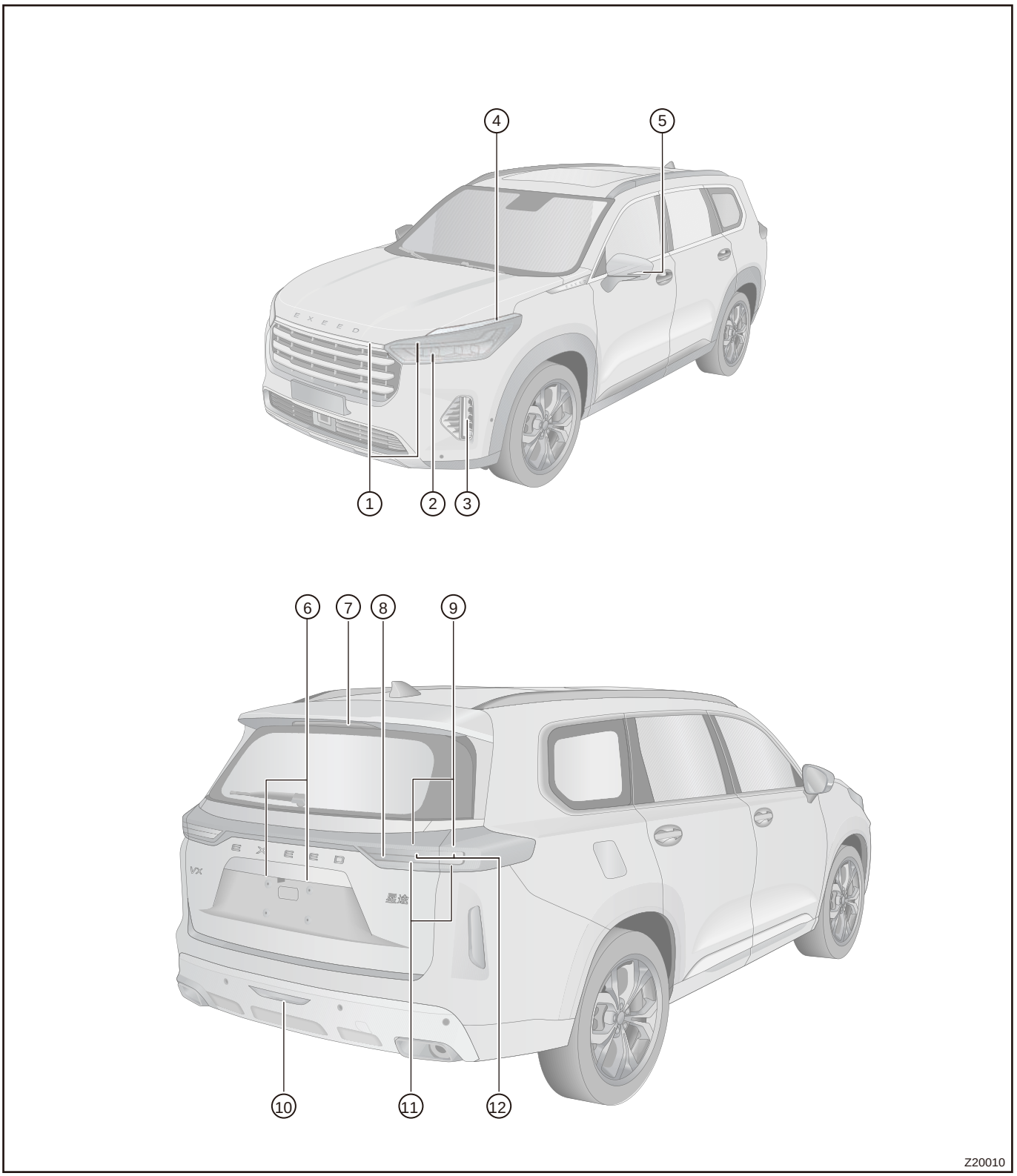
(3) Try to prevent interior and body paint surface from being scratched, when removing exterior lighting appliance.

2 System Overview

2.1 System Description

Lighting system on this model consists of vehicle lighting device and light signal device, which are used for normal operation of vehicle and ensures safety when driving at night or in fog. Lighting system consists of headlight assembly, front position light, turn signal light, daytime running light, side turn signal light, foot light, rear fog light, back-up light, brake light, license plate light and high mounted stop light.

2.2 System Components Diagram



1	Front Position Light	2	Low/High Beam Light
3	Front Fog Light	4	Front Left Turn Signal Light
5	Left Turn Signal Light	6	License Plate Light

7	High Mounted Stop Light	8	Back-up Light
9	Position Light	10	Rear Fog Light
11	Turn Signal Light	12	Brake Light

2.3 System Principle

■ Brake light

Power supply for high mounted stop light and brake light are provided by BCM. There is no fuse in the circuit. Depress brake pedal, BCM 1-39 receives high level signal, BCM 5-08 and 5-11 output 12 V power supply to turn brake light on. **Trigger conditions:**

- When brake switch is pressed, brake switch is a high level self-locking switch.
- CAN signal ‘BrakeLightsRequest=1’ sent from EPB is received.
- CAN signal “BLRequestController=1” sent from ESP is received.

■ Daytime running light

BCM receives the engine speed signal and position light not on signal through CAN network, and BCM 5-15 and 5-14 output 12 V power supply to turn daytime running light on. **Trigger conditions:**

- Engine starts; low and high beam lights and front fog lights are not activated.
- When daytime running light is operating: Flash function does not affect daytime running light operation.

■ Back-up light

Power supply for back-up light is provided by BCM 4-08. When BCM receives the following trigger conditions, back-up light will come on. **Trigger conditions:**

- After receiving reverse switch signal or CAN signal sent from TCU, BCM turns backup light on.

■ Position light

Power supply for position light is provided by BCM. When BCM receives the following trigger conditions, back-up light will come on. **Trigger conditions:**

- IGN ON or ACC; position light input or low beam light input is activated.
- BCM should send ParkLightSts =1(Bcan).

■ Foot light

Foot light on rear view mirror is turned on by using power supply provided by BCM 5-09. **Trigger conditions:**

- With key in OFF/ACC, perform unlock operation through key or remote function, foot light turns on for 15 seconds.
- In OFF status, BCM receives wireless fortifying/remote fortifying/PLG fortifying signal, and vehicle enters fortifying mode successfully, foot light turns on for 15 seconds.
- With key in ON or after counting down for 15 seconds, foot light turns off.
- In OFF/ACC/ON status, open any door, and BCM controls foot light to turn on for 3 minutes.
- Within 3 minutes after foot light is activated: If another door is opened while one door remains open, foot light continues to come on for 3 minutes, and then fades out.
- In OFF/ACC status, foot light comes on, four doors close, BCM controls foot light to come on for 8 seconds and then go off; Turn key to ON within 8 seconds after foot light is on, and foot light turns off immediately.
- When foot light comes on, if key is turned to ON, four doors close and foot light turns off immediately.

■ Rear fog light

Power supply for rear fog light is provided by BCM 5-17. When rear fog light switch is turned on, the rear fog lights turn on. **Trigger conditions:**

- Operating conditions for rear fog light: IGN-ON; Front fog light or low beam lights are activated; Rear fog light switch is activated.
- When rear fog light is operating: Rear fog light comes on and send RearFogLightSts=1.
- When rear fog light is operating: When rear fog light switch is activated again, rear fog lights turn off.
- When rear fog light is operating: When key is switched from IGN ON to ACC or OFF, rear fog light turns off.

- When rear fog light is operating: When low beam light or front fog light load is turned off, rear fog lights turn off at the same time.

■ Hazard warning light

When hazard warning light switch is turned on, BCM 2-14 receives a low level signal. BCM 2-14 will turn on hazard warning light switch, switch indicator turns on, left and right turn signal lights flash at the same time. **Trigger conditions:**

- The corresponding bulb is intact, BCM sends LHTurnsignalSts and RHTurnsignalSts and load operating frequency is the same as that of turn signal light; If any 21 W bulb is damaged, the flashing frequency of turn signal light CAN signals (LHTurnsignalSts and RHTurnsignalSts) and hazard warning light will be 2 times of that when bulb is intact.
- When ABM sends a collision signal, hazard warning light function should be activated automatically (CAN signal of left/right turn signal light, indicator and turn signal light). Automatically activated hazard warning light function due to collision can be canceled as key is switched to OFF, then to ON or hazard warning light button is pressed.
- When turn signal light function and hazard warning light function are both effective, BCM should perform the next action.

■ Turn signal light

When turn signal light switch signal is received, BCM outputs power supply to turn on the corresponding turn signal light. **Trigger conditions:**

- IGN ON, turn signal light switch is activated.
- The flashing frequency of turn signal light is 400 ms on and 400 ms off.
- Key is turned from ON to OFF, turn signal light stops operating and meter stops flashing.
- When turn signal light is operating: The corresponding bulb is intact, BCM sends LHTurnLightSts (Bcan & Pcan) and the load operating frequency is the same as that of left turn signal light; If the corresponding 21W bulb is damaged, BCM will send LHTurnLightSts and the frequency will be 2 times of that when bulb operates normally. No matter whether the bulb is damaged or not, BCM will send DirectionIndLeft (Bcan & Pcan) signal continuously.

■ Low beam light

Power supply for low beam light is provided by the engine compartment fuse and relay box. BCM receives the combination light switch low beam light signal, BCM 1-18 analogs ground, high beam light relay operates to turn on high beam light. **Trigger conditions:**

- IGN ON; Low beam light switch is activated.
- BCM sends LowBeamSts=1.

■ High beam light

Power supply for high beam light is provided by the engine compartment fuse and relay box. BCM receives the combination light switch high beam light signal, BCM 1-43 analogs ground, low beam light relay operates to turn on low beam light. **Trigger conditions:**

- Operating conditions for high beam light: IGN ON; low beam lights are activated, high beam light switch is activated.
- When high beam light is operating: High beam lights come on and send HighBeamSts=1.
- When high beam light is operating: When vehicle cranks, high beam lights temporarily stop operating but CAN data will be sent continuously and resume operation after cranking.
- When high beam light is operating: When high beam light switch is deactivated, high beam light turns off.
- When high beam light is operating: When low beam light switch is deactivated, high beam light turns off.
- When high beam light is operating: When key is turned from IGN ON to ACC or OFF, high beam light turns off.

2.4 Intelligent Headlight

■ Function description

The main function of intelligent headlight control system is the intelligent low/high beam switching. The system can request high beam ON/OFF according to the traffic and environmental factors. If there are no relevant traffic participants in front, the system will activate high beam; With system activated, if there is a meeting or following vehicle or street lighting, high beam will be turned off.

■ **Control principle**

After IGN ON, system switch is turned to ON, and headlight is in AUTO, camera will detect vehicle status, surrounding environment and road condition in front. If IHC opening conditions are met, system will request high beam to be turned ON; When followings, oncomings or vehicles related environment (including the existence of multiple street lights, if external environment brightness is higher than the threshold, etc.) do not meet the IHC open conditions, system will request high beam to be turned off, once the system ON conditions resume, system will follow a certain delay mechanism and send high beam request without interfering with other traffic participants (ECE48 defined vehicles driving in opposite or same directions, ECE50 defined motorbikes driving in opposite or same directions, electric motorcars with light as well as bicycles with light driving in same direction, light size must be more than 150*150 mm and light intensity is greater than 30 cd). The request of low/high beam switching is transmitted to BCM from multi-function front camera via CAN signal, and driver can change lighting state at any time using light rod.

■ **System operating precondition**

(1) IGN ON.

(2) Headlight switch is in AUTO.

(3) Low beam light turns on automatically.

(4) BCM judges that all the above conditions are met, then BCM sends corresponding system switch requests according to functional logic. If any condition is not met, it will send HWASW = 0 continuously and system cancels activation requests.

3 DIAGNOSIS & TEST

3.1 Problem Symptoms Table

⚠ Caution
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Current Status	Possible Cause
Low beam light does not come on (one side)	Fuse
	Headlight assembly
	Wire harness or connector
Low beam lights do not come on (both sides)	Fuse
	Headlight assembly
	Combination light switch assembly
	Low beam relay
	Wire harness or connector
	Body Control Module (BCM)
High beam light does not come on (one side)	Fuse
	Headlight assembly
	Wire harness or connector
High beam light does not come on (both sides)	Fuse
	Headlight assembly
	Combination light switch assembly
	High beam relay
	Wire harness and connector

Current Status	Possible Cause
	Body Control Module (BCM)
Position light does not come on (one side)	Position light bulb
	Wire harness or connector
Position lights do not come on (both sides)	Position light bulbs (all)
	Wire harness or connector
	Combination light switch assembly
	Body Control Module (BCM)

3.2 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the meter system.

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V.

NG → **Replace battery**

OK

3	**Customer problem analysis**

NEXT

4	**Read DTCs**

No DTC → **Customer problem analysis**

NEXT

5	**Conduct test and confirm malfunction has been repaired**

NEXT → **End**

3.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

(1) Turn ENGINE START STOP switch to LOCK.

(2) Connect diagnostic tester (the latest software) to diagnostic interface.

(3) Connect diagnostic tester (the latest software) to diagnostic interface.

(4) Use the diagnostic tester to record and clear DTCs stored in the detection system.

(5) Turn ENGINE START STOP switch to LOCK and wait for a few seconds.

(6) Turn ENGINE START STOP switch to ON, and then select read DTC.

(7) If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.

(8) If no DTC is detected, malfunction indicated by the DTC is intermittent.

3.4 Diagnostic Help

(1) Connect diagnostic tester X-431 PAD (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.

(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.

(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.

(4) Only use a digital multimeter to measure voltage of electronic system.

(5) Refer to any Technical Bulletin that may apply to this malfunction.

(6) Visually check related wire harness and connector.

(7) Check and clean all CD system grounds related to the latest DTCs.

(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.5 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.6 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1000-16	Power Supply Voltage too Low	Battery voltage is less than 9 V	Power supply is not stable, and some loads may decrease suddenly.	• Check fuse • Check charging system • Check wire harness connector • Check BCM
B1000-17	Power Supply Voltage too High	Battery voltage is more than 15 V		
B1002-11	Right Side Turn Lamp Control Circuit Short to Ground	Output current is more than 5 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.) and it is stored as current fault.	• Wire harness connector • Turn signal light • BCM	• Check wire harness connector • Check turn signal light • Check BCM
B1002-13	Right Side Turn Lamp Control Circuit-Circuit Open	Output current is less than 3 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.)		
B104001	Right Turn Signal Light Feedback Fault	/	• Wire harness connector • Turn signal light • BCM	• Check wire harness connector • Check turn signal light • Check BCM
B104101	Left Turn Signal Light Feedback Fault			
B101E-11	Right Static Assist Illumination Light Short to Ground	Output current is more than 4 A (Time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, back-up light will output as long as operating conditions of back-	Wire harness or load fault	• Check wire harness connector • Check load • Check BCM
B101F-11	Left Static Assist Illumination Light Short to Ground			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		up light are met.) and it is stored as current fault.		
B101E-13	Open in Right Static Assist Illumination Light	Output current is less than 0.5 A (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, back-up light will output as long as operating conditions of back-up light are met.)		
B101F-13	Open in Left Static Assist Illumination Light			
B1035-11	Brake Light Short to Ground	Output current is more than 5 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, brake light will output as long as operating conditions of brake light are met.) and it is stored as current fault.	Wire harness or load fault	• Check wire harness connector • Check brake light • Check BCM
B1035-13	Open or Short to Power Supply in Brake Light	Output current is less than 0.5 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, brake light will output as long as operating conditions of brake light are met.)		
B1036-11	High Mounted Stop Light Short to Ground	Output current is more than 2 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position,		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		load will output as long as operating conditions of load are met.) and it is stored as current fault.		
B1036-13	Open or Short to Power Supply in High Mounted Stop Light	Output current is less than 30 mA (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.)		
B1039-11	Back-up Light Circuit Short to Ground	Output current is less than 0.5 A (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, back-up light will output as long as operating conditions of back-up light are met.)	Wire harness or load fault	• Check wire harness connector • Check back-up light • Check BCM
B1039-13	Open or Short to Power Supply in Back-up Light Circuit	Output current is more than 4 A (Time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, back-up light will output as long as operating conditions of back-up light are met.) and it is stored as current fault.		
B102211	Short to Ground or Open in Low Beam Light Relay	When output is off and ignition switch is OFF, output voltage is more than 7 V, and it is stored as current fault. (The error is less than 10%, the time of duration is more than 100 MS, the software will detect once every 10MS,	Relay or wire harness fault	• Check wire harness connector • Check relay • Check BCM
B102311	Short to Ground or Open in High			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Beam Light Relay Circuit	and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will be output as long as operating conditions of load are met.)		
B102212	Short to Power supply in Low Beam Light Relay Circuit	Output current is more than 5 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.) and it is stored as current fault.		
B102312	Short to Power supply in High Beam Light Relay Circuit			
B102611	Short to Ground or Open in Front Fog Light Relay	When output is off and ignition switch is OFF, output voltage is more than 7 V, and it is stored as current fault. (The error is less than 10%, the time of duration is more than 100 MS, the software will detect once every 10MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will be output as long as operating conditions of load are met.)	Relay or wire harness fault	• Check wire harness connector • Check relay • Check BCM
B102612	Short to Power Supply in Front Fog Light Relay	Output current is more than 5 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.) and it is stored as current fault.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B102811	Open or Short to Ground in Rear Fog Light Relay	Output current is less than 30 mA (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.)	Wire harness or load fault	• Check wire harness connector • Check rear fog light • Check BCM
B102813	Rear Fog Light Circuit Short to Power Supply	Output current is more than 2 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.) and it is stored as current fault.		
B102911	Left Daytime Running Light Circuit Short to Ground	Output current is more than 2 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, daytime running light will output as long as operating conditions of daytime running light are met.) and it is stored as current fault.	Wire harness or load fault	• Check wire harness connector • Check daytime running light • Check BCM
B103011	Right Daytime Running Light Circuit Short to Ground			
B102913	Open or Short to Power Supply in Left Daytime Running Light Circuit	Output current is less than 0.1 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, daytime running light will		
B103013	Open or Short to Power Supply in Right Daytime Running Light Circuit			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		output as long as operating conditions of daytime running light are met.)		
B103111	Open or Short to Ground in Position Light Relay	When output is off and ignition switch is OFF, output voltage is more than 7 V, and it is stored as current fault. (The error is less than 10%, the time of duration is more than 100 MS, the software will detect once every 10MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will be output as long as operating conditions of load are met.)	Relay or wire harness fault	• Check wire harness connector • Check relay • Check BCM
B103113	Position Light Relay Short to Power Supply	Output current is more than 5A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.) and it is stored as current fault.		
B104201	Position Light Feedback Fault	/	• Check wire harness connector • Position light • Check BCM	• Check wire harness connector • Position light • Check BCM
B103813	Open in Back Door Light Load	Output current is less than 30 mA (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.)	Wire harness or load fault	• Check wire harness connector • Check back door light • Check BCM

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B103811	Back Door Light Load Short to Ground	Output current is more than 2 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.) and it is stored as current fault.		
B105313	Rear View Mirror Foot Light Short to Ground	Output current is less than 30 mA (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.)	Wire harness or load fault	• Check wire harness connector • Check rear view mirror foot light • Check BCM
B105311	Open or Short to Power Supply in Rear View Mirror Foot Light	Output current is more than 2 A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will output as long as operating conditions of load are met.) and it is stored as current fault.		

3.8 DTC Diagnosis Procedure

■ Power supply voltage fault

DTC	B1000-16	Power Supply Voltage too Low
DTC	B1000-17	Power Supply Voltage too High

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.

- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check battery voltage

(a) Start engine, and use voltage band of multimeter to check if battery voltage is normal. (Rated voltage: Not less than 12 V)

NG → **Repair or replace battery/alternator**

OK

2	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check for continuity of instrument panel fuses MF03 (125A), RF54 (20A) and RF63 (5A) with a digital multimeter.

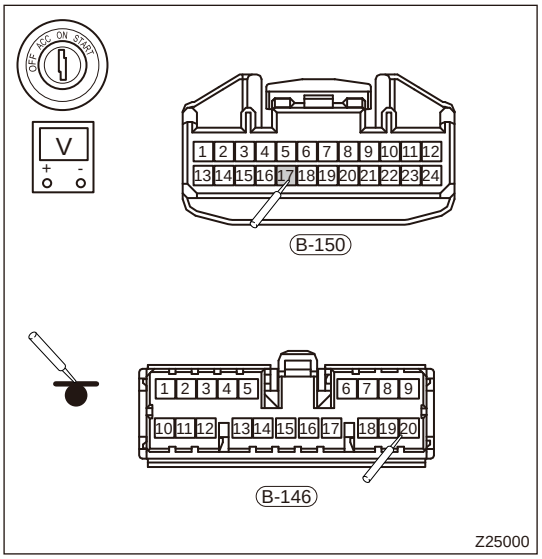
NG → **Replace fuse.**

OK

3	Check interior power supply wire harness

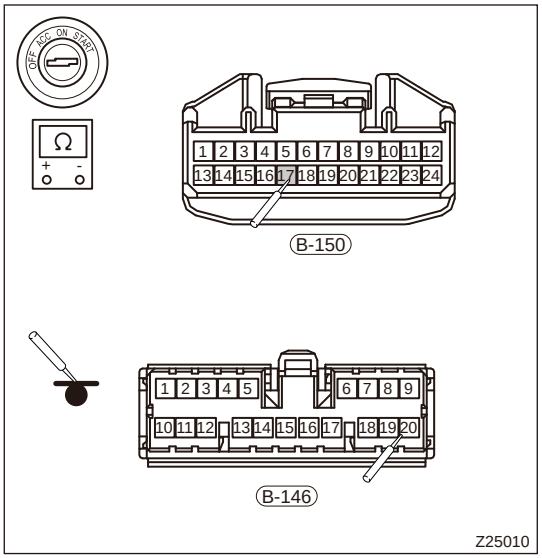
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the interior wire harness connectors B-146 and B-150.
(d) Connect the negative battery cable.
(e) Turn ENGINE START STOP switch to ON.
(f) Using a digital multimeter, measure voltage between interior wire harness connectors B-146 and B-150 and ground, and detect it with a 21 W test lamp according to table below.

Multimeter Connection	Condition	Specified Condition
B-150 (17) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
B-146 (20) - Body ground		Not less than 12 V



(g) Using a digital multimeter, measure resistance between interior wire harness connectors B-146 and B-150 and ground according to table below.

Multimeter Connection	Condition	Specified Condition
B-150 (17) - Body ground	ENGINE START STOP switch "OFF"	∞
B-146 (20) - Body ground		∞



NG → **Repair or replace related wire harness.**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System is normal**

■ **Turn signal light fault**

DTC	B1001-11	Left Turn Signal Light Short to Ground
DTC	B1001-13	Open or Short to Power Supply in Left Turn Signal Light
DTC	B1041-01	Left Turn Signal Light Feedback Fault

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of left turn signal light control circuit

(a) First, confirm the operating status of left turn signal light.

(b) If only left turn signal light does not turn on, check the output circuit of left turn signal light only.

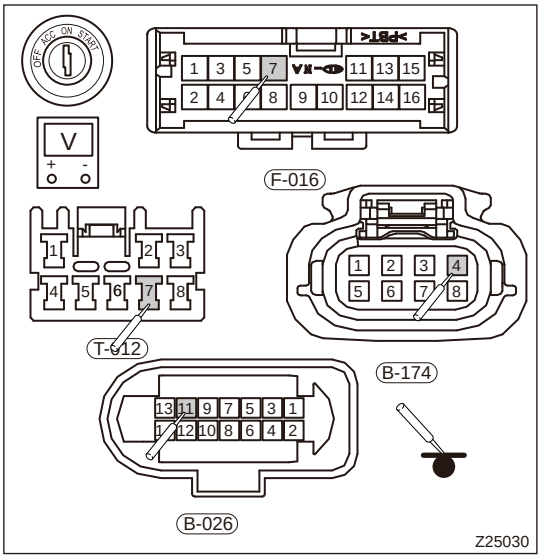
(c) If either front left or rear left light does not come on, check node line and turn signal light.

(d) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(e) Disconnect front left turn signal light connector B-026, left turn signal light connector F-016, rear left fixed turn signal light connector B-174 and rear left movable turn signal light T-012.

(f) Connect the negative battery cable, turn ignition switch to ON, and turn on left turn signal light switch.

(g) Using a multimeter, check output voltage of each turn signal light according to table below.



Multimeter Connection	Condition	Specified Condition
B-026 (11) - Body ground	ENGINE START STOP switch "ON"	Indirect 12 V
B-174 (4) - Body ground		
T-012 (6) - Body ground		
F-016 (7) - Body ground		

OK → **Replace turn signal light**

NG

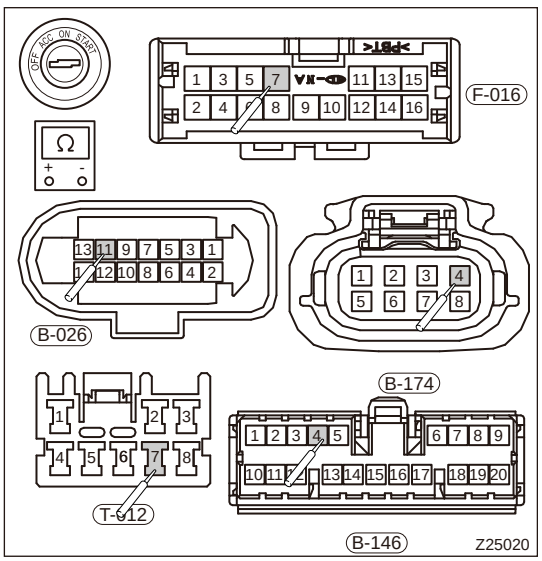
2	Check circuit

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-146.

(c) Disconnect front left turn signal light connector B-026, left turn signal light F-016, rear left fixed turn signal light B-174 and rear left movable turn signal light T-012.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.



Multimeter Connection	Condition	Specified Condition
B-146 (04) - B-026 (11)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (04) - B-174 (4)		
B-146 (04) - T-012 (6)		
B-146 (04) - F-016 (07)		

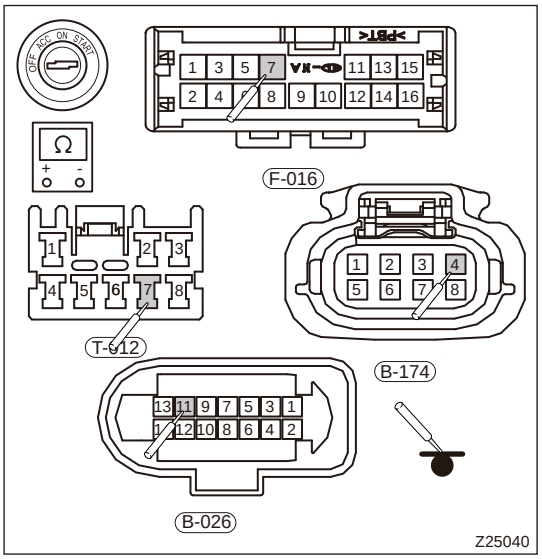
NG → **Replace or repair wire harness.**

OK

3	Check ground circuit of turn signal light

(a) Using a multimeter, check if ground circuit of turn signal light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
B-026 (5) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-174 (1) - Body ground		
T-012 (1) - Body ground		
F-016 (9) - Body ground		



NG → **Repair ground wire harness**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ Position light fault

DTC	**B1005-11**	**Open or Short to Ground in Position Light Relay**
DTC	**B1005-13**	**Position Light Relay Short to Power Supply**
DTC	**B1042-01**	**Position Light Feedback Fault**

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of position light control circuit

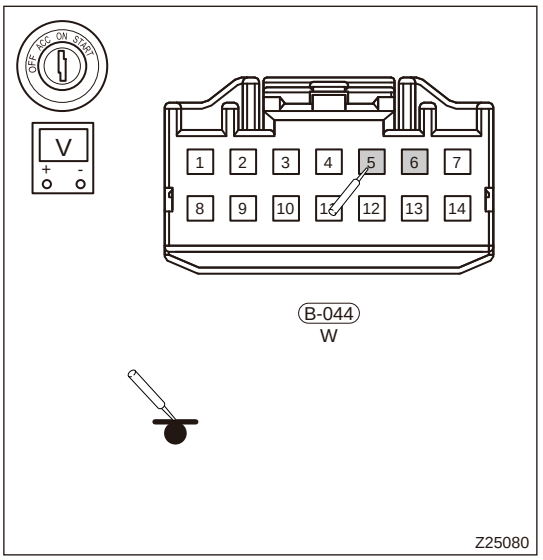
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the engine compartment fuse box connector B-044.

(c) Connect the negative battery cable, turn ignition switch to ON, and turn on position light switch.

(d) Using a multimeter, check output voltage of position light according to table below.

Multimeter Connection	Condition	Specified Condition
B-044 (C5) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
B-044 (C6) - Body ground		



NG → Check relay and power supply wire harness

OK →

2	Check circuit

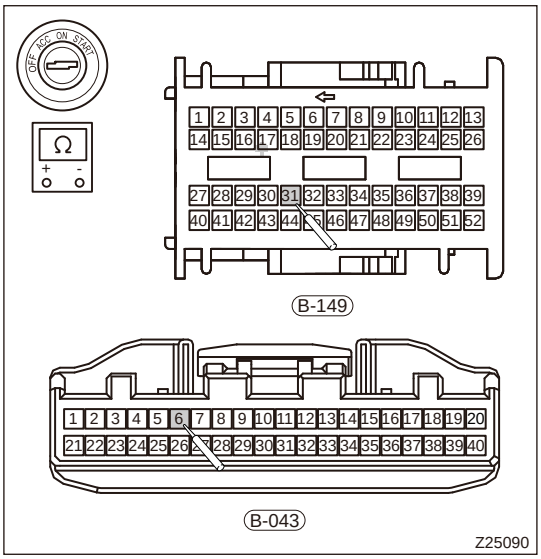
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-149.

(c) Disconnect the engine compartment fuse box connector B-043.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-043 (6) - B- 149 (31)	ENGINE START STOP switch "OFF"	Not less than 12 V



(e) Turn on the position light switch.

(f) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-043 (6) - Body ground	ENGINE START STOP switch "ON"	⩽ 1 Ω

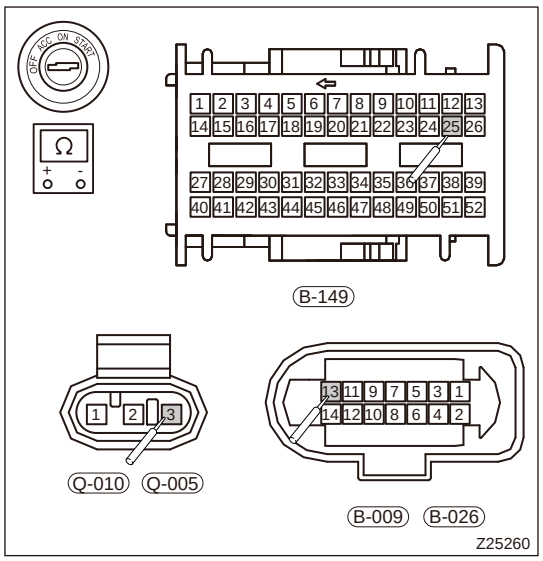
NG → **Replace or repair wire harness and position light relay**

OK

3	Check front position light feedback

(a) Using a multimeter, check if feedback circuit of front position light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
B-026 (13) - B-149 (25)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-009 (13) - B-149 (25)		
Q-005 (3) - B- 149 (25)		
Q-010 (3) - B- 149 (25)		



NG → **Repair ground wire harness**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.

(b) Use diagnostic tester to clear DTCs.

(c) Start the engine.

(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ **Rear fog light fault**

DTC	B1028-11	Rear Fog Light Circuit Short to Power Supply

■ **Description**

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of rear fog light control circuit

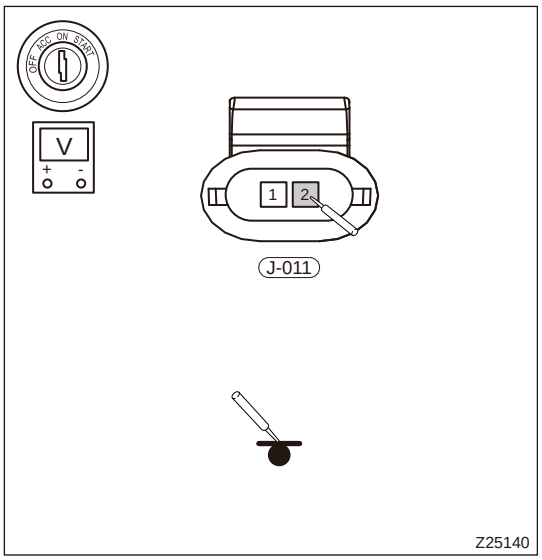
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the rear fog light connector J-011.

(c) Connect the negative battery cable, turn ignition switch to ON, and turn on rear fog light switch.

(d) Using a multimeter, check output voltage of rear fog light according to table below.

Multimeter Connection	Condition	Specified Condition
J-011 (2) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V



NG → **Check power supply wire harness**

OK

2	Check circuit

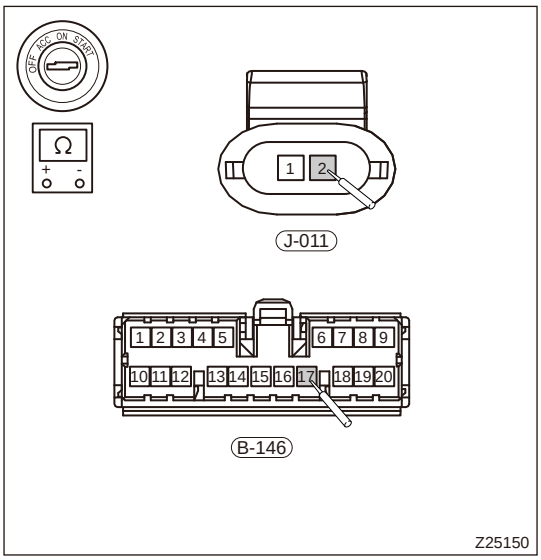
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-076.

(c) Disconnect the rear fog light connector J-011.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (17) - J- 011 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



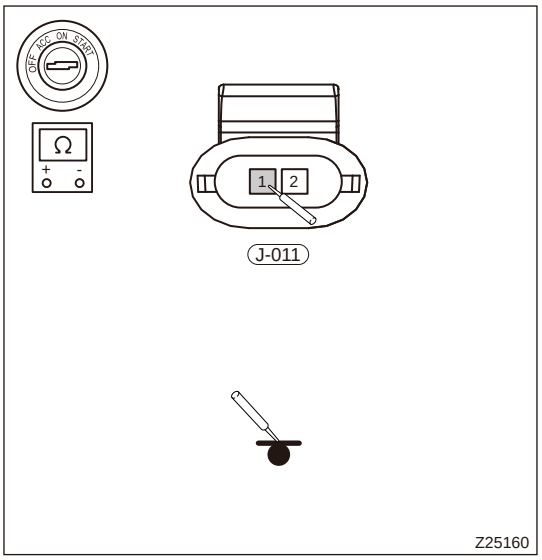
NG → **Replace or repair wire harness.**

OK

3	Check ground circuit of rear fog light

(a) Using a multimeter, check if ground circuit of rear fog light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
J-011 (1) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω



NG → **Replace or repair wire harness.**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ Daytime running light fault

DTC	**B1029-11**	**Left Daytime Running Light Circuit Short to Ground**
DTC	**B1029-13**	**Open or Short to Power Supply in Left Daytime Running Light Circuit**
DTC	**B1030-11**	**Right Daytime Running Light Circuit Short to Ground**
DTC	**B1030-13**	**Open or Short to Power Supply in Right Daytime Running Light Circuit**

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of daytime running light control circuit

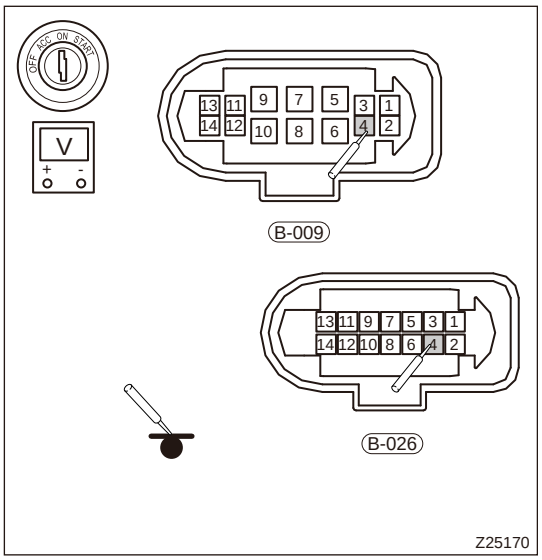
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the left daytime running light connector B-026 and right daytime running light connector B-009.

(c) Connect the negative battery cable, turn ignition switch to ON and start engine.

(d) Using a multimeter, check output voltage of daytime running light according to table below.

Multimeter Connection	Condition	Specified Condition
B-009 (4) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
B-026 (4) - Body ground		Not less than 12 V



NG → **Check power supply wire harness**

OK ↓

2	Check circuit

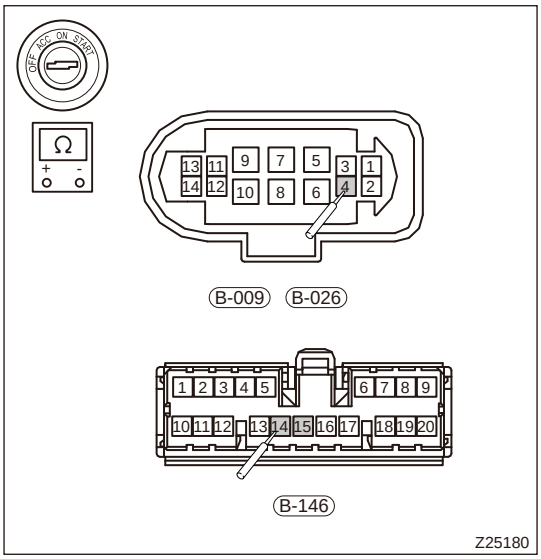
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-076.

(c) Disconnect the left daytime running light connector B-026 and right daytime running light connector B-009.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-026 (4) - B- 076 (14)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-009 (4) - B- 076 (15)		⩽ 1 Ω



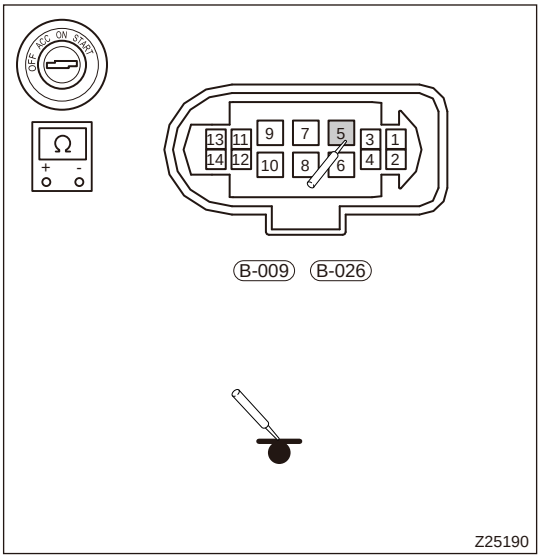
NG → **Replace or repair wire harness.**

OK ↓

3	Check ground circuit of daytime running light

(a) Using a multimeter, check if ground circuit of daytime running light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
B-026 (5) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-009 (5) - Body ground		⩽ 1 Ω



NG	Repair ground wire harness

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG	Replace BCM
OK	System operates normally.

■ **Brake light fault**

DTC	B1035-11	Brake Light Short to Ground
DTC	B1035-13	Open or Short to Power Supply in Brake Light
DTC	B1036-11	High Mounted Stop Light Short to Ground
DTC	B1036-11	Open or Short to Power Supply in High Mounted Stop Light

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

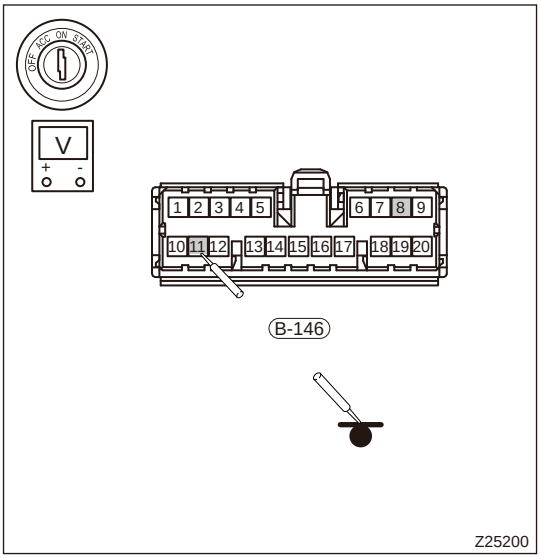
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of brake light control circuit

(a) Turn ignition switch to ON, and depress brake pedal.

(b) Using a multimeter, check output voltage of brake light from back of BCM connector B-146 according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (11) - Body ground	Brake pedal depressed	Not less than 12 V
B-146 (8) - Body ground		Not less than 12 V



NG → **Check BCM module**

OK

2	Check circuit

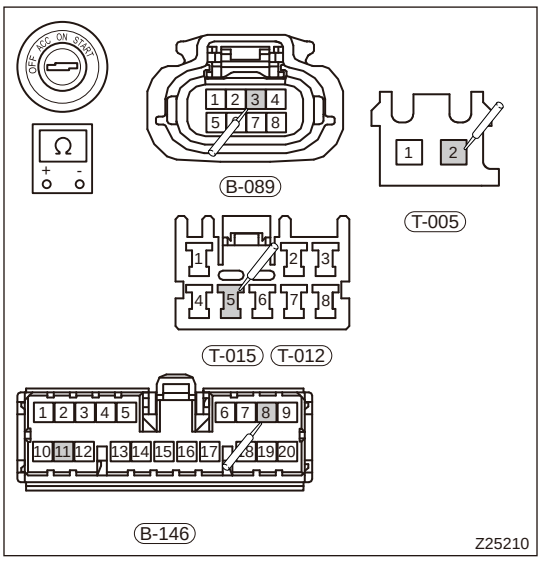
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-146.

(c) Disconnect the left brake light connector B-174 (body part) and T-012 (back door part). Disconnect the right brake light connectors B-089 (body part) and T-015 (back door part). Disconnect the high mounted stop light connector T-005.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (11) - T-005 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (8) - B- 174 (3)		
B-146 (8) - B- 089 (3)		
B-146 (8) - T- 012 (5)		
B-146 (8) - T- 015 (5)		



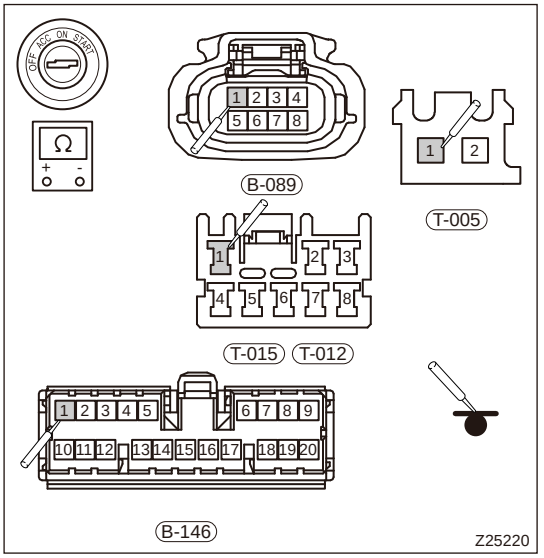
NG → **Replace or repair wire harness.**

OK

3	Check ground circuit of brake light

(a) Using a multimeter, check if ground circuit of brake light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
T-005 (1) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-174 (1) - Body ground		
B-089 (1) - Body ground		
T-012 (1) - Body ground		
T-015 (1) - Body ground		



NG → **Replace or repair wire harness.**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ Back-up light fault

DTC	**B1039-11**	**Back-up Light Circuit Short to Ground**
DTC	**B1039-13**	**Open or Short to Power Supply in Back-up Light Circuit**

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of back-up light control circuit

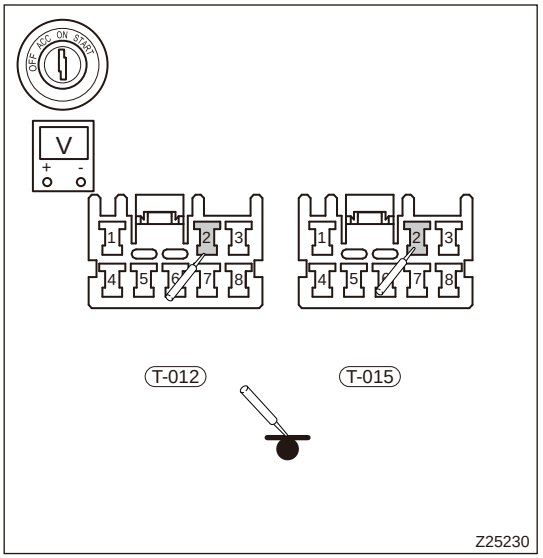
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the left back-up light connector T-012 and right back-up light connector B-089.

(c) Connect the negative battery cable, turn ignition switch to ON, and shift the shift lever to reverse gear.

(d) Using a multimeter, check output voltage of back-up light according to table below.

Multimeter Connection	Condition	Specified Condition
T-012 (2) - Body ground	Brake pedal depressed	Not less than 12 V
T-015 (2) - Body ground		Not less than 12 V



NG → **Check power supply wire harness**

OK

2	Check circuit

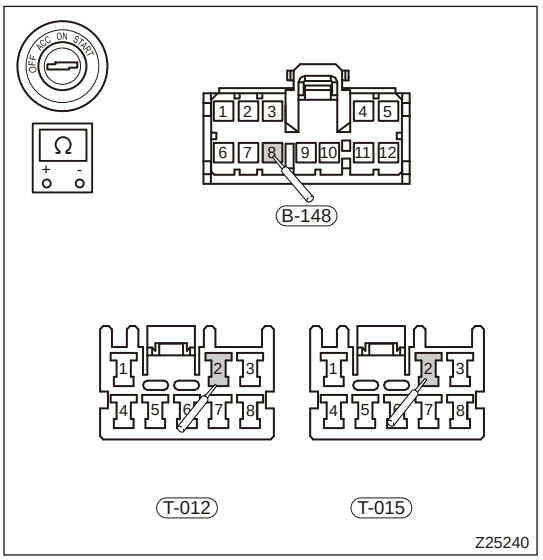
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-148.

(c) Disconnect the left back-up light connector T-012 and right back-up light connector T-015.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
T-012 (2) - B- 148 (8)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
T-009 (2) - B- 148 (8)		



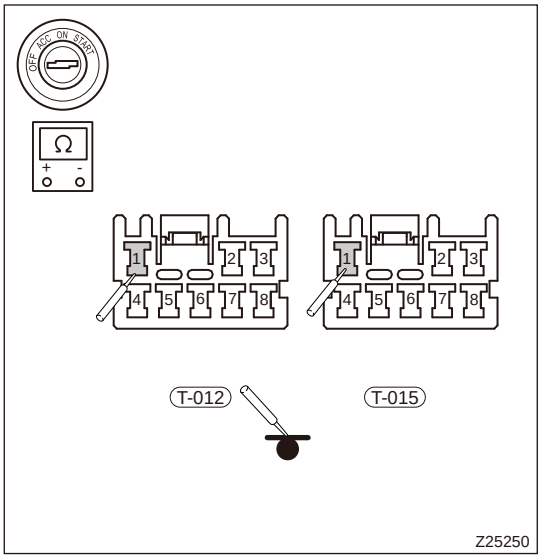
NG → **Replace or repair wire harness.**

OK

3	Check ground circuit of back-up light

(a) Using a multimeter, check if ground circuit of back-up light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
T-012 (1) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
T-015 (1) - Body ground		



NG	Repair ground wire harness

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG	Replace BCM
OK	System operates normally

■ **Front fog light fault**

DTC	B1026-11	Short to Ground or Open in Front Fog Light Relay
DTC	B1026-12	Short to Power Supply in Front Fog Light Relay

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of front fog light control circuit

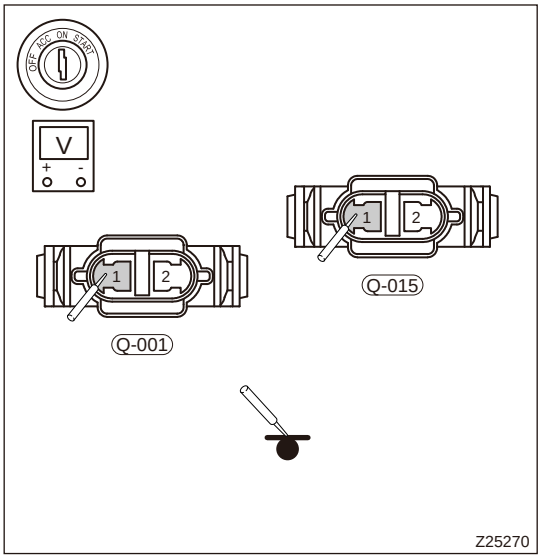
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect front left fog light connector Q-001 and front right fog light connector Q-005.

(c) Connect the negative battery cable, turn ignition switch to ON, and turn on front fog light switch.

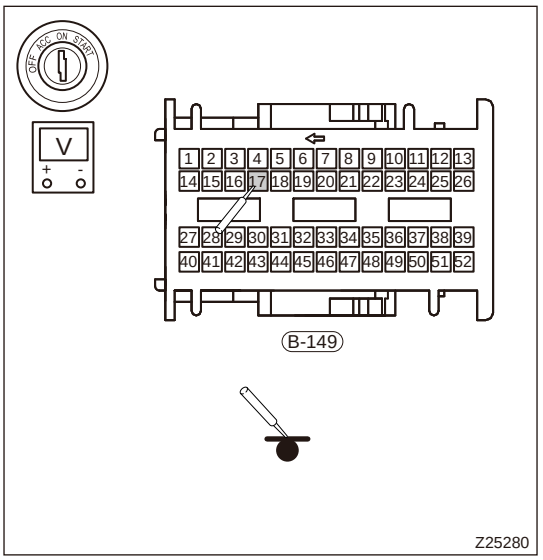
(d) Using a multimeter, check output voltage of front fog light according to table below.

Multimeter Connection	Condition	Specified Condition
Q-001 (1) - Body ground	Front fog light switch ON	Not less than 12 V
Q-015 (1) - Body ground		Not less than 12 V



(e) Disconnect BCM connector B-149, and check voltage of primary coil for front fog light relay.

Multimeter Connection	Condition	Specified Condition
B-149 (17) - Body ground	Front fog light switch ON	Not less than 12 V



NG → **Check power supply wire harness and relay**

OK

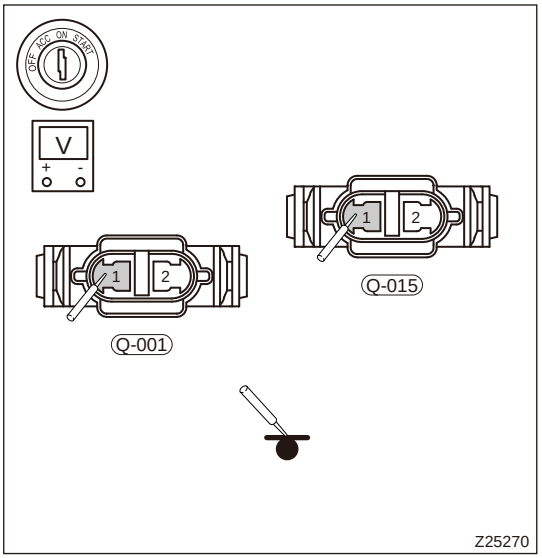
2	**Check circuit**

(a) Turn ENGINE START STOP switch to ON, and turn off front fog light switch.

(b) Disconnect front left fog light connector Q-001 and front right fog light connector Q-005.

(c) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
Q-001 (1) - Body ground	Front fog light switch OFF	0V
Q-015 (1) - Body ground		



NG → **Check for short to power supply in front fog light power supply.**

OK

3	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally**

■ **Right turn signal light fault**

DTC	**B1002-11**	**Right Turn Signal Light Short to Ground**
DTC	**B1002-13**	**Open or Short to Power Supply in Right Turn Signal Light**
DTC	**B1040-01**	**Right Turn Signal Light Feedback Fault**

■ **DTC confirmation procedure**

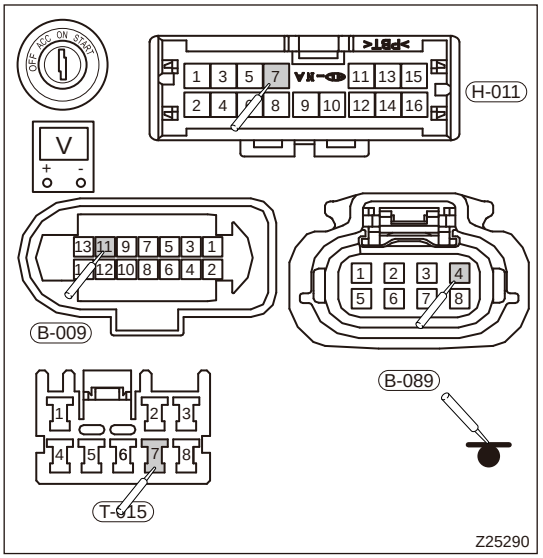
Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of right turn signal light control circuit

(a) First confirm the working state of right turn signal light.
(b) If only right turn signal light does not turn on, check the output circuit of right turn signal light only.
(c) If either front right or rear right light does not come on, check node line and turn signal light.
(d) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(e) Disconnect front right turn signal light connector B-009, right turn signal light connector H-011, rear right fixed turn signal light B-089 and rear right movable turn signal light T-015.
(f) Connect the negative battery cable, turn ignition switch to ON, and turn on right turn signal light switch.
(g) Using a multimeter, check output voltage of each turn signal light according to table below.



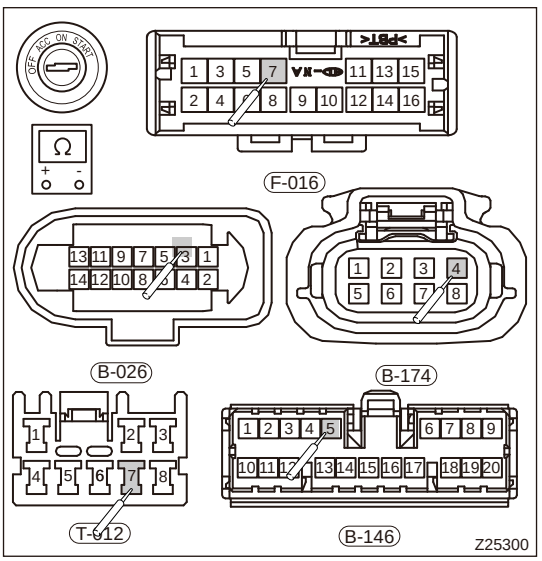
Multimeter Connection	Condition	Specified Condition
B-009 (11) - Body ground	ENGINE START STOP switch "ON"	Indirect 12 V
B-089 (4) - Body ground		
T-015 (6) - Body ground		
H-011 (7) - Body ground		

OK → **Replace turn signal light**

NG

2	Check circuit

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Disconnect the body controller connector B-146.
(c) Disconnect front right turn signal light connector B-009, right turn signal light connector H-011, rear right fixed turn signal light B-089 and rear right movable turn signal light T-015.
(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.



Multimeter Connection	Condition	Specified Condition
B-146 (05) - B-009 (11)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (05) - B-089 (4)		
B-146 (05) - T-015 (6)		
B-146 (05) - H-011 (07)		

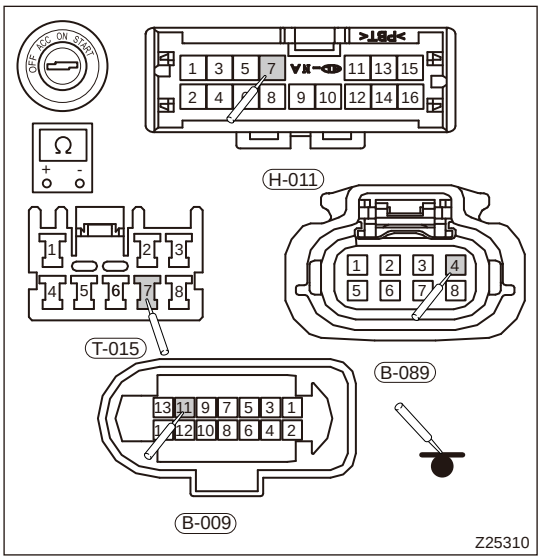
NG → **Replace or repair wire harness.**

OK

3	Check ground circuit of turn signal light

(a) Using a multimeter, check if ground circuit of turn signal light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
B-009 (5) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-089 (1) - Body ground		
T-015 (1) - Body ground		
H-011 (9) - Body ground		



NG → **Repair ground wire harness**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally**

■ **Rear view mirror foot light fault**

DTC	**B1053-11**	**Rear View Mirror Foot Light Short to Ground**
DTC	**B1053-13**	**Open or Short to Power Supply in Rear View Mirror Foot Light**

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

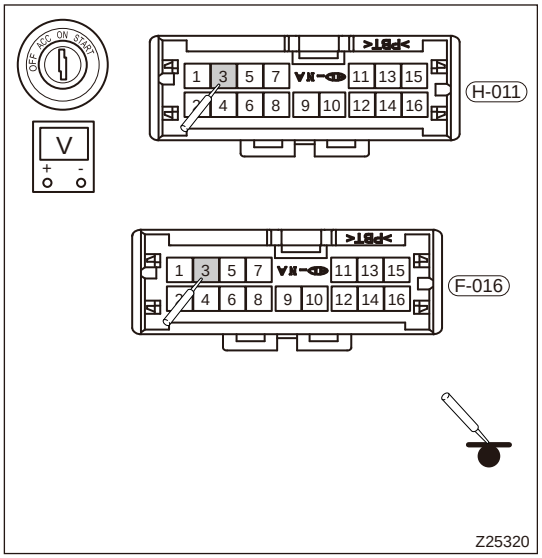
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check output voltage of rear view mirror foot light control circuit

(a) First confirm the working state of rear view mirror foot light.
(b) If only right rear view mirror foot light does not turn on, check the output circuit of right rear view mirror foot light only.
(c) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(d) Disconnect right rear view mirror foot light connector H-011 and left rear view mirror foot light connector F-016.
(e) Connect the negative battery cable, and unlock the vehicle (foot light will turn on).
(f) Using a multimeter, check output voltage of each rear view mirror foot light according to table below.

Multimeter Connection	Condition	Specified Condition
H-011 (3) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
F-016 (3) - Body ground		



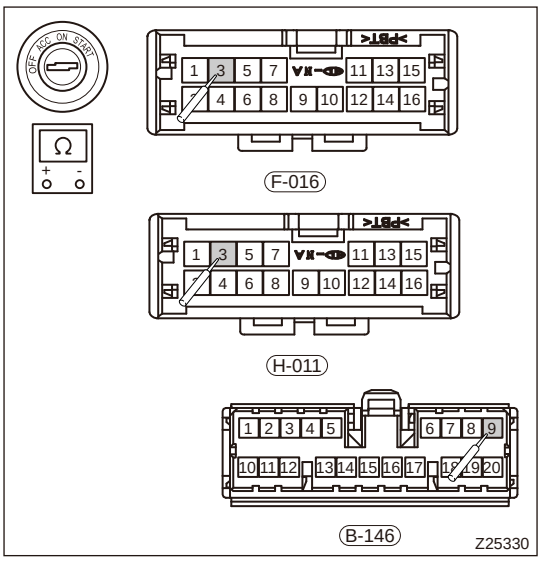
NG → Check module and power wire harness

OK

2	Check circuit

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(b) Disconnect the body controller connector B-146.
(c) Disconnect right rear view mirror foot light connector H-011 and left rear view mirror foot light connector F-016.
(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (09) - H-011 (03)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (09) - F-016 (03)		



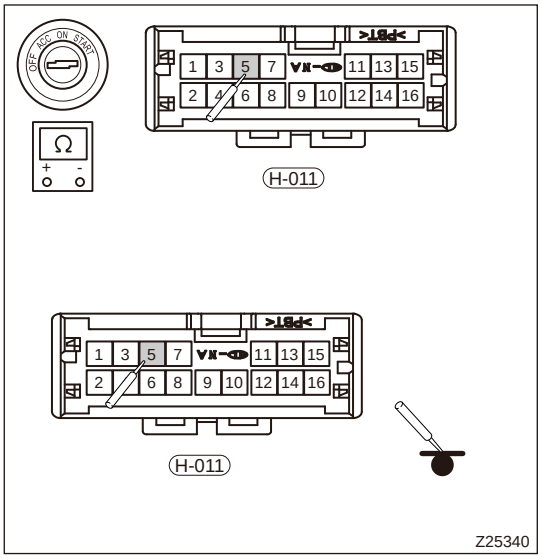
NG → Replace or repair wire harness.

OK

3	Check ground circuit of rear view mirror foot light

(a) Using a multimeter, check if ground circuit of rear view mirror foot light is normal according to table below.

Multimeter Connection	Condition	Specified Condition
H-011 (5) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
F-016 (5) - Body ground		



NG → **Repair ground wire harness**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ Low beam light relay circuit fault

DTC	B1022-11	Short to Ground or Open in Low Beam Light Relay
DTC	B1022-12	Short to Power supply in Low Beam Light Relay Circuit

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check power supply fuse

(a) Check if fuses EF02 (10A) and EF01 (10A) in engine compartment fuse and relay box are normal.

NG → **Check and replace fuse**

OK

2	Check circuit of primary coil for low beam light relay

(a) Turn on low beam light switch and check if there is engaging sound from low beam light relay.

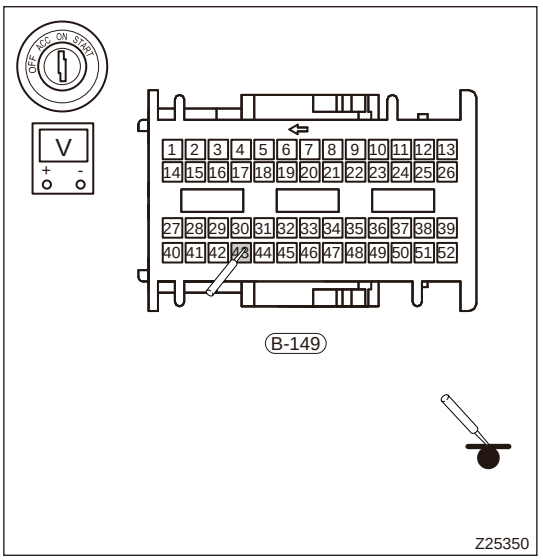
(b) If not, turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(c) Disconnect the BCM connector B-149.

(d) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.

(e) Using a multimeter, check for power supply voltage of primary coil for low beam light relay according to the table below.

Multimeter Connection	Condition	Specified Condition
B-149 (43) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V



OK → **Check module, power supply wire harness and relay**

NG

3	Check low beam light relay output power supply circuit

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

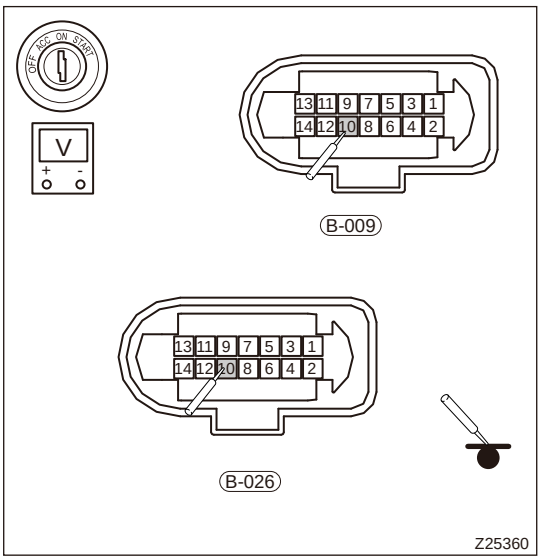
(b) Connect the body controller connector B-149.

(c) Disconnect left headlight assembly connector B-026 and right headlight assembly connector B-009.

(d) Connect the negative battery cable, turn ENGINE START STOP switch to ON, and turn on low beam light switch.

(e) Using a digital multimeter, check if low beam light power supply if normal with a 21W test light according to the table below.

Multimeter Connection	Condition	Specified Condition
B-026 (10) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-009 (10) - Body ground		



NG → **Replace or repair wire harness and relay**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ **High beam light relay circuit fault**

DTC	B1023-11	Short to Ground or Open in High Beam Light Relay Circuit
DTC	B1023-12	Short to Power supply in High Beam Light Relay Circuit

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check power supply fuse

(a) Check if fuses EF05 (10A) and EF06 (7.5A) in engine compartment fuse and relay box are normal.

NG → **Check and replace fuse**

OK

2	Check circuit of primary coil for low beam light relay

(a) Turn on low beam light switch and check if there is engaging sound from low beam light relay.

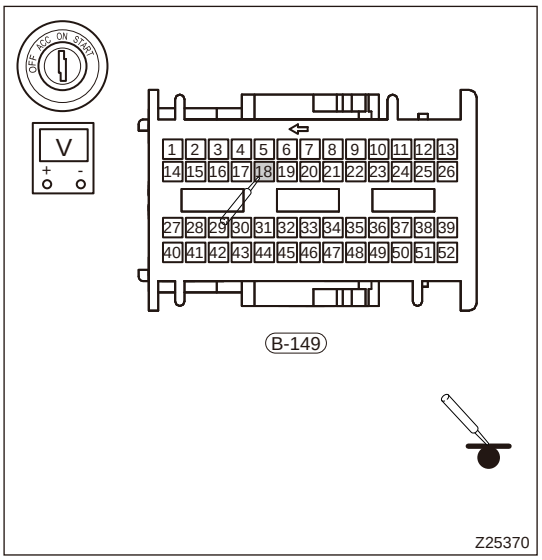
(b) If not, turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(c) Disconnect the BCM connector B-149.

(d) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.

(e) Using a multimeter, check for power supply voltage of primary coil for low beam light relay according to the table below.

Multimeter Connection	Condition	Specified Condition
B-149 (43) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V



NG → **Check module, power supply wire harness and relay**

OK

3	Check low beam light relay output power supply circuit

(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

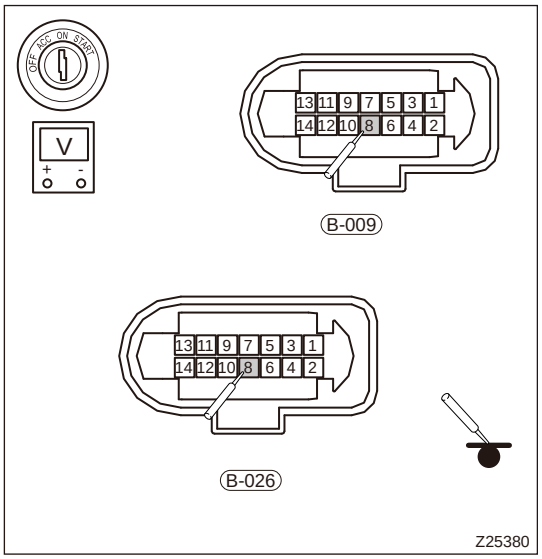
(b) Connect the body controller connector B-149.

(c) Disconnect left headlight assembly connector B-026 and right headlight assembly connector B-009.

(d) Connect the negative battery cable, turn ENGINE START STOP switch to ON, and turn on high beam light switch.

(e) Using a digital multimeter, check if low beam light power supply if normal with a 21W test light according to the table below.

Multimeter Connection	Condition	Specified Condition
B-026 (8) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-009 (8) - Body ground		



NG → **Replace or repair wire harness and relay**

OK

4	Reconfirm DTCs

(a) Connect the negative battery cable.

(b) Use diagnostic tester to clear DTCs.

(c) Start the engine.

(d) Check if the same DTCs are still output.

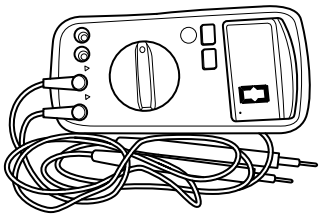
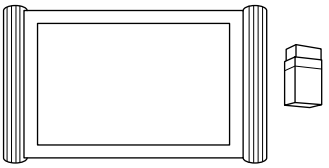
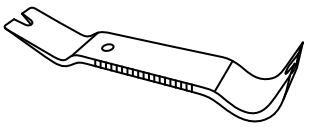
NG → **Replace BCM**

OK → **System operates normally.**

4 ON-VEHICLE SERVICE

4.1 Tools

■ **General tools**

Tool Name	Tool Drawing
Digital Multimeter	 S00002
X-431 PAD Diagnostic Tester	 S00001
Interior Crow Plate	 S00020

4.2 Replacement of Steering Column Module

■ **Removal**

CAUTION

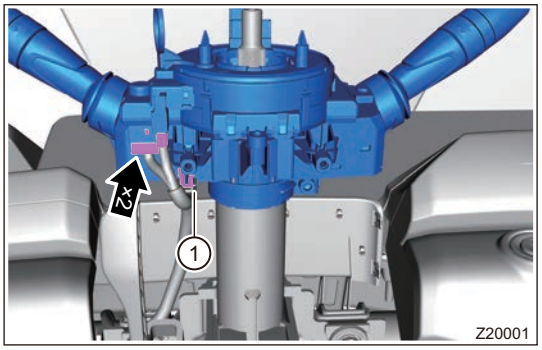
- **Be sure to wear necessary safety equipment to prevent accidents, when removing steering column module.**
- **Appropriate force should be applied when removing steering column module. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched when removing steering column module.**
- **Disconnect the negative battery cable for more than 90 s when removing airbag.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the combination switch lower cover assembly.
(4) Remove the combination switch lower cover assembly.

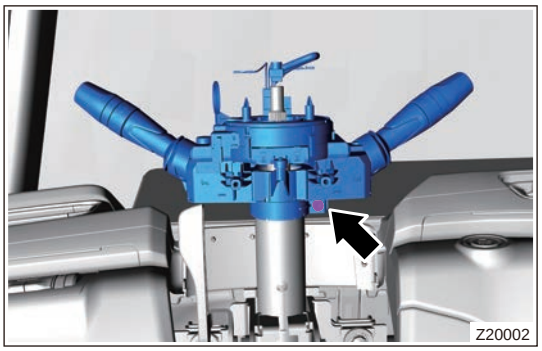
(5) Remove the driver airbag.

(6) Remove the steering wheel assembly.

(7) Disconnect 2 connectors from steering column module, and detach wire harness clip (1).



(8) Remove 1 fixing screw from steering column module.



■ **Installation**

CAUTION
• **Always operate carefully to prevent components from being damaged, when installing steering column module.** • **Install connector in place when installing steering column module.** • **Check switch for proper operation after installing steering column module.**

(1) Install 1 fixing screw to steering column module.

(2) Install the steering column module connector.

(3) Install the combination switch lower cover assembly.

(4) Install the steering wheel assembly.

(5) Install the driver airbag.

(6) Connect the negative battery cable.

4.3 Replacement of Headlight Assembly

■ **Removal**

HINT
• **Use same procedures for right headlight assembly and left headlight assembly.** • **Removal and installation procedures listed below are for right headlight assembly.**

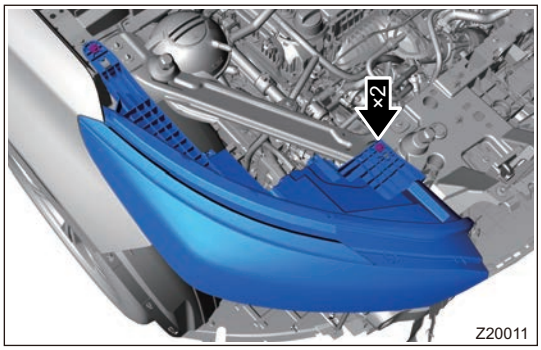
CAUTION
• **Be sure to wear safety equipment to prevent accidents, when removing headlight assembly.** • **Try to prevent body paint surface from being scratched, when removing headlight assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

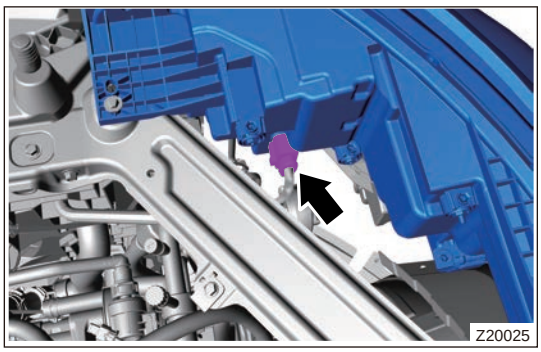
(2) Disconnect the negative battery cable.

(3) Remove the front bumper assembly.

(4) Remove 2 fixing bolts from headlight.



(5) Disconnect headlight assembly wire harness connector and remove headlight assembly.



■ Installation

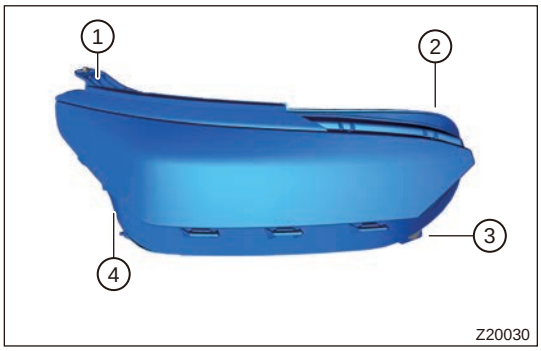
CAUTION

- **When installing headlight assembly, make sure headlight assembly is well fitted with hood, front wing and front bumper. Adjust it as necessary.**
- **Make sure that headlight assembly operates properly after installing.**

(1) Install the left headlight assembly wire harness connector.

(2) Tighten fixing bolts in order shown in illustration.

Tightening torque: 3.5 ± 0.5 N•m



(3) Install the front bumper assembly.

(4) Connect the negative battery cable.

■ Adjustment

Preparations:

(1) Tire inflation pressure comes up to standard.

(2) Vehicle is unloaded (besides spare tire and tool kit, it is generally specified to include the weight of driver).

(3) Park vehicle on a level ground or in workplace.

(4) Keep lens surface of headlight free from dirt.

(5) Check if power supply operates normally and bulbs are installed correctly.

(6) Headlight leveling can be adjusted according to the number of passengers and loading condition of vehicle. It can be adjusted by adjustment switch, and there are 4 adjustment bands to select: 0, 1, 2, 3.

Adjust the light level according to table below:

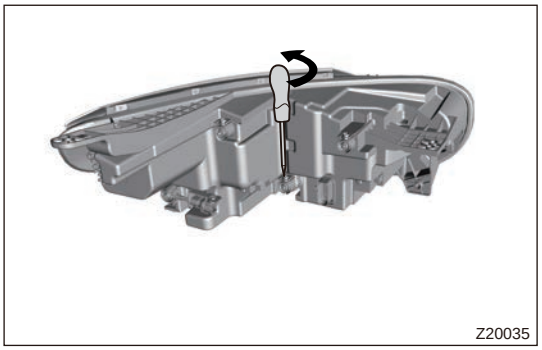
Occupant and Luggage Loading Condition		Knob Position
Occupant	**Luggage Loading**	
Driver	None	0
Driver + Front Passenger	None	1
Full Occupied	None	2
Full Occupied	Full-loaded Luggage	3
Driver	Full-loaded Luggage	2

WARNING
Whether headlight leveling is correct or not will directly affects driving safety. Be sure to adjust the beam with special tool according to related specification.

Manual headlight leveling: The headlight leveling can be changed by adjusting the following areas manually as shown in illustration. Take left headlight beam adjustment as an example.

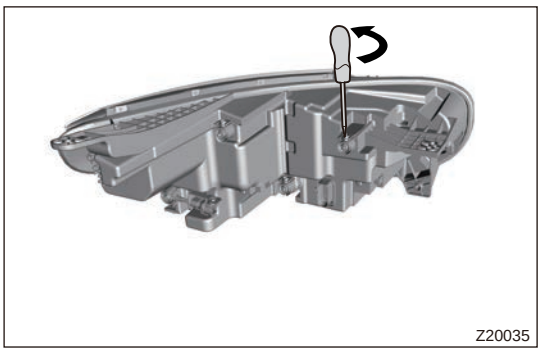
(1) High beam light left/right adjustment:

1) When rotating inner hexagon clockwise: Beam moves right;
2) When rotating inner hexagon counterclockwise: Beam moves left;


Z20035

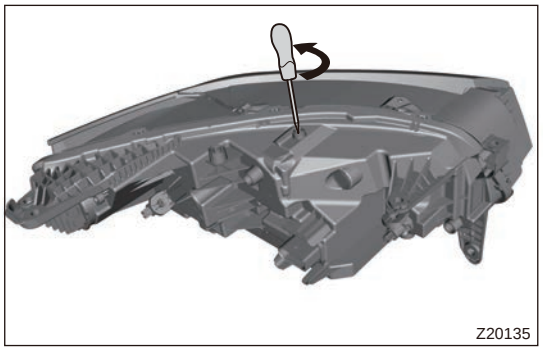
(2) High beam light up/down adjustment:

1) When rotating inner hexagon clockwise: Beam moves down;
2) When rotating inner hexagon counterclockwise: Beam moves up;


Z20035

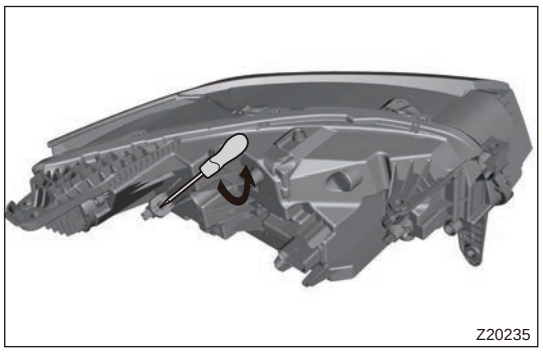
(3) Low beam light up/down adjustment:

1) When rotating inner hexagon clockwise: Beam moves down;
2) When rotating inner hexagon counterclockwise: Beam moves left;



(4) Low beam light left/right adjustment:

1) When rotating inner hexagon clockwise: Beam moves right;
2) When rotating inner hexagon counterclockwise: Beam moves right;



The adjustment direction of left and right headlight beams are shown in following table:

Light Adjustment Direction	Rotation Direction for Screwdriver	Headlight Adjustment Direction	
		Left Headlight	Right Headlight
Left-and-right direction	Clockwise	Right	Left
	Counterclockwise	Left	Right
Up-and-down direction	Clockwise	Up	Up
	Counterclockwise	Down	Down

Low/high beam detection equipment parameter table:

Equipment Name	Basis Parameter Required	M31T Headlight	Note
Headlight Tester	Base center height of headlight low beam	919 mm	Confirm followings when adjusting light: (1) Headlight leveling switch is in “0” position; (2) Distance between light detection screen and lampwick is 10 m; (3) Interference between lens and trim ring or even falling of dimming mechanism due to improper dimming method is not allowed; (4) After adjusting low beam up and down, high beam is not adjusted up and down, left and right low and high beams can be adjusted separately.
	Base center distance between both low beam lights	1515 mm	
	Up and down value of low beam	Cutoff line corner height: 789 mm to 829 mm	
	Left and right value of low beam	Offset for left and right low beam: Left ⩽ 150 mm, right ⩽ 300 mm	
	Base center height of headlight high beam	906 mm	
	Base center distance between both high beam lights	1206 mm	
	Up and down value of high beam	Height is 759 to 859 mm (-After adjusting low beam up and down, high beam is not adjusted up and down)	
	Left and right value of high beam	Offset for left high beam: Left ⩽ 150 mm, right ⩽ 300 mm Offset for right high beam: Left ⩽ 300 mm, right ⩽ 300 mm	
	High beam light intensity detection	Light intensity is higher than 18000 cd	

Low beam detection on screen with a distance of 10 M should be performed according to GB7258 requirements:

Configuration	Function	Up and Down Values	Left Offset Values (LHD)	Right Offset Values (LHD)
LED headlight	Left low beam light	669~~829 mm	No more than 170 mm	No more than 350 mm
	Right low beam light	669~~829 mm	No more than 170 mm	No more than 350 mm

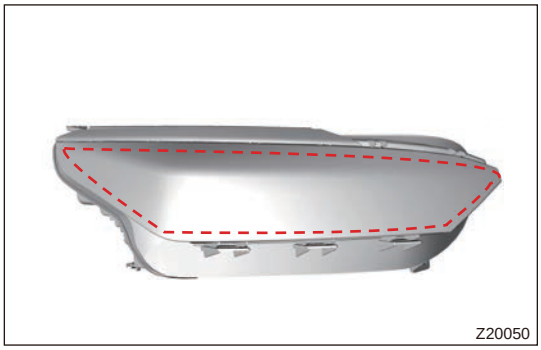
■ Headlight fogging judgment area:

Hint:

- Inside the dashed box are functional areas.
- Outside the dashed box are non-functional areas.

(1) Fogging judgment for outside light after raining:

- If fogging area in functional area is less than 1/3 of total area of the region, or fogging area in non-functional area is more than 1/3 of the total area of the region, vehicle is idling (ambient temperature is not lower than 23 ˚C), and all functions are on for 15 minutes; If fog in the functional area dissipates and fog in the non-functional area is less than 1/3 of the total area of the region, it is judged to be qualified; if not, it is unqualified.



(2) Water entering and fogging judgment:

- Fogging: Inner surface of light cover, less than one third of the functional area or the non-functional area is coated with a sheet of mist or condensation, there is no water drops and there is no sagging when tapping lightly, all others symptoms indicate that there is a water inflowing.

HINT
• **Mist is a thin layer of opaque water vapor formed on the inner surface of light cover.** • **Condensation is water drop formed on the inner surface of light cover.**

4.4 Replacement of Front Position Light

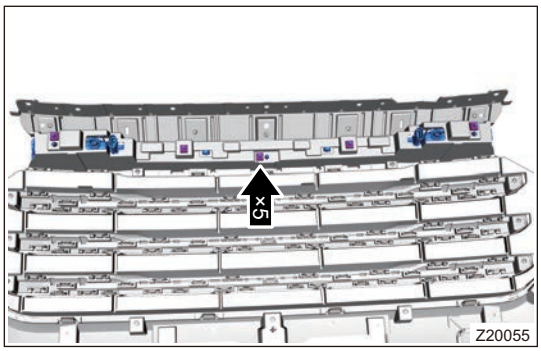
■ Removal

CAUTION
• **Be sure to wear safety equipment to prevent accidents, when removing front position light.** • **Try to prevent body paint surface from being scratched, when removing front position light.**

(1) Remove the front bumper assembly.

(2) Remove the front bumper grille upper strip.

(3) Remove 5 fixing screws between front position light and radiator grille housing.



(4) Remove front position light from grille.

■ Installation

CAUTION
Make sure that front position light functions properly after installing.

(1) Install front position light to grille.

(2) Install 5 fixing screws between front position light and radiator grille housing.

Tightening torque: 3.5 ± 0.5 N•m

(3) Install the front bumper grille upper strip.

(4) Install the front bumper.

4.5 Replacement of Rear Combination Light (Body Part)

■ Removal

Hint:
Use same procedures for right and left headlight assembly. Removal procedures listed below are for left side.

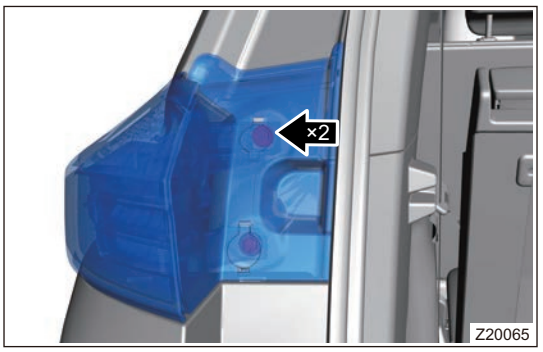
CAUTION

- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear combination light (body part).**
- **Try to prevent body paint surface from being scratched, when removing rear combination light (body part).**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Using an interior crow plate, pry off 2 fixing bolt covers of rear left combination light, remove 2 fixing bolts from rear left combination light, disconnect rear left combination light connector, and remove rear left combination light.



■ Installation

CAUTION

- **Make sure that rear combination light (body part) functions properly after installing.**
- **When pushing rear combination light assembly (body part) toward front of vehicle, note that the positioning pin on combination light is aligned with the corresponding hole in sheet metal.**

(1) Connect the rear left combination light wire harness connector.

(2) Install 2 fixing bolts to rear left combination light assembly.

Tightening torque: 2.5 ± 0.5 N·m

(3) Install the rear left combination light bolt cover.

(4) Connect the negative battery cable.

4.6 Replacement of Rear Combination Light Assembly (Back Door Part)

■ Removal

CAUTION

- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear combination light assembly (back door part).**
- **Try to prevent body paint surface from being scratched, when removing rear combination light assembly (back door part).**

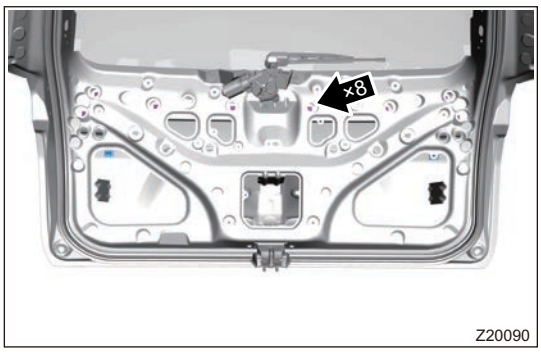
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the back door protector assembly.

(4) Disconnect connectors on both sides of rear combination light assembly.

(5) Remove 8 fixing nuts from rear combination light assembly in order shown in illustration.



(6) Remove the rear combination light assembly (back door part).

■ Installation

CAUTION
Make sure that rear combination light assembly (back door part) functions properly after installing.

(1) Push rear combination light assembly (back door part) into corresponding groove on back door.

(2) Install 8 fixing nuts to rear combination light assembly.

Tightening torque: 3.5 ± 0.5 N·m

(3) Install connectors on both sides of rear combination light assembly.

(4) Install the back door protector assembly.

(5) Connect the negative battery cable.

■ Rear combination light fogging judgment area

Hint:

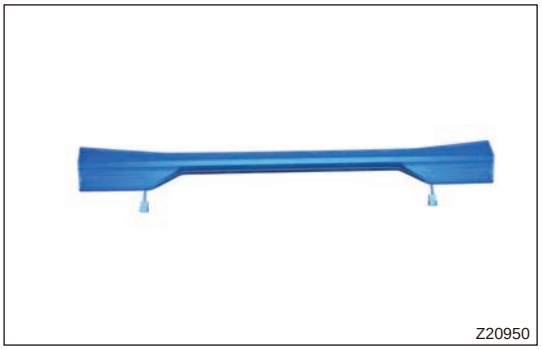
- Inside the dashed box are functional areas.
- Outside the dashed box are non-functional areas.

(1) Fogging judgment for outside light after raining:

- Vehicle is idling (ambient temperature is not lower than 23 ˚C), all functions are on for 15 minutes, then fog in the functional area dissipates, or if fog in the functional area dissipates or fog in the non-functional area is less than 1/3 of the total area of the region, it is judged to be qualified; if not, it is unqualified.

(2) Water entering and fogging judgment:

- Fogging: Inner surface of light cover, less than one third of the functional area or the non-functional area is coated with a sheet of mist or condensation, there is no water drops and there is no sagging when tapping lightly, all others symptoms indicate that there is a water inflowing.


Z20950

HINT

- **Mist is a thin layer of opaque water vapor formed on the inner surface of light cover.**
- **Condensation is water drop formed on the inner surface of light cover.**

4.7 Replacement of High Mounted Stop Light Assembly

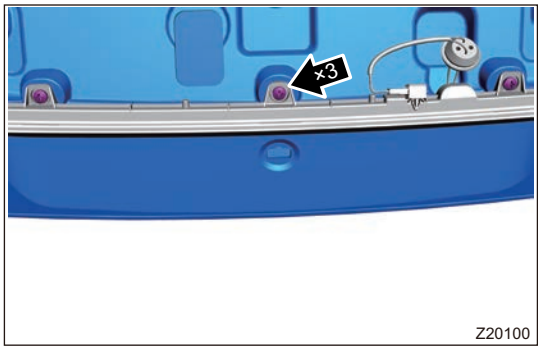
■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear spoiler assembly.

(4) Remove 3 fixing screws from high mounted stop light.



Z20100

(5) Remove the high mounted stop light assembly.

■ Installation

CAUTION

Make sure that high mounted stop light assembly functions properly after installing.

(1) Install 4 fixing nuts to high mounted stop light.

Tightening torque: 1.5 ± 0.5 N·m

(2) Install the rear spoiler assembly.

(3) Connect the negative battery cable.

4.8 Replacement of License Plate Light Assembly

■ Removal

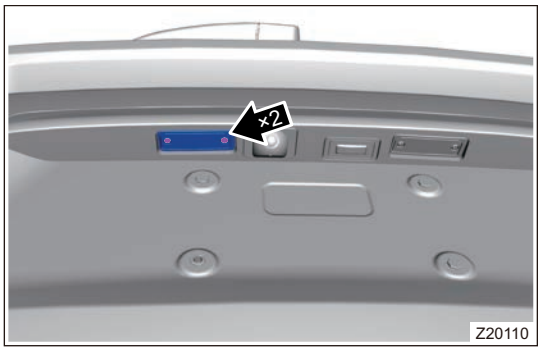
HINT

- **Operation steps of right license plate light are same as that of left license plate light.**
- **Procedures listed below are for left side.**

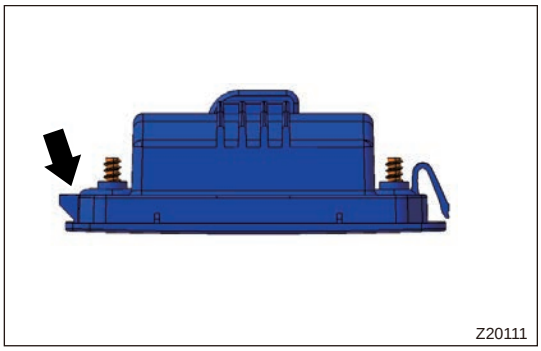
CAUTION

- **Be sure to wear safety equipment to prevent accidents, when removing license plate light assembly.**
- **Try to prevent interior and body paint surface from being scratched, when removing license plate light assembly.**

(1) Open the back door.
(2) Turn off all electrical equipment and ENGINE START STOP switch.
(3) Disconnect the negative battery cable.
(4) Removal 2 fixing screws from left license plate light (if equipped).



(5) Push the license plate light to the right (in +Y direction) until the left clip is exposed, push out license plate light downward, disconnect the connector and remove left license plate light assembly.



■ **Installation**

CAUTION

Make sure that license plate light assembly functions properly after installing.

(1) Connect left license plate light connector. When installing, clip the right side into protector first and then push the left side.
(2) Install 2 fixing screws to left license plate light (if equipped).

Tightening torque: 1.5 ± 0.5 N·m

(3) Connect the negative battery cable.

4.9 Replacement of Rear Fog Light Assembly

■ **Removal**

CAUTION

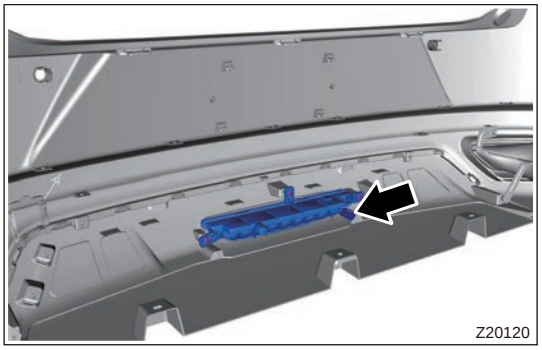
- **Be sure to wear safety equipment to prevent accidents, when removing rear fog light assembly.**
- **Try to prevent interior and body paint surface from being scratched, when removing rear fog light assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

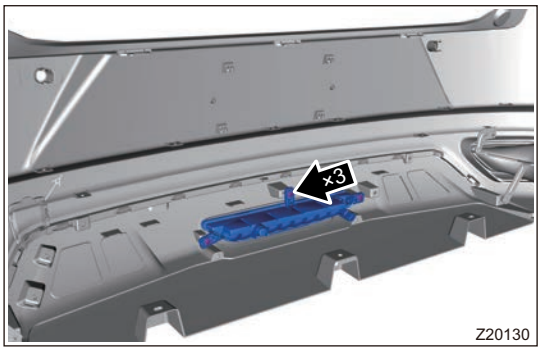
(2) Disconnect the negative battery cable.

(3) Remove the rear bumper assembly.

(4) Disconnect the rear fog light assembly connector.



(5) Remove 3 fixing screws from rear fog light assembly.



(6) Remove rear fog light assembly from rear bumper assembly.

■ **Installation**

CAUTION
Make sure that rear fog light assembly functions properly after installing.

(1) Set rear fog light assembly to a proper position on rear bumper, and install 3 fixing screws to rear fog light assembly.

Tightening torque: 1.5 ± 0.5 N·m

(2) Connect the rear fog light assembly connector.

(3) Install the rear bumper assembly.

(4) Connect the negative battery cable.

11.15 INTERIOR LIGHTING SYSTEM

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Be sure to wear safety equipment to prevent accidents, when removing interior lighting appliance.

(2) Appropriate force should be applied when removing interior lighting appliance. Be careful not to operate roughly.

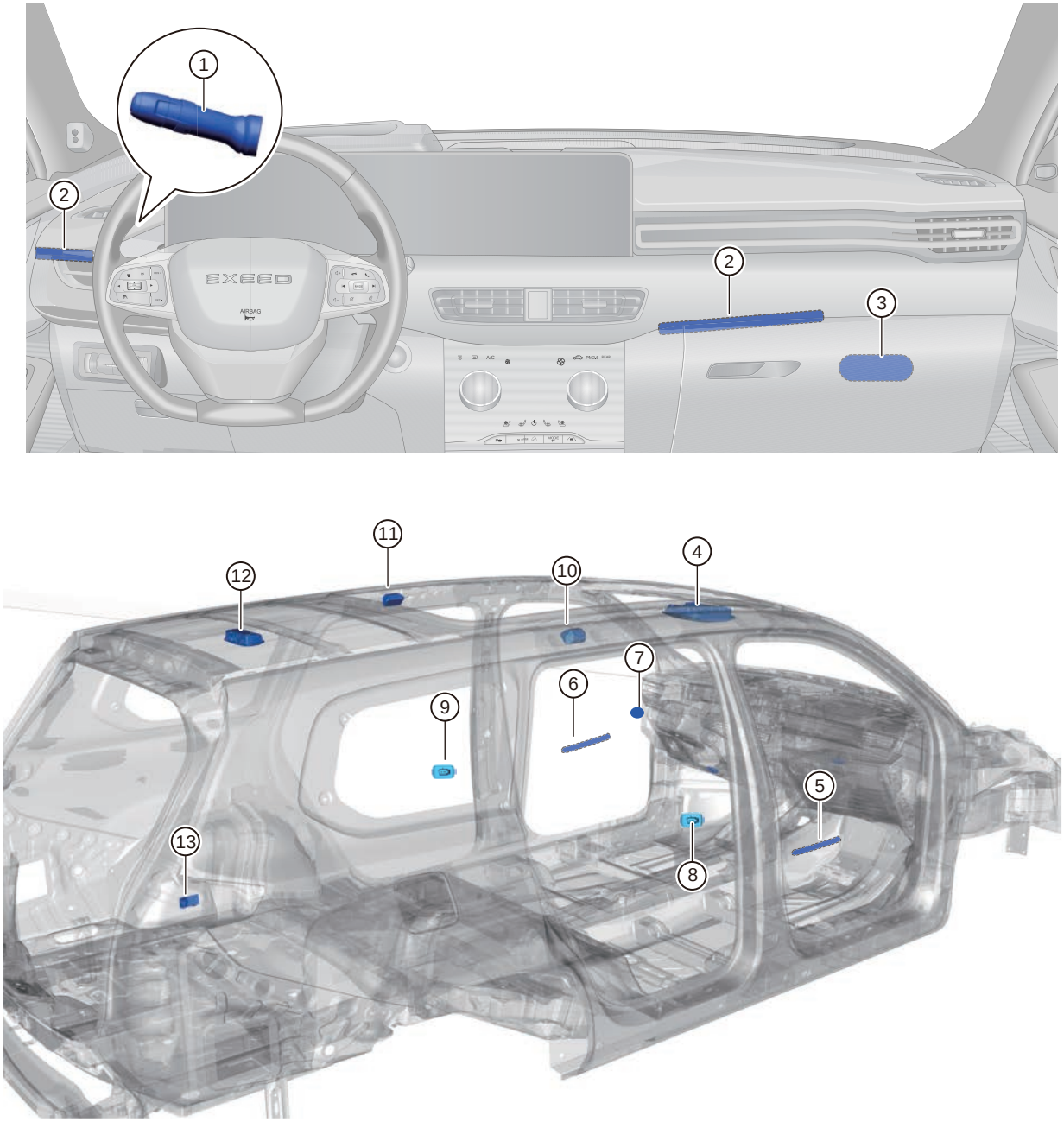
(3) Try to prevent interior and body paint surface from being scratched, when removing interior lighting appliance.

2 System Overview

2.1 System Description

Interior lighting system on this model consists of vehicle interior lighting device and light signal device, which are used for normal operation of vehicle and ensures safety when driving at night. Interior lighting system includes front and rear interior dome lights and ambient light.

2.2 System Components Diagram



1	Combination Switch	2	Instrument Panel Ambient Light
3	Glove Box Light	4	Front Dome Light
5	Front Right Door Ambient Light	6	Front Left Door Ambient Light

7	Anti-theft Indicator	8	Rear Right Door Opening Warning Light
9	Rear Left Door Opening Warning Light	10	Rear Right Interior Dome Light Assembly
11	Rear Left Interior Dome Light Assembly	12	Rear Interior Dome Light Assembly
13	Luggage Compartment Light		

3 DIAGNOSIS & TEST

3.1 Problem Symptoms Table

⚠ Caution

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Current Status	Possible Cause
Interior dome light does not operate	Wire harness or connector
	Dome light
	BCM
Ambient light does not come on	Wire harness or connector
	Combination switch
	Ambient light
	BCM
Vanity mirror light does not come on	Wire harness or connector
	Vanity mirror
	Vanity mirror light
	BCM
Glove box light does not come on	Wire harness or connector
	Glove box
	Glove box light
	BCM
Luggage compartment light does not come on	Wire harness or connector
	Back door lock
	Luggage compartment light
	BCM

3.2 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the meter system.

1	**Vehicle brought to workshop**

NEXT

2	**Check battery voltage**

Check if battery voltage is normal.

OK

Standard voltage: Not less than 12 V.

NG → **Replace battery**

OK ↓

3	**Customer problem analysis**

NEXT ↓

4	**Read DTCs**

No DTC → **Customer problem analysis**

NEXT ↓

5	**Conduct test and confirm malfunction has been repaired**

NEXT → **End**

3.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

(1) Turn ENGINE START STOP switch to LOCK.
(2) Connect diagnostic tester (the latest software) to diagnostic interface.
(3) Connect diagnostic tester (the latest software) to diagnostic interface.
(4) Use the diagnostic tester to record and clear DTCs stored in the blind spot detection system.
(5) Turn ENGINE START STOP switch to LOCK and wait for a few seconds.
(6) Turn ENGINE START STOP switch to ON, and then select read DTC.
(7) If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.
(8) If no DTC is detected, malfunction indicated by the DTC is intermittent.

3.4 Diagnostic Help

(1) Connect diagnostic tester X-431 PAD (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all CD system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.5 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.6 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.
(2) Check all contact surfaces for tarnish, dirt and rust, etc.
(3) Clean as necessary to ensure that contact is in good condition.
(4) Reinstall ground bolt or nut securely.
(5) Check if any additional accessories interfere with ground circuit.
(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B102411	Blue Ambient Light Short to Ground	Output current is more than 4 A (Time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, back-up light will output as long as operating conditions of back-up light are met.) and it is stored as current fault.	Wire harness or load fault	• Check wire harness connector • Check ambient light • Check BCM
B102711	Red Ambient Light Short to Ground			
B102413	Open in Blue Ambient Light	Output current is less than 0.5 A (The error is within a range of 10%, the time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since		
B102713	Open in Red Ambient Light			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		power supply is turned on. Regardless of key position, back-up light will output as long as operating conditions of back-up light are met.)		
B102A11	Interior Light Power Supply Short to Ground	/	Wire harness or load fault	• Check wire harness connector • Check load • Check BCM
B104211	Background Light Circuit Short to Ground			

3.8 DTC Diagnosis Procedure

■ Ambient light fault

DTC	B102411	Blue Ambient Light Short to Ground
DTC	B102413	Open in Blue Ambient Light
DTC	B102711	Red Ambient Light Short to Ground
DTC	B102713	Open in Red Ambient Light

■ DTC confirmation procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuse

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check for continuity of fuse in instrument panel fuse with a digital multimeter.

NG → Replace fuse.

OK

2	Check ambient light power supply wire harness

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

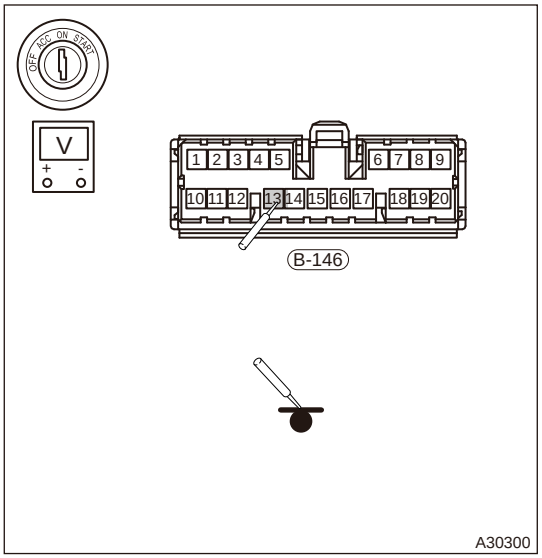
(c) Disconnect the interior wire harness connector B-146.

(d) Connect the negative battery cable.

(e) Turn ENGINE START STOP switch to ON.

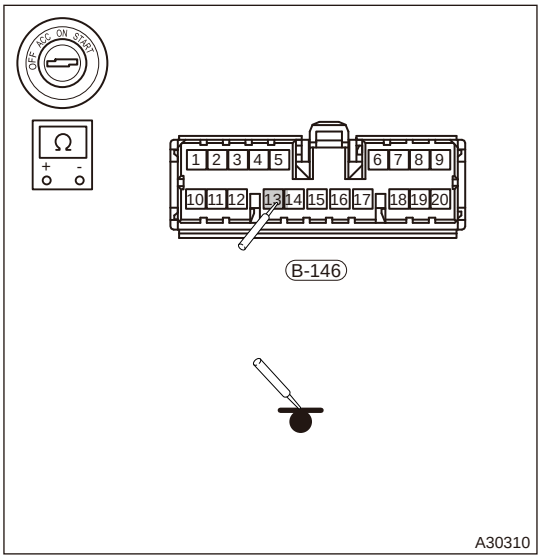
(f) Using a digital multimeter, measure voltage between interior wire harness connector B-146 and ground, and detect it with a 21 W test lamp according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (13) - Body ground	ENGINE START STOP switch “ON”	Not less than 12 V



(g) Using a digital multimeter, measure resistance between interior wire harness connector B-146 and ground according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (13) - Body ground	ENGINE START STOP switch “OFF”	∞

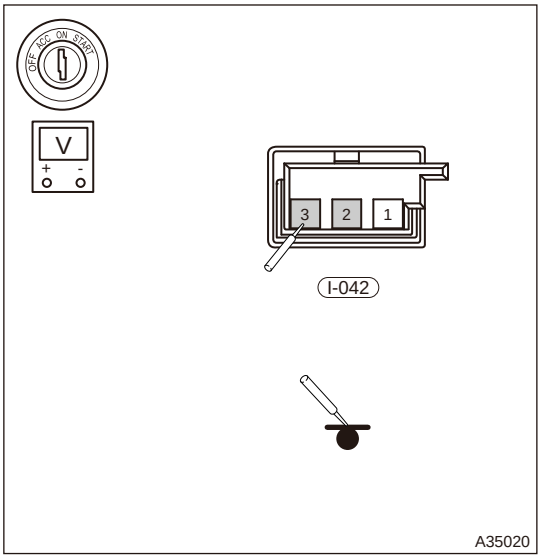


NG → **Repair or replace related wire harness.**

OK

3	**Check dual color ambient light output control circuit**

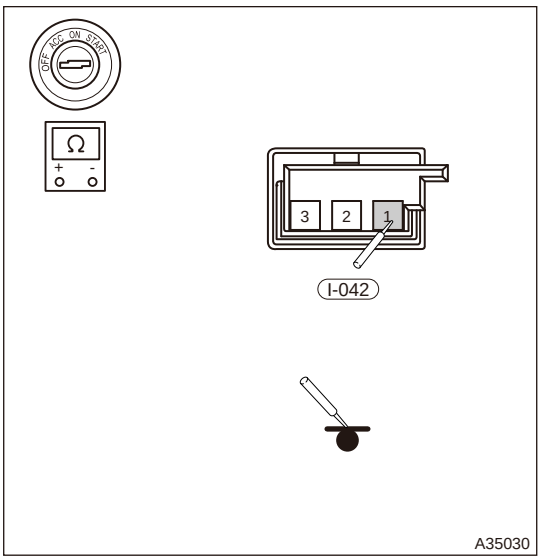
(a) First, confirm the operating status of left turn signal light.
(b) If only a certain ambient light is not on, check the output circuit of the ambient light only. Take the instrument panel left dual color ambient light as an example.
(c) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
(d) Disconnect the instrument panel left dual color ambient light I-042.
(e) Connect the negative battery cable, turn ignition switch to ON, and turn on position light switch.
(f) Using a multimeter, check output voltage of instrument panel left dual color ambient light according to table below.



Multimeter Connection	Condition	Specified Condition
I-042 (3) - Body ground	ENGINE START STOP switch "ON"	Indirect 12 V
I-042 (2) - Body ground		

(g) Using a multimeter, check ground of instrument panel left dual color ambient light according to table below.

Multimeter Connection	Condition	Specified Condition
I-042 (1) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω



OK → **Replace instrument panel left dual color ambient light**

NG

4	**Check circuit**

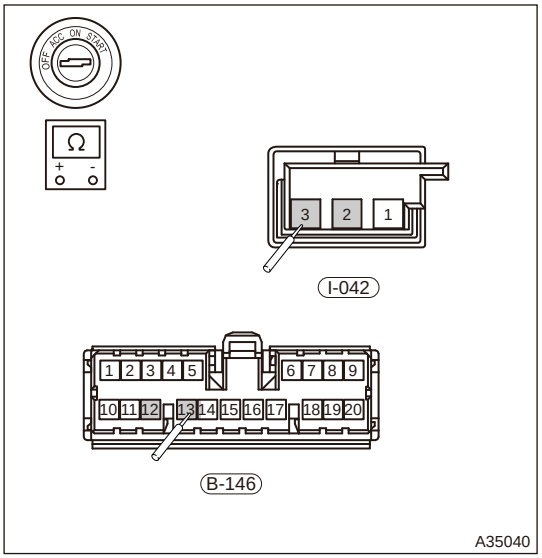
(a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.

(b) Disconnect the body controller connector B-146.

(c) Disconnect the instrument panel left dual color ambient light connector I-042.

(d) Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (13) - I-042 (3)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-146 (12) - I-042 (2)		



NG → **Replace or repair wire harness.**

OK →

5	Reconfirm DTCs

(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System is normal**

■ **Interior light fault**

DTC	B102A11	Interior Light Power Supply Short to Ground

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check power supply wire harness of interior light

(a) Turn ENGINE START STOP switch to OFF.

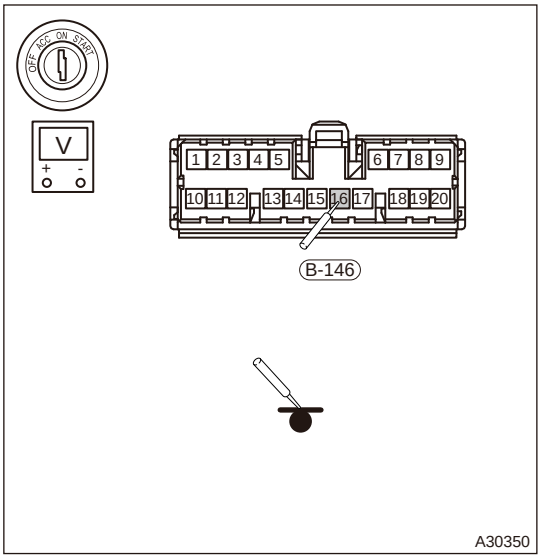
(b) Disconnect the negative battery cable.

(c) Disconnect the interior wire harness connector B-146.

(d) Connect the negative battery cable.

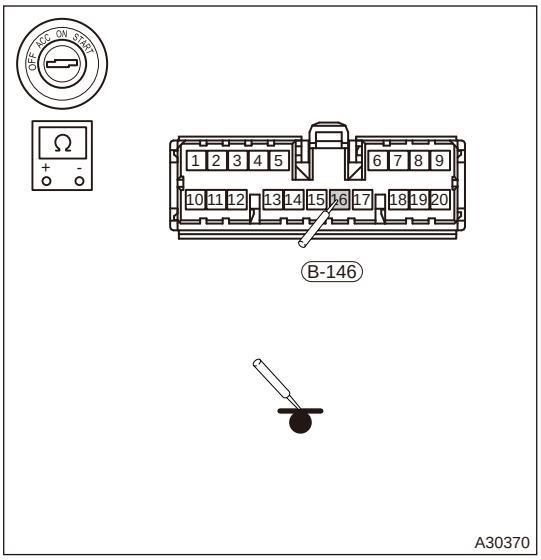
(e) Turn ENGINE START STOP switch to ON.

(f) Using a digital multimeter, measure voltage between interior wire harness connector B-146 and ground, and detect it with a 21 W test lamp according to table below.



Multimeter Connection	Condition	Specified Condition
B-146 (16) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V

(g) Using a digital multimeter, measure resistance between interior wire harness connector B-146 and ground according to table below.



Multimeter Connection	Condition	Specified Condition
B-146 (16) - Body ground	ENGINE START STOP switch "OFF"	∞

NG → **Repair or replace related wire harness.**

OK

2	Reconfirm DTCs

(a) Connect the negative battery cable.

(b) Use diagnostic tester to clear DTCs.

(c) Start the engine.

(d) Check if the same DTCs are still output.

NG → **Replace BCM**

OK → **System operates normally.**

■ **Background light fault**

DTC	B104211	Background Light Circuit Short to Ground

■ **DTC confirmation procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check power supply wire harness of interior light**

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

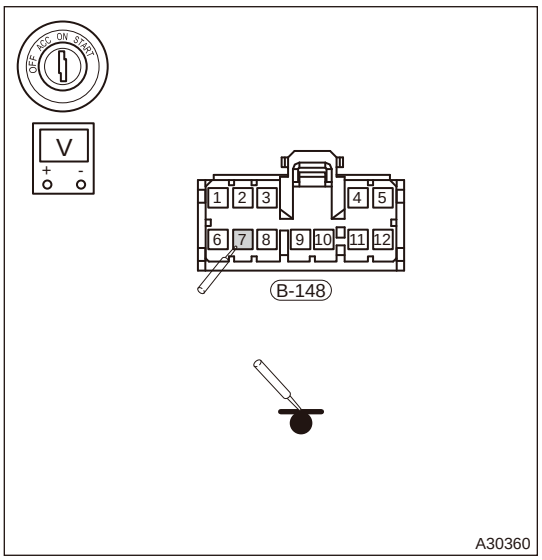
(c) Disconnect the interior wire harness connector B-148.

(d) Connect the negative battery cable.

(e) Turn ENGINE START STOP switch to ON.

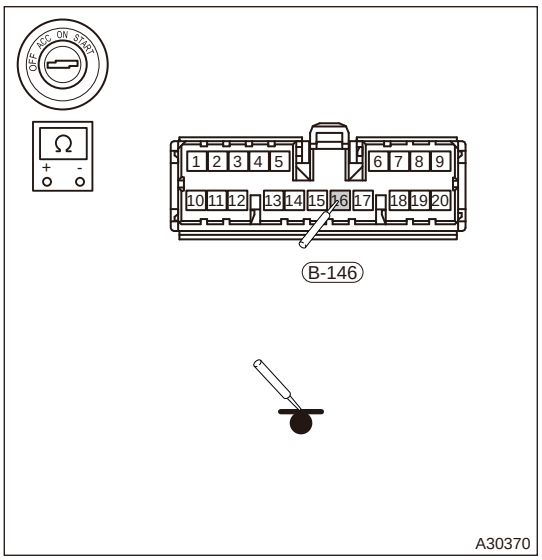
(f) Using a digital multimeter, measure voltage between interior wire harness connector B-148 and ground, and detect it with a 21 W test lamp according to table below.

Multimeter Connection	Condition	Specified Condition
B-148 (7) - Body ground	ENGINE START STOP switch “ON”	Not less than 12 V



(g) Using a digital multimeter, measure resistance between interior wire harness connector B-146 and ground according to table below.

Multimeter Connection	Condition	Specified Condition
B-146 (16) - Body ground	ENGINE START STOP switch “OFF”	∞



NG → **Repair or replace related wire harness.**

OK ↓

2	**Reconfirm DTCs**

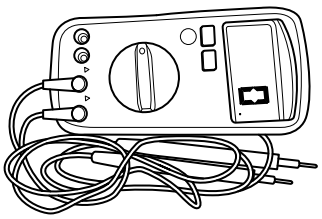
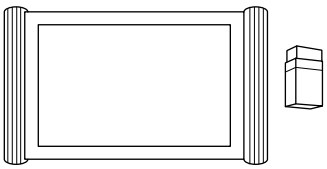
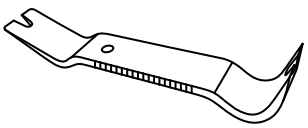
(a) Connect the negative battery cable.
(b) Use diagnostic tester to clear DTCs.
(c) Start the engine.
(d) Check if the same DTCs are still output.

NG	**Replace BCM**
OK	**System operates normally.**

4 ON-VEHICLE SERVICE

4.1 Tools

■ General tools

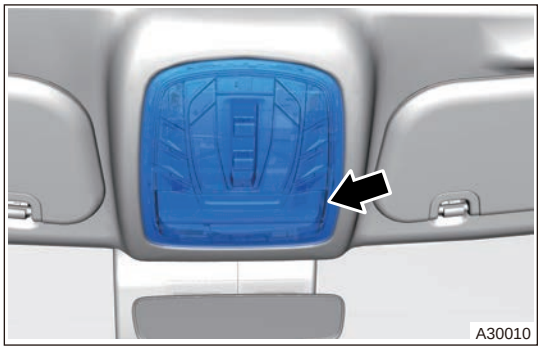
Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001
Interior Crow Plate	 S00020

4.2 Replacement of Front Dome Light Assembly

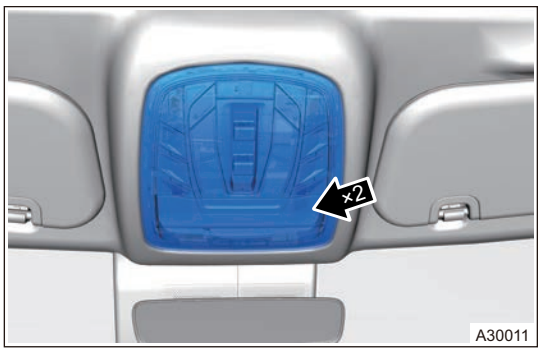
■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.

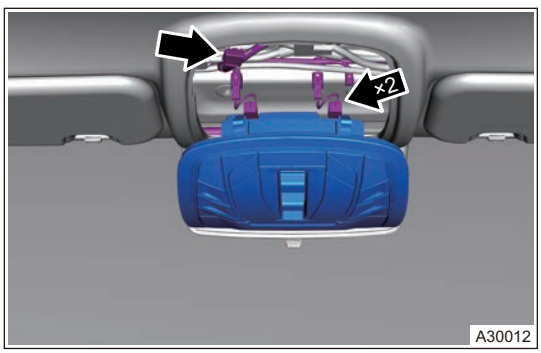
(3) Open the glasses box on front dome light as shown in illustration.



(4) Remove 2 fixing screws from front dome light assembly.



(5) Disconnect front dome light assembly wire harness connector and 2 microphone connectors, and remove interior dome light assembly.



■ Installation

CAUTION

- **Pay attention to wiring harness connection before assembling front dome light assembly to avoid rework.**
- **The 2 fixing screws of front dome light assembly are hidden in glasses box, pay attention to avoid missing.**

(1) Connect front dome light assembly wire harness connector and 2 microphone connectors, and install interior dome light assembly.

(2) Install 2 fixing screws of front dome light assembly.

Tightening torque: 2.5 ± 0.5 N·m

(3) Close the glasses box.

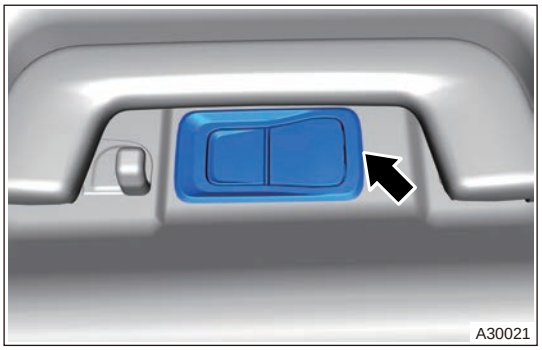
(4) Connect the negative battery cable.

4.3 Replacement of Rear Left Interior Dome Light Assembly

■ Removal

HINT
• **Use same operation procedures for rear left interior dome light assembly and rear right interior dome light assembly. Operation procedures listed below are for rear left interior dome light assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Pry off rear left interior dome light assembly with an interior crow plate, disconnect connector and remove rear left interior dome light assembly.



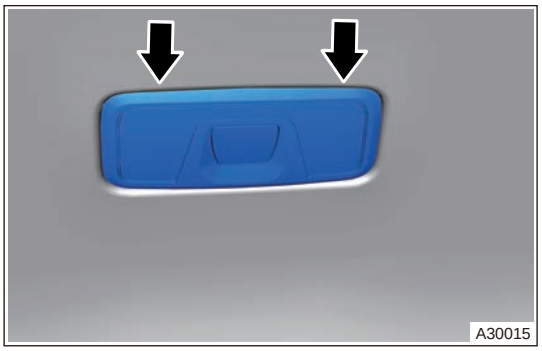
■ Installation

(1) Connect the rear left interior dome light assembly connector.
(2) Install the rear left interior dome light assembly.
(3) Connect the negative battery cable.

4.4 Replacement of Rear Dome Light Assembly

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Pry off 2 spring plates from backside with an interior crow plate.



(4) Unplug dome light connector, and remove rear dome light assembly.

■ Installation

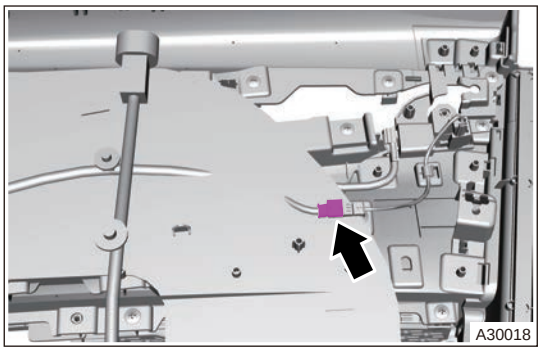
(1) Connect the dome light connector.
(2) Install the rear dome light assembly.
(3) Connect the negative battery cable.

4.5 Replacement of Front Left Door Ambient Light

■ Removal

CAUTION
• **Use same operation procedures for front left door ambient light and front right door ambient light. Operation procedures listed below are for front left door ambient light.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left door protector assembly.
(4) Disconnect front left door ambient light connector from front left door, and detach clip.



(5) Disconnect front left door ambient light connector from front left door, and detach clip.

(6) Remove the front left door ambient light.

■ Installation

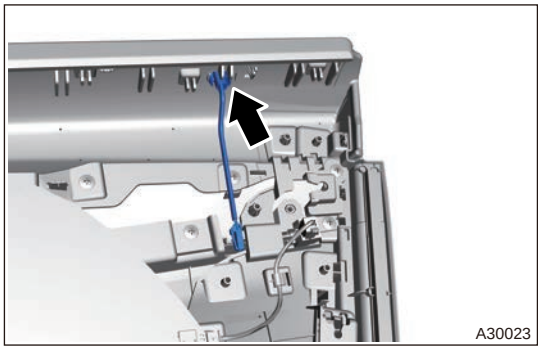
(1) Install front left door ambient light, and connect 2 connectors of front left door ambient light.
(2) Install the front left door protector assembly.
(3) Connect the negative battery cable.

4.6 Replacement of Anti-theft Indicator

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front left door protector assembly.

(4) Detach fixing clip of anti-theft indicator from front left door.



(5) Remove the anti-theft indicator.

■ **Installation**

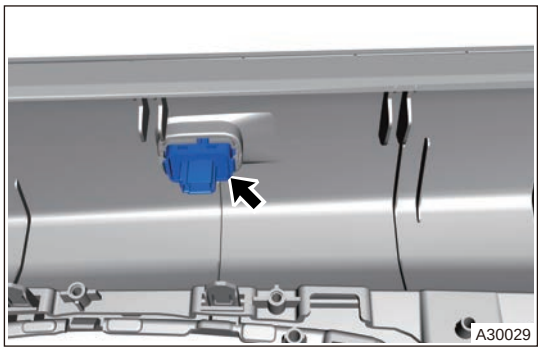
(1) Install the anti-theft indicator.
(2) Install the front left door protector assembly.
(3) Connect the negative battery cable.

4.7 Replacement of Rear Door Opening Warning Light

■ **Removal**

HINT
• **Use same removal and installation methods for rear right door opening warning light and rear left door opening warning light.** • **Operation procedures listed below are for rear left door opening warning light.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the rear left door protector assembly.
(4) Detach fixing clip of rear left door opening warning light from rear left door.



(5) Remove the rear left door opening warning light.

■ **Installation**

(1) Install the rear left door opening warning light.
(2) Install the rear left door protector assembly.
(3) Connect the negative battery cable.

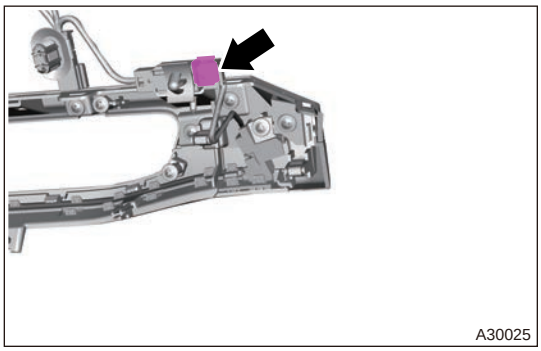
4.8 Replacement of Instrument Panel Ambient Light

■ Removal

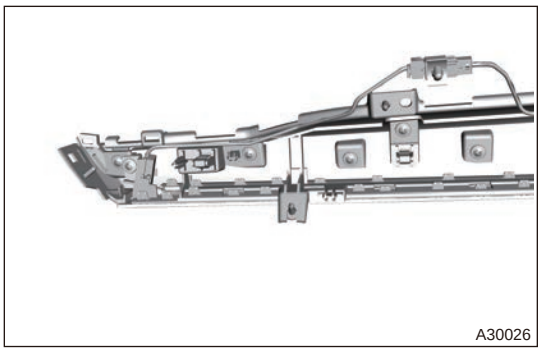
WARNING

- **Be sure to wear safety equipment to prevent accidents, when removing auxiliary fascia console ambient light.**
- **Appropriate force should be applied, when removing auxiliary fascia console ambient light. Be careful not to operate roughly.**

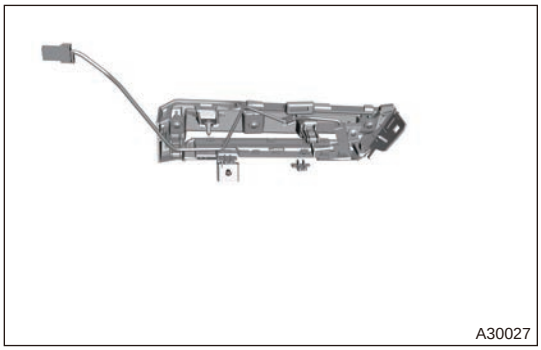
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the right instrument panel trim panel assembly.
(4) Remove the right instrument panel trim panel assembly ambient light.


A30025

(5) Remove the right instrument panel trim panel assembly.
(6) Remove the right instrument panel trim panel assembly ambient light.


A30026

(7) Remove the left instrument panel trim panel assembly.
(8) Remove the left instrument panel ambient light.


A30027

■ Installation

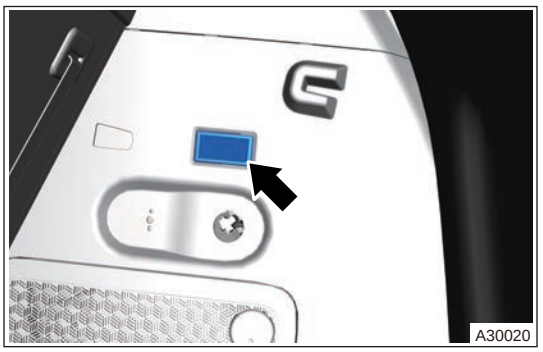
(1) Install the left instrument panel ambient light.
(2) Install the right instrument panel trim panel assembly ambient light.
(3) Install the right instrument panel trim panel assembly ambient light.

(4) Connect the negative battery cable.

4.9 Replacement of Luggage Compartment Light

■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Pry off luggage compartment light assembly with an interior crow plate, and disconnect luggage compartment connector.



(4) Remove the luggage compartment light.

■ Installation

(1) Connect luggage compartment light connector and install luggage compartment light.
(2) Connect the negative battery cable.

11.16 CAN SYSTEM

1 Warnings and Precautions

1.1 Precautions

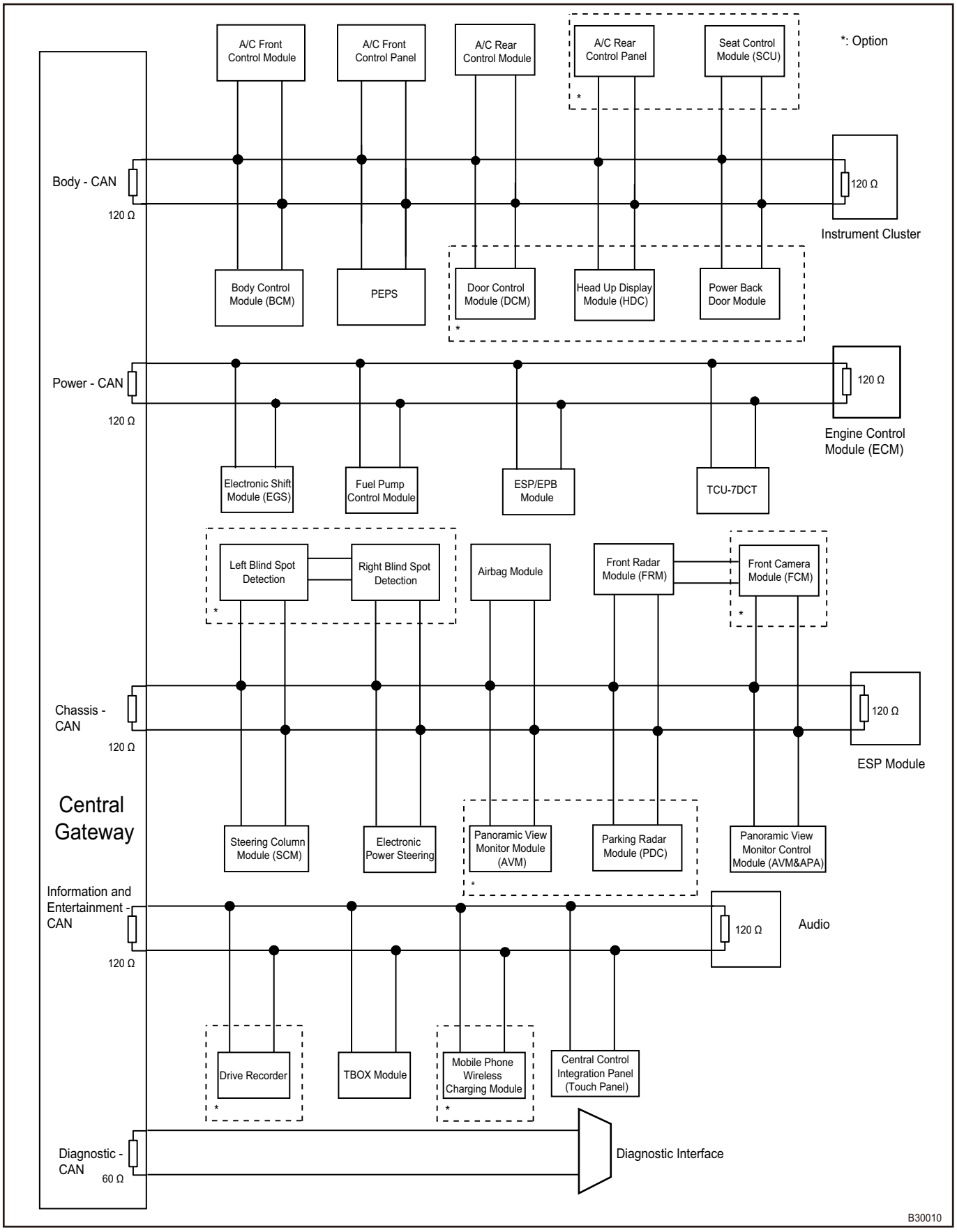
In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Read configuration code of CGW module and record it with a diagnostic tester, before removing gateway module.

(2) Try to prevent interior and body paint surface from being scratched, when removing gateway module.

(3) Perform power-off for 5 minutes when measuring resistance in vehicle.

2 System Principle



- Bus speed: 500 Kbit/s.
- Cannot run in single line - If a CAN line of module is disconnected, CAN signal of this module cannot be transmitted.
- Vehicle driving CAN diagnosis is performed through No.6 pin and No.14 pin of diagnostic interface.
- Most controllers and diagnostic interfaces of M36T data communication system are connected via vehicle gateway module (VGW), CAN controller and CAN transceiver are integrated into gateway module. Terminal resistors are respectively integrated into VGW, IPC(DMC), ESP, EMS and IHU(DMC), forming a body CAN bus with VGW and IPC as terminal nodes. EMS and VGW are power CAN bus of terminal nodes, IHU and VGW are information entertainment CAN bus of terminal nodes, and ESP and VGW are chassis CAN bus of terminal nodes. Termination resistance is 120 Ω, termination resistance of gateway module connected with diagnostic interface is 60 Ω.
- CAN bus is a vehicle bus, and full name is “Controller Area Network” which connects the controllers in some form to form a complete system. Each control unit collects different signals by each sensor, and transmits data among modules under the same rules. Network information can meet different real-time requirements by its priority. CAN bus data transmitted by control unit is level signal of binary format, and data transmission line transmits the voltage signal.

3 DIAGNOSIS & TEST

3.1 Problem Symptoms Table

⚠ Caution
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Possible Cause
Diagnostic interface cannot access to the system	Fuse
	CAN bus
	Gateway module
Engine control system failure	CAN bus
	Battery voltage
	Module damage
	Ground wire
Brake control system failure	Wire harness or connector
	EPB module
Airbag system failure	ECM
	Wire harness and connector
	Airbag module failure
Body electrical failure	Body Control Module (BCM) failure
	Wire harness or connector
	Instrument cluster
Transmission failure	Transmission Control Module (TCU) failure
	Wire harness or connector
	ECM

3.2 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the control system.

1	**Vehicle brought to workshop**

NEXT

2	**Examine vehicle and check basic items**

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK

3	**Using a diagnostic tester, read related DTC and data stream information**

Result

Result	Go to
No DTC	A
DTC	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B

5	**According to airbag system malfunction repair completion inspection and delivery, confirm that malfunction is resolved**

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A → **Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

3.3 DTC Confirmation Procedure

Confirm that battery voltage is normal before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ENGINE START STOP switch to ON.
- Use diagnostic tester to record and clear DTCs stored in supplemental restraint system.
- Turn the ENGINE START STOP switch to OFF and wait for several seconds.
- Turn ENGINE START STOP switch to ON, and then select Read DTC.
- If DTC is detected, it indicates current malfunction. Go to inspection procedure - Step 1.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

3.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.6 Failure Analysis Method

(1) Use diagnostic tester to diagnose and analyze the trouble code.

When a module or several modules need to receive the data sent by a module to complete the corresponding function, once the data is not received, the module received the data will generate trouble codes, which could be read by diagnostic tester as: “Lost communication with XX module”, “Communication with XX module is not normal”; When the bus is out of work, the trouble code will be read as CAN bus close; When there is malfunction on module CAN configuration, code will be reported as “configuration code error”.

CAN network failures consist of the following types:

1) Receive continuous invalid signals: This type of fault indicates communication effective bit received by control module is “invalid” or invalid signal after processing.
2) Signal is below normal range: This type of fault indicates serial data bus signal is below normal range.
3) Signal is above normal range: This type of fault indicates serial data bus signal is above normal range.
4) Invalid signal: This type of fault indicates serial data bus signal does not match specified execution condition.
5) Lost signal: This type of fault indicates specified no specified information is received.
6) Bus closed: This type of fault indicates bus is out of work.
7) Unstable signal: This type of fault indicates a transient distortion or interruption of a bus signal.

(2) Waveform analysis.

It is main method to determine the hardware fault of CAN bus system. Check operation of high speed CAN and low speed CAN and judge most CAN network hardware faults through oscilloscope.

For example, if bus waveform is abnormal, after sales staff can judge by “plug and unplug each joint and observe the waveform of oscilloscope at the same time”. If bus waveform is normal after unplugging a joint, the fault is in the module or the bus connected this module. This method is especially suitable for modules that do not have trouble code self-diagnosis.

(3) Circuit diagram analysis.

Use multimeter, oscilloscope, diagnostic tester and combine with circuit diagram to determine where is the fault.

3.7 Common Troubleshooting

(1) Diagnostic tester reads trouble code of CAN configuration error.

Fault expression: CAN or configuration code error is not performed by meter or BCM, read “Software configuration error”, “Configuration code error” with diagnostic tester.

Exclusion methods and steps:

This type of situation usually belongs to CAN system software failure. Write correct configuration code to these modules or sensors or calibrate these sensors, clear the trouble code and verify the malfunction phenomenon again.

(2) Diagnostic tester cannot communicate with all modules.

Malfunction symptom: If diagnostic tester can be used normally on other vehicle, but cannot communicate with each module on faulty vehicle, malfunction indicators or warning lights on the meter turn on.

Malfunction reason: Diagnostic interface power supply and ground malfunction, diagnostic interface CAN line is open to normal CAN line, bus CAN-H is short to CAN-L, CAN-H is short to ground, CAN-L is short to ground, CAN-H is short to power supply, CAN-L is short to power supply, CAN line is mixed, node (-module) is malfunctioning or power supply grounding is abnormal.

(3) Exclusion methods and steps:

1	Diagnose if power supply voltage and grounding resistance are correct

NG → **Inspect and repair diagnosis interface power supply or ground, verify the fault phenomenon again**

OK ↓

2	Use multimeter to detect parallel termination resistor, and check if resistance is correct

NG → **Check and repair connecting wire between diagnostic interface and two modules with termination resistor or replace module with incorrect resistance to verify the malfunction symptom again.**

OK ↓

3	Connect oscilloscope and observe waveform at the same time. Observe if waveform is normal.

NG → **Inspect and repair the power supply and ground of these modules, and verify the malfunction symptom again.**

OK ↓

4	Determine type of fault waveform, inspect and repair, then reconfirm the fault phenomenon again.

(4) The diagnostic tester cannot communicate with several modules.

Malfunction symptom: The diagnostic tester cannot communicate with several modules, but can communicate with at least one module.

Malfunction cause: Module power supply malfunction, CAN main line open, CAN line mixed fitting, node (module) malfunction, gateway module malfunction.

(5) Power supply malfunction (power supply and ground).

The core part of vehicle multiplex system is an electronic control unit containing a communication IC chip. The normal operating voltage of the electronic control unit is generally in the range of operating voltage: 9 V $\leqslant$ U $\leqslant$ 16 V. CAN network communication voltage range: 6 V $\leqslant$ U $\leqslant$ 16 V. If the operating voltage provided by vehicle power system is lower than this value, some electronic control units with higher requirements on operating voltage will temporarily stop working, thus making multiplex system unable to communicate. The CAN hardware controller inside ECM may not work under 6 V. Use battery tester to detect, if it does not meet the requirements, charge the battery or replace the battery (and also detect the power generated by alternator).

(6) Link malfunction.

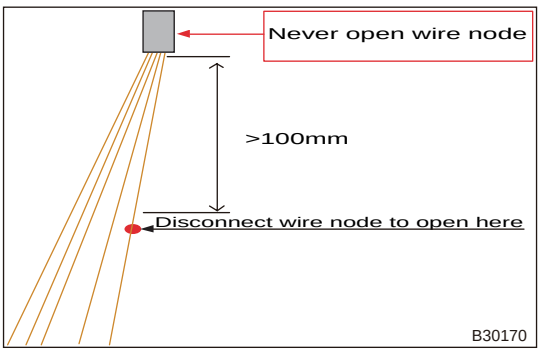
Link refers to a communication connection line between nodes. Link malfunction refers to malfunction of data communication lines, such as short circuit, open circuit and communication signal attenuation or distortion caused by changes in physical properties of the lines. These factors often cause multiple electronic control units to fail to work properly or the control system to operate improperly. To determine whether the link is malfunctioning, use an oscilloscope or a specific vehicle CAN tester to observe whether the current data communication signal matches the standard data communication signal.

Maintenance methods are generally to repair shorted or open twisted-pair lines, or to eliminate the root cause of changing the physical properties of twisted-pair lines.

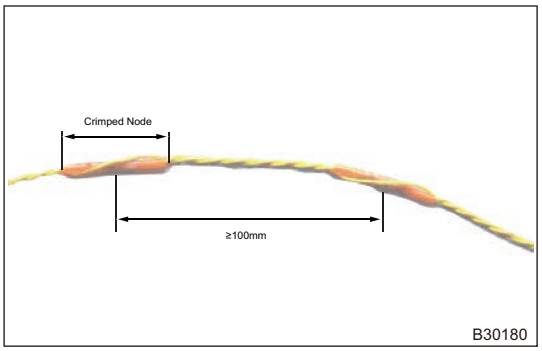
1) Maintenance instructions for CAN line.

   Sometimes, in order to determine the malfunction, it is necessary to disconnect a control unit from line connection point and disconnect the CAN bus connected to the control unit, or to repair wire harness after the malfunction has been determined. The data transmitted by CAN bus may even affect vehicle safety and life safety of personnel. Improper maintenance of CAN bus may cause interference or loss of signals, resulting in these data not being transmitted. Therefore, the following regulations must be observed during maintenance:

   - During CAN bus maintenance, the disconnection point is required to be at least 100 mm away from the line node, and the line node must never be opened, maintained and updated.

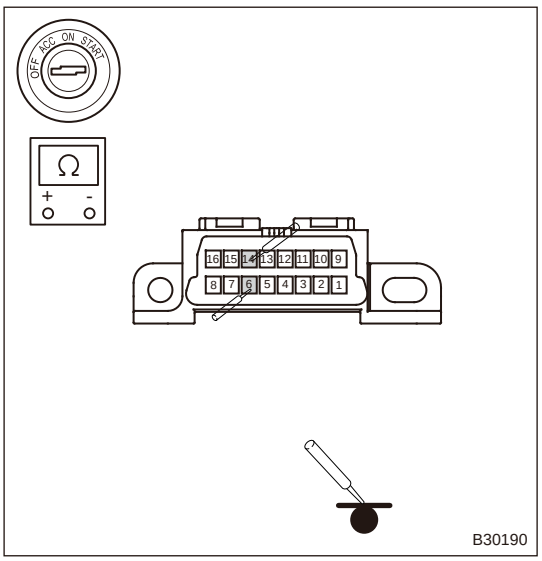


- If the CAN line is to be disconnected, it is only allowed to be carried out at a distance of ⩾ 100 mm from the next pressure node; The twisting of CAN lines is of decisive significance to the interference effect of CAN. Only if the twisting is not damaged, the CAN can be protected from interference, so keep as little interference with the twisting as possible during maintenance.

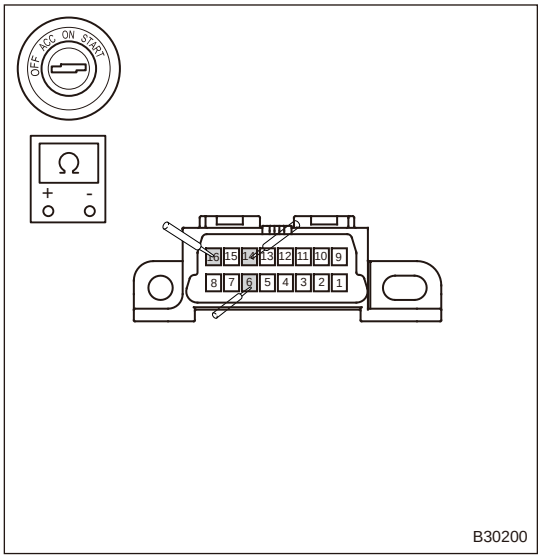


2) Use a multimeter to measure the resistance to ground and power supply of CAN-H and CAN-L.

   - After disconnecting battery for 5 minutes, the measured resistance values between diagnostic interfaces 6# (CAN-H) and 14# (CAN-L) and ground are both 32 MΩ.



- After disconnecting battery for 5 minutes, the measured resistance values between diagnostic interfaces 6# (CAN-H) and 14# (CAN-L) and 16# are both 33.5 MΩ.



3) Termination resistor.

The termination resistor is installed in gateway module of system and is used to prevent CAN bus signal from reflecting the changing voltage on CAN bus. When the termination resistor fails and the square wave is transmitting, because of the reflection of line, if it is serious, the signal will be deformed and the signal of control unit will be invalid. When measuring the CAN bus signal with an oscilloscope, if the signal does not match standard signal, it is also necessary to check whether the termination resistor is damaged.

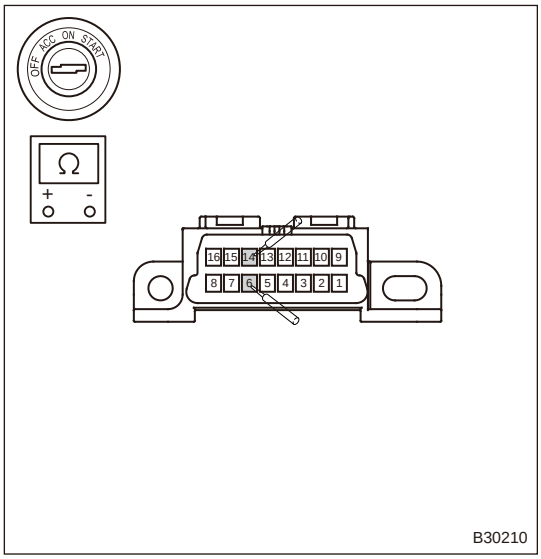
Measurement step of termination resistor:

(1) Turn ENGINE START STOP switch to OFF, disconnect the negative battery cable;

(2) Wait about 5 minutes until all capacitors are fully discharged;

(3) Connect the measuring instrument and measure total resistance. Using ohmmeter, measure resistance between diagnostic interfaces (6) and (14) (standard resistance is 60 Ω).

Measured value (for reference only): the measured resistance between diagnostic interfaces 6 # and 14 # is 58.7Ω (the two termination resistors are connected in parallel), after gateway module is disconnected separately, and the measured resistance between diagnostic interfaces 6 # and 14 # is ∞.

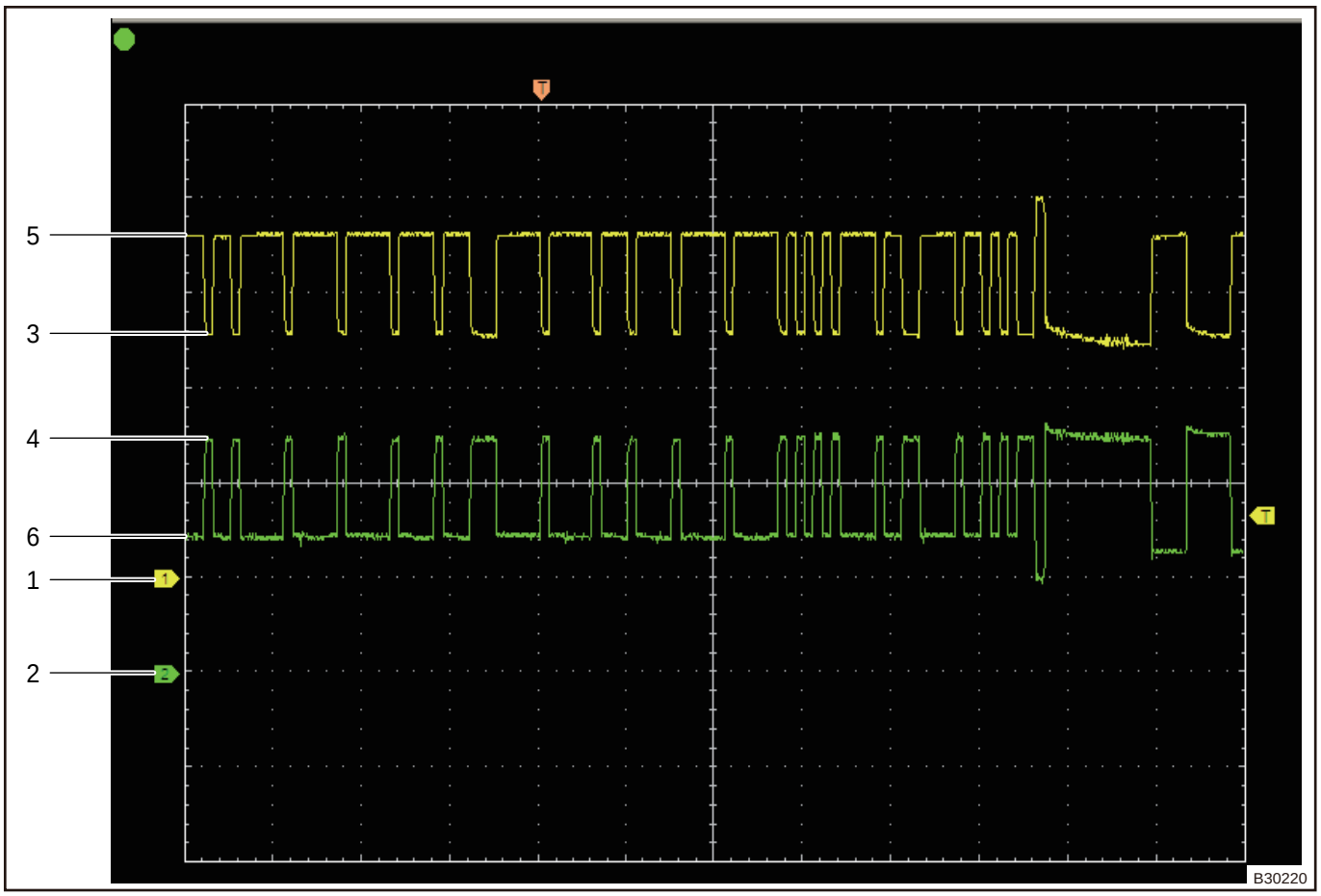


3.8 Oscilloscope Analysis

(1) Oscilloscope connection

CH1 (channel 1) is connected to diagnostic interface 6# (CAN-H), CH2 (channel 2) is connected to diagnostic interface 14# (CAN-L), and alligator clip of the oscilloscope probe is connected to the common body ground.

Normal waveform



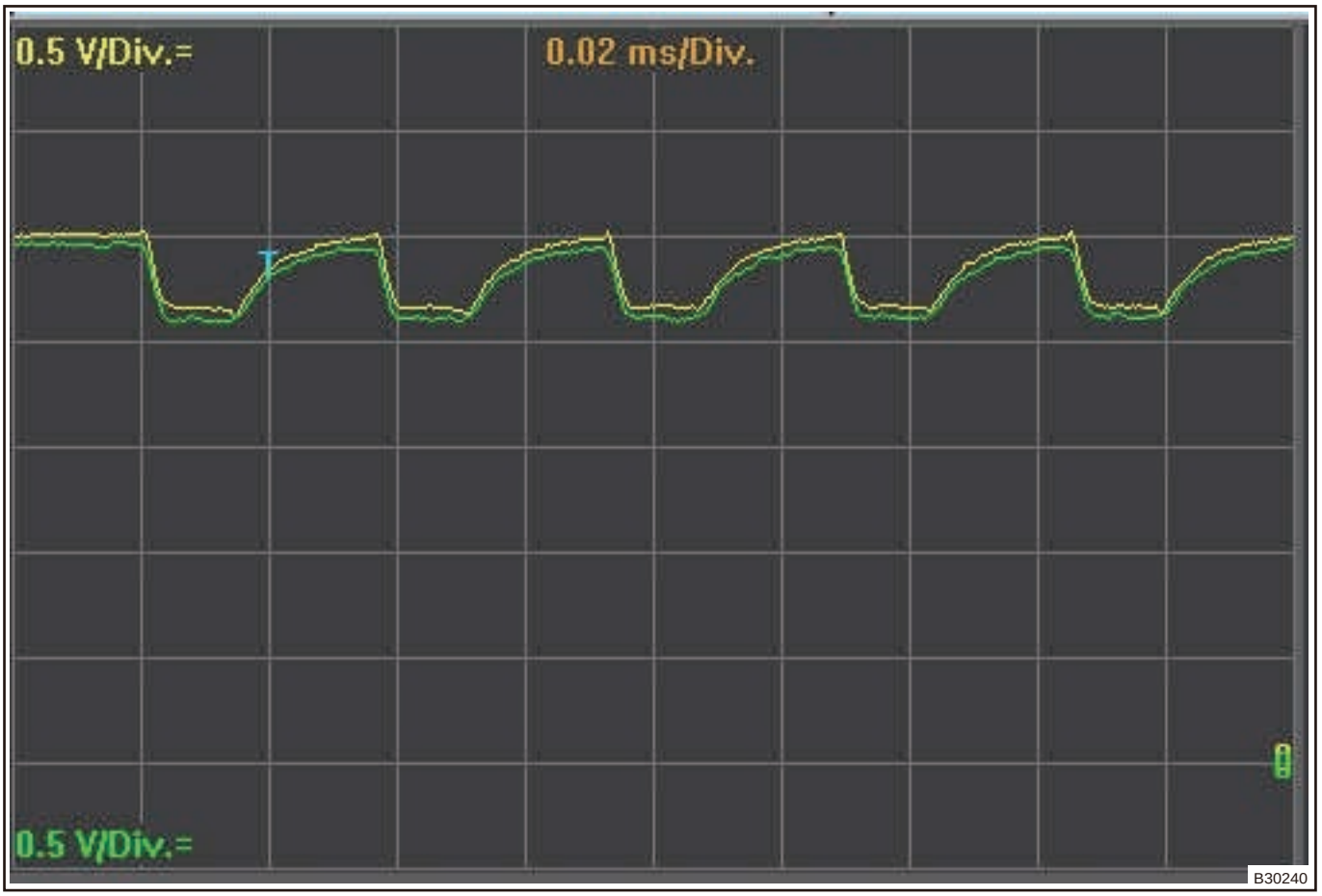
1	Zero potential of CAN-H	4	The recessive voltage potential of CAN-L is approximately 2.5 V (logic value 1)
2	Zero potential of CAN-L	5	The dominant voltage potential of CAN-H is approximately 3.6 V (logic value 0)
3	The recessive voltage potential of CAN-H is approximately 2.6 V (logic value 1)	6	The dominant voltage potential of CAN-L is approximately 1.4 V (logic value 0)

Potential	CAN-H - Ground	CAN-L - Ground	Voltage Difference
Dominant	3.6 V (3.5 V)	1.4 V (1.5 V)	2.2 V (2.0 V)
Recessive	2.6 V (2.5 V)	2.5 V (2.5 V)	0.1 V (0 V)

Hint:

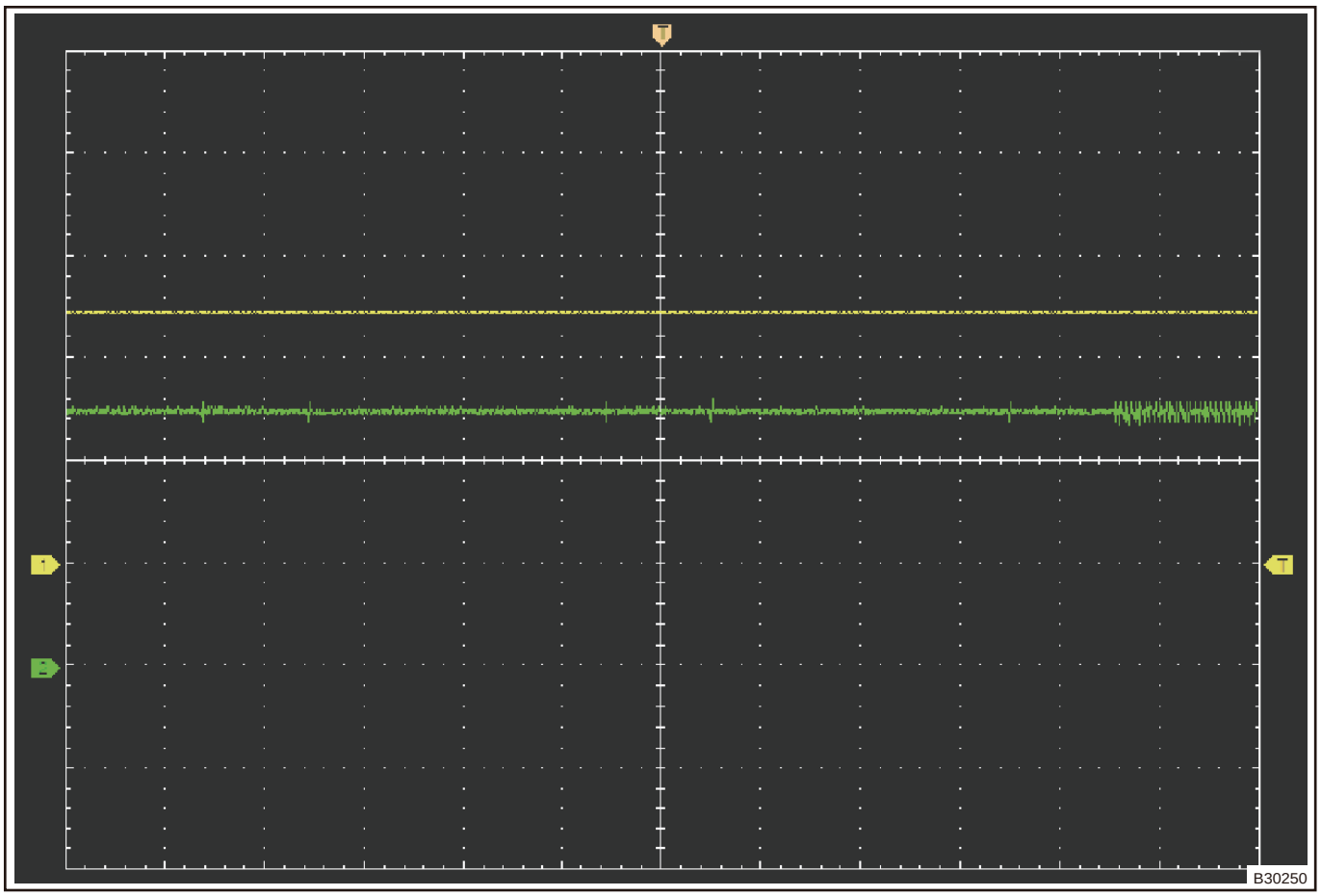
1) Always use voltage difference between two lines to confirm data. When voltage of CAN-H rises, the voltage of CAN-L decreases accordingly. The waveform is rectangular and symmetrical.
2) As the oscilloscope shows, CAN-Bus has only two operating states. At the recessive voltage potential, the two voltage values are very close. At the dominant voltage potential, the two voltage standard difference is 2.0 V.
3) The difference between measured voltage value and standard value is approximately 100 mV.
4) During communication, high-speed CAN operating voltage range: CAN-H: 2.75 V~4.5 V (dominant), 2 V~3 V (recessive); CAN_L: 0.5 V~2.25 V (dominant), 2 V~3 V (recessive); No signal transmission means that CAN bus will transmit recessive signals when it is idle, and new information will start with dominant signals.

(2) Short point (arrow) between CAN-H and CAN-L



Short circuit malfunction waveform of CAN-H and CAN-L

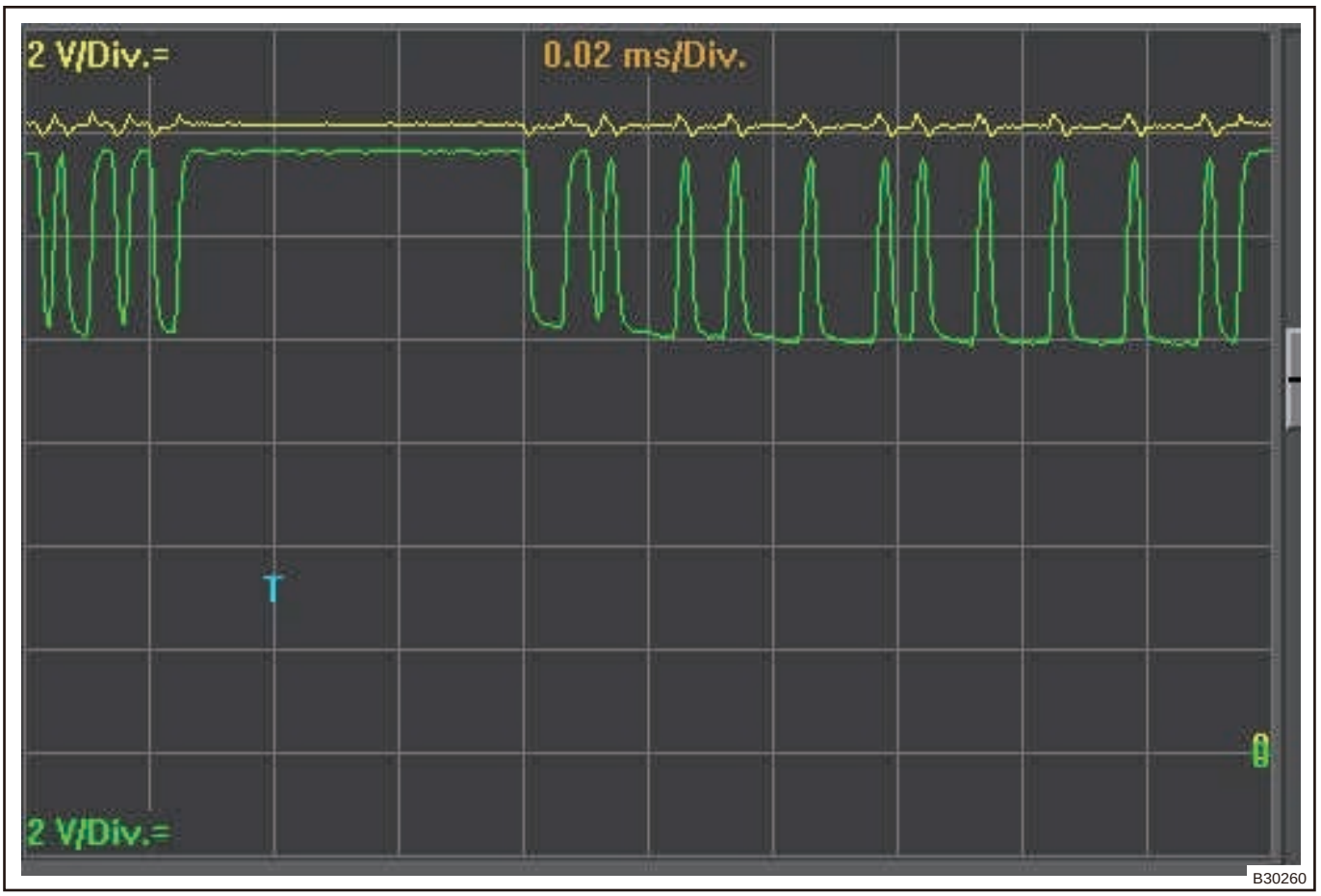
- Observe with an oscilloscope, the voltage potential is at recessive voltage value (approximately 2.5 V). By moving the position of zero potential on two oscilloscope channels to make the zero potential of two channels be coincident. It can be seen that waveforms of the CAN-H and CAN-L change consistently and their potentials are consistent;
- The short circuit waveforms of CAN-H and CAN-L during actual vehicle test are shown in following illustration. Both waveforms are straight line with a voltage of approximately 2.5 V. Use a multimeter to test that the termination resistor is close to or equal to 0 ohms. Power CAN and body CAN, CAN-H and CAN-L short circuit vehicles can not start.



Troubleshooting procedures:

1) By plugging and unplugging control unit on CAN bus one by one and observing oscilloscope waveform at the same time, it can be judged whether it is a short circuit caused by the control unit or by the CAN-H and CAN-L line connection;
2) If the waveform returns to normal when unplugging the connector of a module, this module is malfunctioning;
3) For short circuit caused by short circuit of line, it is necessary to disconnect CAN wire groups (CAN-H and CAN-L) from wire harness connector or wire harness node in turn, and pay attention to waveform of oscilloscope; After disconnecting faulty wire group, waveform of oscilloscope returns to normal;
4) When there is no other measurement method, only CAN line can be disconnected from line connection point. Pay attention to maintenance instructions of CAN line.

(3) CAN-H is short to power supply



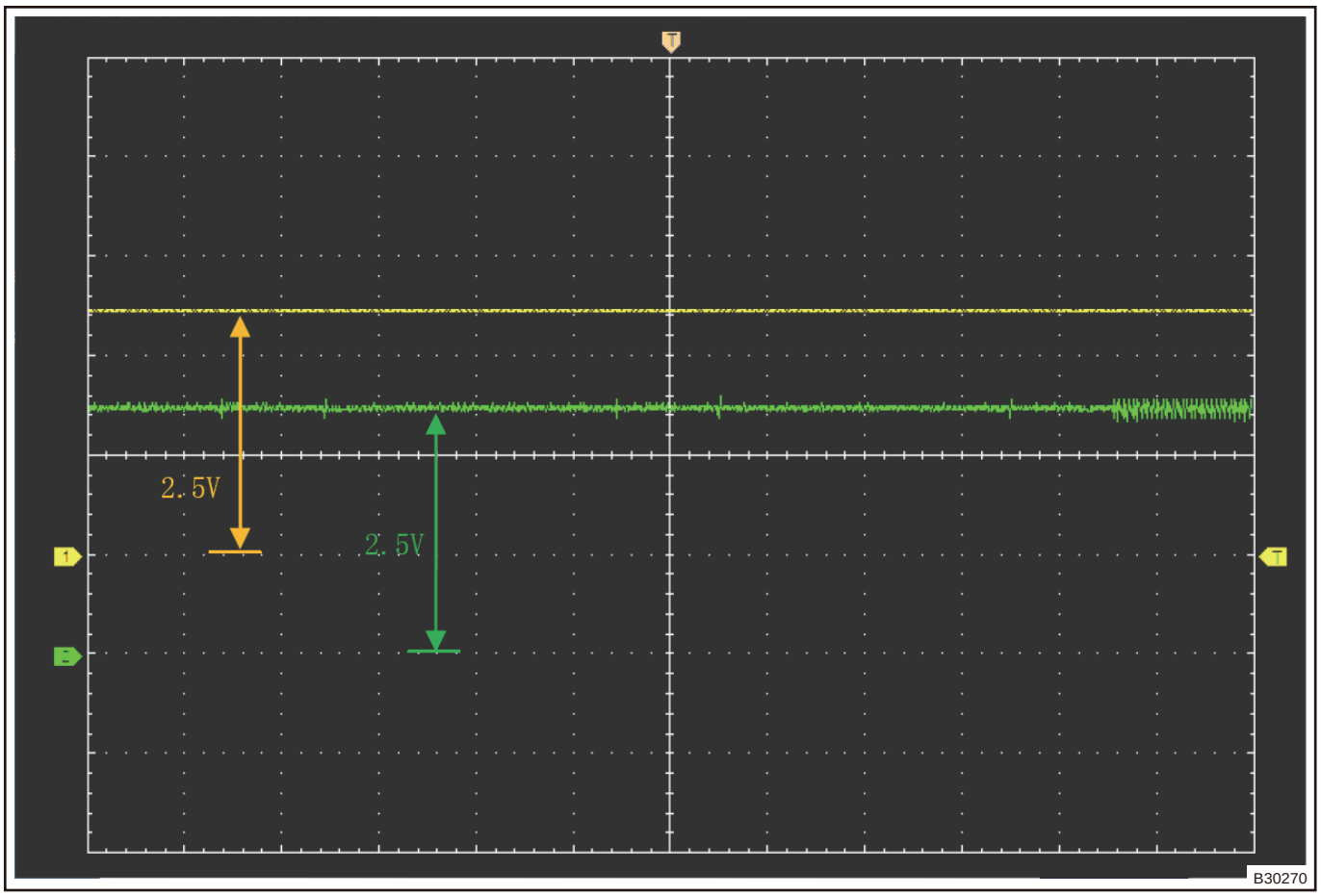
Malfunction symptoms:

- Observe with an oscilloscope: the voltage potential of CAN-H line is placed at 12 V, the recessive voltage of CAN-L line is placed at approximately 12 V, and amplitude becomes larger due to internal connection of CAN-H and CAN-L in transceiver of control unit.

  Troubleshooting procedures:

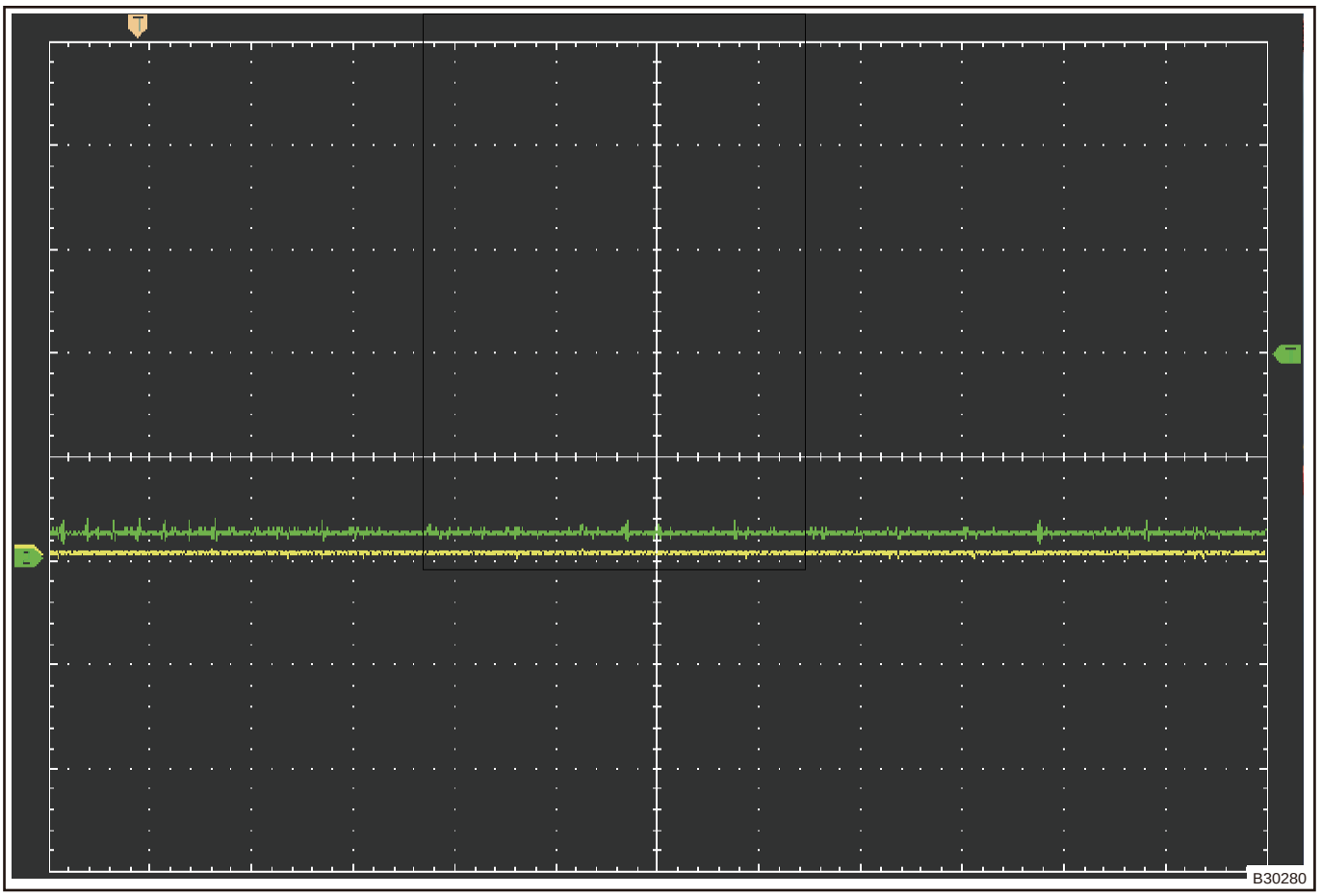
  1) By plugging and unplugging control unit on CAN bus one by one and observing oscilloscope waveform at the same time, it can be judged whether it is a short circuit caused by the control unit or by the CAN-H line connection;
  2) If the waveform returns to normal when unplugging the connector of a module, this module is malfunctioning;
  3) When there is no other measurement method, only CAN line can be disconnected from line connection point. Pay attention to maintenance instructions of CAN line.

- The short circuit waveform to positive in CAN-H during actual vehicle test is shown in following illustration. The voltage potential of CAN-H line is placed at 12 V (battery voltage), and the recessive voltage of CAN-L line is placed at approximately 12 V (battery voltage). The amplitude becomes larger. The diagnostic tester cannot access each module. Power CAN and body CAN, CAN-H short to power supply, vehicles can not start.



(4) CAN-H is short to ground

Malfunction waveform



Malfunction symptoms:

- Observe with an oscilloscope: The voltage potential of CAN-H line is placed at 0 V, and the voltage of CAN-L line is placed at about 0.2 V (near 0 V).

Malfunction causes

- Bus CAN-H is short to ground, node (module) malfunction.

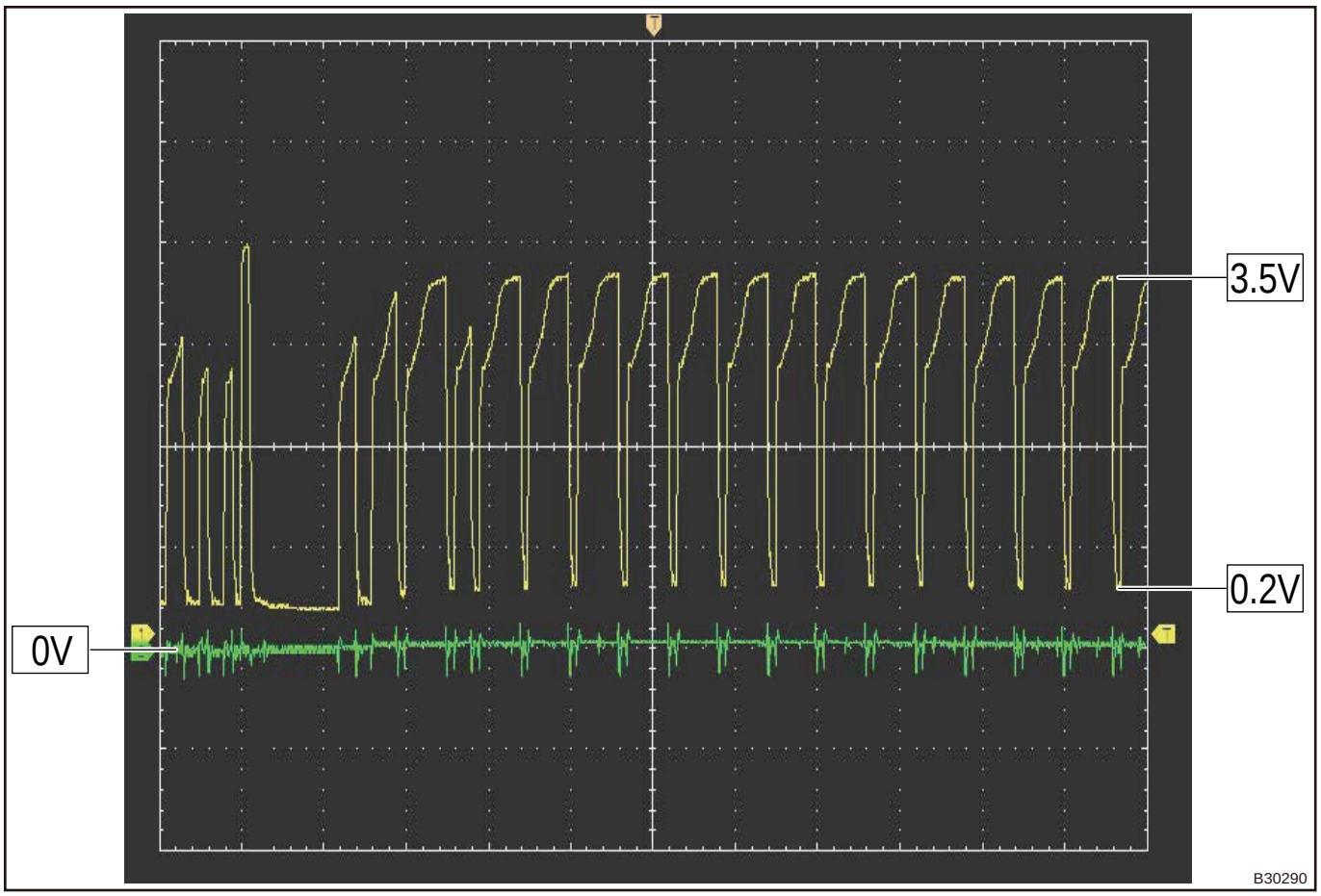
Troubleshooting procedures:

1) Plug and unplug control unit on CAN bus one by one, and observe if the oscilloscope waveform becomes normal?
2) If the waveform returns to normal when unplugging the connector of a module, this module is malfunctioning;
3) When there is no other measurement method, only CAN line can be disconnected from line connection point. Pay attention to maintenance instructions of CAN line.

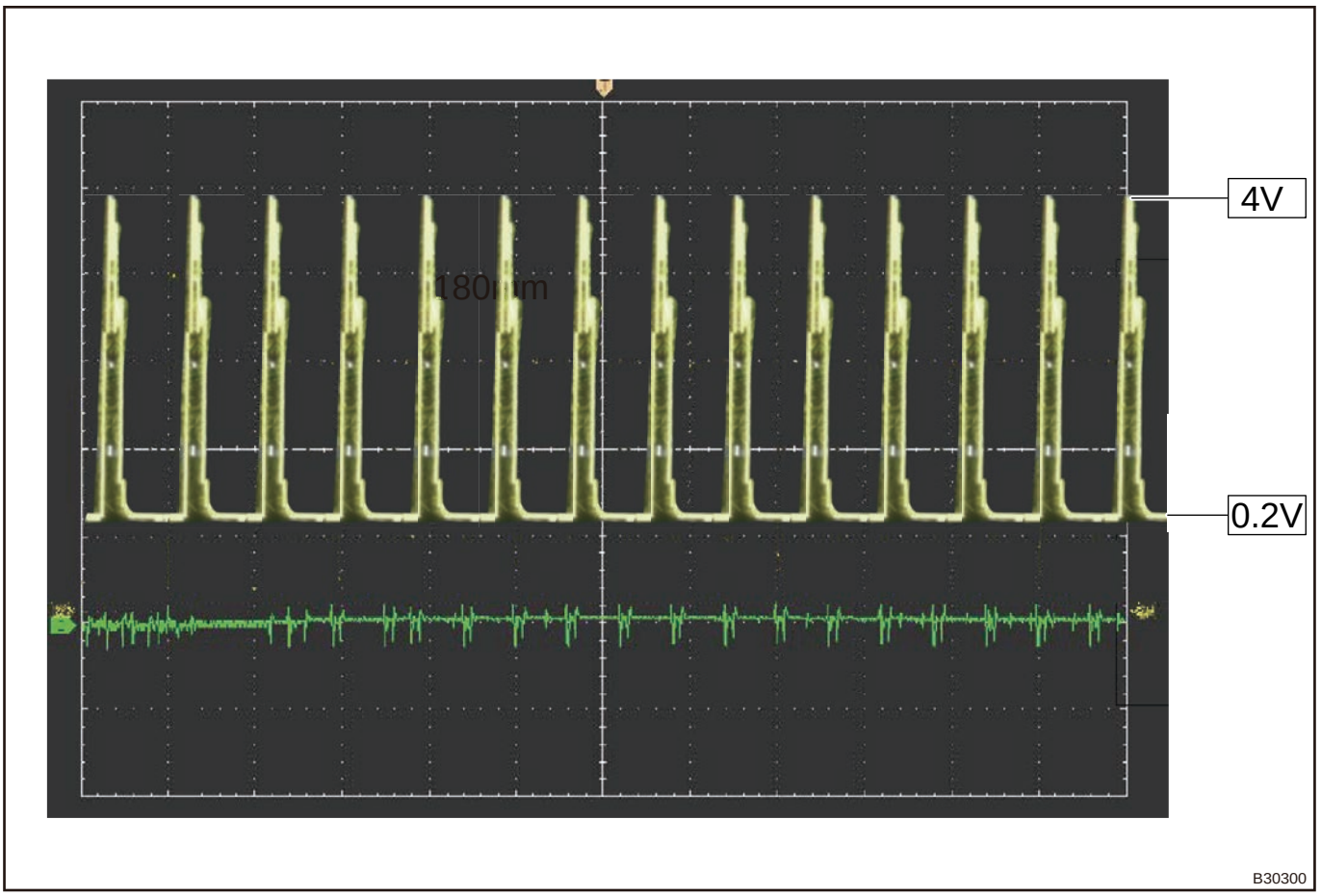
In the short circuit waveform to ground in CAN-H during actual vehicle test, the voltage potential of CAN-H line is placed at 0 V, and the recessive voltage of CAN-L line is placed at approximately 0.2 V. Power CAN and body CAN, CAN-H short to ground, vehicles can not start.

(5) Short to ground in CAN-L

Malfunction waveform



CAN malfunction waveform



Malfunction symptoms:

- Observe with an oscilloscope: The voltage of CAN-L is approximately 0 V, and the recessive voltage of CAN-H line is also reduced to 0.2 V (near 0 V). Malfunction cause: Bus CAN-L is short to ground, node (module) malfunction.

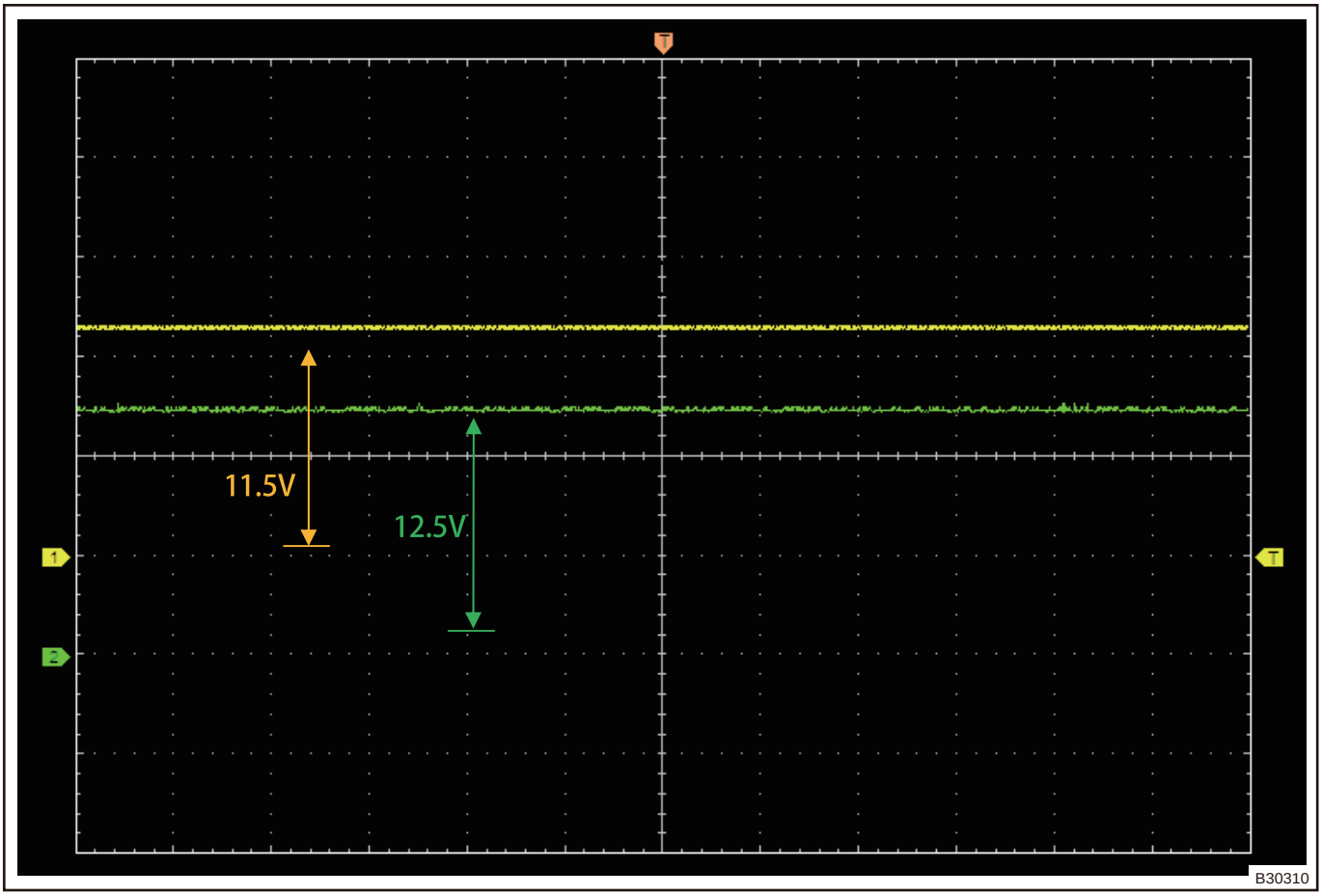
Troubleshooting procedures:

1) By plugging and unplugging control unit on CAN bus one by one and observing oscilloscope waveform at the same time, it can be judged whether it is a short circuit caused by the control unit or by the CAN-L line ground;
2) If the waveform returns to normal when unplugging the connector of a module, this module is malfunctioning;
3) When there is no other measurement method, only CAN line can be disconnected from line connection point. Pay attention to maintenance instructions of CAN line.

In the short circuit waveform to ground of CAN-L during actual vehicle test, the voltage potential of CAN-L line is placed at 0 V. Power CAN and body CAN, CAN-L short to ground, vehicles can not start.

(6) CAN-L short to power supply

Malfunction waveform



Malfunction symptoms:

- Observe with an oscilloscope: Both bus voltages are approximately 12 V, and waveforms are straight lines.

  Malfunction cause: Bus CAN-L is short to power supply, node (module) malfunction.

  Troubleshooting procedures:

  1) By plugging and unplugging control unit on CAN bus one by one and observing oscilloscope waveform at the same time, it can be judged that the short circuit is caused by the control unit or short circuit to power supply in CAN-L line;
  2) If the waveform returns to normal when unplugging the connector of a module, this module is malfunctioning;
  3) When there is no other measurement method, only CAN line can be disconnected from line connection point. Pay attention to maintenance instructions of CAN line.

  After short circuit between CAN-L and power supply is judged during real vehicle test, power CAN and body CAN and CAN- L are short to power supply, and vehicle cannot start.

3.9 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B140116	Power Supply Fault-Circuit Voltage Below Threshold
B140117	Power Supply Fault-Circuit Voltage Above Threshold
B140244	RAM Error
B140345	ROM Error
B140446	EEPROM Error
B140055	Configuration data is not written

3.10 DTC Diagnosis Procedure

DTC	**B140116**	**Power Supply Fault-Circuit Voltage Below Threshold**
DTC	**B140117**	**Power Supply Fault-Circuit Voltage Above Threshold**

DTC	DTC Definition	Possible Causes
B140116	Power Supply Fault-Circuit Voltage Below Threshold	• Central network module • Wire harness or connector • Battery
B140117	Power Supply Fault-Circuit Voltage Above Threshold	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check voltage**

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check battery voltage (not less than 12 V) with a digital multimeter.

NG → **Replace battery**

OK

2	**Check charging system**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check positive and negative battery cables for broken or damage.
(c) Turn ENGINE START STOP switch to ON.
(d) Start the engine.
(e) Check if voltage of positive and negative battery is normal with a digital multimeter (13.5V-14.8V).

NG → **Repair or replace positive and negative battery cables and alternator**

OK

3	**Check CGW module power supply fuse**

(a) Turn ENGINE START STOP switch to OFF.
(b) Check if PEPS module power supply fuses RF19 5A and RF39 5A are blown.

NG → **Replace power supply fuse**

OK

4	Check engine compartment fuse and relay box

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the instrument panel fuse box connector.

(c) Using digital multimeter, check for continuity between fuse RF19 and Pin C3-17 of instrument panel fuse box.

(d) Using digital multimeter, check for continuity between fuse RF39 and Pin C4-4 of instrument panel fuse box.

Multimeter Connection	Condition	Normal Condition
RF17 - Instrument panel fuse box C3-17	Always	⩽ 1 Ω
RF39 - Instrument panel fuse box C4-4	Always	⩽ 1 Ω

NG → Replace the instrument panel fuse box

OK

5	Check CGW module power wire harness

(a) Turn ENGINE START STOP switch to ON.

(b) Disconnect CGW connector B-145.

(c) Using a digital multimeter, check if the voltage between terminal B-145 (18), (19) and body ground is normal.

Multimeter Connection	Condition	Normal Condition
B-145 (18) - Body ground	Always	Not less than 12 V
B-145 (19) - Body ground	Always	Not less than 12 V

(d) Using digital multimeter, check for continuity between terminal B-145(18) of CGW module connector and terminal C4-4 of instrument panel fuse box and terminal B-145(19) and terminal C3-17 of instrument panel fuse box to check power supply wire harness for open.

Multimeter Connection	Condition	Normal Condition
B-145(18) - Instrument panel fuse box C4-4	Always	⩽ 1 Ω
B-145(19) - Instrument panel fuse box C3-17	Always	⩽ 1 Ω

NG → **Repair or replace instrument panel wire harness**

OK

6	Check CGW module ground circuit

(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect CGW module connector.

(c) Using digital multimeter, check for continuity between terminals (20) of B -145 and ground wire harness connector GB-162 to check ground wire harness for open.

Multimeter Connection	Condition	Normal Condition
B-145 (20) - GB-162	Always	⩽ 1 Ω

(d) Using voltage band of digital multimeter, measure voltage between B-145 (20) and body ground to check for short to power supply.

Multimeter Connection	Condition	Normal Condition
B-145 (20) - Body ground	Always	0V

NG → **Replace instrument panel wire harness**

OK → **Replace CGW module**

DTC	B160244	RAM Error
DTC	B160345	ROM Error
DTC	B160446	EEPROM Error

DTC	DTC Definition	Possible Causes
B160244	RAM Error	• Random malfunction; • Internal module fault.
B160345	ROM Error	
B160446	EEPROM Error	

■ DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check for DTCs

(a) Using diagnostic tester, clear DTCs and read CGW control module system DTCs again.
(b) Check if DTCs occur again.

OK	System is normal

OK

2	Check if the vehicle CGW control function is normal

NG	Replace CGW module
OK	Turn off vehicle power supply (disconnect the negative battery cable), then clear DTC again

DTC	U140055	CAN Has No Configuration

DTC	DTC Definition	Possible Causes
U140055	CAN Has No Configuration	• Configuration code misses; • Replace module configuration, do not writing module failure; • Module fails.

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

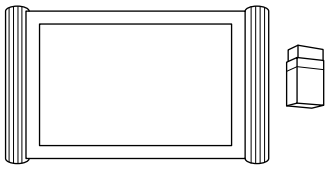
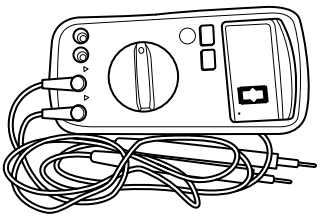
Hint:

- The following detection takes rear bumper antenna as an example.
- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Using diagnostic tester to write configuration data.

4 ON-VEHICLE SERVICE

4.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006
Oscilloscope	 RCH006106

Hint:

- Oscilloscopes are available in the market as a general tool. Chery does not provide this tool.
- As a general diagnostic method, oscilloscope diagnosis can be replaced by other diagnostic methods.

4.2 Gateway Module (CGW)

■ Removal

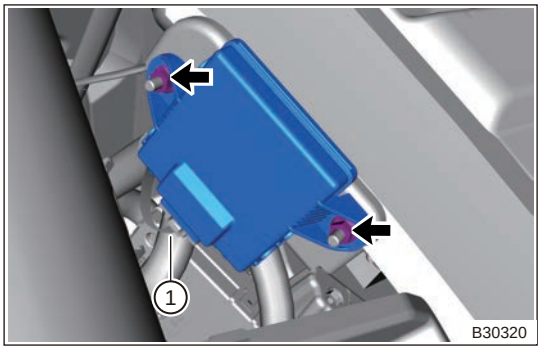
CAUTION
• **Read configuration code of CGW module and record it with a diagnostic tester, before removing gateway module.** • **Try to prevent interior and body paint surface from being scratched, when removing gateway module.**

(1) Turn ENGINE START STOP switch to OFF.

(2) Disconnect the negative battery cable.

(3) Remove the instrument panel assembly.

(4) Remove 2 fixing nuts from gateway bracket, disconnect connector (1) from gateway module, and remove gateway module.



■ Installation

(1) Install network module and connect connector.
Torque: 4 + 1 N·m

(2) Install the instrument panel assembly.

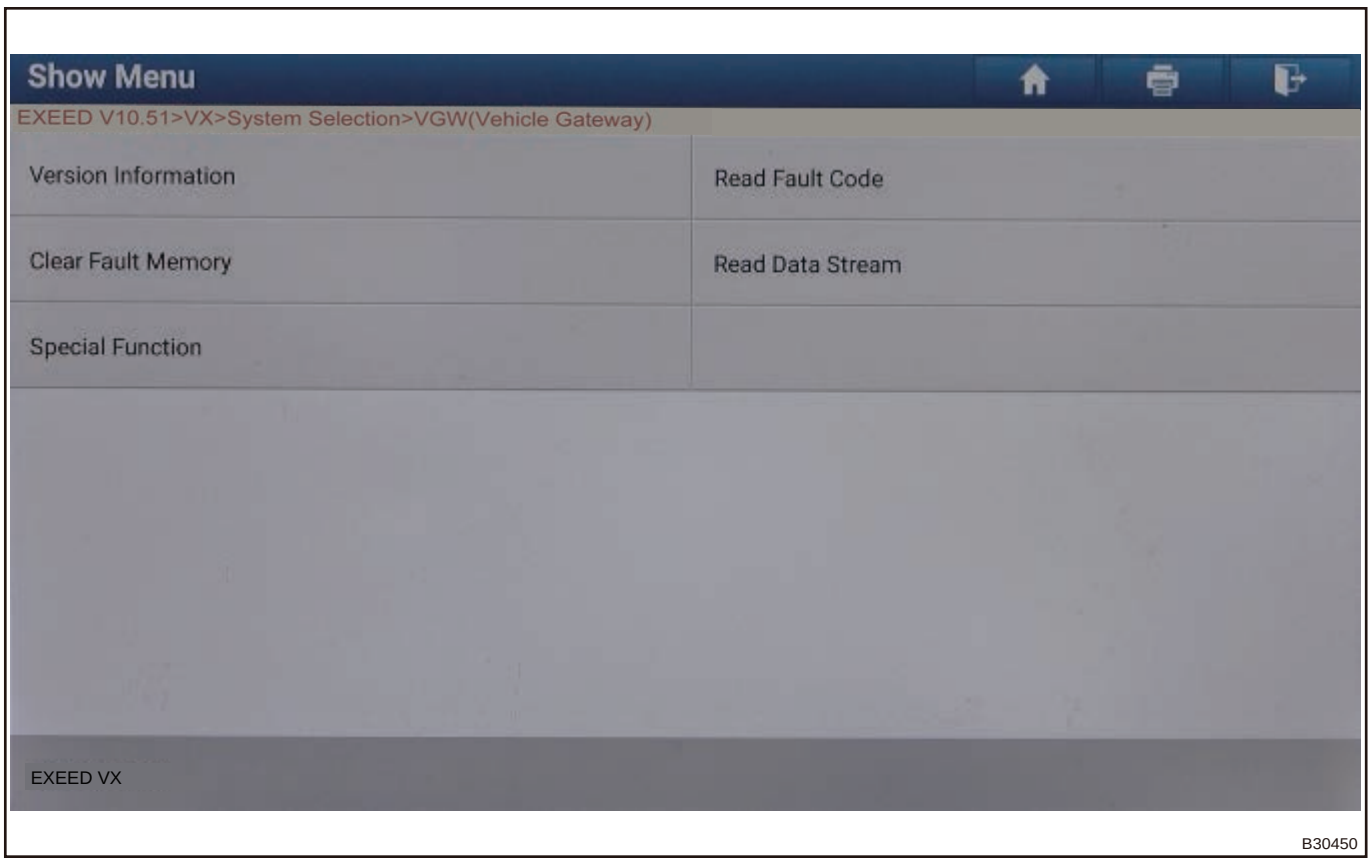
(3) Connect the negative battery cable.

■ Matching Learning

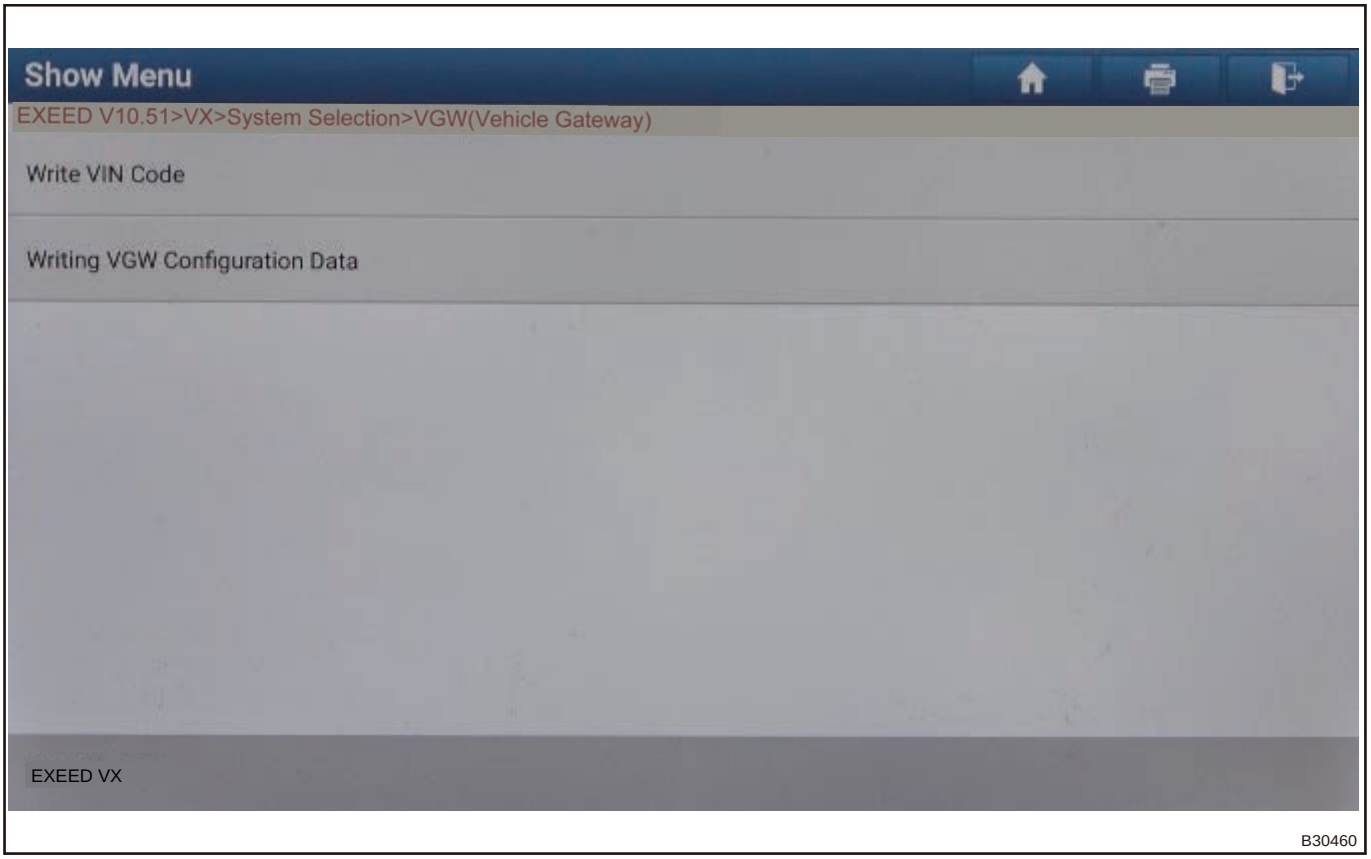
■ Writing VIN code

(1) Connect the diagnostic tester, turn ENGINE START STOP switch to ON and select model, then enter “CGW”.

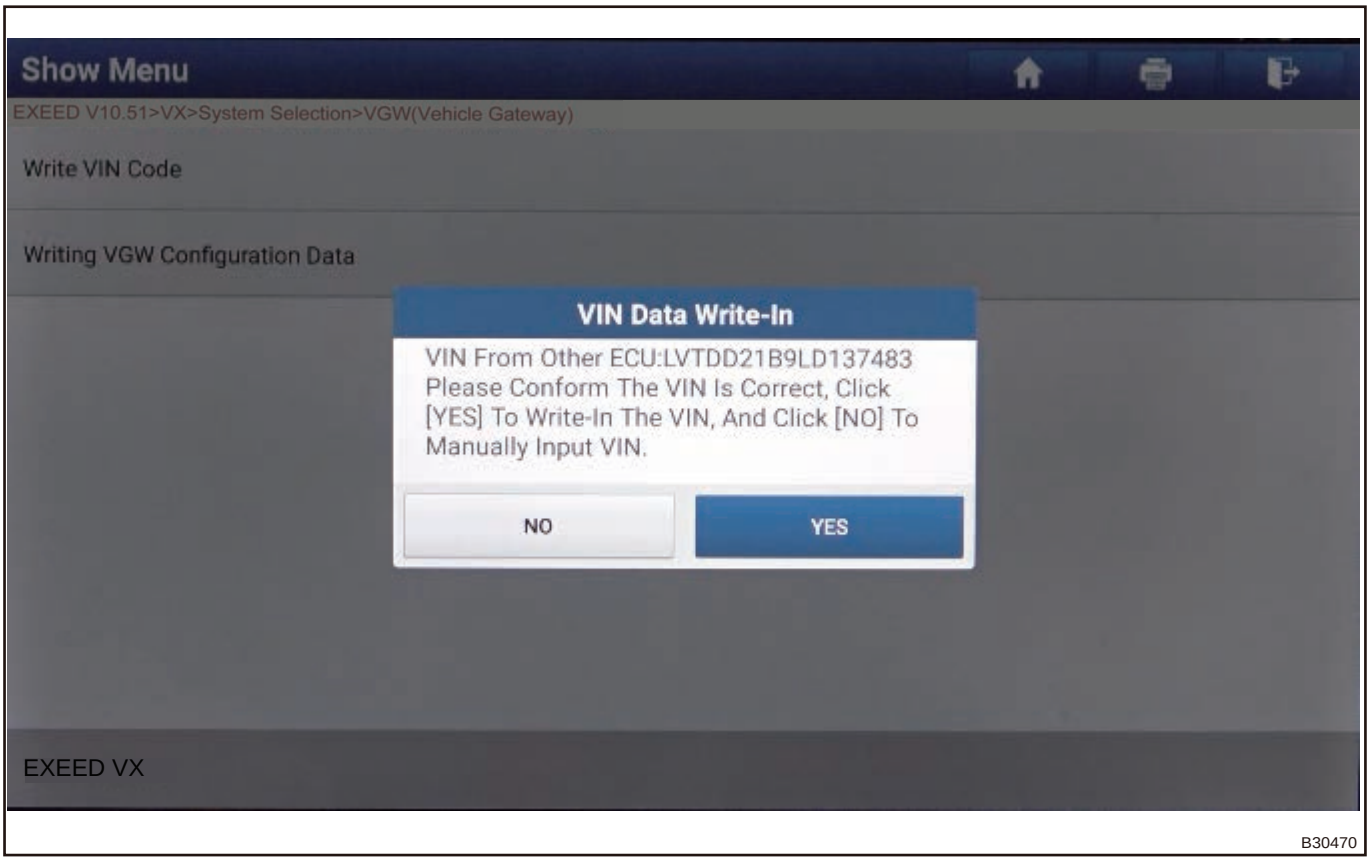
(2) Click “Special Function”.



(3) Select Special Function and click “Write VIN Code”.



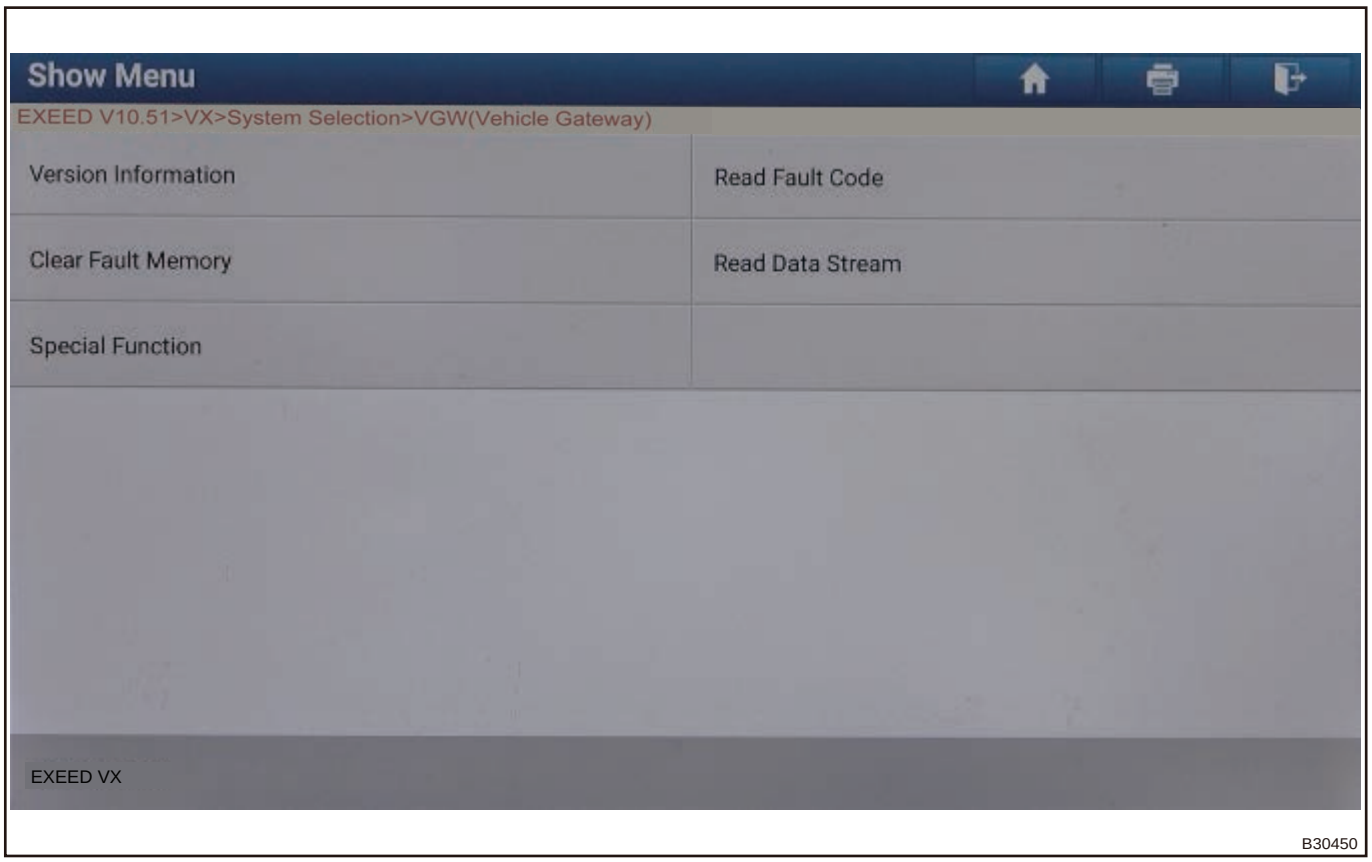
(4) Enter next screen, determine if VIN code is correct, if correct, click “OK”, if not, click “NO” to input manually.



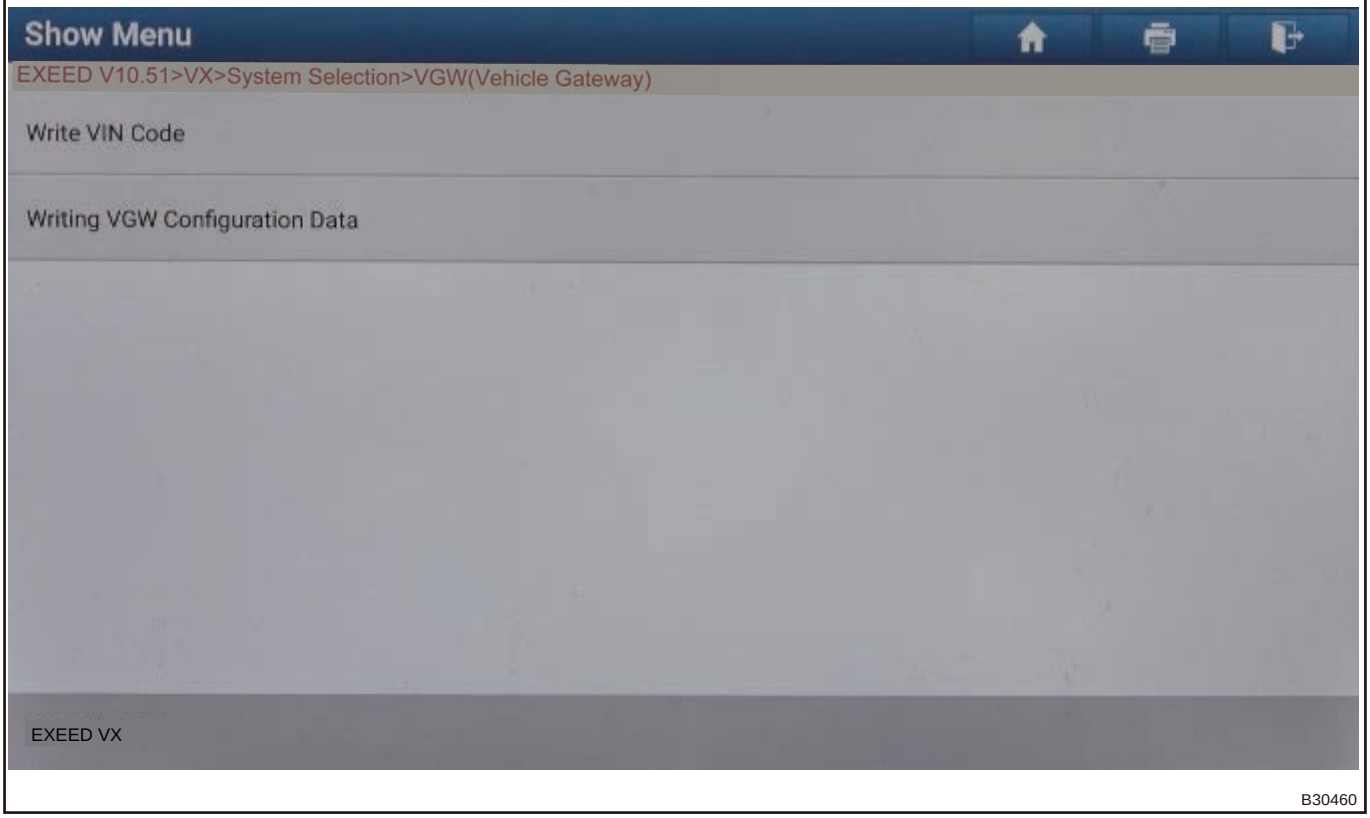
■ **Saving configuration data**

(1) Click “VGW (Vehicle Gateway Module)”.

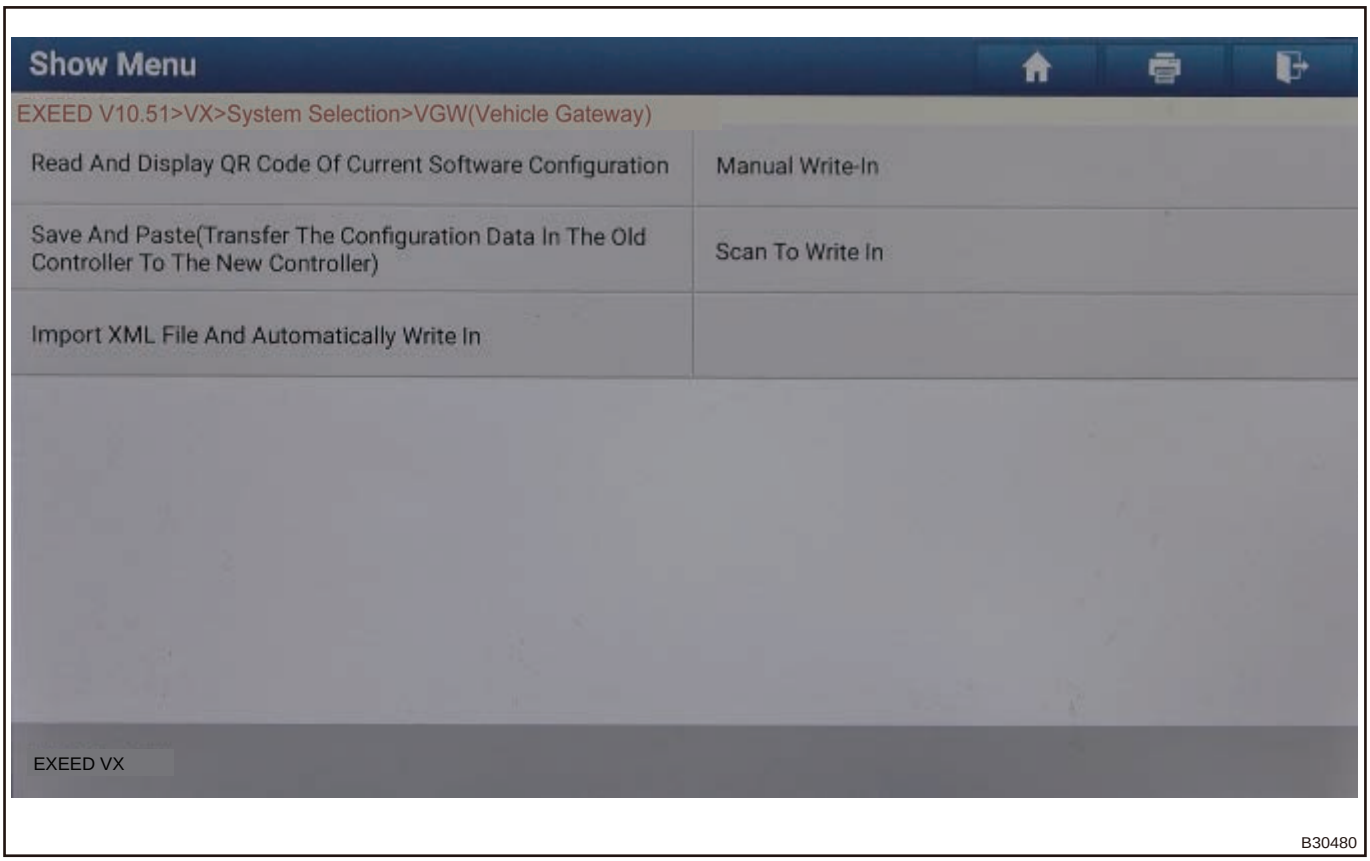
(2) Click “Special Function”.



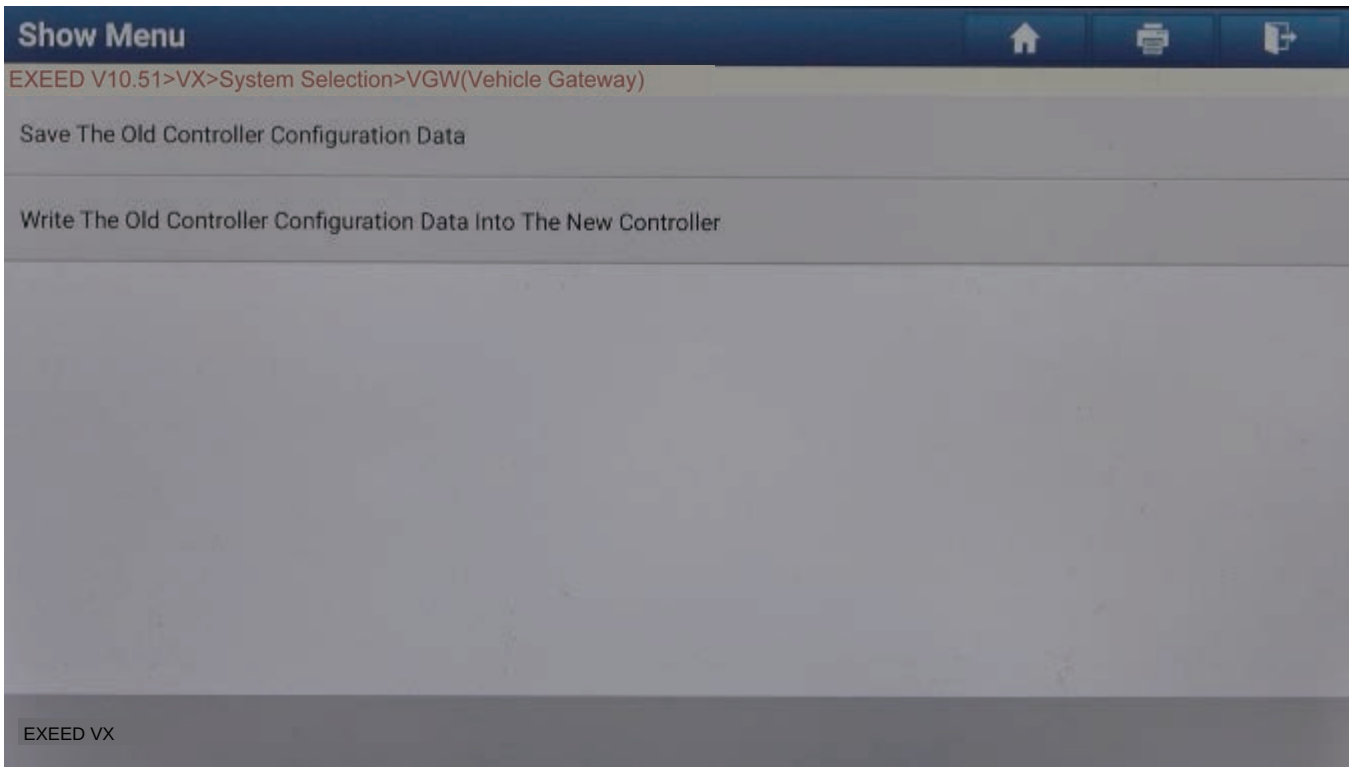
(3) Click “Writing VGW Configuration Data”.



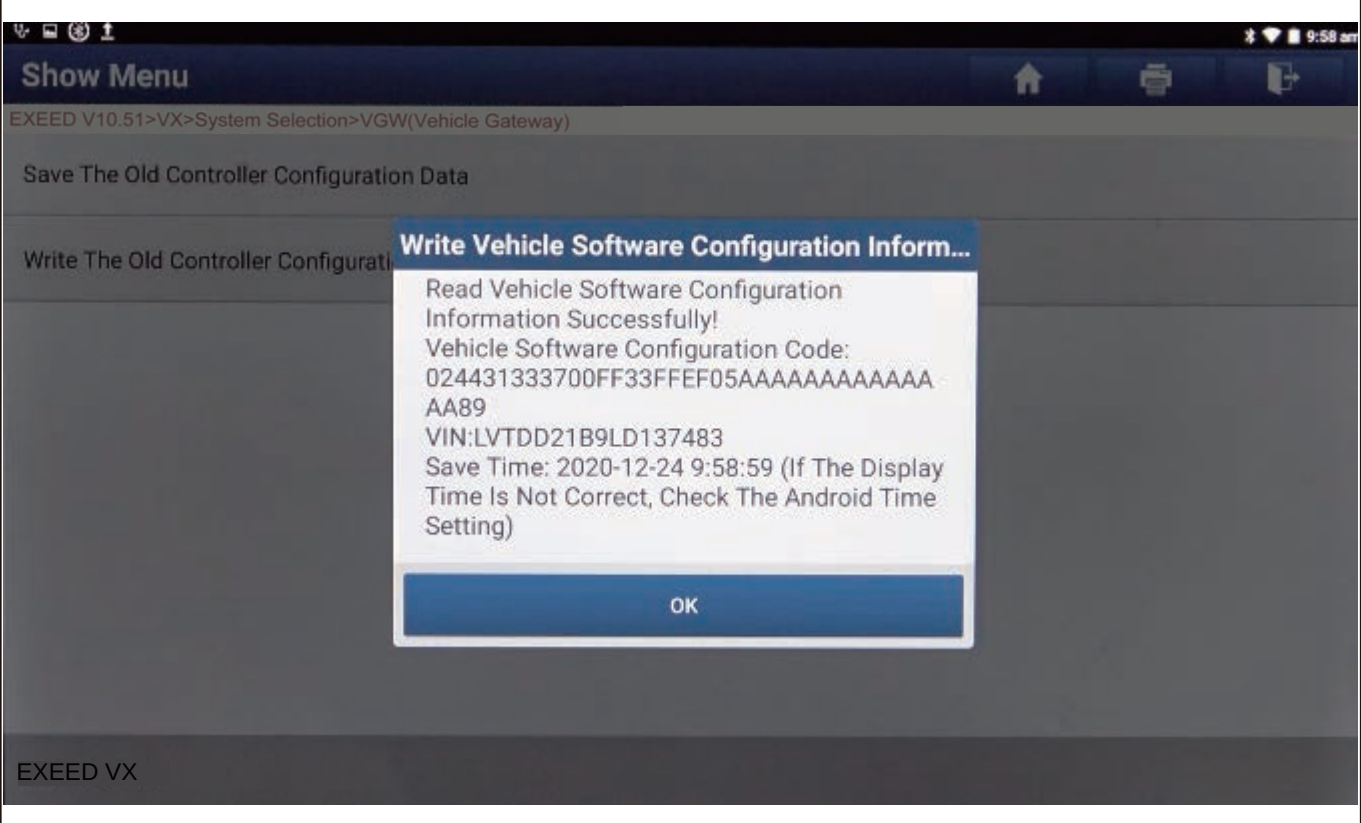
(4) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



(5) Click “Save The Old Controller Configuration Data”.

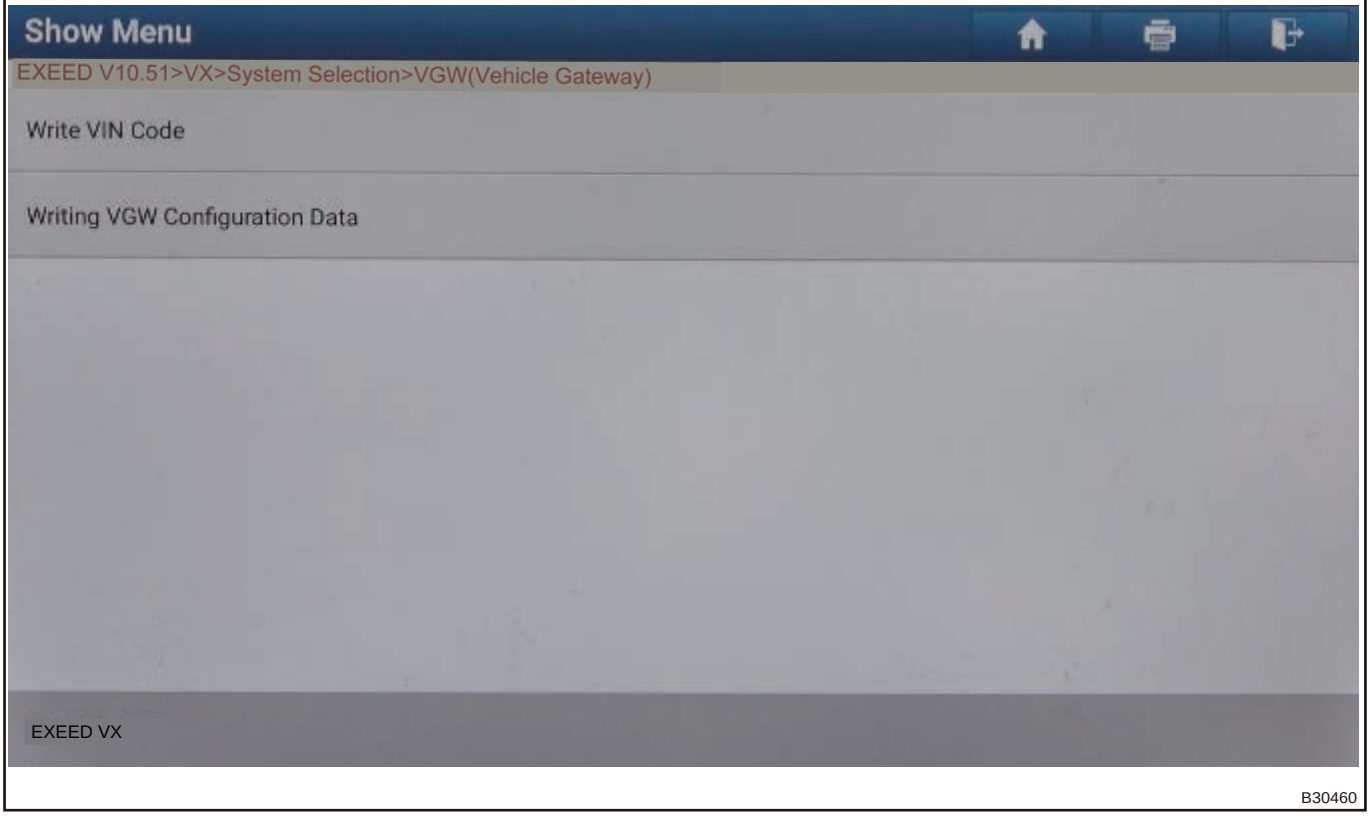


(6) The diagnostic tester interface shows "Read and Save Vehicle Configuration Code Successfully".

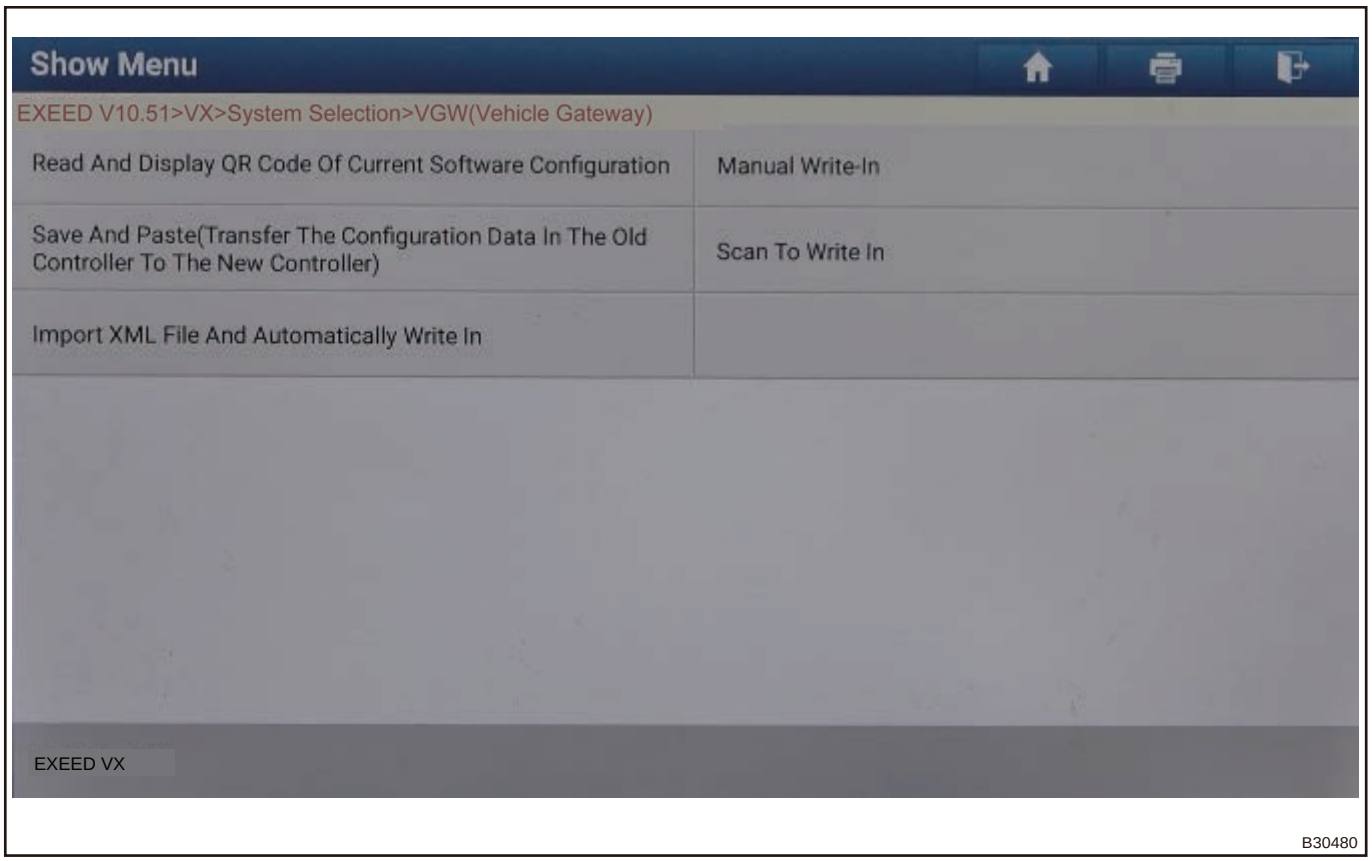


■ **Writing VGW configuration data**

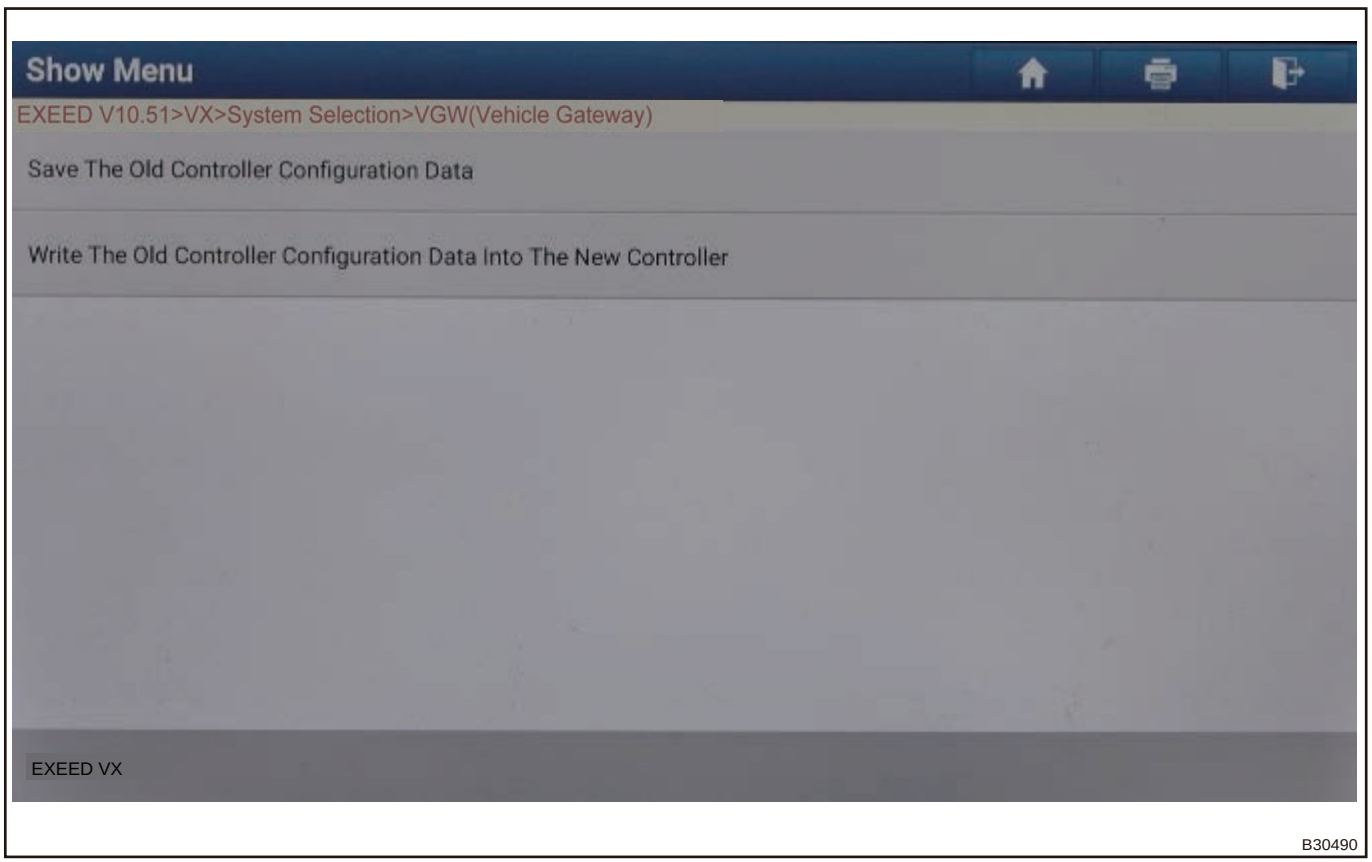
(1) Click “Writing VGW Configuration Data”.



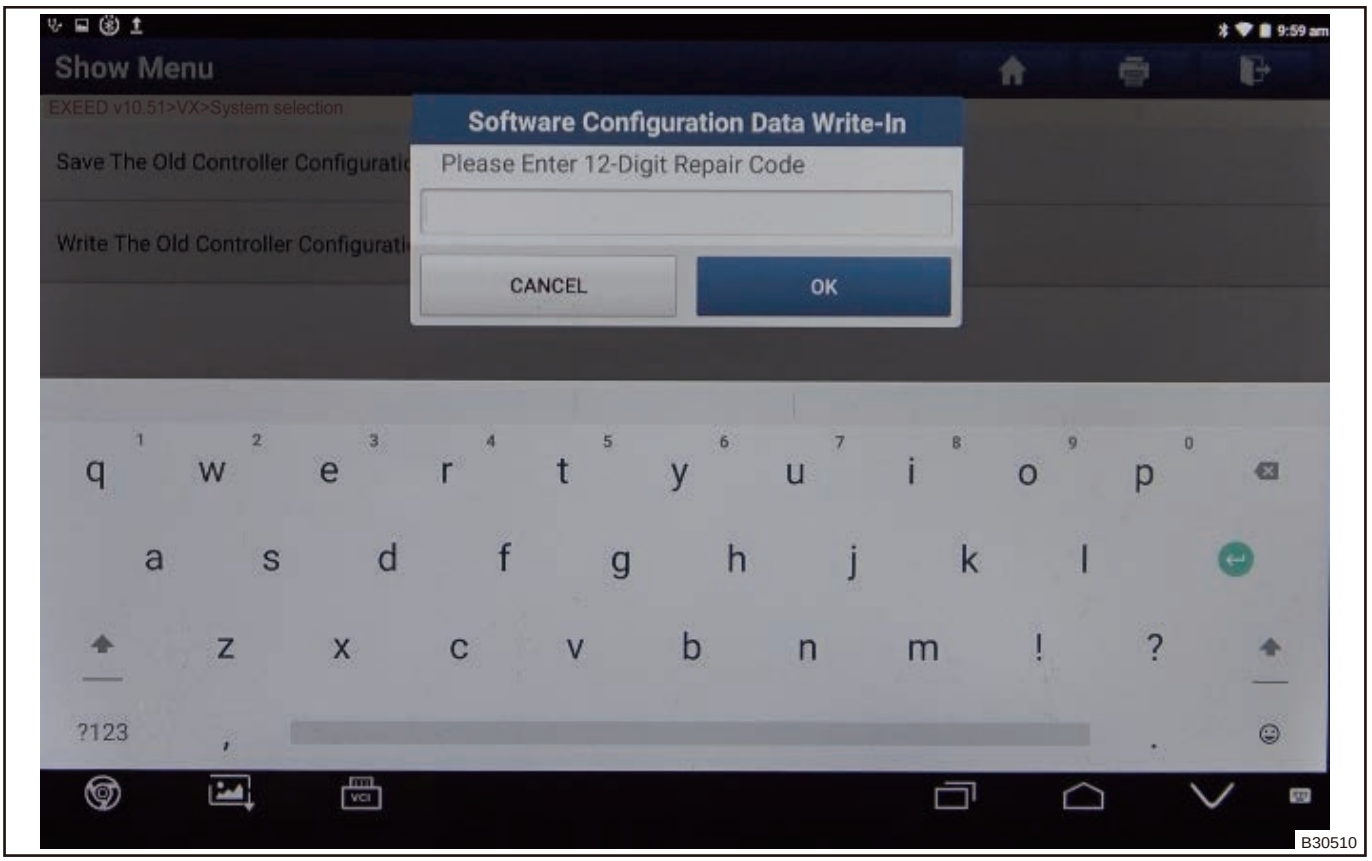
(2) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller”.



(3) Click “Write The Old Controller Configuration Data Into The New Controller”.



(4) The diagnostic tester interface shows “Please Enter 12-Digit Repair Code”.



(5) Click “OK” after entering.
(6) Click “YES” after confirming that repair shop code is correct again.
(7) The diagnostic tester interface shows “Saved Vehicle Configuration Code Last Time”. Click "Yes" after confirming that they are consistent.
(8) The diagnostic tester interface shows “Write Configuration Data Successfully”.
(9) Click “OK”.
(10) Click “OK” when the diagnostic tester interface shows “Configuration Data Check is Valid”.

11.17 Horn

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Be sure to wear necessary safety equipment to prevent accidents, when removing horn.

(2) Operate carefully to prevent damage to horn and horn switch, when removing horn.

(3) Connect connectors in place when installing horn.

(4) Check that each function can operate properly after installing.

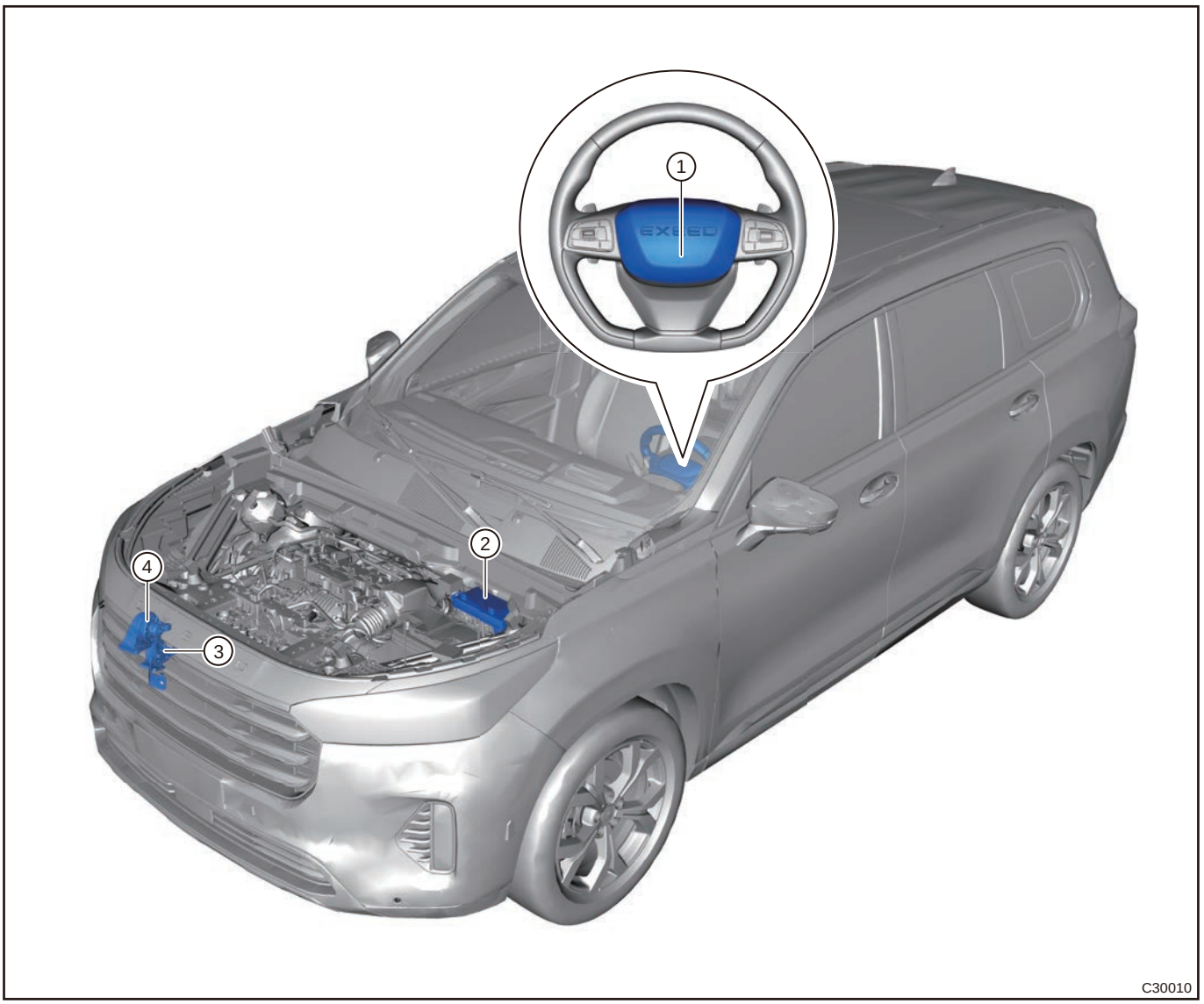
2 System Overview

2.1 System Description

This vehicle is equipped with dual electronic horn (high pitched, low pitched) system. Horn system consists of following components:

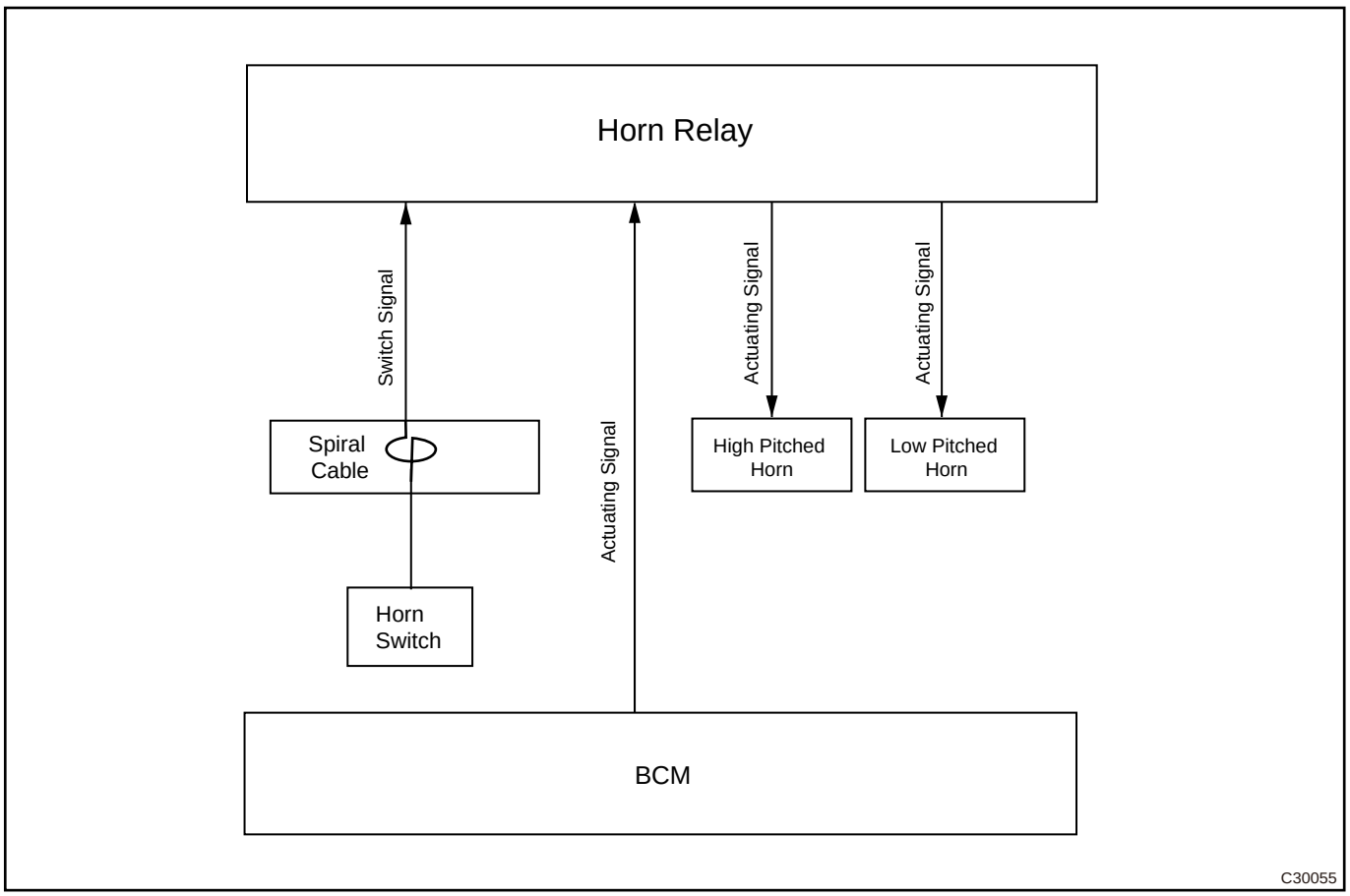
- Horn: High pitched horn is installed in groove of front bumper crossmember left mounting plate, and low pitched horn is installed in groove of front bumper crossmember right mounting plate.
- Horn switch: Horn switch is installed on steering wheel.
- Horn fuse: Horn fuse is located in engine compartment fuse and relay box.
- Horn relay: Horn relay is located in engine compartment fuse and relay box.

2.2 System Components Diagram



1	Horn Switch	2	Engine Compartment Fuse and Relay Box
3	High Pitched Horn	4	Low Pitched Horn

2.3 System Schematic Diagram



- By pressing the horn switch, the horn relay contacts are engaged, and the high and low pitched horns start to work.
- When the vehicle is locked, BCM feedbacks when fortifying mode is entered: Drive high and low pitched horns.

3 DIAGNOSIS & TEST

3.1 Problem Symptoms Table

⚠ Caution
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Current Status	Possible Cause
Low pitched horn does not sound	Low pitched horn (damaged)
	Wire harness (open)
	Connector (loose)
High pitched horn does not sound	High pitched horn (damaged)
	Wire harness (open)
	Connector (loose)
Horn does not sound	Horn fuse (blown)

Current Status	Possible Cause
	Horn relay
	Horn switch (damaged)
	Spiral cable (damaged)
	Wire harness (short or open)

3.2 Horn System Inspection

■ **Press and release the horn button**

Measure	Normal Result	Abnormal Result
Press and release the horn button	Horn sounds when horn button is pressed. Horn stops sounding when horn button is released.	Horn does not sound; Horn sounds abnormally

■ **Horn does not sound or sounds abnormally**

Malfunction Symptom	Inspection Method
Horn sounds hoarsely	Check the battery or power supply circuit
Only high pitched horn or low pitched horn sounds	Check and repair wire harness of horn that does not sound or replace horn
Both high pitched and low pitched horns do not sound	Check horn fuse or relay box
Button horn sounds, but wireless door locking does not sound	Check if the audio is set as if “horn alerts when it is fortified”. If the setting is correct and the fault exists, check and repair BCM and line
Horn does not sound when pressing button, and sounds when locking vehicle with remote controller	Check and repair horn button and its circuit

3.3 Troubleshooting for Abnormal Horn Sound

(1) If horn sound is obviously abnormal, perform the following routine inspection:

1) Check terminals for poor contact; repair any poor contact problem;
2) Check ground circuit; if there is poor contact, repair it;
3) Make sure horn assembly fixing bolt is properly fastened;
4) Make sure there is no contact between horn assembly and any other objects; if contact occurs, determine the correct position of other objects again, bend the horn assembly bracket if necessary, and operate horn to determine if the situation still exists.

(2) If the situation is still obvious, perform the following specific inspection:

1) Determine the type of sound produced by horn;
   - Grave.
   - Sharp.
2) If it is obviously grave, it indicates that the current is too high and the horn assembly must be replaced;
3) If it is obviously sharp, foreign matters may attach to horn, remove horn assembly and check for foreign matters;
4) Remove any attached foreign matters and reinstall the horn assembly.

CAUTION
If no foreign matter is found, or if the foreign matter cannot be removed, replace horn assembly.

3.4 Diagnostic Help

(1) Connect diagnostic tester X-431 PAD (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.

(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.

(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.

(4) Only use a digital multimeter to measure voltage of electronic system.

(5) Refer to any Technical Bulletin that may apply to this malfunction.

(6) Visually check related wire harness and connector.

(7) Check and clean all CD system grounds related to the latest DTCs.

(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

3.5 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

3.6 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

3.7 Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B103711	Horn External Relay Circuit Failure (LSD)	When output is off and ignition switch is OFF, output voltage is more than 7 V, and it is stored as current fault. (The error is less than 10%, the time of duration is more than 100 MS, the software will detect once every 10MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, load will be output as long as operating conditions of load are met.)	Relay or wire harness fault	1. Check wire harness connector; 2. Relay; 3. Check BCM.
B103712	Horn External Relay circuit Failure (LSD) Overload	Output current is more than 5A (The time of duration is more than 100 MS, the software will detect once every 20MS, and it will be determined after at least 3 consecutive times of detection. The detection will start after 2 seconds since power supply is turned on. Regardless of key position, turn signal light will output as long as operating conditions of turn signal light are met.) Store current DTC.		

3.8 DTC Diagnosis Procedure

■ **Controller Fault**

DTC	**B1037-11**	**Horn External Relay Circuit Failure (LSD)**
DTC	**B1037-12**	**Horn External Relay Circuit Failure (LSD) Overload**

■ **DTC Confirmation Procedure**

Confirm that battery voltage is not less than 12 V before performing the following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check horn relay (ERLY12) and fuse EF07 (15A)**

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Disconnect the negative battery cable.
(c) Remove horn relay and fuse, test horn relay for damage.

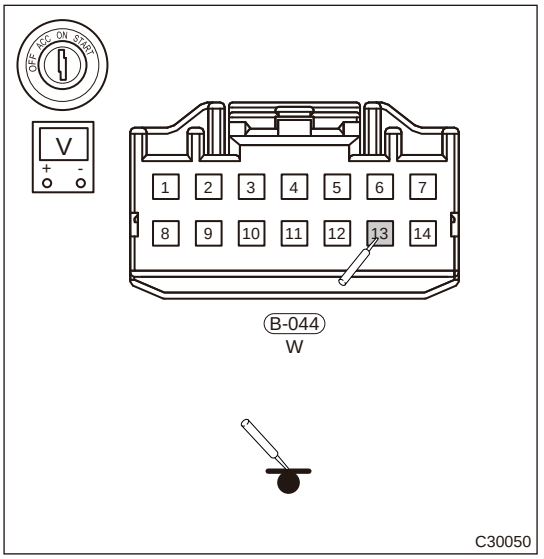
NG → **Replace relay or fuse**

OK →

2	Check power supply voltage of horn relay

(a) Turn off all electrical equipment and ENGINE START STOP switch.
(b) Using a digital multimeter, check if voltage between connector terminal B-044 (13) and ground is normal according to table below.

Multimeter Connection	Specified Condition
B-044 (13) to ground	Not less than 12 V



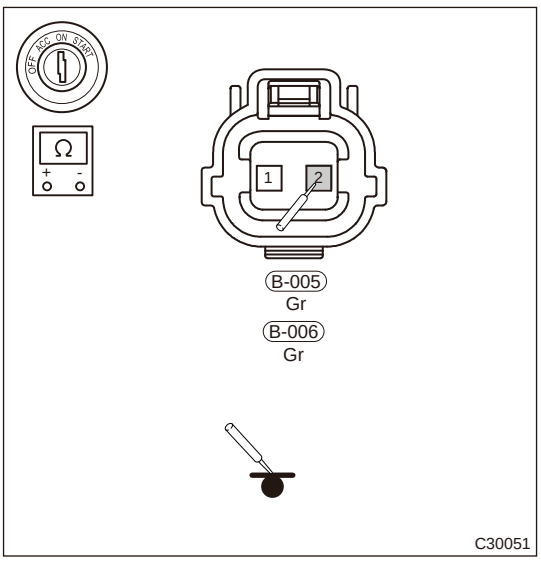
NG → **Repair or replace related wire harness**

OK →

3	Check horn wire harness

(a) Using a digital multimeter, measure resistance between high/low pitched horn connectors B-006 and B-005 and ground to check for an open circuit according to table below.

Multimeter Connection	Condition	Specified Condition
B-006 (2) to ground point GB-014	Always	⩽ 1 Ω
B-005 (2) to ground point GB-014	Always	⩽ 1 Ω



NG → **Repair or replace related wire harness**

OK

4	Reconfirm DTCs

(a) Use diagnostic tester to clear DTCs.
(b) Start the engine.
(c) Check if the same DTCs are still output.

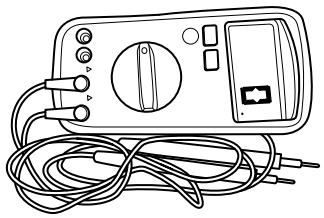
NG → **Replace BCM module.**

OK → **System operates normally.**

4 ON-VEHICLE SERVICE

4.1 Tools

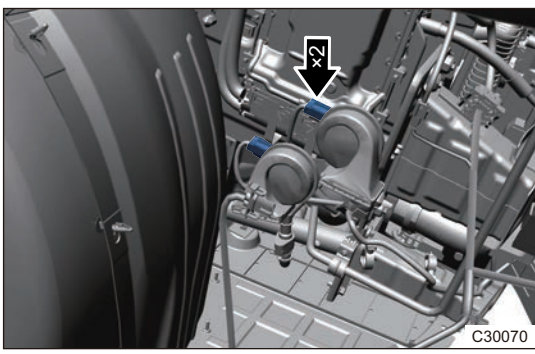
■ General Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002

4.2 Replacement of Dual Pitched Horn

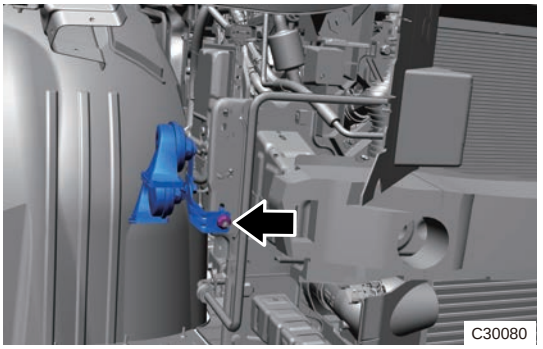
■ Removal

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front bumper assembly.
(4) Disconnect the low pitched horn and high pitched horn wire harness connectors.



C30070

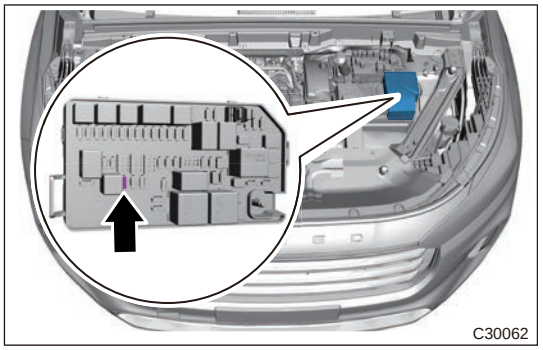
(5) Remove fixing bolt from dual pitched horn bracket.



■ Inspection

(1) Check the horn fuse.

1) Identify the horn fuse in engine compartment fuse and relay box.
2) Check the horn fuse.
3) Using a fuse puller, remove the horn fuse EF07 (15A).
4) Check if fuse is blown. Replace fuse if it is blown.

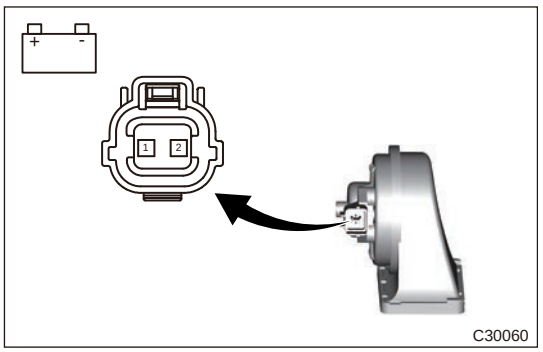


CAUTION
Use a fuse with the same specification as original fuse to avoid affecting the normal use of electrical equipment.

(2) Check the high pitched horn.

Apply battery voltage to high pitched horn and check operation of high pitched horn.

Measurement Condition	Condition	Specified Condition
Battery positive (+) → Terminal 1	Always	Horn sounds
Battery negative (-) - Terminal 2		

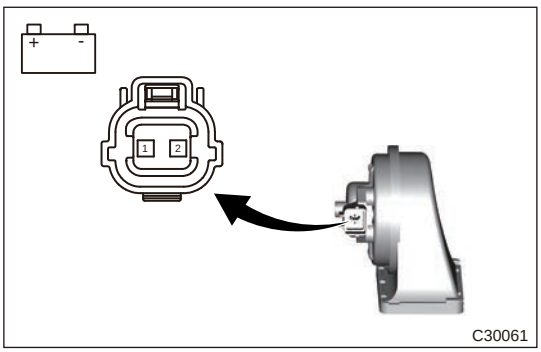


If result is not as specified, replace horn.

(3) Check the low pitched horn.

Apply battery voltage to low pitched horn and check operation of low pitched horn.

Measurement Condition	Condition	Specified Condition
Battery positive (+) → Terminal 1	Always	Horn sounds
Battery negative (-) - Terminal 2		



If result is not as specified, replace horn.

■ Installation

(1) Install the dual pitched horn bracket fixing nut.

Installation torque: 20 ± 2 N•m

(2) Connect the dual pitched horn wire harness connector.

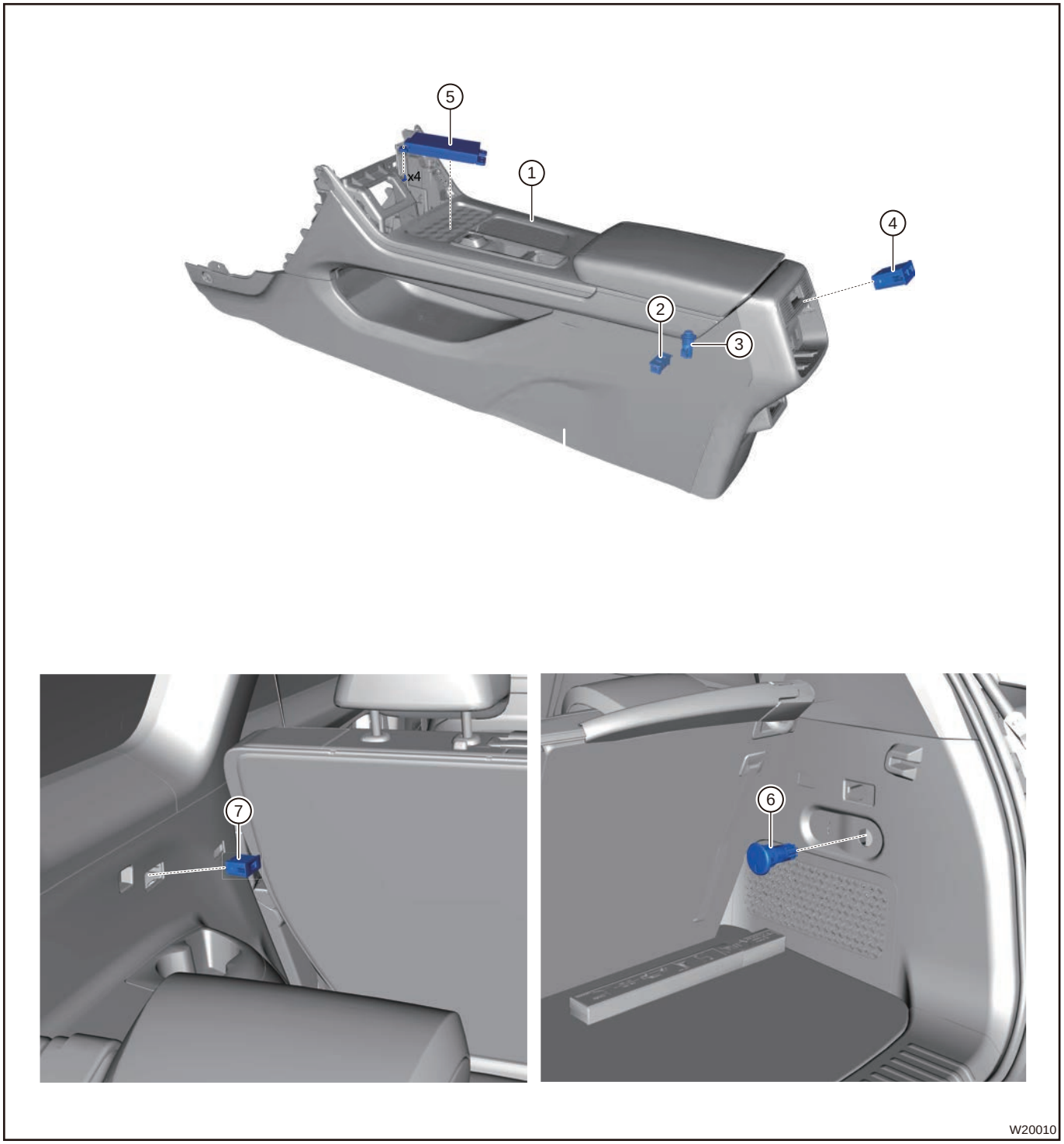
(3) Install the front bumper assembly.

(4) Connect and tighten negative battery cable.
(5) Turn the ENGINE START STOP switch to ON and conduct test.

11.18 Body Control System

1 System Overview

1.1 System Components Diagram



BCM is installed under instrument panel on driver side. Body control module is called BCM for short which integrates most of vehicle electrical appliances, and it is an important part of the body electrical system.

1.2 Component Operation Description

■ Function Description

- Tire pressure function (if equipped): Tire pressure monitoring system is an active safety device, which can monitor tire pressure and temperature in real time and display tire pressure and temperature on meter. When tire pressure is too low or temperature is too high, tire pressure monitoring system will warn the driver of driving danger.
- Window jam protection function (if equipped): When window auto up or remote one-button window up function is operated, if a passenger is jammed by automatically rising window due to carelessness, the jam protection control module controls glass regulator motor to operate in reverse before motor reaches the set jam protection force, so that window glass lowers a certain distance, thus preventing passenger from being jammed.
- The main functions are as follows: Defrost, turn signal light, lane change, hazard warning light, position light, park light, low beam light, follow me home, car location, automatic lighting, high beam light, flash function, rear fog light control, daytime running light, battery save, dome light, rear dome light, rear view mirror foot light, window, PEPS start button backlight control, anti-theft management, luggage compartment door opening management (with PLG), door status, central lock, front wiper control, front washer control, rear wiper control, rear washer control, back-up light control, key status position signal, sudden braking hazard warning light double flashing alarm function, assist steering illumination, brake light control, rear view mirror folding, DVD settings, remote control function, LIN ambient light.

1.3 Defrost Function

(1) When IGN ON and engine is started (including the state that engine automatically turns off when idle start and stop system operates), defrost signal is activated.

(2) When defroster is operating: Defroster stops after 20 minutes are elapsed.

(3) When defroster is operating: Defroster stops when defroster signal is activated again.

(4) When defroster is operating: Defroster stops when key is switched from IGN ON to ACC or OFF.

(5) When defroster is operating: After the operation time reaches to 20 min ± 5 s, defroster stops.

(6) When defroster is operating: Defroster function pauses when engine cranks while it resumes after engine has started.

CAUTION
Under normal temperature (3℃ ~ 5℃), when battery power is less than 35% (open circuit voltage of battery is about 12.22 V), defroster function will be disabled and unavailable; after battery power is greater than 37.5%, defroster function will be available again.

1.4 Turn Signal Light Function

(1) With hazard warning light not activated, if hazard warning light switch is pressed, BCM should light up turn signal lights on both sides at the same time in a cycle of 960 ms;

(2) When ignition switch state is in KL15, KL15+ or KL50 and BCM receives a valid CAN signal during emergency braking, BCM should light up turn signal lights on both sides in a cycle of 240 ms;

(3) When BCM receives a valid CAN network collision signal, BCM should light up turn signal lights on both sides in a cycle of 960 ms.

1.5 Hazard Warning Light Function

(1) With hazard warning light not activated, if hazard warning light switch is pressed, BCM should light up turn signal lights on both sides at the same time in a cycle of 960 ms;

(2) When ignition switch state is in KL15, KL15+ or KL50 and BCM receives a valid CAN signal during emergency braking, BCM should light up turn signal lights on both sides in a cycle of 240 ms;

(3) When BCM receives a valid CAN network collision signal, BCM should light up turn signal lights on both sides in a cycle of 960 ms.

1.6 Position Light

(1) Activation conditions for position light: Power supply is in IGN ON, ACC, START position; position light input or low beam light input is activated.

(2) When position light is operating: BCM should send CAN signal.

(3) When position light is operating: When position light input and low beam input are deactivated, position light stops operating.

(4) When position light comes on, if ignition key is turned to OFF position, position light will turn off after 30 minutes. If any state of four doors and back door changes or an unlock/lock signal is received within 30 minutes, the timing will restart.

1.7 Low Beam Light

(1) Activation conditions for low beam light: IGN ON, low beam light switch is activated.

(2) When low beam light is activated: BCM sends CAN signal.

(3) When low beam light is activated: When low beam light switch input is canceled, low beam light turns off immediately.

(4) When low beam light is activated: When key is turned from IGN ON to ACC or OFF, low beam light turns off immediately.

1.8 Follow Me Home

- Within 1 minute after ENGINE START STOP switch is switched to OFF mode, operate combination light switch to steering wheel side or away from steering wheel side and release, follow me home function is activated, and low beam and position light will come on for 30 seconds; Operate follow me home function again before the setting time is reached, the follow me home function will be turned off; Follow me home function will automatically turn off, and low beam and position light will go off immediately after the setting time is reached.
- When ENGINE START STOP switch is switched to ACC/ON mode, follow me home function will automatically turn off, and low beam and position light will go off immediately.
- User can set delay on/off for headlight in head unit system and turn on follow me home function and set the time for light to automatically turn on; within 1 minute after ENGINE START STOP switch is switched to OFF mode, follow me home function can be turned on and off any number of times.

1.9 Car Locating

- After the vehicle is locked, operate remote control lock button twice within 2 seconds to activate intelligent car locating function, low beam light and position light will automatically turn on for 30 seconds, turn signal light will flash three times and horn will sound three times. When car locating function is activated, if accompanying horn sound prompt can be set in head unit.

1.10 Automatic Lighting

(1) Activation conditions for automatic light: IGN is in ON position; light switch is turned to AUTO, LIN valid signal sent from rain sensor is received.

(2) After automatic lighting is activated, BCM sends low beam light and position light CAN signal to the instrument cluster.

(3) Low beam lights turn off if any condition is met.

- IGN switch is not in ON position.
- Light switch is switched from AUTO.
- Rain sensor LIN signal is invalid.

(4) When automatic light function is activated and deactivated, position light and low beam light turn on and off at the same time.

1.11 High Beam Light

(1) Operating conditions for high beam light: IGN ON; low beam light is in activated status, and high beam light switch is activated.

(2) When high beam light is operating: High beam light turns on and sends CAN signal.

(3) When low beam light is operating: When engine starts, high beam light temporarily stops operating but CAN data will be sent continuously and resume operation after engine starts.

(4) When high beam light is operating: When high beam light switch is deactivated, high beam light turns off.

(5) When high beam light is operating: When low beam light switch is deactivated, high beam light turns off.

(6) When high beam light is operating: When key is turned from IGN ON to ACC or OFF, high beam light turns off.

1.12 Flash Function

(1) Flash operating conditions: It can be activated at any power supply position (except starting process).

(2) When Flash is operating: High beam lights turn on and send CAN signal.

(3) When Flash is operating: When engine starts, high beam lights temporarily stop operating but CAN data will be sent continuously and resume operation after engine starts.

(4) When Flash is operating: When Flash switch is deactivated, high beam light turns off.

1.13 Front Fog Light Control

(1) Operating conditions for front fog light: With IGN-ON, position light or low beam light turned on, front fog light switch is activated.

(2) When front fog light is operating: Front fog lights turn on and sends CAN signal.

(3) When front fog light is operating: When front fog light switch is activated again, front fog light turns off.

(4) When front fog light is operating: When key is switched from IGN ON to ACC or OFF, front fog light turns off.

(5) When front fog light is operating: When position light and low beam light are turned off, front fog light turns off.

1.14 Rear Fog Light Control

(1) Operating conditions for rear fog light: With IGN ON, front fog light or low beam light or high beam light turned on, rear fog light switch is activated.

(2) When rear fog light is operating: Rear fog light turns on and sends CAN signal.

(3) When rear fog light is operating: When rear fog light switch is activated again, rear fog light turns off.

(4) When rear fog light is operating: When key is switched from IGN ON to ACC or OFF, rear fog light turns off.

(5) When rear fog light is operating: When front fog light is turned off (if front fog light is equipped) or low beam light is turned off (if front fog light is not equipped), rear fog light turns off.

1.15 Daytime Running Light

(1) Operating conditions for daytime running light: Engine is started, position light is not activated;

(2) When daytime running light is operating: When engine is stopped, daytime running light function turns off.

(3) When daytime running light is operating: Position light or hazard warning light is activated, causing daytime running light to be turned off. When turn signal light is activated, daytime running light on the illuminated side of turn signal light turns off.

(4) When daytime running light is operating: Flash function does not affect daytime running light operation.

1.16 Dome Light

(1) Dome light ON mode

- If corresponding map light switch is in OFF state and the current mode switch is in ON state, front map light will be in dome light ON mode; if corresponding mode switch is in AUTO mode, rear map light will also be in dome light ON mode.

(2) Dome light OFF mode

- If corresponding mode switch is in OFF state, the corresponding map mode switch will be in OFF mode, and rear map light will be in dome light OFF mode.
- If the corresponding mode switch is in OFF state, front map light will be in dome light OFF mode when the current mode switch is in OFF mode; if corresponding mode switch is in AUTO mode, rear map light will also be in dome light OFF mode.

(3) Door opening AUTO mode

- If the corresponding map light switch is in OFF state, front map light will be in AUTO mode when the current mode switch is in AUTO mode. If the corresponding mode switch is in AUTO mode, rear map light will also be in AUTO mode.

1.17 Luggage Compartment Light

(1) Operating conditions for luggage compartment light: When luggage compartment door is opened, luggage compartment light continuously turns on.

(2) When luggage compartment light is operating: When luggage compartment door is closed, luggage compartment light turns off immediately.

1.18 Rear View Mirror Foot Light

(1) Unlocking operation triggering foot light function

- Condition: Complete a unlocking operation successfully in OFF position (including remote control unlocking, mechanical key unlocking, touch door handle switch unlocking and induction unlocking); Operation after the rear view mirror is unfolded in night mode: Foot light comes on for 25 seconds immediately after unlocking operation is performed (if rear view mirror is in folded state currently, a delay of 2 seconds will be required, the light comes on after rear view mirror unfolds; If the rear view mirror is in unfolded state currently, the light comes on immediately); after 25 seconds, if timeout occurs or locking operation is performed or if ignition switch is switched to any position other than OFF, foot light will be turned off immediately.

(2) Courtesy light triggering foot light function

- Condition: Courtesy light comes on in OFF position; Operation after the rear view mirror is unfolded in night mode: Foot light comes on for 25 seconds immediately after unlocking operation is performed (if rear view mirror is in folded state currently, a delay of 2 seconds will be required, the light comes on after rear view mirror unfolds; If the rear view mirror is in unfolded state currently, the light comes on immediately); after 25 seconds, if timeout occurs or courtesy light is turned off or if ignition switch is switched to any position other than OFF, foot light will be turned off immediately.

(3) Door opening triggering foot light function

- Conditions: Operation with vehicle in deactivation mode, any one of four side doors open and rear view mirror in unfolded state: Foot light comes on for 10 minutes immediately after unlocking operation is performed (if rear view mirror is in folded state currently, the light will not come on); After 10 minutes, if timeout occurs or if ignition switch is switched to any position other than OFF, foot light will be turned off immediately; If the four side doors are closed, foot light will be turned off after a delay of 25 seconds.

CAUTION
During lighting up of foot light, if other operating conditions are met, foot light will start timing again according to the new operating condition.

1.19 Window

(1) Activation condition for window: Within 1 minute after turning to IGN ON, ACC or OFF and both front doors are not opened, window switch is activated.

(2) Window switch has 4 states:

- Manual UP: When switch is in this position, window is moving up. When switch leaves this position, window stops.
- Manual DOWN: When switch is in this position, window is moving down. When switch leaves this position, window stops.
- Auto UP: When switch is in this position, window is moving up automatically until it stops due to block or position changed.
- Auto DOWN: When switch is in this position, window is moving down automatically until it stops due to block or position changed.

(3) When window is operated under auto mode: Press corresponding window up or down switch again to stop the operation.

(4) When window is operated under auto mode: For example, after 1 minutes which described in point 1, the operating window stops after finishing this operation.

(5) When window is operated under manual mode: For example, after 1 minutes which described in point 1, the operating window stops immediately.

(6) Within 1 minutes when key is turned to OFF: If front left door opens, window function is disabled.

(7) When window disable switch is activated: Input of passenger side will be disabled; The automatically operating window operated by passenger side switch will stop after this window operation is completed, and the manual mode window operation operated by passenger side switch will stop immediately. When window disable switch is deactivated, passenger side input is disabled to cancel and window disabled indicator goes off.

(8) With key in OFF: When front left door is opened, window switch input will be invalid (it is still invalid when front door is opened and then closed); With front door open, the automatically operating window will stop after this window operation is completed, and the manual mode window operation will stop immediately.

(9) When engine starts, the automatically operating window will stop immediately, and it automatically resumes the operation after starting. The window operation in manual mode will stop when starting, and it cannot resume after engine is started.

1.20 Anti-theft Management

(1) Fortifying mode

1) Trigger conditions:

- IGN is in OFF (it is not in IGN ON or ACC)
- Four doors & two covers are closed;
- BCM receives remote control lock command.

2) BCM feedback when fortifying mode is entered:

- Turn signal light flashes once and sends corresponding CAN signal;
- Anti-theft indicator flashes;
- Actuate the anti-theft horn to sound.

(2) Fortifying failure mode

1) Trigger conditions:

- IGN OFF;
- Any of four doors & two covers is open;
- BCM receives remote control lock command.

2) When entering fortifying failure mode:

- If four doors are closed and any of the two covers is open, BCM will perform lock once, while turn signal light flashes three times and horn sounds three times;
- If any door other than front left door is not closed, BCM will perform central control lock operation, turn signal light will not flash, and horn will not sound;
- If front left door is not closed, BCM will do not perform central control lock, turn signal light will not flash, and horn will not sound.

(3) Intrusion mode

1) Trigger conditions: BCM will enter to alarm status after the following conditions are met when the vehicle is in fortifying mode:

- Doors or engine hood is opened;
- Key is turned to IGN ON;
- Luggage compartment is opened forcibly.

2) After entering to intrusion mode, BCM feedback the conditions within one alarm cycle (300 s):

- After anti-theft alarm is triggered, horn will sound for 30 seconds within one alarm cycle; Turn signal light will flash for 300 seconds; Anti-theft indicator will not flash.

3) All doors, engine hood, luggage compartment and IGN ON illegal activation action are alarm trigger sources:

- 10 alarm cycles can be triggered at most;
- Once triggered, no matter whether trigger source disappears or not, an alarm cycle will be completed; If the alarm is triggered again, it will re-enter the alarm state; After the alarm cycle ends, BCM is still in fortifying mode.

(4) Fortifying deactivation mode

- Activation conditions: Vehicle is in alarm mode; BCM receives RF unlock command or signal is detected within 1 second after key is turned to IGN ON;

- When alarm is released: Vehicle exits anti-theft function mode; anti-theft horn (high and low pitched horns (if equipped)) stops working, and the turn signal light stops flashing;
- After alarm is released: Anti-theft indicator turns off.

(5) Re-fortifying mode

1) Trigger conditions:
   - Vehicle is in fortifying mode;
   - BCM receives remote control unlock command.
2) BCM feedbacks when fortifying mode is released.
   - Theft deterrent indicator turns off immediately;
   - Turn signal light flashes twice and sends corresponding signal.
3) Within 30 ± 2 seconds after fortifying mode is released:
   - If any of all doors, engine hood or luggage compartment are open, BCM exits anti-theft mode;
   - If all four doors & two covers are always closed, BCM will lock automatically and enter the fortifying state after 30 seconds, and anti-theft indicator will flash.

(6) Luggage compartment opening mode

1) Trigger conditions:
   - Vehicle is in fortifying mode;
   - BCM receives the remote control open command of luggage compartment.
2) BCM feedback when luggage compartment opening mode is triggered:
   - Turn signal light illuminates and sends the corresponding signals;
   - Luggage compartment is open and no alarm is triggered.
3) Then close the luggage compartment, vehicle returns to the fortifying state, the luggage compartment switch cannot open luggage compartment.
4) After using remote control to open the luggage compartment: After BCM receives remote control lock command, vehicle will immediately lock and return to fortifying state, but the turn signal light prompts fortifying failure.
5) After using remote control to open the luggage compartment and close it again: After BCM receives remote control lock command, vehicle will immediately lock and return to fortifying state, but the turn signal light prompts fortifying successfully. If there is no registered key after the luggage compartment closed, the switch will not open the luggage compartment.

1.21 Luggage Compartment Opening Management

(1) When the vehicle is in fortifying deactivation mode:

1) When the luggage compartment switch is activated, the luggage compartment opens/closes, and turn signal light flashes.
2) During the process of opening / closing back door, press remote control briefly to stop the current action of back door.

(2) When the vehicle is in fortifying mode:

1) Luggage compartment is open/closed.
   - IGN OFF/ACC position;
   - BCM receives remote control luggage compartment command, turn signal light flashes.
2) During the process of opening / closing back door, press remote control briefly to stop the current action of back door.
3) After back door is closed, the vehicle returns to fortifying state.

1.22 Door, Hood and Luggage Compartment Door Status

(1) BCM sends CAN signal to open/close front left door.
(2) BCM sends CAN signal to open/close front right door.
(3) BCM sends CAN signal to open/close rear left door.
(4) BCM sends CAN signal to open/close rear right door.
(5) BCM sends CAN signal to open/close engine hood.

(6) BCM sends CAN signal to open/close luggage compartment.

1.23 Central Control Lock

(1) Central control lock activation conditions:

- Close all four doors;
- Vehicle is not in anti-theft state;
- Central control lock locked switch is activated.

(2) Central control unlock activation conditions:

- Central control lock unlocked switch is activated;
- Vehicle is not in anti-theft state.

(3) Mechanical lock locked/unlocked activation conditions:

- Activation conditions for mechanical central control unlock: Power supply is in OFF, ACC or ON;
- Activation conditions for mechanical central control lock: Power supply is in OFF or ACC;

(4) Activation conditions for auto unlock (if equipped):

- Vehicle speed is 0 km/h;
- Door lock is locked;
- Key is switched to OFF from other positions.

CAUTION
The bench testing needs to ensure that there is no speed signal after IGN is turned off.

(5) Collision unlock:

- After BCM receives CAN signal with IGN ON: BCM performs central control unlock twice and the interval time is 3 seconds (regardless of the door state); lock operation is prohibited; When key is turned to OFF and then back to ACC/ON, or any door status changes from open to closed, BCM receives unlock or lock signal twice within 240 ms, and the second time will be ignored.

CAUTION
– **BCM receives unlock or lock command twice within 3 seconds and the second time will be ignored.** • **BCM is powered on again after powered off, BCM has no lock or unlock action.** • **For remote control lock and unlock function, please refer to lock and unlock contents in anti-theft management.**

1.24 Front Wiper Control

(1) Low speed wiper mode (Note: Wiper switch)

- Activation conditions: IGN ON, low speed range switch of the wiper is activated;
- When low speed wiper is operating: When wiper switch is switched to other operation mode, the wiper will work in other modes immediately;
- When wiper switch is switched to OFF from low speed range, the wiper will operate at low speed automatically until it returns to wiper stop position (whether it is IGN ON or not).

(2) High speed wiper mode

- Activation conditions: IGN ON, high speed range switch of the wiper is activated;
- When high speed wiper is operating: When wiper switch is switched to other operation mode, the wiper will work in other modes immediately;
- When wiper switch is switched to OFF from high speed range, the wiper will operate at low speed automatically until it returns to wiper stop position (whether it is IGN ON or not).

(3) Intermittent wiper mode (without rain sensor)

1) Activation conditions: IGN ON, wiper intermittent/automatic switch is activated.
2) Wiper sensitivity switch is used to select 4 gear positions: Intermittent time corresponding to each sensitivity switch of the wiper is related to the vehicle speed. The higher the vehicle speed, the

shorter the intermittent time. When vehicle speed is less than 5 km/h, the intermittent time is: 24s, 15s, 8s, 3s.

3) When the intermittent wiper activation status switches intermittent time to other gear positions, the operation status of wiper is as below:

When new time interval is shorter than the original one:

- If wiper is in pause status, wiper will operate at new interval at once;
- If wiper is in moving status, wiper will operate at new interval since it is paused.

When new time interval is longer than the original one:

- If wiper is in pause status, wiper will start to operate at a new interval at once;
- If wiper is in moving status, wiper will operate at new interval since it is paused.

(4) Auto wiper (with rain sensor)

- With switch at AUTO position, BCM receives LIN signal sent from rain sensor, and drives wiper to operate;
- Once LIN signal S_AUTO_H is received, wiper operates at high speed;
- Once LIN signal S_AUTO_L is received, wiper operates at low speed;
- When LIN signal stops or ignition key is turned from ON, if wiper is not at stop position, wiper stops after operating to stop;
- Operation stops during ignition and restores when ignition is finished.

(5) Wiper service mode

- Within 30 seconds when ignition state is switched from IGN-ON to IGN-OFF, if ignition switch is valid, BCM drives front wiper to operate in low-speed mode for 700 ms and stop at the middle of the windshield for easy maintenance;
- With wiper in wiper maintenance position, if ignition state is switched to IGN-ON, wiper is activated, or ignition state is switched from OFF to ON again, BCM will drive wiper back to the initial position.

1.25 Front Washer Control

(1) Operating condition for front washer: IGN ON.

(2) Front washer operation will keep on outputting when front washer input is activated, the maximum output time is 12 seconds each time.

(3) The washer stops operating when starting, and resumes operating after starting.

(4) When front washer operation is over.

- When wiper switch is in OFF position, wiper will operate for 3 cycles at low speed, and it operates for 1 cycle again after 6 ± 0.2 seconds; If BCM receives new front washer operation requirements during 3 cycles and 6 seconds of this wiper, wiper will perform new operation;
- When front washer operation ends, if wiper is in intermittent, low speed, and high speed mode, wiper will wipe at low speed for 3 cycles, and then continue to maintain the previous operating mode.

1.26 Rear Wiper Control

(1) Activation conditions: IGN ON, rear wiper is activated.

(2) During rear wiper is operating, if rear wiper switch is turned to OFF and rear wiper is not in Stop position, rear wiper will continue to operate until it stops at stopping position.

(3) During rear wiper is operating, if ignition key is turned to ON and rear wiper is not in Stop position, rear wiper will continue to operate until it stops at stopping position.

(4) During rear wiper operation, the rear wiper when engine starts, and resumes operating after engine has started.

(5) When BCM judges front wiper is opened and reverse gear is input, rear wiper operates automatically at intermittent position. When either front wiper or reverse gear is closed, rear wiper stops operation.

1.27 Rear Washer Control

(1) Operating condition for rear washer: IGN ON.

(2) Rear washer operation will keep on outputting when rear washer input is activated, the maximum output time is 12 seconds each time.

(3) The rear washer stops operating when engine starts, and resumes operating after engine has started.

(4) When rear washer operation is finished:

- When wiper switch is in OFF position, wiper will operate for 3 cycles at low speed; If BCM receives new rear reset operation requirements during 3 cycles, wiper will perform new operation;
- When wiper is in sweeping mode, wiper will sweep in original condition and continue to keep original condition after washer switch is released.

1.28 Back-up Light Control

(1) If all of the following conditions are met, back-up light should be activated:

- Ignition state is kl15; or
- Shift input is activated.

(2) Shift input is activated.

- Ignition state is OFF;
- Reverse gear input is invalid.

1.29 Emergency Alarm Function

■ Emergency alarm function activated

(1) BCM should output a alarm request (REQ_PanicAlarm = Activation) through an internal signal, if all the following conditions are met:

- Emergency alarm function is not activated;
- Emergency alarm function is set to ON (Setting_Panicenable = Enable);
- Without DCM: Long press CDL switch lock button (HW_CDL_SW = lock) (press for more than CDL_LONG_PRESS_TIME), after receiving an alarm command, BCM should send an alarm immediately;
- In addition, once emergency alarm function is activated, BCM will output an alarm message via CAN signal (WarnMsg_BCM) for the message reminder on the IPC.

■ Emergency alarm function OFF

(1) When emergency alarm function is activated and the following conditions are met, BCM does not output an alarm request through internal signals:

- Emergency alarm function is set to OFF to receive RKE lock signal from CAN;
- Receive RKE unlock signal from CAN;
- Using DCM: Once CDL command signal—value of Lock ‖ is received;
- Using DCM: Once the CDL command signal with -UnLock ‖ is received;
- Without DCM: Press CDL switch to lock the button;
- Without DCM: Press CDL switch to unlock the button;
- In addition, once alarm function is invalid, BCM will output alarm message via CAN signal for the message reminder OFF on the IPC.

1.30 Brake Light Control

(1) When any of following conditions is met, turn on the brake light function:

- When brake switch is pressed, brake switch is a high level self-locking switch;
- CAN signal sent from EPB is received;
- CAN signal sent from ESC is received.

(2) When brake light function is turned on, left and right brake lights and high mounted stop light turn on at the same time.

(3) When all the above conditions are not met, left and right brake lights and high mounted stop light will turn off simultaneously.

1.31 Rear View Mirror Folding and Heating

■ Rear view mirror folding

(1) The switch is point contact type. Press the folding switch, the mirror is automatically folded, and press it again, the mirror is automatically unfolded.

(2) After power supply is cut off, BCM determines that rear view mirror is in folded state by default, and folding switch operation needs to be operated once to synchronize BCM memory state with the actual state.

(3) When the vehicle speed is greater than 15 km/h, the folding function is shielded and the unfolding function works.

(4) When engine starts, the unfolding/folding function is paused and the function resumes after engine has started.

■ **Rear view mirror heating**

(1) Rear view mirror heating

- Heating state of rear view mirror is the same as that of rear window;
- If rear window heater is activated, BCM should activate rear view mirror heating function at the same time;
- If rear window heating function is in OFF status, BCM should turn off rear view mirror heating function at the same.

(2) Automatic rear view mirror heating

Automatic heating function of OSM complies with the rain condition provided by RLS when front wiper switch is in the "automatic wiper" position. When rear view mirror is automatically heated, it will not be affected by rear window defroster switch command and OSM heating command.

If the following conditions are met, BCM should automatically activate rear view mirror heating function:

- Automatic rear view mirror heating function is set to ON;
- Ignition status is in ON;
- Engine status (KL15+) (EngineState = running);
- Front wiper switch is in "automatic wiper" position;
- While receiving front wiper operation signal, BCM outputs the following CAN signals: Automatic rear view mirror heating; rear view mirror automatically heats up through an alarm message.

HINT
The automatic rear view mirror heating is affected by engine start and stop function.

1.32 DVD Settings

(1) Fortifying prompt

- DVD is set to Light, turn signal light flashes once and horn does not sound when it is fortified;
- DVD is set to Horn, horn sounds and turn signal light does not flash when it is fortified;
- DVD setting is light and Horn that turn signal light flashes and horn sounds when it is fortified.

(2) Auto lock

- DVD is set to ON to turn on the auto lock function; DVD setting is OFF to turn off the auto lock function.

(3) Headlight delay

- DVD is set to On to turn on the headlight delay function; DVD is set to off to turn off the headlight delay function.

(4) Rear view mirror folding

- DVD is set to On to turn on the rear view mirror auto folding function; DVD is set to off to turn off the rear view mirror auto folding function.

1.33 Remote Control Function

(1) Remote fortifying mode

1) Trigger conditions:
   - IGN is in OFF (it is not in IGN ON or ACC)
   - Four doors & two covers are closed;
   - BCM receives remote fortifying command.
2) BCM feedback when fortifying mode is entered:
   - Turn signal light flashes once and sends corresponding signal;

(2) Remote fortifying deactivation mode

1) Trigger conditions:
   - IGN is in OFF (it is not in IGN ON or ACC)
   - Four doors & two covers are closed;
   - BCM receives remote fortifying command.
2) BCM feedback when remote fortifying deactivation mode is entered:
   - BCM performs fortifying deactivation operation, four doors and luggage compartment unlock and left/right turn signal lights flash twice.

(3) Remote open luggage compartment mode

1) Trigger conditions:
   - Key position is in OFF;
   - BCM receives remote open luggage compartment command.
2) BCM feedback when luggage compartment opening mode is triggered:
   - Turn signal light illuminates and sends the corresponding signals;
   - Meanwhile, trunk is opened and no alarm is triggered.

(4) Remote car location mode

1) Trigger conditions:
   - IGN-OFF/IGN-ACC;
   - BCM receives car location function command.
2) BCM feedback when remote fortifying deactivation mode is entered:
   - High and low pitched horns sound, left and right turn signal lights flash and low beam lights turn on.

(5) Remote start mode

1) Trigger conditions: BCM receives PEPS signal.
2) BCM feedback when remote start mode is entered.
   - Anti-theft alarm function caused by ON gear position is shielded, but caused by four doors, engine hood and luggage compartment is not shielded;
   - After BCM receives engine state signal, it will turn on position light and send signals.
3) Exit remote start mode: Turn the key to OFF position.
4) BCM feedback when remote start mode is exited:
   - BCM will not shield the anti-theft alarm caused by ON gear position;
   - BCM sends signals.

1.34 LIN Ambient Light

(1) Initial status

- When vehicle rolls from the line and powered on for the first time or vehicle battery is powered on again after disconnection, ambient light function default is on, and it turns on/off according to DVD setting.

(2) Ambient light turns on/off

1) When all the following conditions are met, BCM sends LIN signals (ambient light ON):
   - Position light output is in activated state;
   - DVD setting is ON.
2) Position light output is deactivated or DVD setting is OFF, ambient light turns off.

(3) Door control logic related to ambient light

1) When all the following conditions are met, BCM sends LIN signals (ambient light ON):
   - Position light output is deactivated;
   - Vehicle is in fortifying deactivation mode;
   - Any door is open;
   - DVD setting is ON.

2) Ambient light turns on for 3 minutes.

3) Close all vehicle doors within 3 minutes after ambient light is turned on, and ambient light is turned off after 8 seconds.

4) Open any other door within 3 minutes after ambient light comes on, and then count again for 3 minutes after last door is opened.

5) When the position light output is not activated, if any condition is met, BCM will immediately send LIN signal (ambient light turns off):

   - Vehicle enters fortifying mode successfully;
   - DVD setting is off.

(4) Ambient light color

1) After the vehicle is powered on first time after leaving production line or powered on after battery is disconnected and reconnected from vehicle, the related driving mode is OFF by default. And it turns on/off according to DVD setting.

2) When related driving mode is off: Ambient light default color is blue, and different colors can be selected according to DVD setting.

3) When related driving mode is on:

   - Ambient light is green under ECO mode;
   - Ambient light is red under sport mode;
   - Ambient light is blue under Normal mode.

(5) Ambient light brightness (musical rhythm)

1) Initial status

   - When vehicle rolls from the line and powered on for the first time or vehicle battery is powered on again after disconnection, musical rhythm mode default is off.

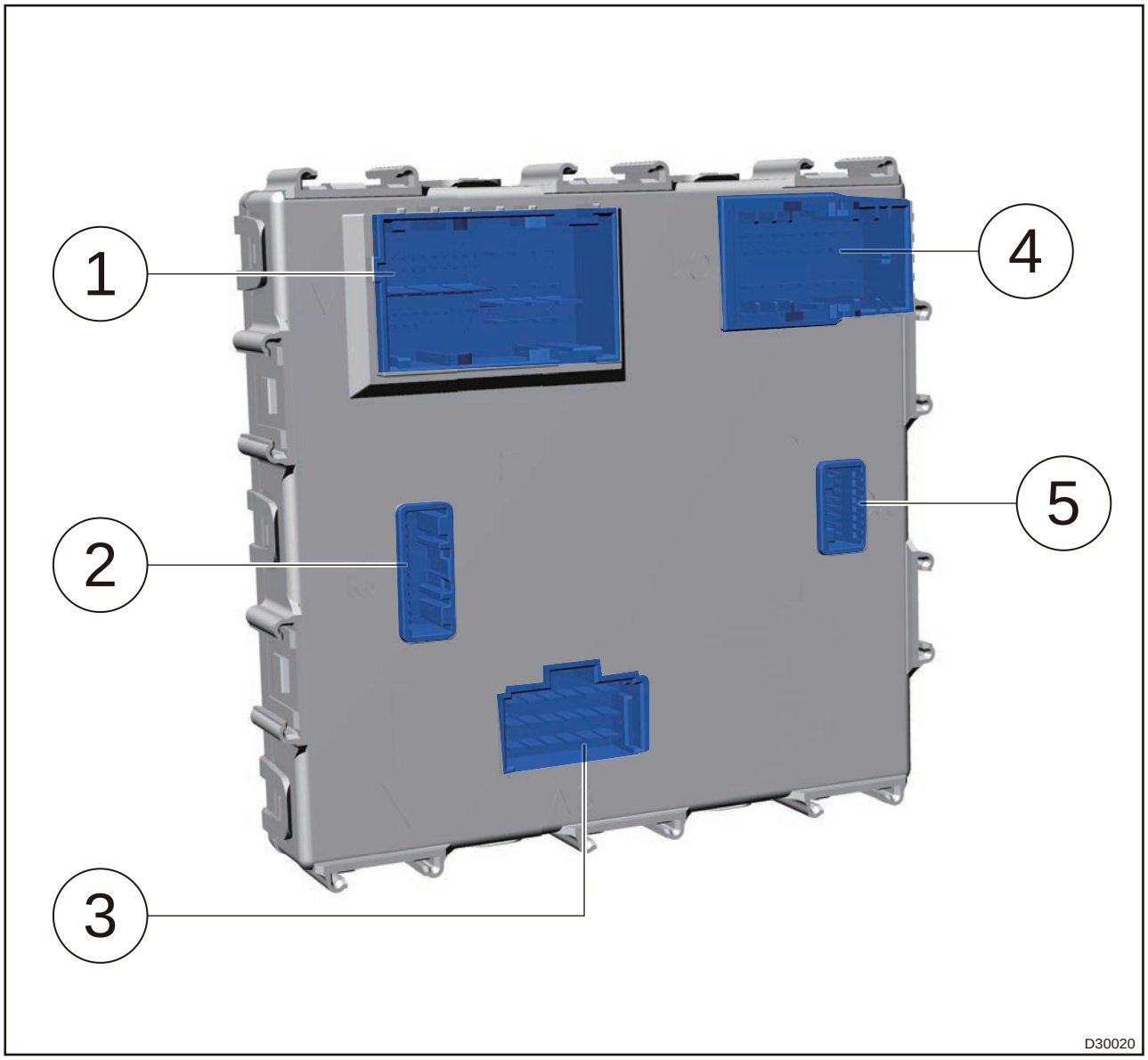
2) When musical rhythm mode is off: Ambient light brightness is Level 3, and different levels can be selected according to DVD setting.

3) When musical rhythm mode is on: According to different brightness level signals sent from IHU, it changes levels from zero with the musical rhythm.

2 DIAGNOSIS & TESTING

2.1 Terminal Definition

■ **Body control module terminal definition**



1	24 Pin Connector	4	12 Pin Connector
2	14 Pin Connector	5	20 Pin Connector
3	52 Pin Connector		

■ **24-Pin connector terminal definition**

PIN	Description	PIN	Description
1	ESS Indicator Output	13	Turn Signal Light Mode Selection Signal
2	HS-CAN_L	14	Hazard Warning Light Operation Indicator Input
3	-	15	HS-CAN_H

PIN	Description	PIN	Description
4	-	16	-
5	-	17	IGN-ON Signal Input
6	Coolant Level Input	18	-
7	ESS Switch Input	19	-
8	-	20	-
9	LDW Switch Input	21	-
10	Rear View Mirror Folding Input	22	-
11	Hazard Warning Light Input	23	-
12	-	24	Light Adjustment Input

■ **14-Pin connector terminal definition**

PIN	Description	PIN	Description
1	Power Supply 3	8	Rear Left Window Up Output
2	Power Supply 6	9	Rear Left Window Down Output
3	Ground 1	10	Power Supply 1
4	Ground 2	11	Front Right Window Up Output
5	Rear Right Window Down Output	12	Front Right Window Down Output
6	Rear Right Window Up Output	13	Front Left Window Up Output
7	Power Supply 2	14	Front Left Window Down Output

■ **52-Pin connector terminal definition**

PIN	Description	PIN	Description
01	-	27	Interior Light Control Ground Wire
02	-	28	Luggage Compartment Lock Motor
03	-	29	Rear Defroster Output
04	Anti-theft Indicator	30	High Speed Wiper Output
05	Front Left Steering Diagnosis	31	Position Light and Signal Light Output
06	Front Right Turn Diagnosis	32	-

PIN	Description	PIN	Description
07	Hard Wire Crash	33	Driver Side Front Right Window Regulator Switch
08	-	34	Driver Side Front Left Window Regulator Switch
09	-	35	Back Door Unlock Signal Input
10	Rear Left Door Open Signal	36	Passenger Side Window Regulator Disabled Switch
11	-	37	Front Right Door Open Signal
12	Rear Right Door Open Signal	38	-
13	Front Left Door Unlock Status Signal	39	Brake Switch Signal
14	-	40	Passenger Side Window Regulator Disabled Switch Operation Indicator Light
15	-	41	Rear View Mirror Defroster Output
16	LIN Signal (TDL + RSM)	42	Low Speed Wiper Output
17	Front Fog Light Output	43	Low Beam Light Output
18	High Beam Light Output	44	Horn Output
19	Driver Side Rear Right Window Regulator Switch	45	AGND
20	Passenger Side Front Right Window Regulator Switch	46	-
21	Passenger Side Rear Left Window Regulator Switch	47	Driver Side Rear Left Window Regulator Switch
22	Passenger Side Rear Right Window Regulator Switch	48	Back Door Open Signal
23	Front Left Door Open Signal	49	Central Control Lock Switch Input
24	Front Wiper Stop Signal	50	Central Control Unlock Switch Input
25	Position Light Feedback	51	-
26	Rear Wiper Stop Position Signal	52	Engine Hood Contact Switch

■ **12-Pin connector terminal definition**

PIN	Description	PIN	Description
01	-	07	Backlight Adjustment Output
02	Central Control Unlock Output	08	Back-up Light Output
03	Central Control Lock Output	9	Power Supply 5
04	Driver Unlock Output	10	Rear Wiper Output
05	Front Washer Output	11	-
06	-	12	Rear Washer Output

■ **20-Pin connector terminal definition**

PIN	Description	PIN	Description
01	-	11	High Mounted Stop Light Output
02	Rear View Mirror Unfolding Output	12	Red Ambient Light Output
03	Rear View Mirror Folding Output	13	Blue Ambient Light Output
04	Left Turn Signal Light Output	14	Left Daytime Running Light Output
05	Right Turn Signal Light Output	15	Right Daytime Running Light Output
06	-	16	Battery Save Output
07	-	17	Rear Fog Light Output
08	Stop Light Output	18	Left Steering Auxiliary Lighting
09	Foot Light Output	19	Right Steering Auxiliary Lighting
10	Luggage Compartment Light Output	20	Power Supply 4

2.2 Problem Symptoms Table

Symptom	Probable Cause and Recommended Countermeasures
Remote controller failure or distance of remote control is close	(For PEPS model, remote controller failure has nothing to do with BCM. BCM cannot be replaced) • Battery voltage of remote controller is low - Replace the battery. (Voltage of new replaced battery should be more than 2.9 V), it needs to rematch • Metallic films are attached to windows, which causes signal to be shielded and vehicle is malfunctioning without any reason. Peel off the metallic films to solve the problem. • There is electromagnetic interference. Perform the test at another place. • If remote controller is damaged, replace and rematch it.
Rear defroster does not operate	Refer to operation principle (control logic). Check the input and output signal. For diagnosis, please refer to “Perform Diagnosis According to Symptoms”
Turn signal light does not come on	
Small light does not come on	
High beam light does not come on	
Fog light does not come on	
Daytime running light does not come on	
Glass cannot raise up and down	
Door lock cannot lock/unlock/luggage compartment cannot open	
Wiper washer dose not operate or operate abnormally	
Only horn alarms or only turn signal light flashes when it fortifies	It can be set on DVD/navigation interface, refer to On-vehicle Service section

2.3 Diagnostic Help

(1) Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
(2) Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
(3) If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
(4) Only use a digital multimeter to measure voltage of electronic system.
(5) Refer to any Technical Bulletin that may apply to this malfunction.
(6) Visually check related wire harness and connector.
(7) Check and clean all CD system grounds related to the latest DTCs.
(8) If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

2.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.

- If possible, try to duplicate the conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

2.5 Ground Inspection

Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect the control circuit. Check the ground points as follows:

(1) Remove ground bolt or nut.

(2) Check all contact surfaces for tarnish, dirt and rust, etc.

(3) Clean as necessary to ensure that contact is in good condition.

(4) Reinstall ground bolt or nut securely.

(5) Check if any additional accessories interfere with ground circuit.

(6) If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

2.6 Malfunction Diagnosis Repair Flow

CAUTION
When reading DTCs, some DTCs are not related to trouble symptom. And these functions are normal and not affect vehicle use, clear them.

(1) Check if DTC occurs again

- If malfunction does not occur, check and repair the suspected wire harness and electrical connector. Proceed to the next step if malfunction occurs again.

(2) Check for DTCs

- Perform reading to check whether there is any DTC. Proceed to the diagnostic procedures based on malfunction symptoms when there is no DTC. Proceed to the next step when DTC is found:

(3) Clear and read DTCs again

- Record DTCs and clear them. Perform test and read DTC again to check whether there is any DTC. Proceed to the diagnostic procedures based on malfunction symptoms when there is no DTC. Proceed to the next step when DTC related to malfunction symptom is found.

(4) Deal with the malfunction symptom according to DTC

(5) After inspection and repair, perform test again according to DTC strategy

- Check and repair it again if malfunction has not been solved.

(6) After malfunction has been solved, prevent the malfunction from reoccurring according to malfunction causes.

(7) Malfunction diagnosis ends.

2.7 Trouble Symptom Diagnosis

CAUTION
• **If a function of BCM is failed, but there is no DTC, perform diagnosis according to trouble symptom.** • **This diagnosis needs to combine with control logic (see Operation section). Check input/output signal of BCM for normal operation. If input/output is normal, there is a malfunction in BCM. Otherwise, check the input or output part.**

(1) Check if DTC occurs again

- If malfunction does not occur, check and repair the suspected wire harness and electrical connector. Proceed to the next step if malfunction occurs again.

(2) Check if power supply and ground of controller are normal

- If it is abnormal, repair the power supply and ground based on the electronic diagram. Proceed to the next step if it is normal.

(3) According to the control logic, read related data stream with diagnostic tester and check if it is normal

- If it is abnormal, repair the related input signals based on the circuit diagram. Proceed to the next step if it is normal.

(4) Perform operation test using diagnostic tester to see if there is any related operations performed by diagnostic tester.

- If it is normal, input part has no malfunction. Otherwise, proceed to the next step.

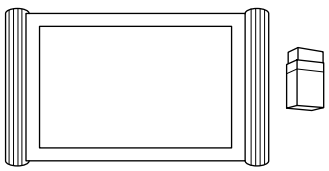
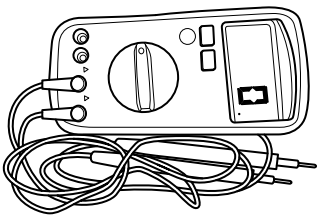
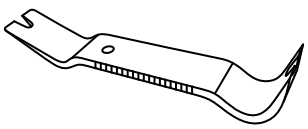
(5) Check if actuator is normal.

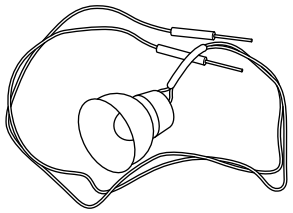
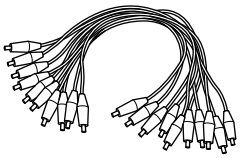
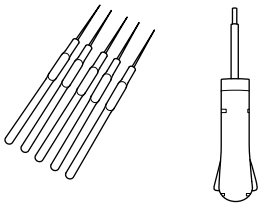
- If result is abnormal, check and repair actuator.

(6) If above diagnostic results are normal, replace BCM

3 ON-VEHICLE SERVICE

3.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006
Interior Crow Plate	 RCH002506

Tool Name	Tool Drawing
Bulb Test Light (21 W)	 RCH008706
Jumper Wire	 RCH008806
Wire Harness Terminal Tools	 RCH008906

3.2 Body Control Module

■ Removal

Hint:

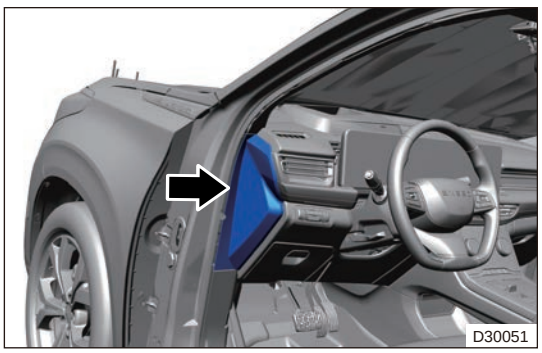
- Before replacing BCM, read configurations of the original software. After replacing it, write the original configuration codes.

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable

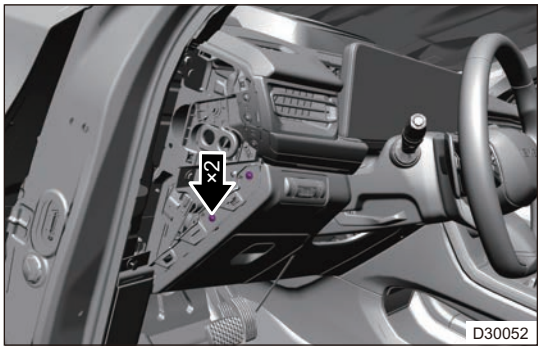
(3) Remove the body control module.

1) Remove the instrument panel left end panel assembly.



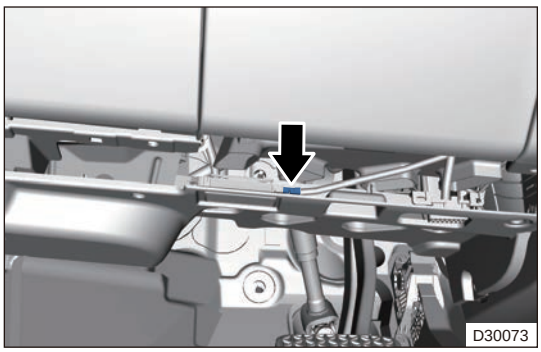
2) Remove 2 fixing screws from instrument panel lower left protector assembly.

Tightening torque
1.5 ± 0.5 N m



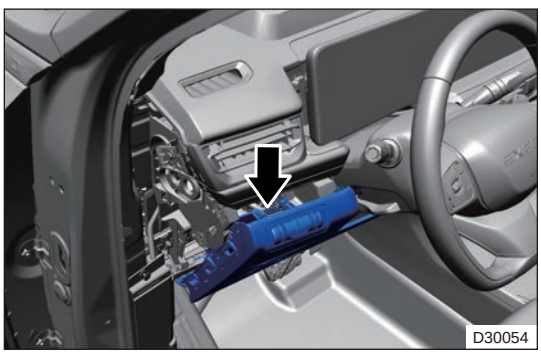
3) Remove the 5 plastic rivets from soundproof board on driver side.

4) Disconnect glove box light connector and remove soundproof board on driver side.

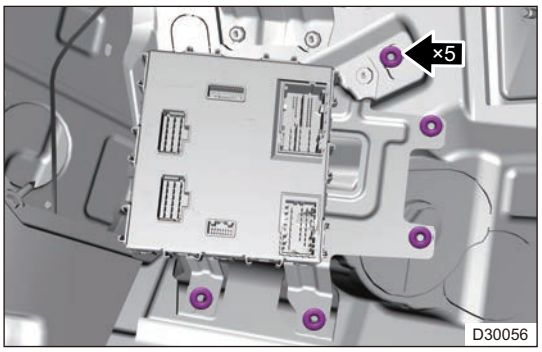


5) Remove the instrument panel left lower protector assembly.

6) Disconnect the headlight switch wire harness connector.



7) Remove the instrument panel fuse and relay box assembly.
8) Disconnect the body control module connector.
9) Remove 3 fixing nuts from body control module bracket.



■ Installation

(1) Installation is in the reverse order of removal.

■ Matching learning

■ Software configuration information writing

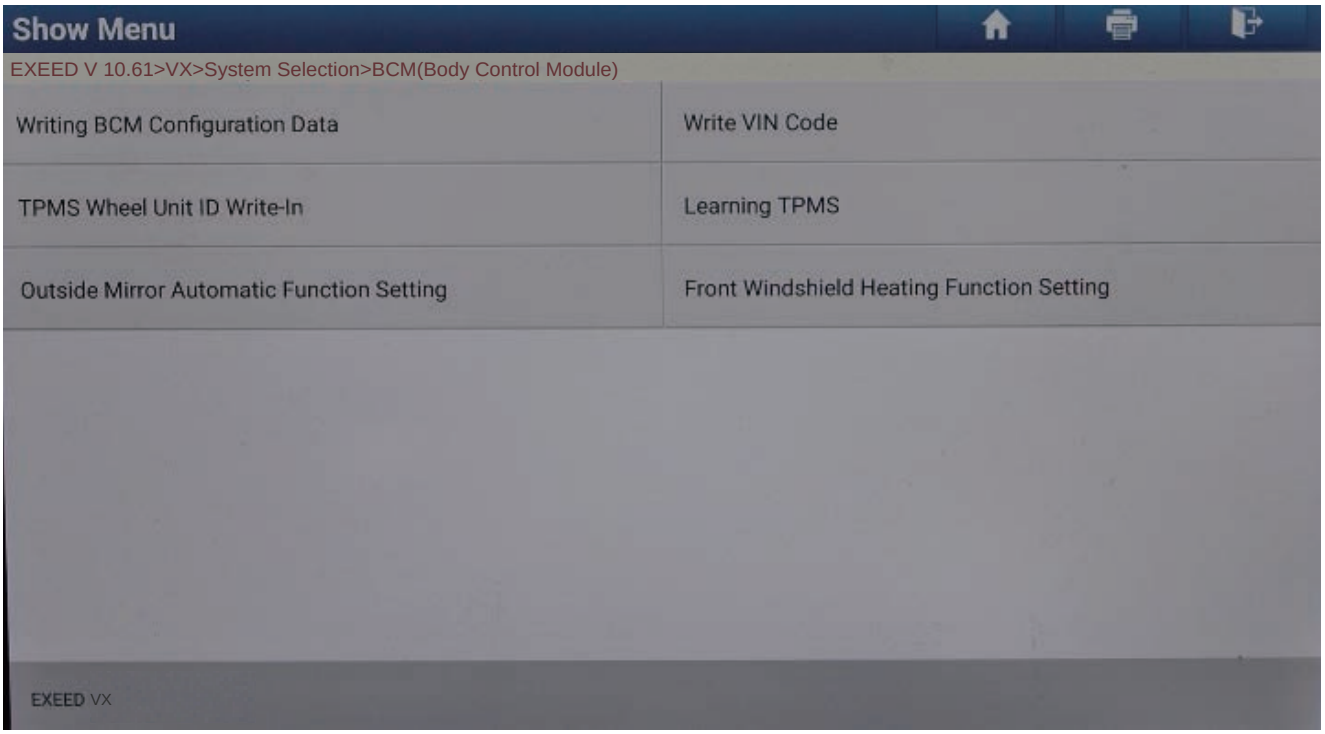
CAUTION

- **Write the configuration code after replacing BCM with a new one.**
- **If it is a non-PEPS model and has engine immobilizer configuration, it needs to be configured for anti-theft matching and then for remote control matching, if it is a PEPS model, there is no need to do the operation in this step.**
- **Perform tire pressure sensor learning if the vehicle has a tire pressure configuration.**
- **Perform jam protection learning if the vehicle has a window jam protection configuration.**

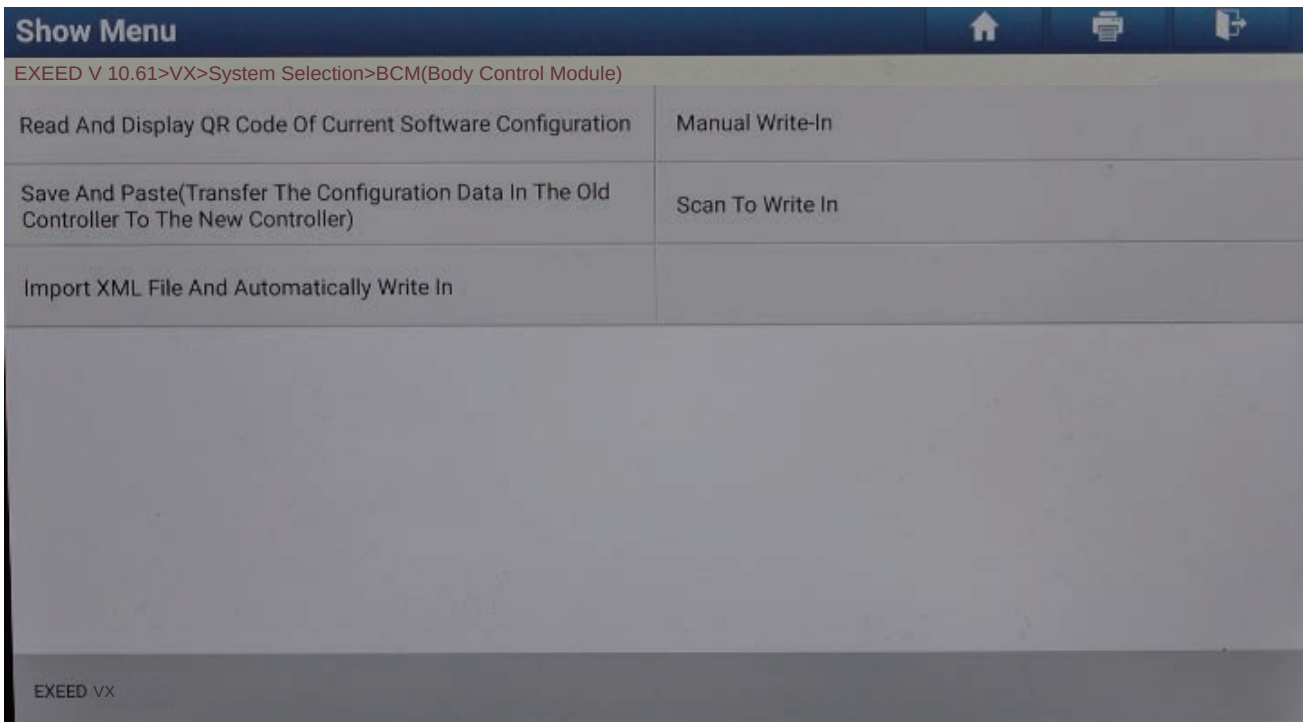
(1) Use the diagnostic tester to connect the vehicle to enter the system. Click Body Control Module (BCM).

(2) Before removing the old BCM, click "Version Information" to read VIN code of the old BCM module; click "Read Data Stream" to read the vehicle configuration code of old BCM.

(3) After new BCM is installed, click "Special Operation", click "Write Body Controller Module (BCM) Configuration Data" to write the configuration code of the new BCM module by manually writing, saving and pasting; click "Write VIN Code", enter the recorded 17-digit VIN code and then click "OK”, confirm it again and go back.



D30040



D30050

BODY

BODY

12.1 INSTRUMENT PANEL

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

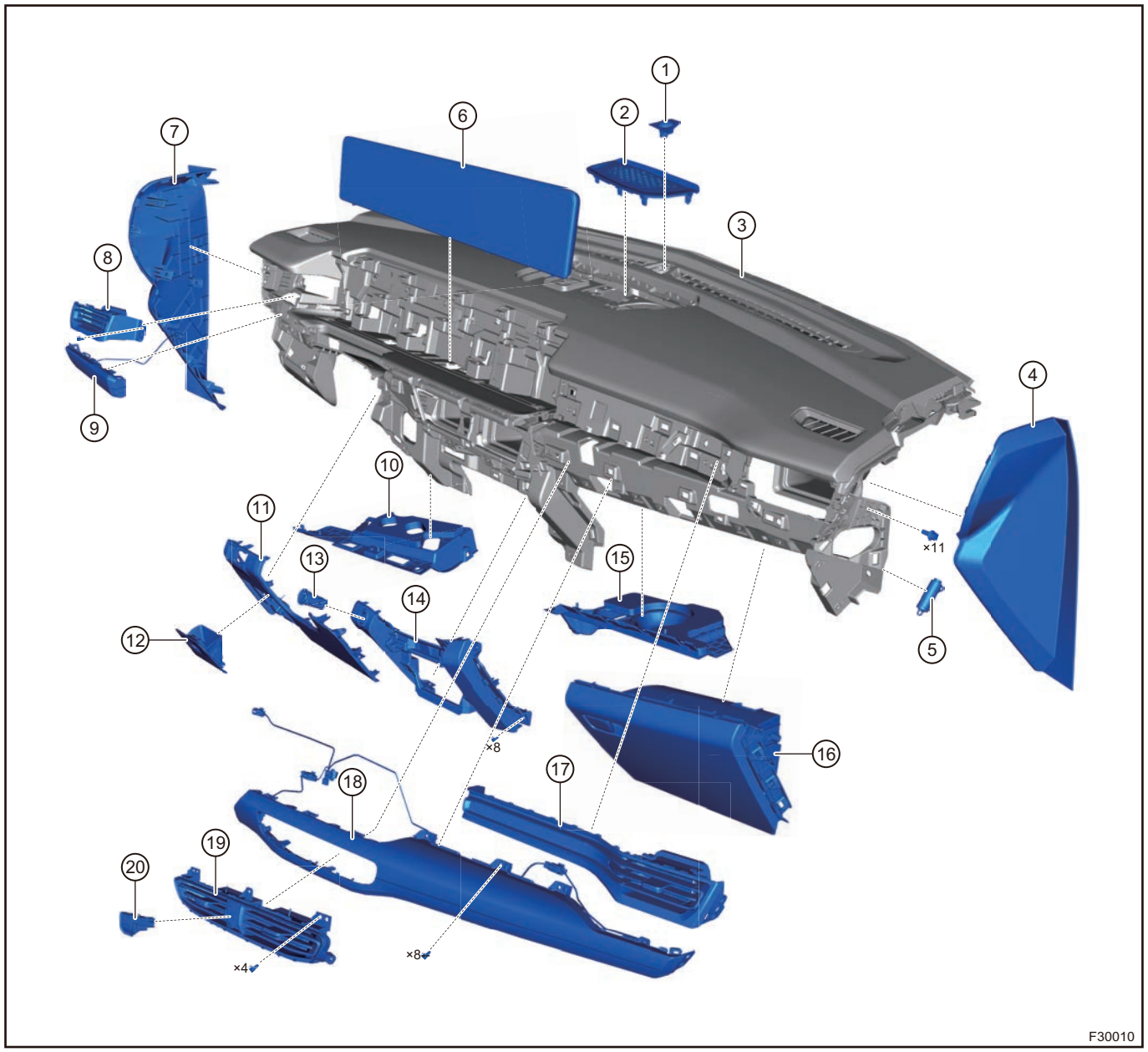
(1) Be sure to wear safety equipment to prevent accidents, when removing instrument panel assembly.

(2) Appropriate force should be applied, when removing instrument panel assembly. Be careful not to operate roughly.

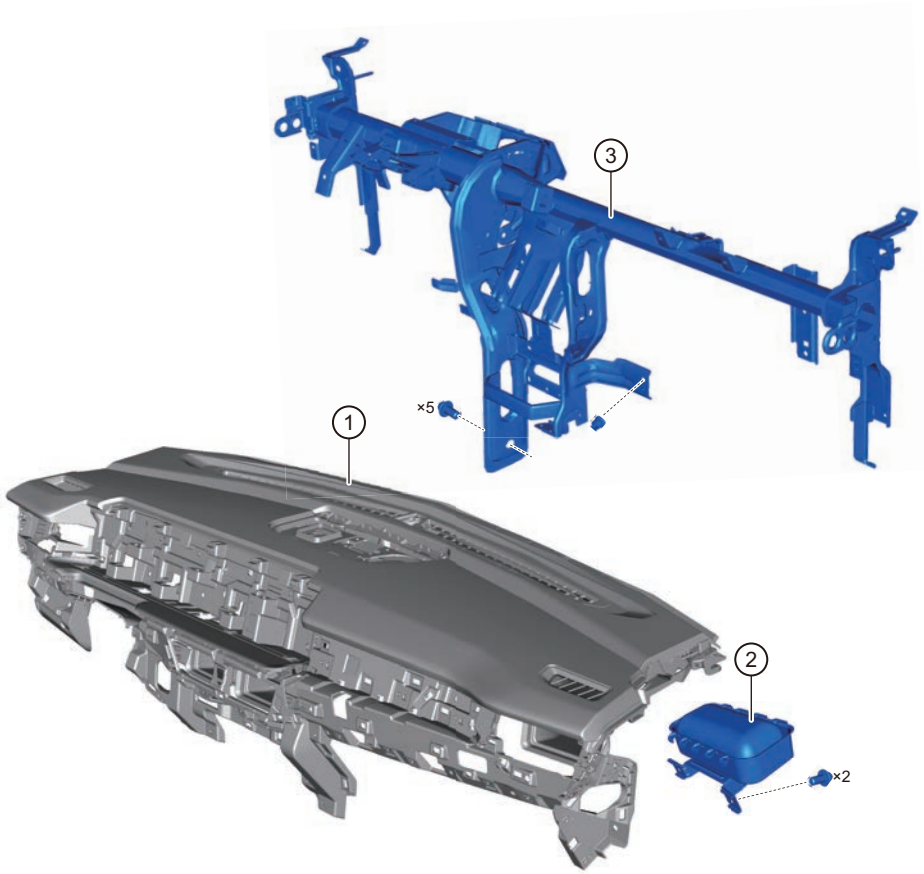
(3) DO NOT scratch interior and body paint, when removing instrument panel assembly.

2 System Overview

2.1 System Components Diagram



1	Solar Sensor Assembly	11	Lower Left Protector Body
2	Speaker Trim Panel	12	Lower Left Storage Box Assembly
3	Instrument Panel Upper Body Assembly	13	Ignition Switch Assembly
4	Right End Cover Body	14	Center Lower Protector Body
5	Damper Assembly	15	Instrument Panel Right Soundproof Board Assembly
6	Dual LCD	16	Glove Box Body Assembly
7	Left End Cover Body	17	A/C Right Outlet Assembly
8	A/C Left Outlet Assembly	18	Right Instrument Panel Trim Panel Assembly
9	Left Instrument Panel Trim Panel Assembly	19	Central A/C Outlet Assembly
10	Drive Side Soundproof Board	20	Warning Light Switch



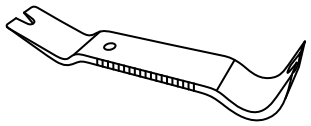
F300201

1	Instrument Panel Assembly	3	Instrument Panel Crossmember Assembly
2	Front Passenger Airbag Assembly		

3 On-vehicle Service

3.1 Tools

■ **General tools**

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

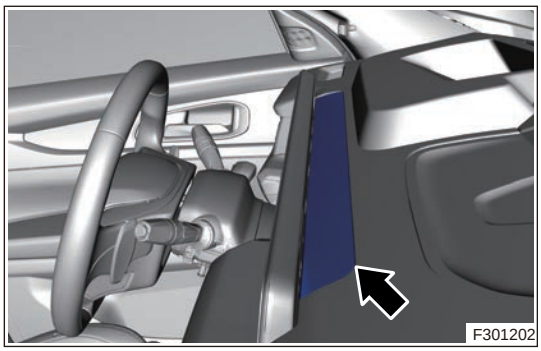
3.2 Replacement of Instrument Panel

■ **Removal**

⚠ Warning

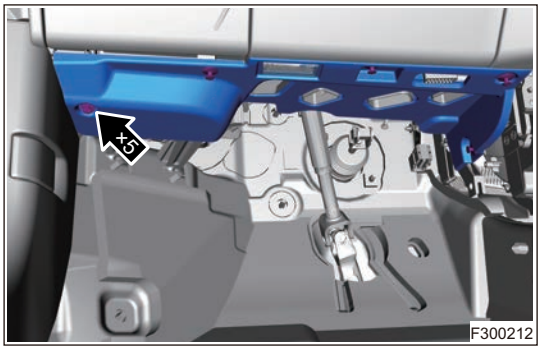
- **Be sure to wear safety equipment to prevent accidents, when removing instrument panel.**
- **Appropriate force should be applied, when removing instrument panel. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the auxiliary fascia console assembly.
(4) Remove the steering wheel assembly.
(5) Remove the spiral cable assembly.
(6) Remove the combination switch assembly.
(7) Remove the instrument cluster block cover (behind dual displays).

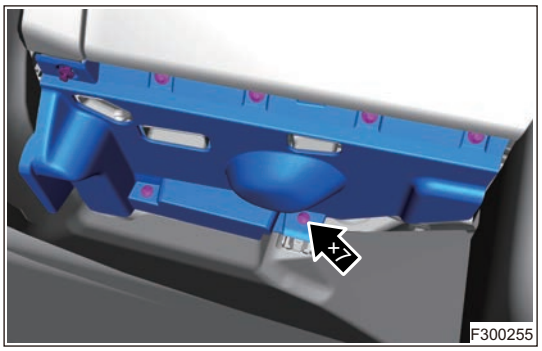

F301202

(8) Remove the dual LCD.
(9) Remove the A-pillar upper protector assembly.
(10) Remove 2 fixing screws from steering column lower cover assembly.
(11) Remove 1 fixing bolt from steering column lower cover assembly, and remove combination switch lower cover assembly.

(12) Remove 5 plastic clips from soundproof board on driver side, and remove soundproof board on driver side.

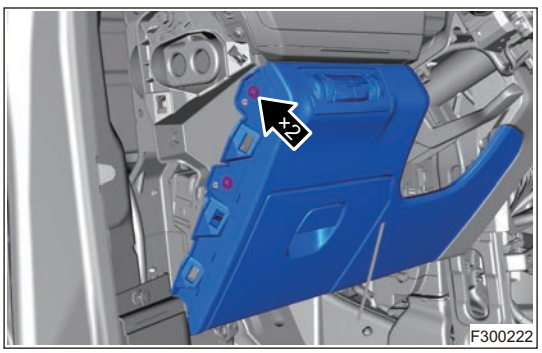


(13) Remove 7 plastic clips from instrument panel right soundproof board assembly, and remove instrument panel right soundproof board.

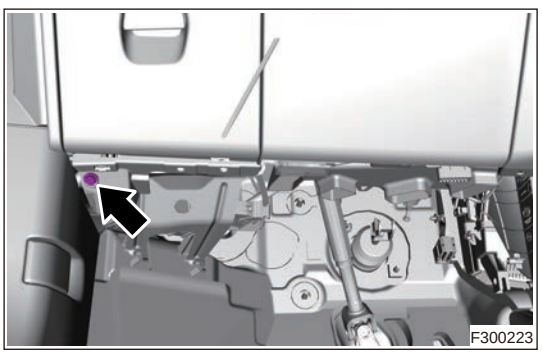


(14) Using an interior crow plate, remove the instrument panel left end panel assembly.

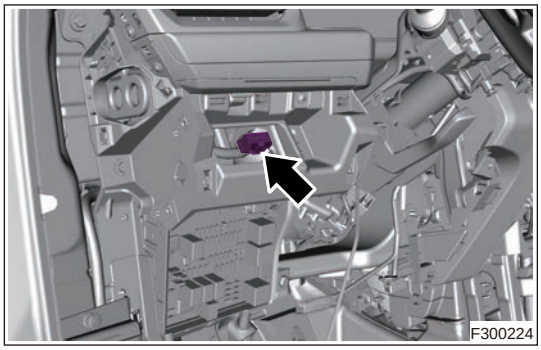
(15) Remove 2 fixing screws from instrument panel lower left protector assembly.



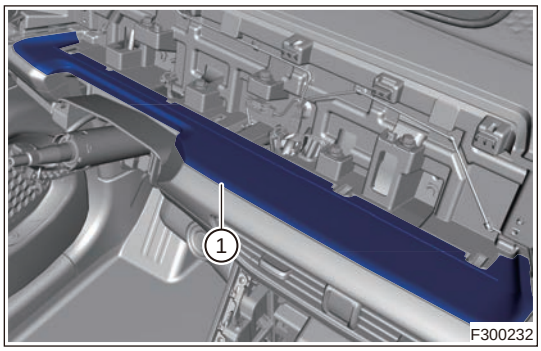
(16) Remove fixing bolt from lower side of instrument panel lower left protector assembly.



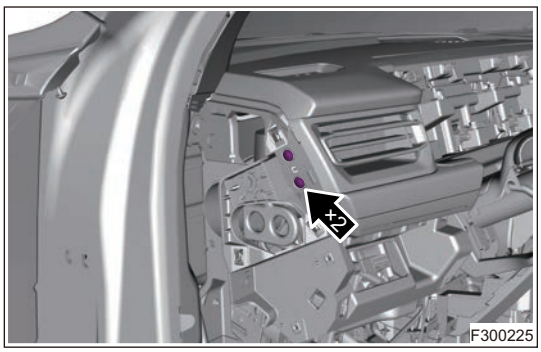
(17) Disconnect the headlight adjustment switch connector, and remove instrument panel lower left protector assembly using an interior crow plate.



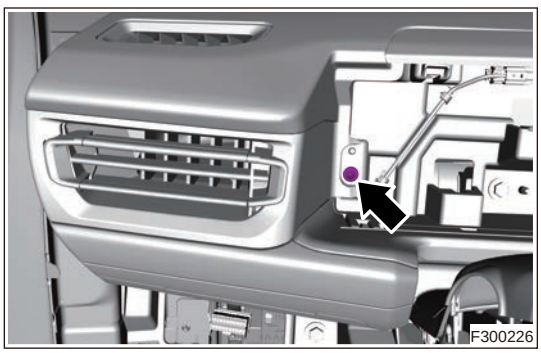
(18) Remove the large display lower finish panel (1).



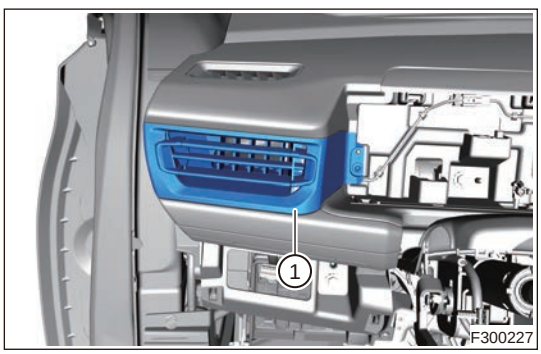
(19) Remove 2 fixing screws from A/C left outlet assembly.



(20) Remove 1 fixing screw from A/C left outlet assembly.

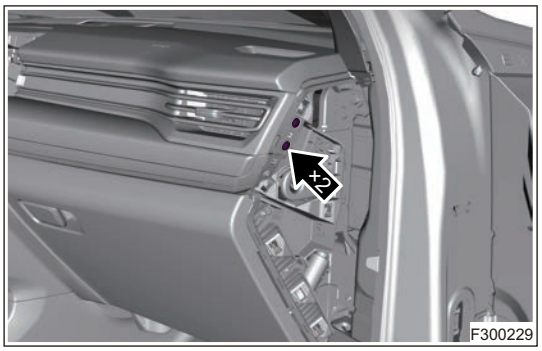


(21) Remove A/C left outlet assembly (1).

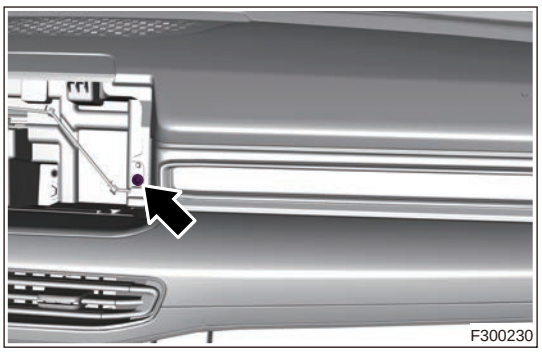


(22) Using an interior crow plate, remove the instrument panel right end panel assembly.

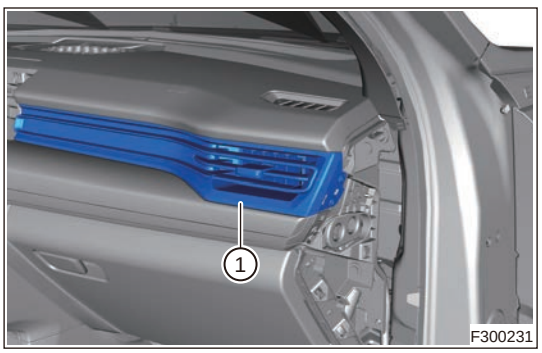
(23) Remove 2 fixing screws from A/C right outlet assembly.



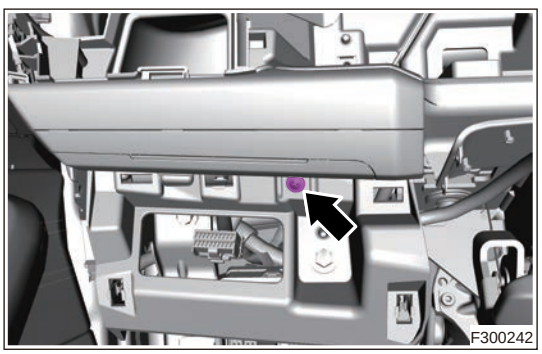
(24) Remove 1 fixing screw from A/C right outlet assembly.



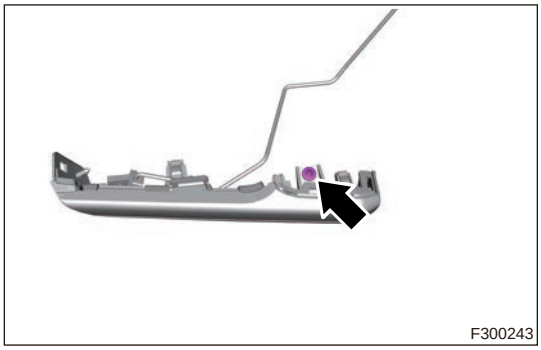
(25) Remove A/C right outlet assembly (1).



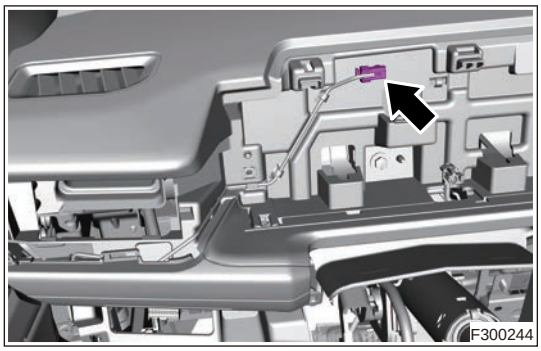
(26) Remove 1 fixing screw from left instrument panel trim panel assembly.



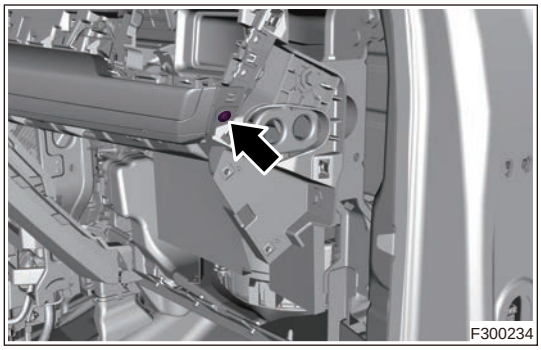
(27) Remove 1 fixing screw from left instrument panel trim panel assembly.



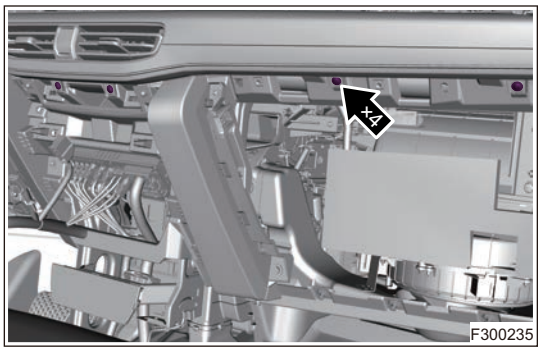
(28) Disconnect the ambient light connector, and remove left instrument panel trim panel assembly using an interior crow plate.



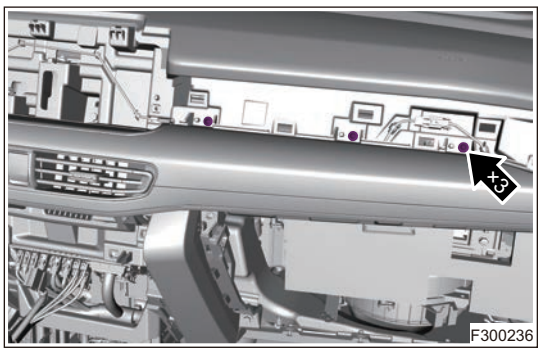
(29) Remove 1 fixing screw from right instrument panel trim panel assembly.



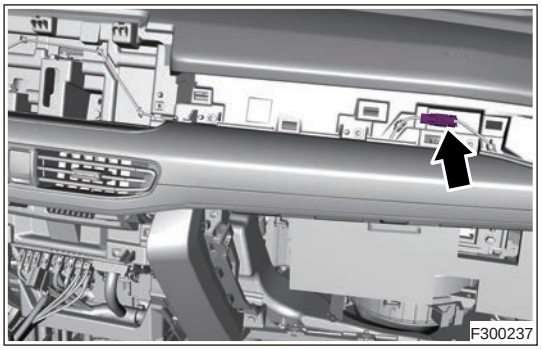
(30) Remove 4 fixing screws from right instrument panel trim panel assembly.



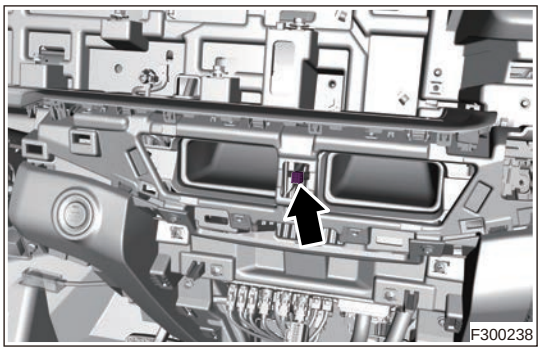
(31) Remove 3 fixing screws from right instrument panel trim panel assembly.



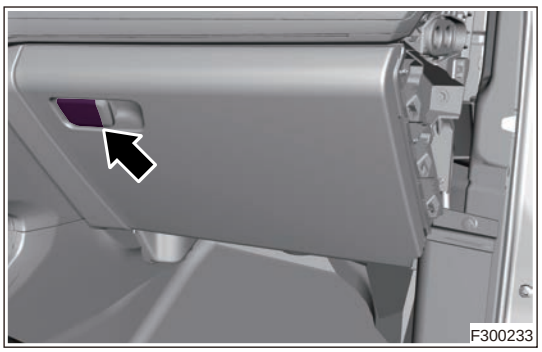
(32) Disconnect the ambient light connector.



(33) Disconnect warning light switch connector, and remove right instrument panel trim panel assembly.



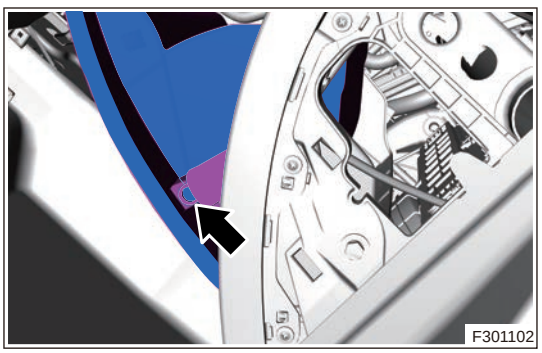
(34) Press glove box lock button to open glove box.



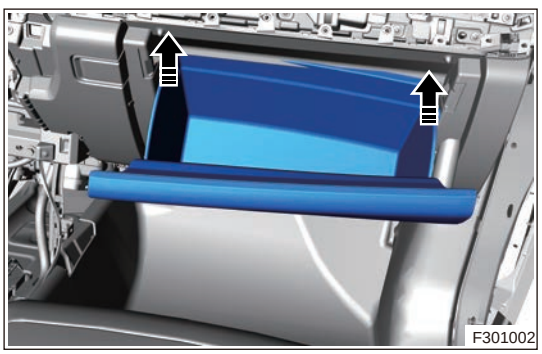
(35) Disengage fixing clip of air damper from glove box to remove glove box assembly.

⚠ Caution

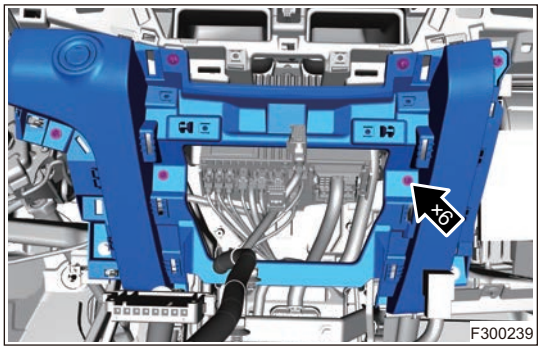
- **It is not necessary to remove damper separately when removing glove box assembly; it is necessary to remove damper first when removing glove box body separately.**



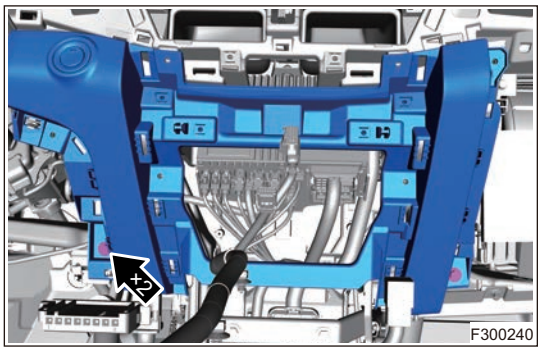
(36) Pull upward in direction of arrow to remove glove box.



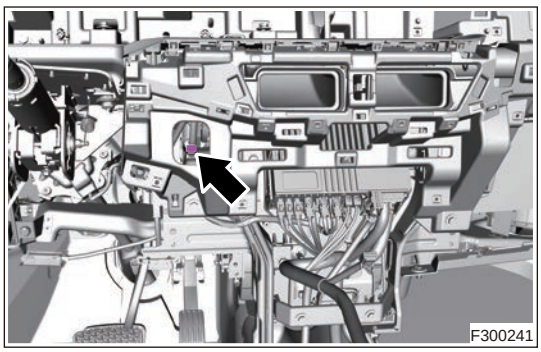
(37) Remove 6 fixing screws from center lower protector body.



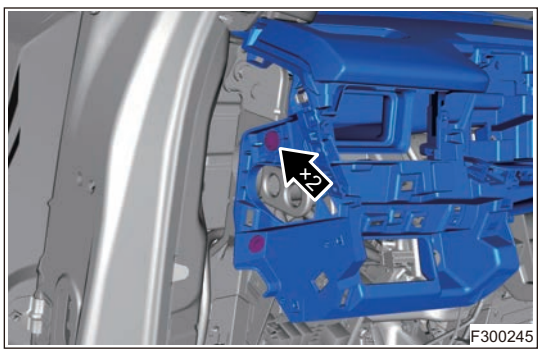
(38) Remove 2 fixing bolts from center lower protector body.



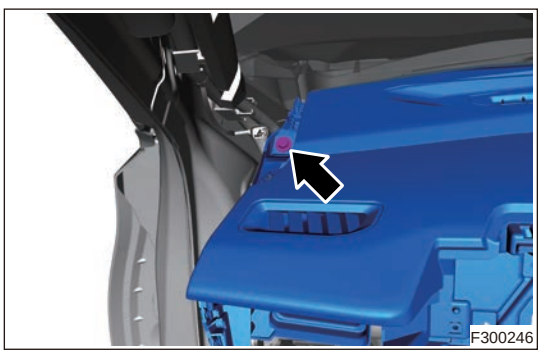
(39) Disconnect ENGINE START STOP switch connector and remove center lower protector body using an interior crow plate.



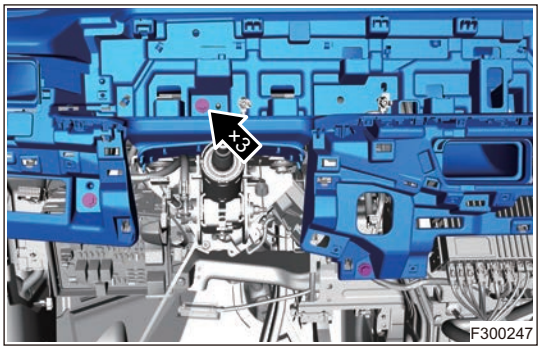
(40) Remove 2 fixing bolts from left side of instrument panel assembly.



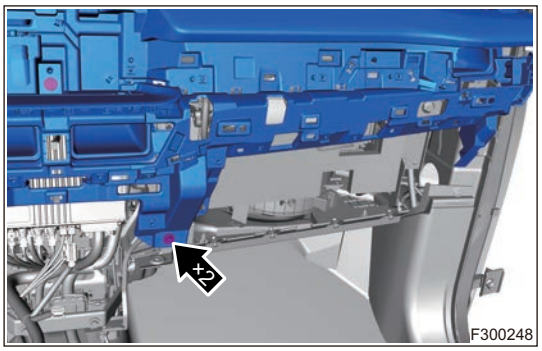
(41) Remove 1 fixing bolt from rear side of left A-pillar upper protector.



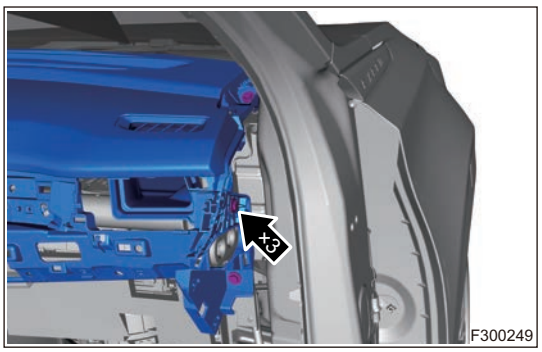
(42) Remove 3 fixing bolts from left side of instrument panel assembly.



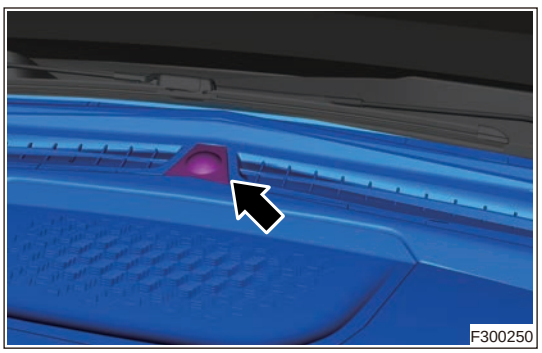
(43) Remove 2 fixing bolts from middle of instrument panel assembly.



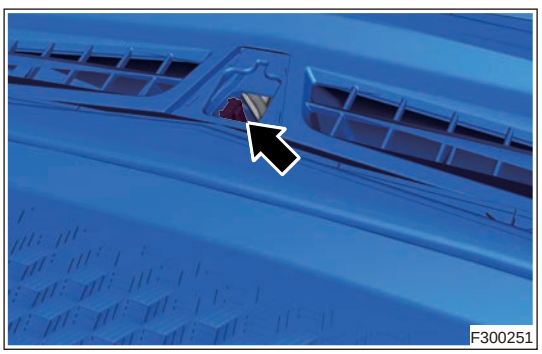
(44) Remove 3 fixing bolts from right side of instrument panel assembly.



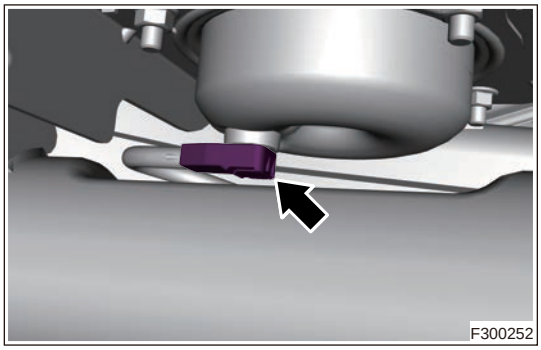
(45) Using an interior crow plate, pry off solar sensor.



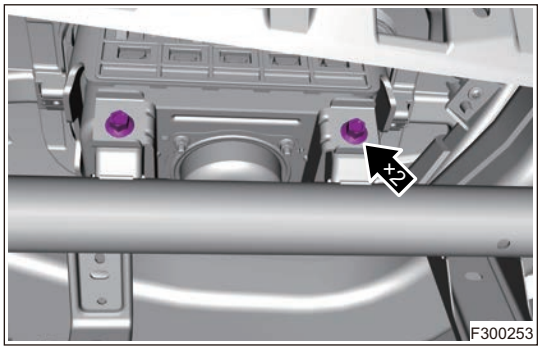
(46) Disconnect the solar sensor connector.



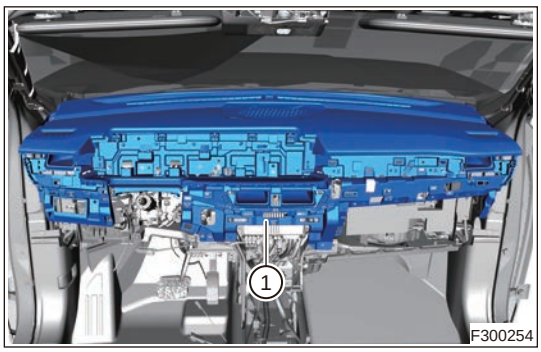
(47) Disconnect the passenger side airbag connector.



(48) Remove 2 fixing bolts between passenger side airbag and crossmember.



(49) Remove wire harness clip from instrument panel and instrument panel assembly (1).



■ Installation

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing instrument panel assembly.**
- **Appropriate force should be applied, when installing instrument panel assembly. Be careful not to operate roughly.**
- **DO NOT scratch interior and body paint, when installing instrument panel assembly.**

(1) Install instrument panel assembly to a proper position of instrument panel crossmember, arrange instrument panel wire harness, and install instrument panel wire harness clip.

(2) Install 2 fixing bolts between passenger side airbag and crossmember (10# socket wrench).

Torque: 23 ± 2 N·m

(3) Connect the passenger side airbag connector.

(4) Connect solar sensor connector, and install solar sensor to instrument panel.

(5) Install 3 fixing bolts on the right side of instrument panel assembly (10# socket wrench).

Torque: 7 ± 1 N·m

(6) Install 2 fixing bolts on the middle of instrument panel assembly (10# socket wrench).

Torque: 7 ± 1 N·m

(7) Install 3 fixing bolts on the left side of instrument panel assembly (10# socket wrench).

Torque: 7 ± 1 N·m

(8) Install 1 fixing bolt on the rear side of left A-pillar upper protector (10# socket wrench).

Torque: 7 ± 1 N·m

(9) Install 2 fixing bolts on the left side of instrument panel assembly (10# socket wrench).

Torque: 7 ± 1 N·m

(10) Connect ENGINE START STOP switch connector and install center lower protector body to proper position of instrument panel.

(11) Install 2 fixing bolts to center lower protector body (10# socket wrench).

Torque: 1.5 ± 0.5 N·m

(12) Install 6 fixing screws to center lower protector body (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(13) Install glove box to proper position of instrument panel, and install glove box air damper.

(14) Connect warning light switch connector, and install right instrument panel trim panel assembly to proper position of instrument panel.

(15) Connect the ambient light connector.

(16) Install 8 fixing screws to right instrument panel trim panel assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(17) Connect ambient light connector, and install left instrument panel trim panel assembly to proper position of instrument panel.

(18) Install 2 fixing screws to left instrument panel trim panel assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(19) Install A/C right outlet assembly to a proper position of instrument panel.

(20) Install 1 fixing screw to A/C right outlet assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(21) Install 2 fixing screws to A/C right outlet assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(22) Install the instrument panel right end panel assembly.

(23) Install A/C left outlet assembly.

(24) Install 3 fixing screws to A/C left outlet assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(25) Install the large display lower finish panel.

(26) Connect headlight adjustment switch connector, and install instrument panel lower left protector assembly to proper position of instrument panel.

(27) Install fixing bolt on the lower side of instrument panel lower left protector assembly (10# socket wrench).

Torque: 7 ± 1 N·m

(28) Install 2 fixing screws to instrument panel lower left protector assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(29) Install the instrument panel left end panel assembly.

(30) Install the instrument panel right soundproof board to a proper position of instrument panel, and fasten 7 plastic clips.

(31) Install the soundproof board on driver side to a proper position of instrument panel, and fasten 5 plastic clips.

(32) Install the combination switch lower cover assembly to a proper position of instrument panel, and install 1 fixing screw to combination switch lower cover assembly (cross screwdriver).

Torque: 4 ± 1 N·m

(33) Install 2 fixing screws to combination switch lower cover assembly (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(34) Install A-pillar upper protector assembly.

(35) Install the dual LCD.

(36) Install the instrument cluster block cover (behind dual displays).

(37) Install the combination switch assembly.

(38) Install the spiral cable assembly.

(39) Install the steering wheel assembly.

(40) Install the auxiliary fascia console assembly.

(41) Connect the negative battery cable.

■ Disassembly

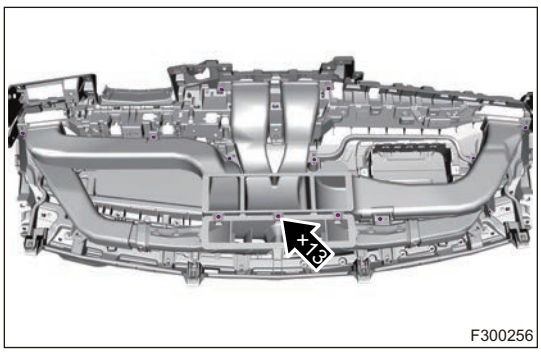
⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when disassembling instrument panel.**
- **Appropriate force should be applied, when disassembling instrument panel. Be careful not to operate roughly.**

(1) Remove the instrument panel assembly.

(2) Remove the front passenger airbag assembly.

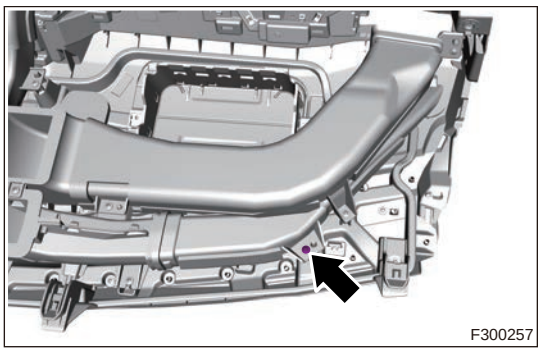
(3) Remove 13 fixing screws of face air duct assembly from instrument panel.



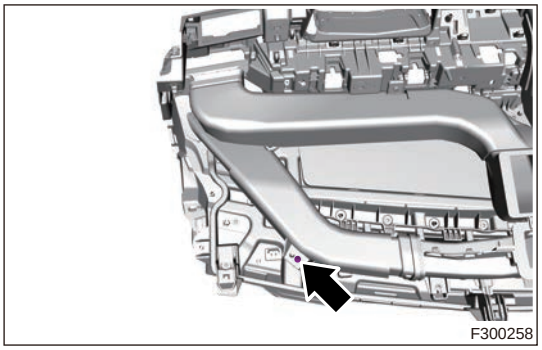
F300256

(4) Remove the face air duct assembly.

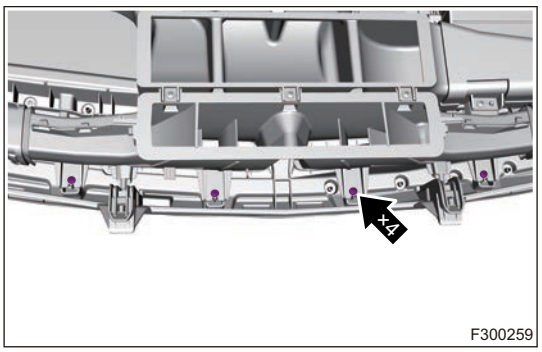
(5) Remove 1 fixing screw and right defroster duct assembly.


F300257

(6) Remove 1 fixing screw of left defroster duct assembly from instrument panel, and remove left defroster duct assembly.

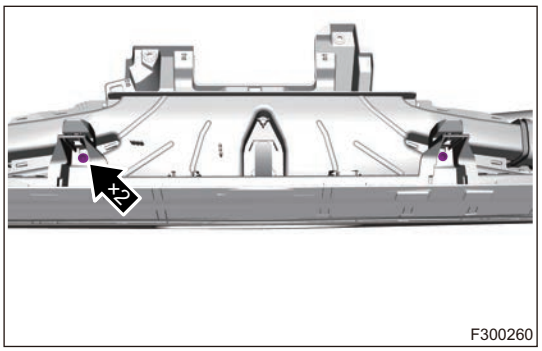

F300258

(7) Remove 4 fixing screws of windshield defroster duct assembly from instrument panel.



F300259

(8) Remove 2 fixing screw of windshield defroster duct assembly from instrument panel, and remove left defroster duct assembly.



F300260

■ Assembly

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when assembling instrument panel assembly.**
- **Appropriate force should be applied, when assembling instrument panel assembly. Be careful not to operate roughly.**

(1) Install left defroster duct assembly to a proper position of instrument panel, and install 6 fixing screws (- cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(2) Install left defroster duct assembly to a proper position of instrument panel, and install 1 fixing screw (- cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(3) Install right defroster duct assembly to a proper position of instrument panel, and install 1 fixing screw (- cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(4) Install the face duct assembly to a proper position of instrument panel, and install 13 fixing screws (cross screwdriver).

Torque: 1.5 ± 0.5 N·m

(5) Install the front passenger airbag assembly.

(6) Install the instrument panel assembly.

3.3 Replacement of A/C to Instrument Panel Left A/C Outlet Pipe Assembly

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing A/C to instrument panel left A/C outlet pipe assembly.**
- **Appropriate force should be applied, when removing A/C to instrument panel left A/C outlet pipe assembly. Be careful not to operate roughly.**

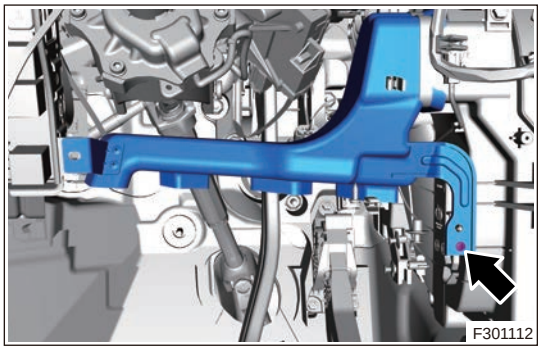
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

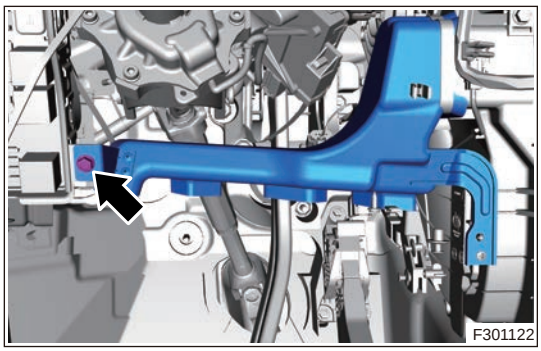
(3) Remove the instrument panel left soundproof board assembly.

(4) Remove the lower left protector assembly.

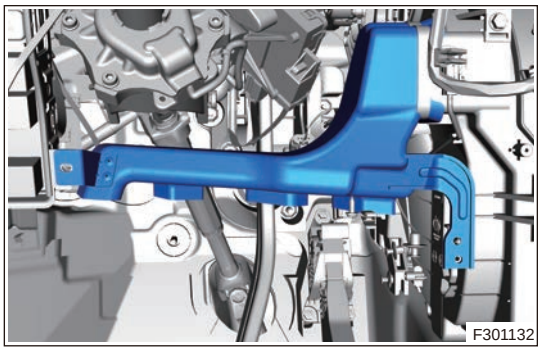
(5) Remove 1 fixing screw from A/C to instrument panel left A/C outlet pipe assembly.


F301112

(6) Remove 1 fixing bolt from A/C to instrument panel left A/C outlet pipe assembly.


F301122

(7) Remove the A/C to instrument panel left A/C outlet pipe assembly.


F301132

■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing A/C to instrument panel left A/C outlet pipe assembly.**
- **Appropriate force should be applied, when installing A/C to instrument panel left A/C outlet pipe assembly. Be careful not to operate roughly.**

(1) Install A/C to instrument panel left A/C outlet pipe assembly to a proper position on body.
(2) Install 1 fixing bolt to A/C to instrument panel left A/C outlet pipe assembly.
(3) Install 1 fixing screw to A/C to instrument panel left A/C outlet pipe assembly.

Torque: 1.5 ± 0.2 N·m

(4) Install the lower left protector assembly.
(5) Install the instrument panel left soundproof board assembly.
(6) Connect the negative battery cable.

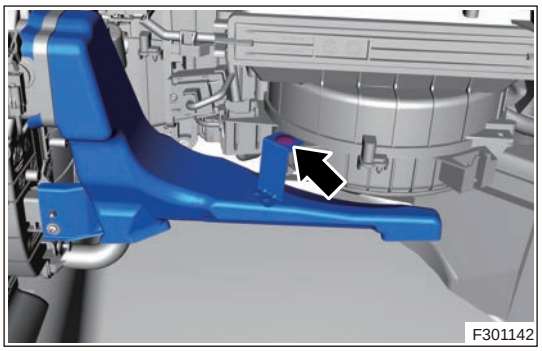
3.4 Replacement of A/C to Instrument Panel Right A/C Outlet Pipe Assembly

■ **Removal**

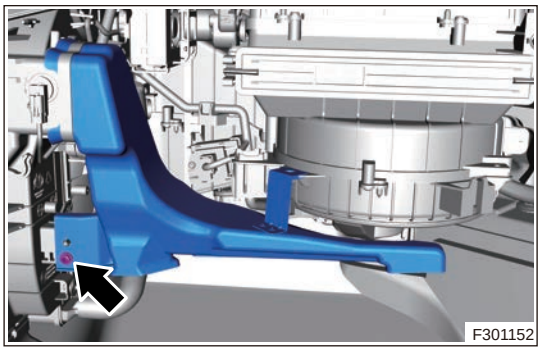
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing A/C to instrument panel right A/C outlet pipe assembly.**
- **Appropriate force should be applied, when removing A/C to instrument panel right A/C outlet pipe assembly. Be careful not to operate roughly.**

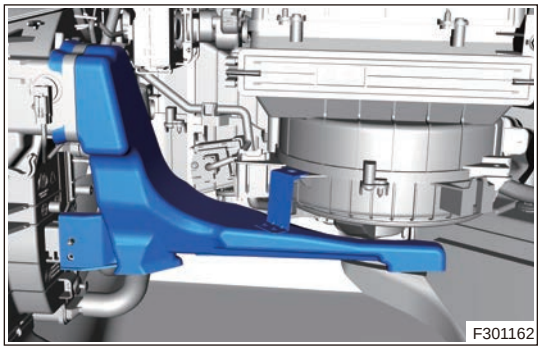
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the instrument panel right soundproof board assembly.
(4) Remove the glove box assembly.
(5) Remove tree-formed fixing clip from A/C to instrument panel right A/C outlet pipe assembly.



(6) Remove 1 fixing screw from A/C to instrument panel right A/C outlet pipe assembly.



(7) Remove the A/C to instrument panel right A/C outlet pipe assembly.



■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing A/C to instrument panel right A/C outlet pipe assembly.**
- **Appropriate force should be applied, when installing A/C to instrument panel right A/C outlet pipe assembly. Be careful not to operate roughly.**

(1) Install A/C to instrument panel right A/C outlet pipe assembly to a proper position on body.

(2) Install 1 fixing screw to A/C to instrument panel right A/C outlet pipe assembly.

Torque: 1.5 ± 0.2 N·m

(3) Install tree-formed fixing clip to A/C to instrument panel right A/C outlet pipe assembly.

(4) Install the glove box assembly.

(5) Install the instrument panel right soundproof board assembly.

(6) Connect the negative battery cable.

3.5 Replacement of Left Front and Rear Foot Ducts

■ **Removal**

⚠ Warning

- **When removing left front and rear foot ducts, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied, when removing left front and rear foot ducts. Be careful not to operate roughly.**

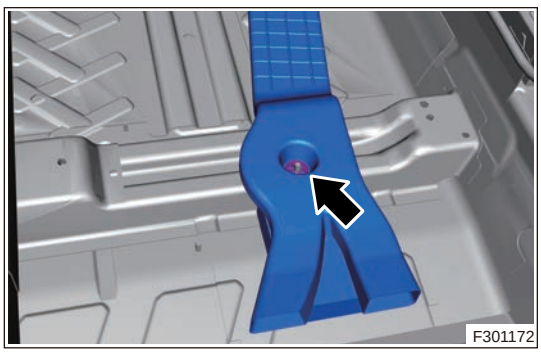
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

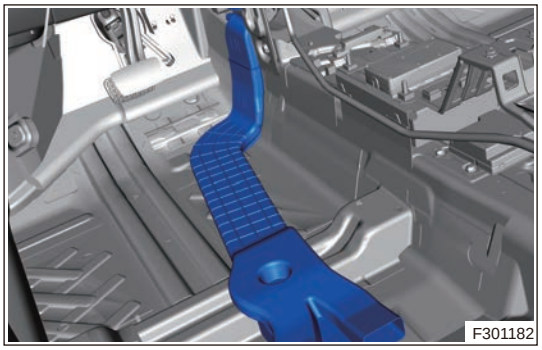
(3) Remove the front left seat assembly.

(4) Remove the front carpet assembly (It is not necessary to completely remove).

(5) Remove clamping washer from left front and rear foot ducts.



(6) Remove the left front and rear foot ducts.



■ **Installation**

⚠ Caution

- **When installing left front and rear foot ducts, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied, when installing left front and rear foot ducts. Be careful not to operate roughly.**

(1) Install left front and rear foot ducts to a proper position on body.
(2) Install clamping washer to left front and rear foot ducts.
(3) Install the front carpet assembly.
(4) Install the front left seat assembly.
(5) Connect the negative battery cable.

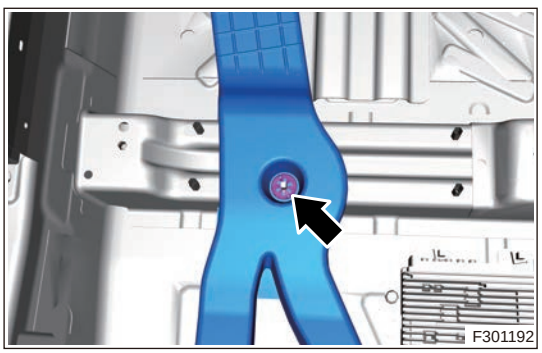
3.6 Replacement of Right Front and Rear Foot Ducts

■ **Removal**

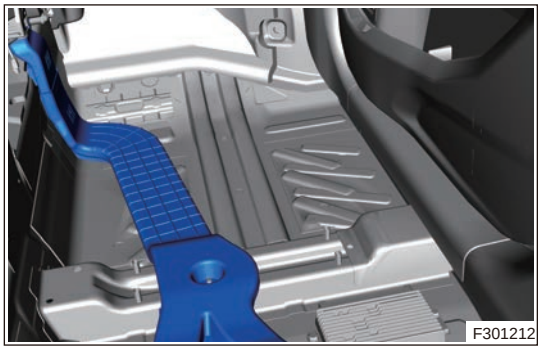
⚠ Warning

- **When removing right front and rear foot ducts, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied, when removing right front and rear foot ducts. Be careful not to operate roughly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the front right seat assembly.
(4) Remove the front carpet assembly (It is not necessary to completely remove).
(5) Remove clamping washer from right front and rear foot ducts.



(6) Remove the right front and rear foot ducts.



■ **Installation**

⚠ Caution

- **When installing right front and rear foot ducts, be sure to wear safety equipment to prevent accidents.**
- **Appropriate force should be applied, when installing right front and rear foot ducts. Be careful not to operate roughly.**

(1) Install right front and rear foot ducts to a proper position on body.
(2) Install clamping washer to right front and rear foot ducts.
(3) Install the front carpet assembly.
(4) Install the front right seat assembly.
(5) Connect the negative battery cable.

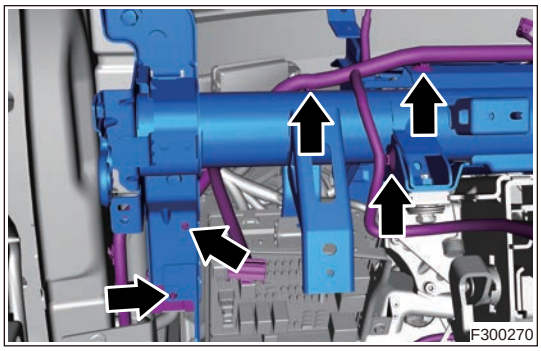
3.7 Replacement of Instrument Panel Crossmember Assembly

■ **Removal**

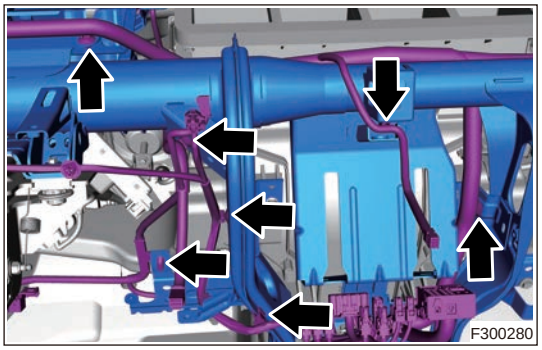
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing instrument panel crossmember assembly.**
- **Appropriate force should be applied, when removing instrument panel crossmember assembly. Be careful not to operate roughly.**

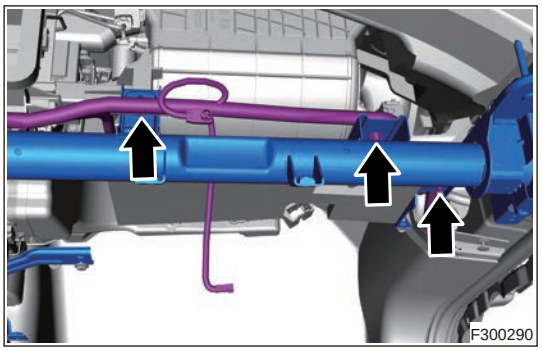
(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the auxiliary fascia console assembly.
(4) Remove the instrument panel assembly.
(5) Remove the front windshield lower trim board body.
(6) Remove the steering column assembly.
(7) Remove the domain controller.
(8) Remove the OBD connector.
(9) Disengage fixing clips of instrument panel wire harness from instrument panel crossmember.



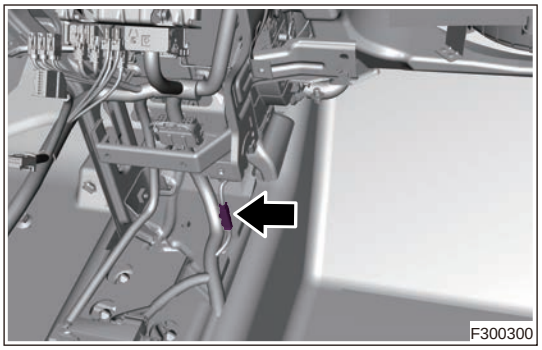
(10) Disengage fixing clips of instrument panel wire harness from instrument panel crossmember.



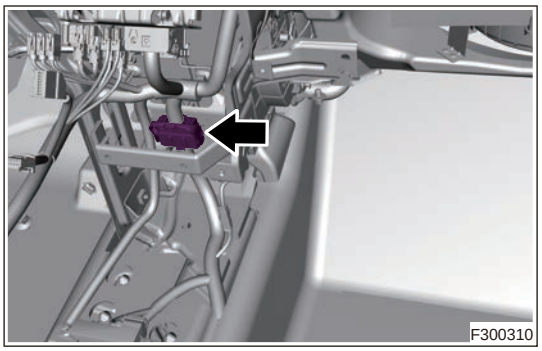
(11) Disengage fixing clips of instrument panel wire harness from instrument panel crossmember.



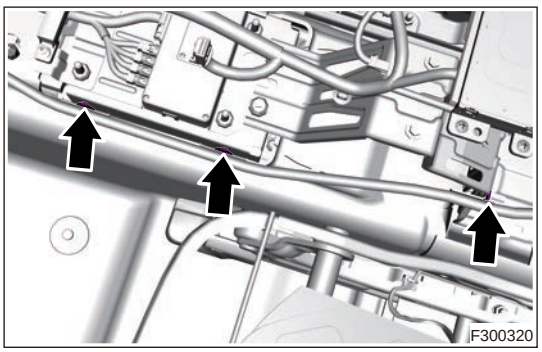
(12) Disconnect the AM/FM/GPS connector.



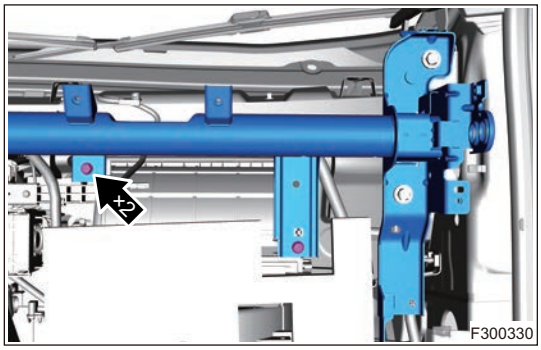
(13) Disconnect connector between instrument cluster wire harness and central control wire harness.



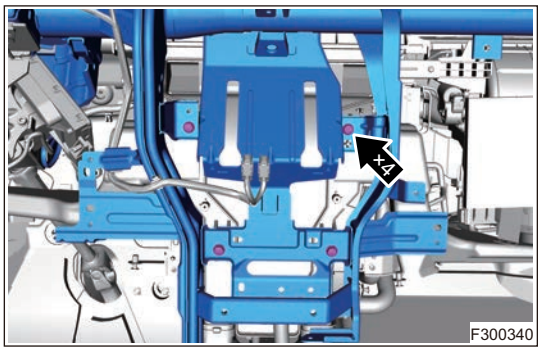
(14) Disengage fixing clips from wire harness.



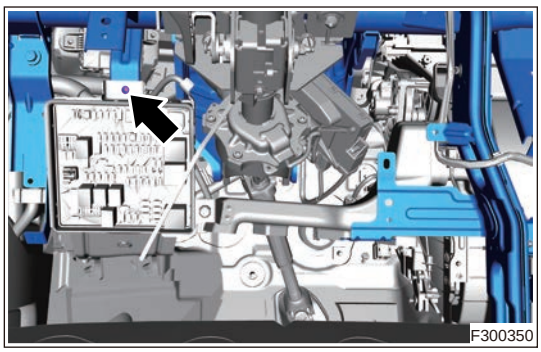
(15) Remove 2 coupling bolts between HVAC and the right side of instrument panel crossmember.



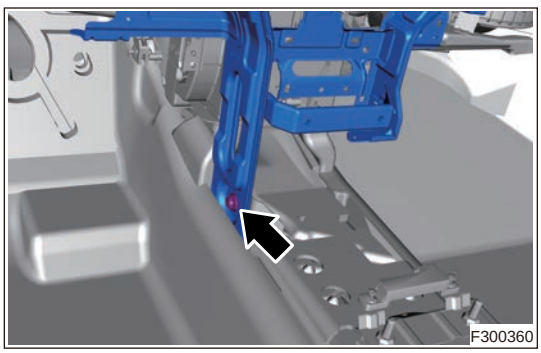
(16) Remove 4 coupling bolts between HVAC and the middle of instrument panel crossmember.



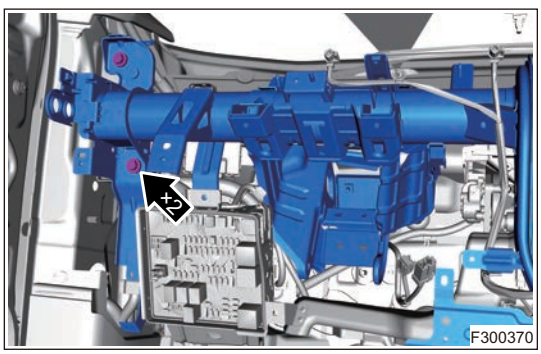
(17) Remove 1 fixing bolt from instrument panel relay box.



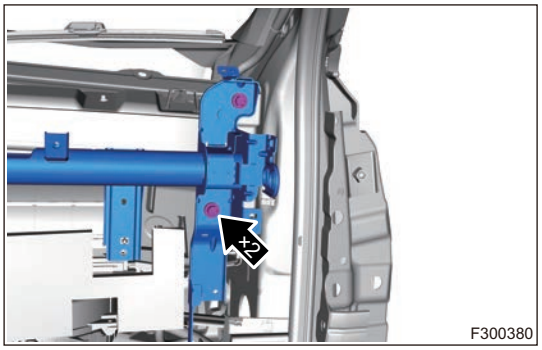
(18) Remove 1 coupling bolt from center of instrument panel crossmember.



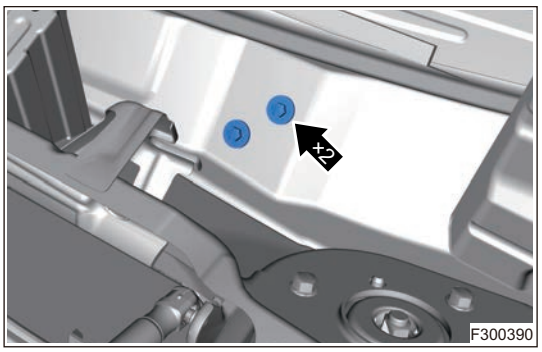
(19) Remove 2 coupling bolts from the left side of instrument panel crossmember and body.



(20) Remove 2 coupling bolts from the right side of instrument panel crossmember and body.



(21) Remove 2 coupling bolts from instrument panel crossmember and cowl.



(22) Remove the instrument panel crossmember assembly.

■ Installation

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing instrument panel crossmember.**
- **Appropriate force should be applied, when installing instrument panel crossmember. Be careful not to operate roughly.**

(1) Install instrument panel crossmember to a proper position on body.

(2) Install 2 coupling bolts between instrument panel crossmember and cowl (13# socket wrench).

Torque: 23 ± 2 N·m

(3) Install 2 coupling bolts between the right side of instrument panel crossmember and body (13# socket wrench).

Torque: 23 ± 2 N·m

(4) Install 2 coupling bolts between the left side of instrument panel crossmember and body (13# socket wrench).

Torque: 23 ± 2 N·m

(5) Install 1 coupling bolt on the middle of instrument panel crossmember (13# socket wrench).

Torque: 23 ± 2 N·m

(6) Install 1 fixing bolt to instrument panel relay box (10# socket wrench).

Torque: 5 ± 1 N·m

(7) Install 4 coupling bolts between HVAC and the middle of instrument panel crossmember (10# socket wrench).

Torque: 5 ± 1 N·m

(8) Install 2 coupling bolts between HVAC and the right side of instrument panel crossmember (10# socket wrench).

Torque: 5 ± 1 N·m

(9) Connect connector between instrument cluster wire harness and central control wire harness.

(10) Connect the AM/FM/GPS connector.

(11) Install all fixing clips on instrument panel wire harness.

(12) Install the OBD connector.

(13) Install the domain controller.

(14) Install the steering column assembly.

(15) Install the front windshield lower trim board body.

(16) Install the instrument panel assembly.

(17) Install the auxiliary fascia console assembly.

(18) Connect the negative battery cable.

12.2 AUXILIARY FASCIA CONSOLE

1 Warnings and Precautions

1.1 Precautions

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

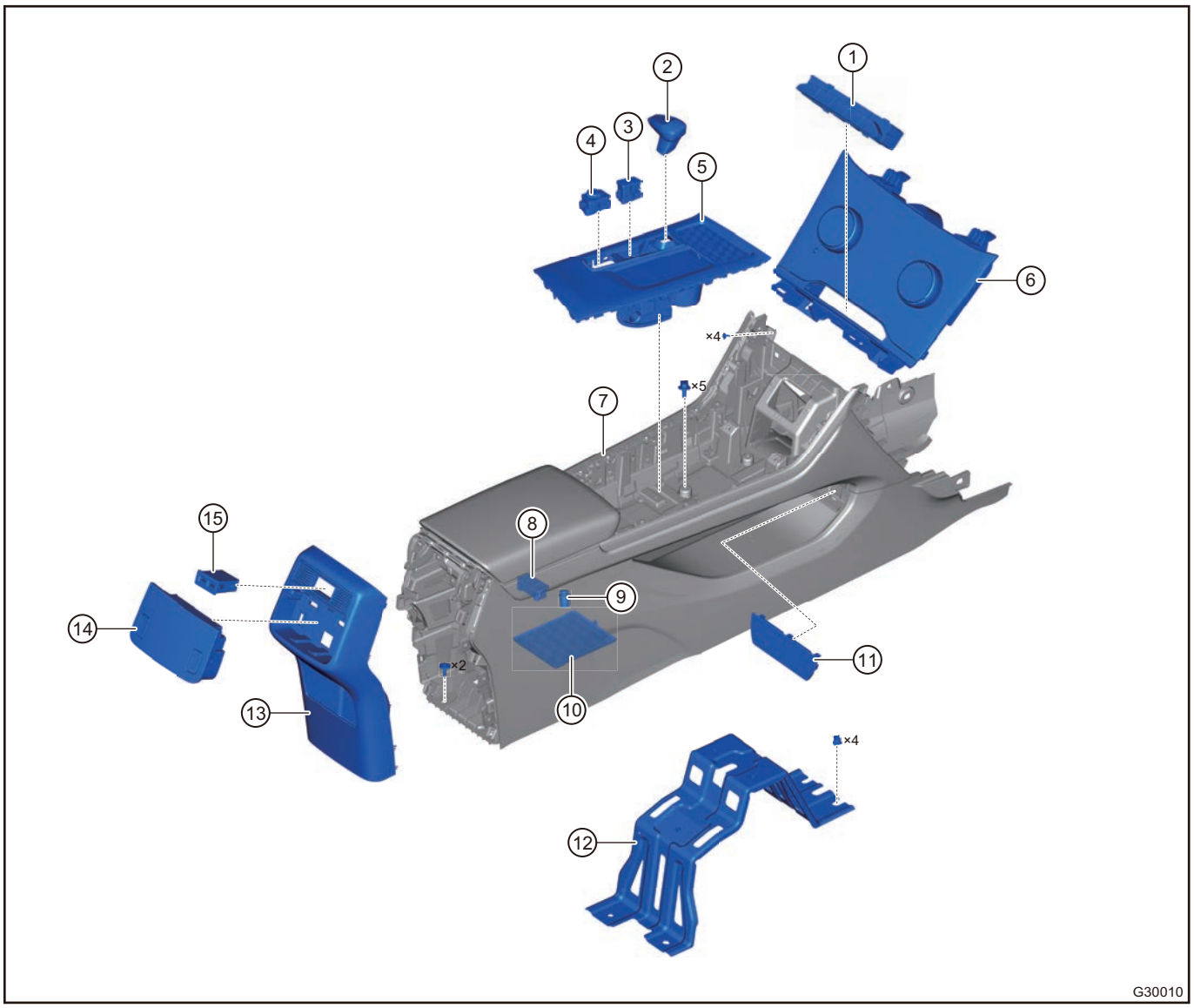
(1) Be sure to wear safety equipment to prevent accidents, when removing auxiliary fascia console assembly.

(2) Appropriate force should be applied, when removing auxiliary fascia console assembly. Be careful not to operate roughly.

(3) DO NOT scratch interior and body paint, when removing auxiliary fascia console assembly.

2 System Overview

2.1 System Components Diagram

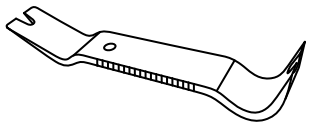


1	Central Console Switch Assembly	9	Cigarette Lighter Block Cover
2	Shift Lever Assembly	10	Armrest Box Storage Box Rubber Gasket
3	EPB Switch Assembly	11	Auxiliary Fascia Console Screw Cover Plate
4	Audio Switch Assembly	12	Auxiliary Fascia Console Iron Bracket
5	Auxiliary Fascia Console Trim Panel Assembly	13	Auxiliary Fascia Console Rear Panel Assembly
6	Auto A/C Control Panel Assembly	14	Rear A/C Control Panel Assembly
7	Auxiliary Fascia Console Body Assembly	15	USB Assembly
8	Multi-function Interface		

3 On-Vehicle Service

3.1 Tools

■ General tools

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

3.2 Replacement of Auxiliary Fascia Console

■ Removal

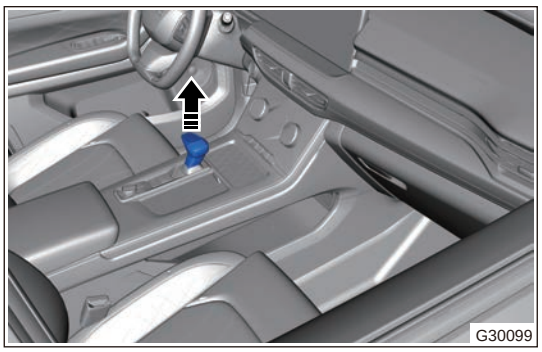
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing auxiliary fascia console.**
- **Appropriate force should be applied, when removing auxiliary fascia console. Be careful not to operate roughly.**

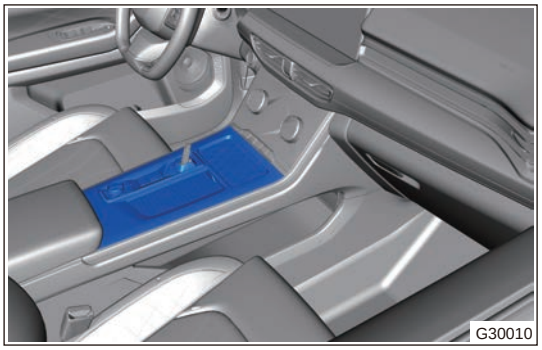
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Lift it up in the direction of the arrow, and remove shift lever assembly.


G30099

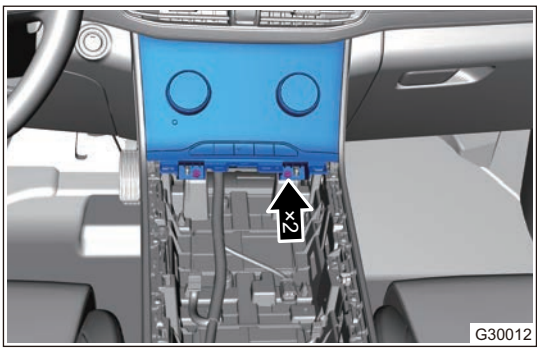
(4) Using an interior crow plate, pry off auxiliary fascia console center cover plate (interior crow plate).



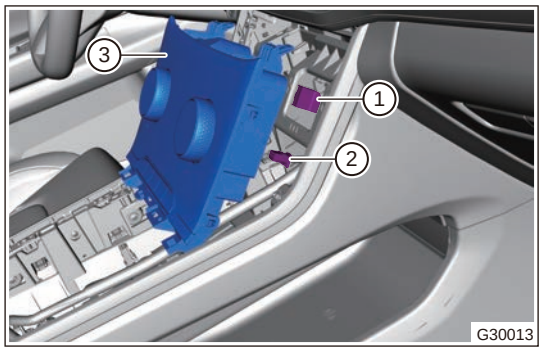
(5) Disconnect audio switch connector and parking switch connector, remove the auxiliary fascia console center cover plate.

(6) Remove the electronic shift module.

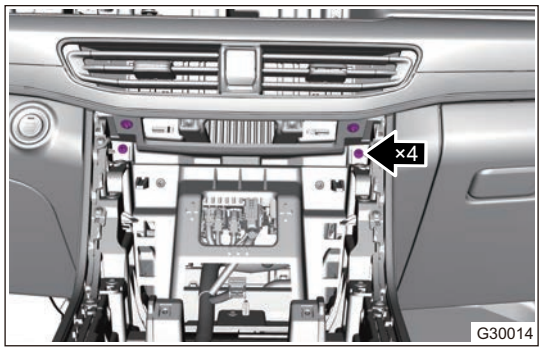
(7) Remove 2 fixing screws from A/C control panel assembly (cross screwdriver).



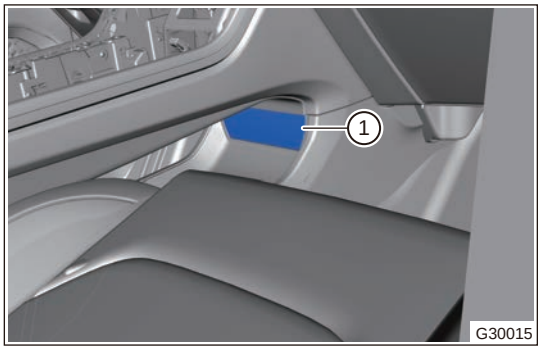
(8) Using an interior crow plate, pry off A/C control panel assembly carefully, disconnect A/C control panel assembly connector (1) and center console switch assembly connector (2), and remove A/C control panel assembly (3).



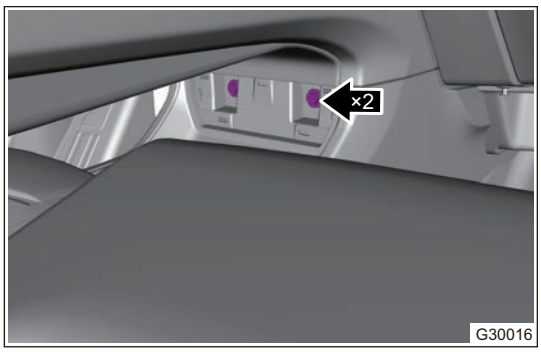
(9) Remove 4 fixing screws from front part of auxiliary fascia console body (cross screwdriver).



(10) Using an interior crow plate, pry off auxiliary fascia console screw cover plate assembly (1) carefully (-interior crow plate).



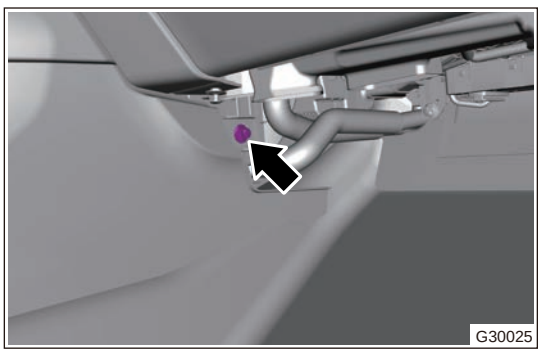
(11) Remove 2 fixing bolts from rear side of auxiliary fascia console screw cover plate (10# socket wrench).



(12) Remove the instrument panel right soundproof board assembly.

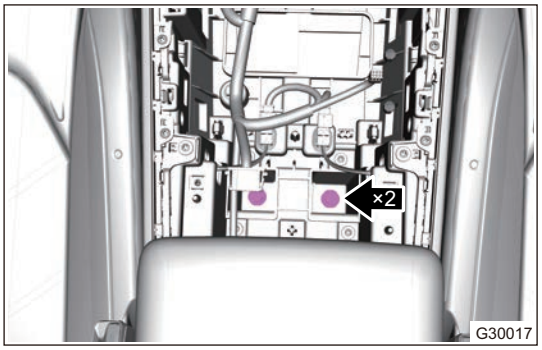
(13) Remove the instrument panel left soundproof board assembly.

(14) Remove plastic rivet from the right side of front part of auxiliary fascia console body assembly (cross screwdriver).

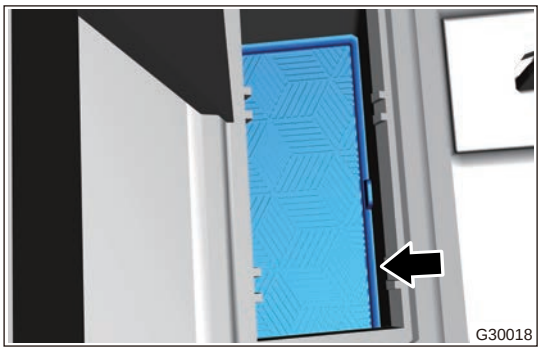


(15) Remove plastic rivet from the left side of front part of auxiliary fascia console body assembly (cross screwdriver).

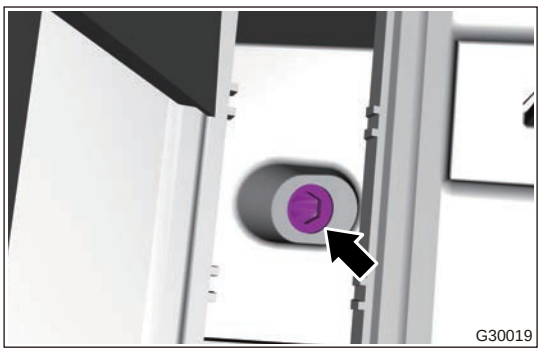
(16) Remove 2 fixing bolts from the center of auxiliary fascia console body (10# socket wrench).



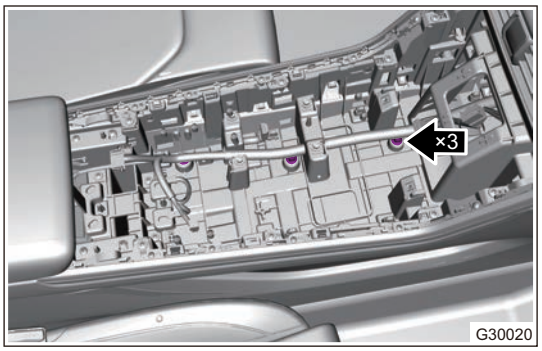
(17) Remove the auxiliary fascia console armrest box rubber pad.



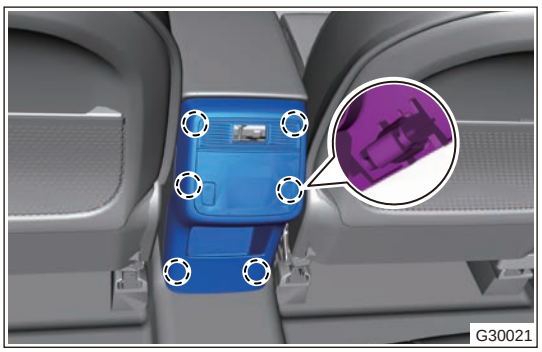
(18) Remove 1 fixing bolt from rear side of auxiliary fascia console armrest box rubber pad (10# socket wrench).



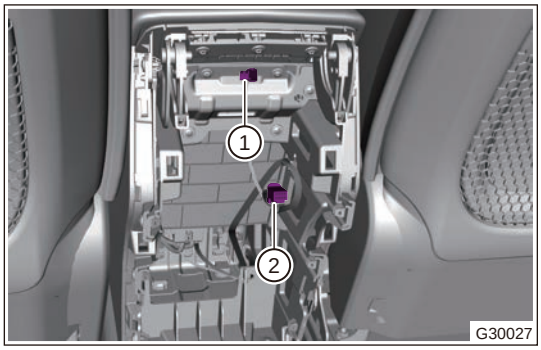
(19) Using an interior crow plate, pry off wire harness clips on auxiliary fascia console body assembly carefully (-interior crow plate).



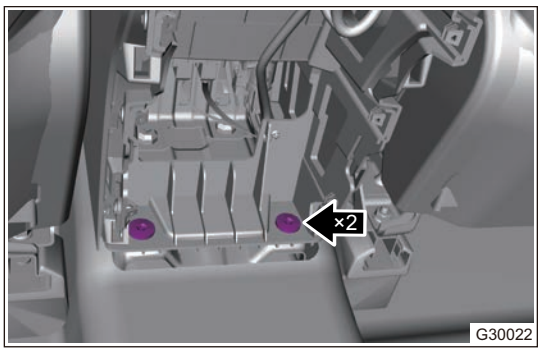
(20) Using an interior crow plate, pry off auxiliary fascia console rear end cover plate assembly carefully (interior crow plate).



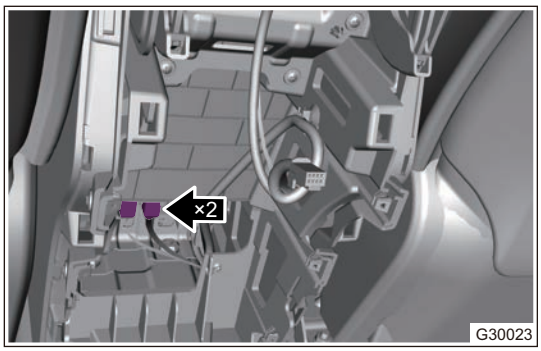
(21) Disconnect USB wire harness connector (1) and rear A/C control panel assembly connector (2).



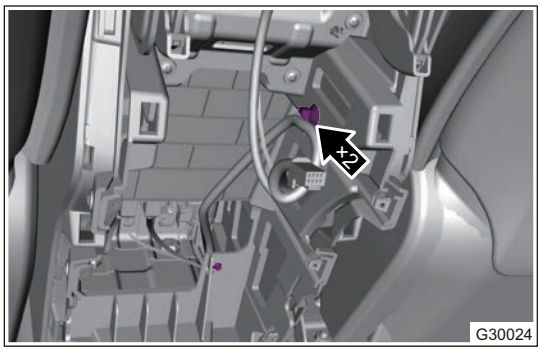
(22) Remove 2 fixing bolts from rear end of auxiliary fascia console body assembly (spline wrench).



(23) Disconnect wire harness connectors from multi-function interface.

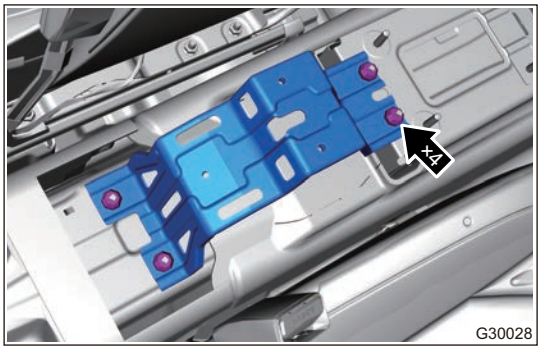


(24) Using an interior crow plate, pry off wire harness clip on rear side of auxiliary fascia console body assembly carefully (interior crow plate).



(25) Remove the auxiliary fascia console assembly.

(26) Remove 4 fixing nuts from front bracket of auxiliary fascia console.



(27) Remove the front bracket of auxiliary fascia console.

■ Inspection

(1) Inspect if front bracket of auxiliary fascia console is deformed and corroded.

(2) Inspect if auxiliary fascia console has abnormal scratches.

■ Installation

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing auxiliary fascia console assembly.**
- **Appropriate force should be applied, when installing auxiliary fascia console assembly. Be careful not to operate roughly.**
- **DO NOT scratch interior and body paint, when installing auxiliary fascia console assembly.**

(1) Install front bracket of auxiliary fascia console to a proper position on body.

(2) Install 4 fixing nuts to front bracket of auxiliary fascia console.

Torque: 20 ± 3 N·m

(3) Install auxiliary fascia console assembly to a proper position on body.

(4) Install wire harness clip on rear side of auxiliary fascia console body assembly.

(5) Connect wire harness connectors to multi-function interface.

(6) Install 2 fixing bolts to rear end of auxiliary fascia console body assembly (spline wrench).

Torque: 3.5 ± 0.5 N·m

(7) Connect the USB wire harness connector and rear A/C control panel assembly connector.

(8) Install the auxiliary fascia console rear end cover plate assembly.

(9) Install wire harness clips to auxiliary fascia console body assembly.

(10) Install 1 fixing bolt to rear side of auxiliary fascia console armrest box rubber pad (10# socket wrench).

Torque: 5.0 ± 1.0 N·m

(11) Install the auxiliary fascia console armrest box rubber pad.

(12) Install 2 fixing bolts on the center of auxiliary fascia console body (10# socket wrench).

Torque: 5.0 ± 1.0 N·m

(13) Install plastic rivet to the left side of front part of auxiliary fascia console body assembly (cross screwdriver).

(14) Install plastic rivet to the right side of front part of auxiliary fascia console body assembly (cross screwdriver).

(15) Install instrument panel left soundproof board assembly and right soundproof board assembly.

(16) Install 2 fixing bolts on the rear side of auxiliary fascia console screw cover plate. (10# socket wrench).

Torque: 5.0 ± 1.0 N·m

(17) Install the auxiliary fascia console screw cover plate assembly (1).

(18) Install 4 fixing screws on the front part of auxiliary fascia console body (cross screwdriver).

Torque: 1.5 ± 0.2 N·m

(19) Connect A/C control panel assembly connector (1) and center console switch assembly connector (2), and install A/C control panel assembly (3).

(20) Install 2 fixing screws to A/C control panel assembly (cross screwdriver).

Torque: 1.5 ± 0.2 N·m

(21) Connect electronic shift switch connector (1), audio control panel connector (2), and mobile phone wireless charging module connector (3).

(22) Install the auxiliary fascia console center cover plate.

(23) Connect the negative battery cable.

12.3 EXTERIOR

1 Warnings and Precautions

1.1 Warnings

Be sure to wear safety equipment to prevent accidents before repairing, to avoid property damage, personal injury or even death.

1.2 Precautions

It should be avoid dangerous operation and damage to the vehicle when performing the repair in this section.

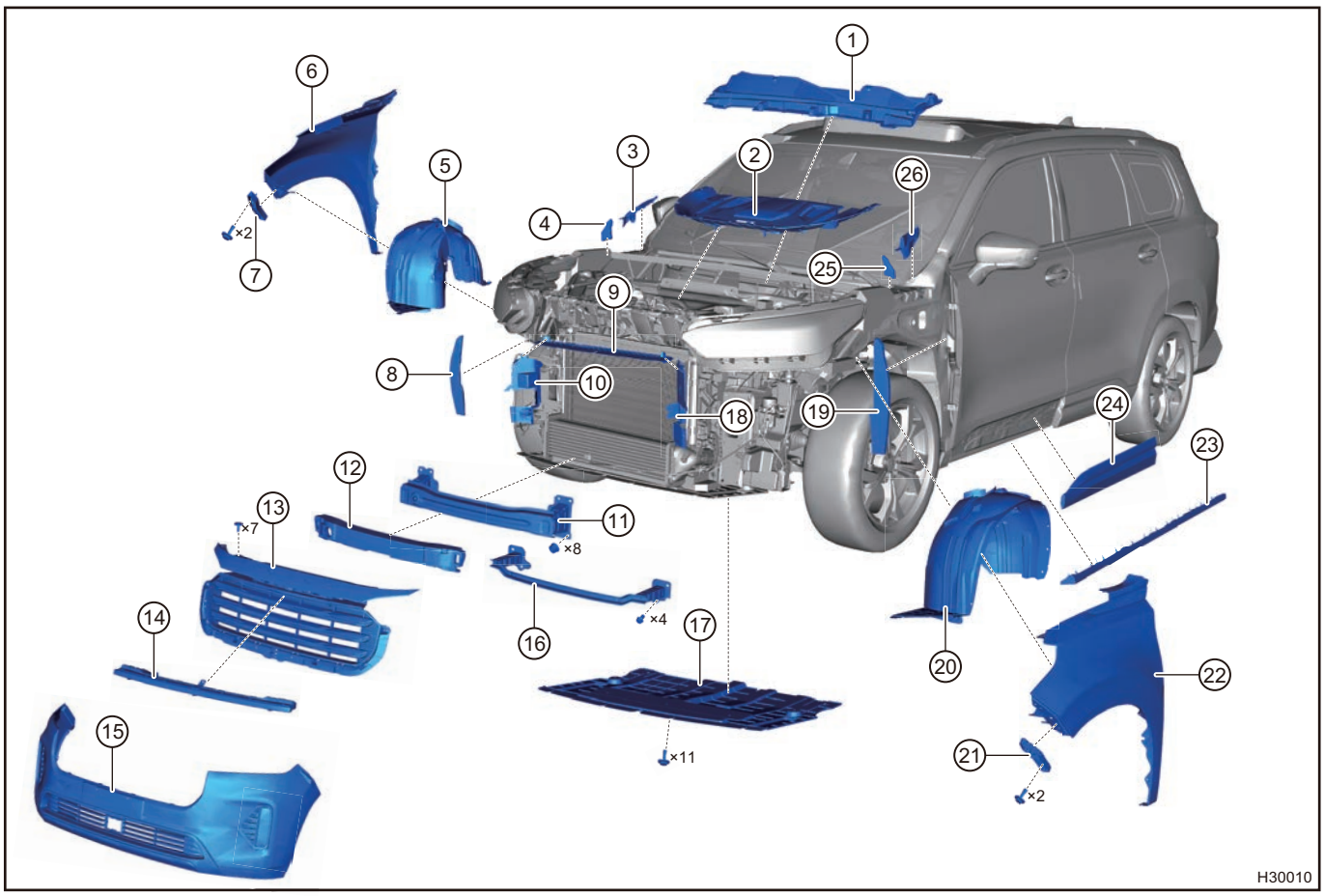
2 System Overview

2.1 System Description

Bumper assembly and bumper crossmember assembly are safety device to protect the front and rear body, which mainly absorb and reduce outside shock.
Exterior mainly consists of front bumper assembly, front bumper mounting bracket, front bumper crossmember assembly, radiator grille, front wheel house protector, front wheel arch, wing assembly, side skirt protector assembly, door trim panel assembly, engine hood lower protector, rear bumper assembly, rear bumper mounting bracket, rear bumper bracket, rear bumper crossmember assembly, rear wheel house protector, front windshield lower trim board assembly, D-pillar protector assembly, roof rack assembly, spoiler, etc.

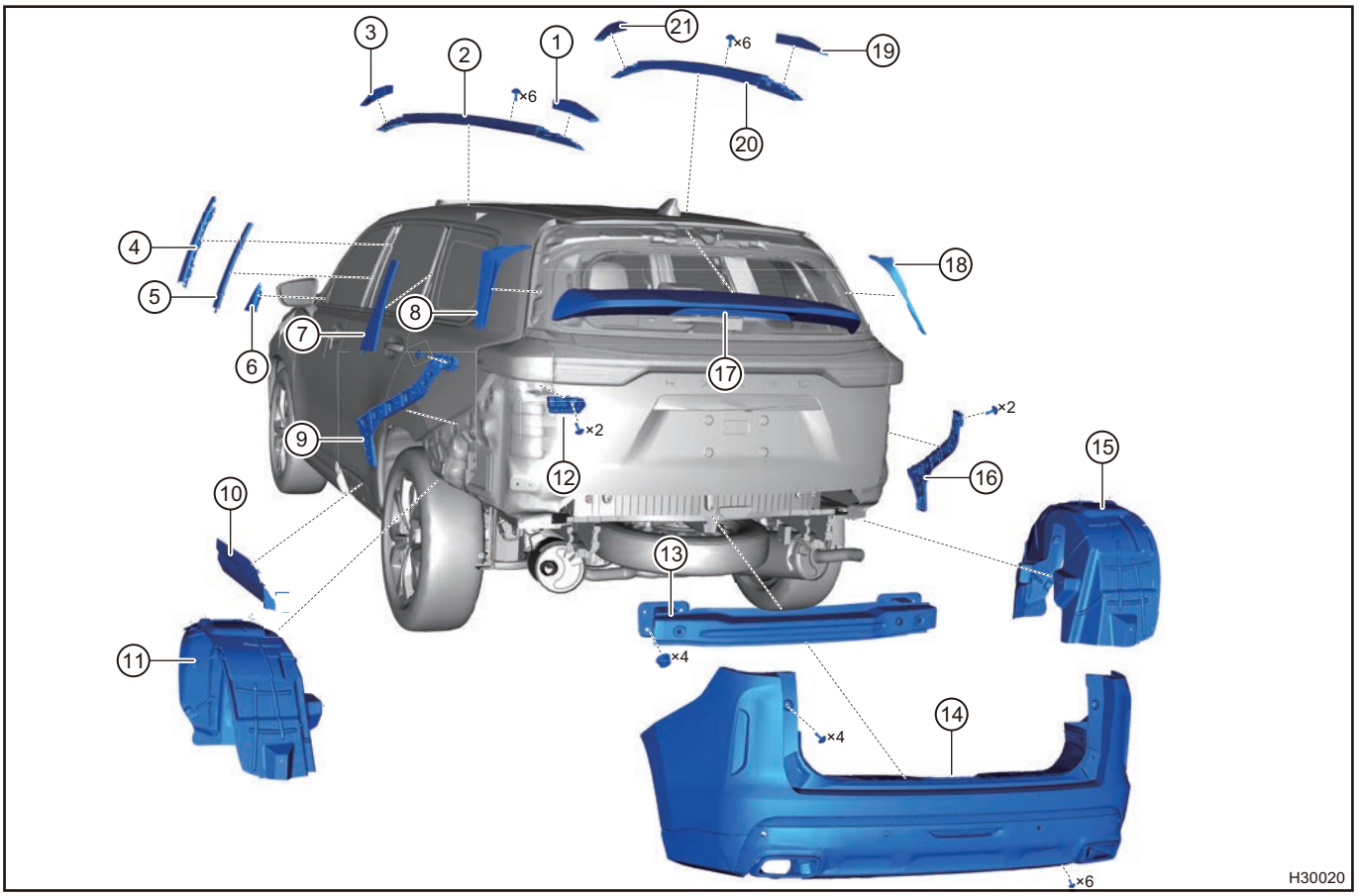
2.2 System Components Diagram

Front View

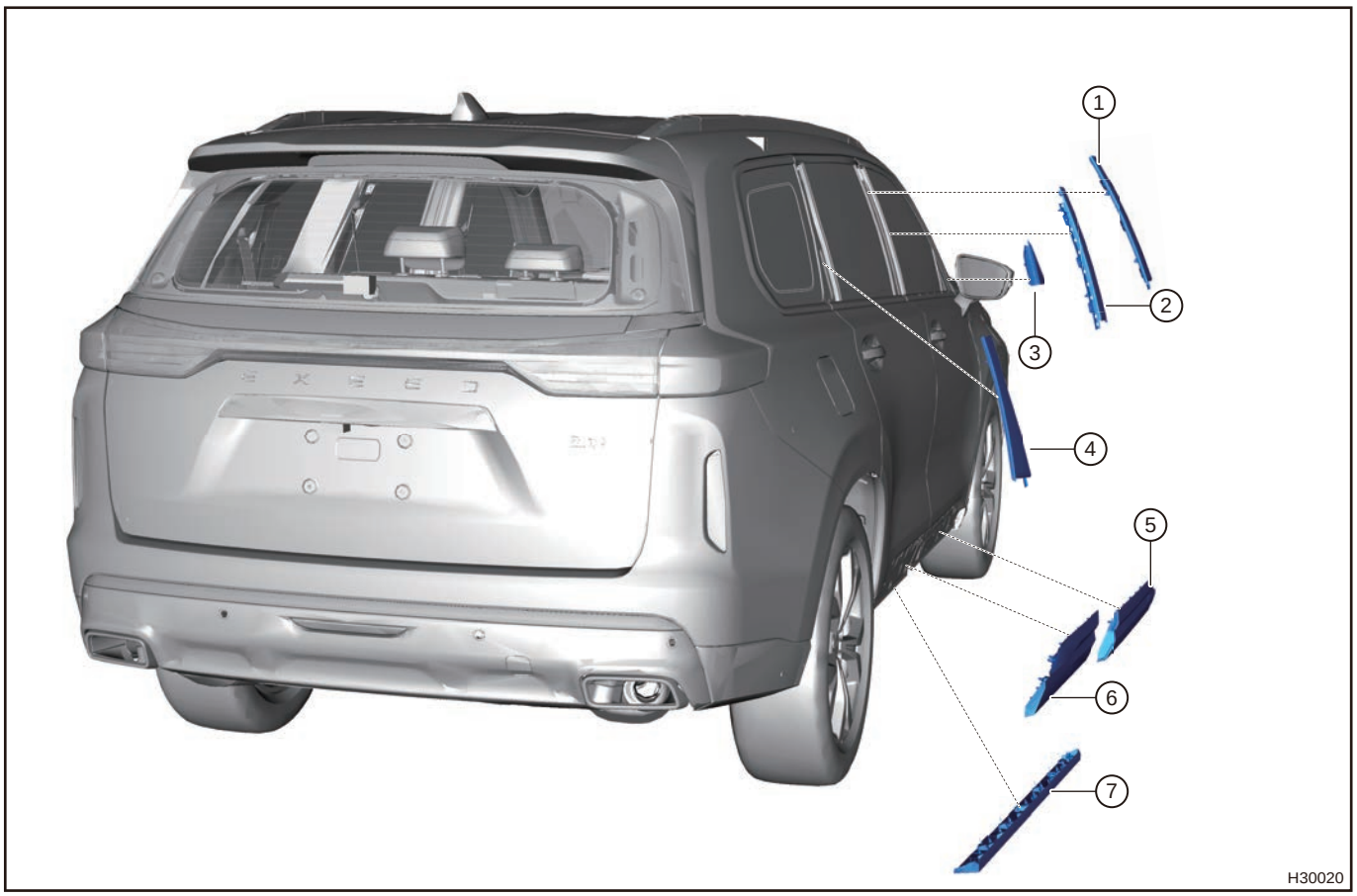


1	Front Windshield Lower Trim Panel	14	Front Position Light Assembly
2	Engine Compartment Trim Cover Assembly	15	Front Bumper Assembly
3	Front Windshield Lower Trim Panel Right Cover Plate	16	Front Bumper Crossmember Assembly
4	Front Windshield Lower Trim Panel Right Block	17	Engine Compartment Lower Protector Assembly
5	Front Right Wheel House Protector Assembly	18	Left Air Deflector
6	Right Wing Assembly	19	Left Wing Spacer
7	Front Right Bumper Mounting Bracket	20	Front Left Wheel House Protector Assembly
8	Right Wing Spacer	21	Front Left Bumper Mounting Bracket
9	Air Deflector Assembly	22	Left Wing Assembly
10	Right Air Deflector	23	Left Skirt Protector Assembly
11	Front Bumper Crossmember Assembly	24	Front Left Door Chafing Strip Assembly
12	Upper Energy Absorbing Block	25	Front Windshield Lower Trim Panel Left Block
13	Front Grille	26	Front Windshield Lower Trim Panel Left Cover Plate

Rear View



1	Rear Left Rack End Cover	12	Rear Bumper Combination Light Lower Mounting Bracket
2	Left Roof Rack Assembly	13	Rear Bumper Crossmember
3	Front Left Rack End Cover	14	Rear Bumper Assembly
4	Front Left Door B-pillar Cover Plate Assembly	15	Rear Right Wheel House Protector Assembly
5	Rear Left Door B-pillar Cover Plate Assembly	16	Rear Bumper Right Mounting Bracket
6	Left Triangular Trim Board Assembly	17	Rear Spoiler Assembly
7	Rear Left Door C-pillar Trim Board Assembly	18	Right D-pillar Trim Board Assembly
8	Left D-pillar Trim Board Assembly	19	Rear Right Rack End Cover
9	Rear Bumper Left Mounting Bracket	20	Right Rack Assembly
10	Rear Left Scuff Plate Assembly	21	Front Right Rack End Cover
11	Rear Left Wheel House Protector Assembly		



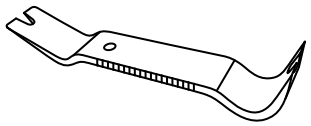
1	Front Right Door B-pillar Cover Plate Assembly	5	Front Right Scuff Plate Assembly
2	Rear Right Door B-pillar Cover Plate Assembly	6	Rear Right Door Scuff Plate Assembly

3	Right Triangular Trim Board Assembly	7	Right Skirt Protector Assembly
4	Rear Right Door C-pillar Trim Board Assembly		

3 ON-VEHICLE SERVICE

3.1 Tool

■ General Tool

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

3.2 Replace Front Bumper Assembly

■ Removal

⚠ Warning

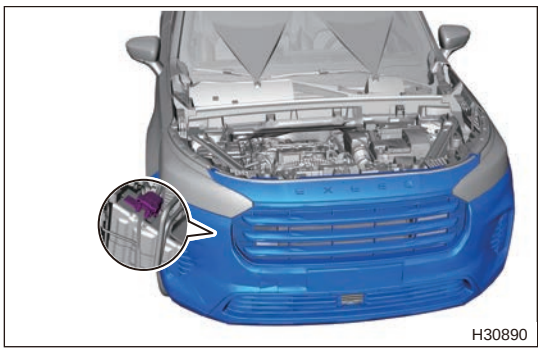
- **Be sure to wear necessary safety equipment to prevent accidents, when removing front bumper assembly.**
- **Appropriate force should be applied, when removing front bumper assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing front bumper assembly.**
- **Avoid breaking claws, when disassembling front bumper assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

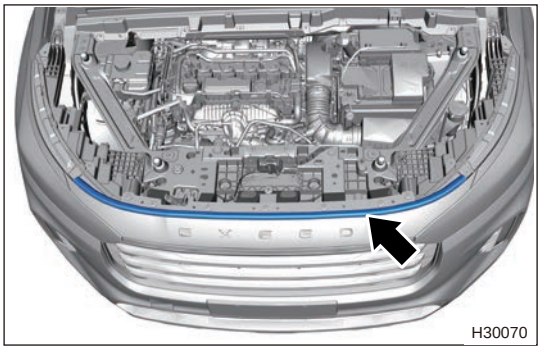
(2) Disconnect the negative battery cable.

(3) Remove the engine compartment trim cover assembly.

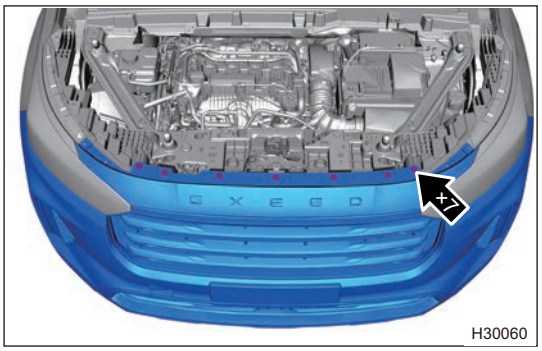
(4) Disconnect the front bumper wire harness connector.


H30890

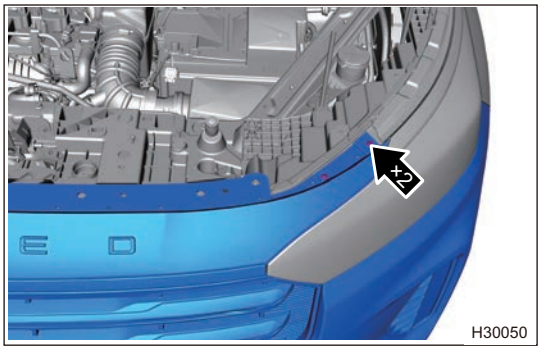
(5) Remove the engine compartment weatherstrip.



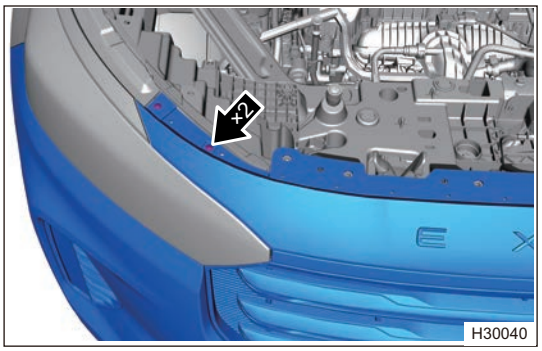
(6) Remove 7 fixing bolts between grille upper strip and radiator bracket.



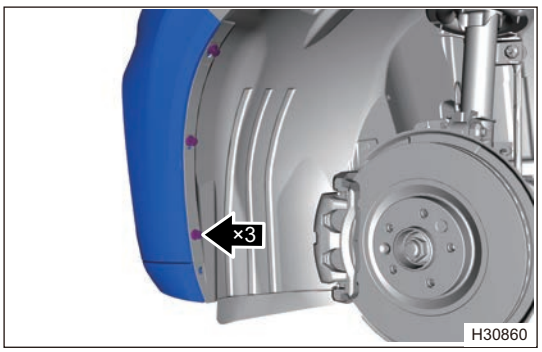
(7) Remove 2 fixing screws from left side of grille strip.



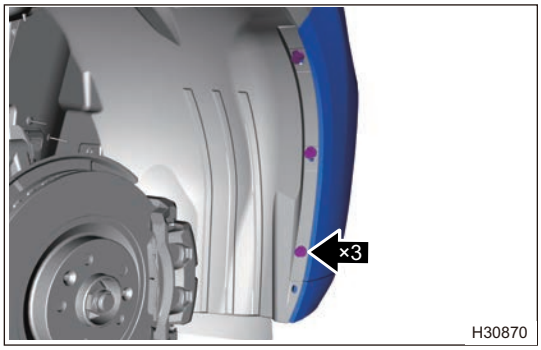
(8) Remove 2 fixing screws from right side of grille strip.



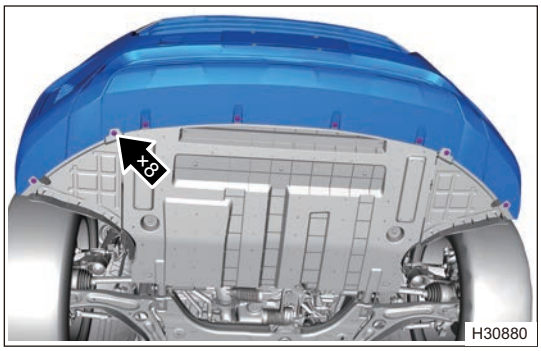
(9) Remove 3 fixing clips between front bumper and front left wheel house protector.



(10) Remove 3 fixing clips between front bumper and front right wheel house protector.



(11) Remove 8 fixing bolts between front bumper and bottom protector.



■ Installation

(1) Connect the front bumper wire harness connector.
(2) Install front bumper to a proper position, install 7 fixing bolts between grille upper strip and radiator bracket.

Torque: 5 ± 1 N·m

(3) Raise the vehicle, install 8 fixing bolts between front bumper and bottom protector.

Torque: 4 ± 0.5 N·m

(4) Install 3 fixing clips between front bumper and front right wheel house protector.
(5) Install 3 fixing clips between front bumper and front left wheel house protector.
(6) Install 2 fixing screws on right side of grille strip.

Torque: 2.0 ± 0.5 N·m

(7) Install 2 fixing screws on left side of grille strip.

Torque: 2.0 ± 0.5 N·m

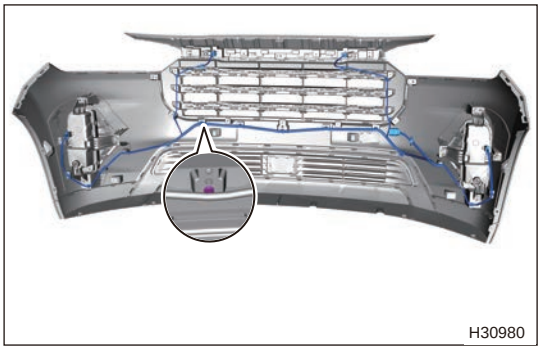
(8) Install the engine compartment weatherstrip.
(9) Install the engine compartment trim cover assembly.
(10) Connect the negative battery cable.
(11) Connect ENGINE START STOP switch and perform running test.

■ Disassembly

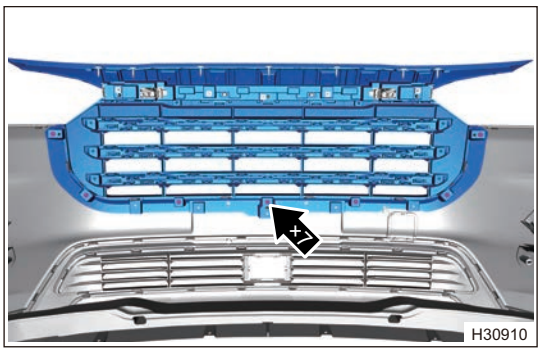
⚠ Caution

- **Appropriate force should be applied, when disassembling front bumper assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when disassembling front bumper assembly.**
- **Avoid breaking claws, when disassembling front bumper assembly.**

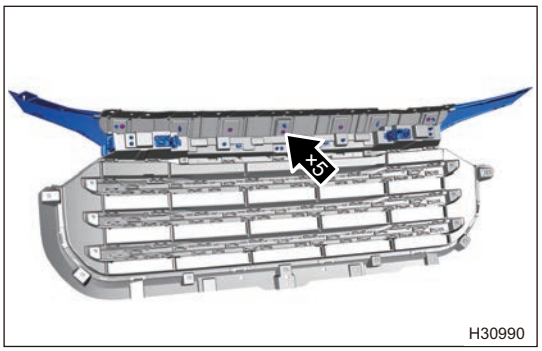
(1) Disengage the fixing clip from front bumper wire harness.



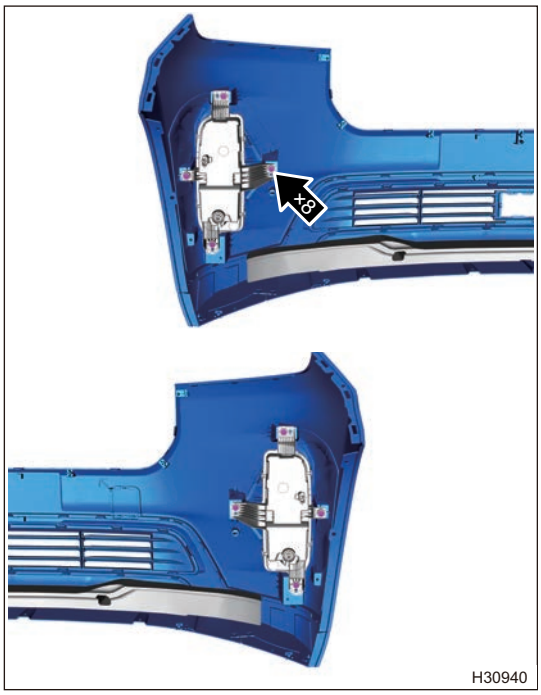
(2) Remove 7 fixing screws between front bumper and front grille.



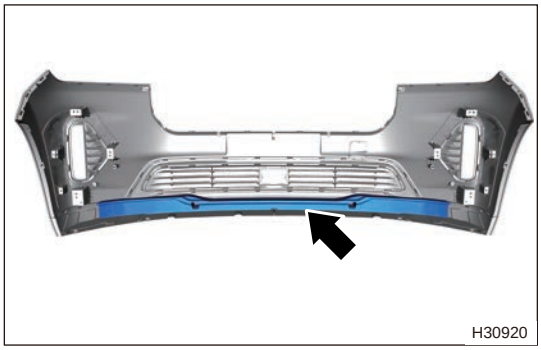
(3) Remove 5 screws of grille upper strip, and remove front position light assembly.



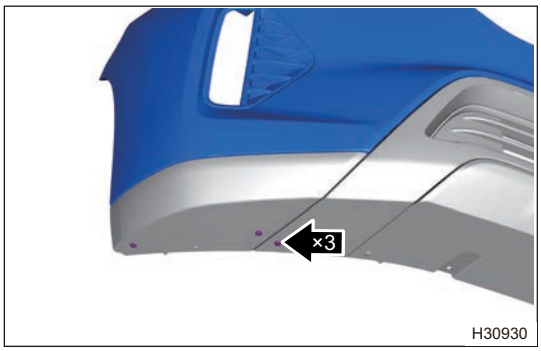
(4) Remove 8 fixing screws between front bumper and fog light bracket.



(5) Remove the front lower protection crossmember energy absorbing block.



(6) Remove 3 fixing screws between front bumper and lower ornament (Use same procedures for right and left sides, take left side as an example).



■ **Assembly**

⚠ Caution

- **Appropriate force should be applied, when assembling front bumper assembly. Be careful not to operate roughly.**
- **Avoid breaking claws, when assembling front bumper assembly.**

(1) Install 3 fixing screws between front bumper and lower ornament.

Torque: 1.5 ± 0.5 N·m

(2) Install the front lower protection crossmember energy absorbing block.

(3) Install 8 fixing screws between front bumper and fog light bracket.

Torque: 1.5 ± 0.5 N·m

(4) Install the front position light assembly and grille upper strip.

(5) Install 7 fixing screws between front bumper and front grille.

(6) Install the fixing clip to front bumper wire harness.

3.3 Replace Front Bumper Mounting Bracket

■ **Removal**

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

- **Appropriate force should be applied, when removing front bumper mounting bracket. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing front bumper mounting bracket.**

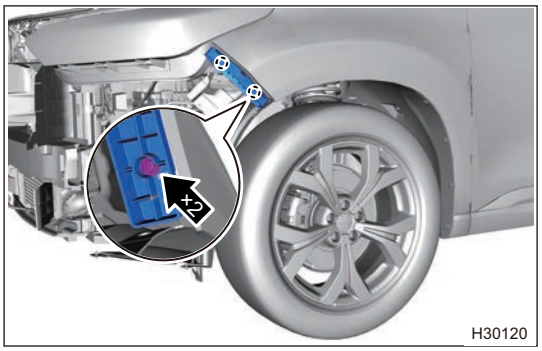
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the engine compartment trim cover assembly.

(4) Remove the front bumper assembly.

(5) Remove 2 fixing bolts from front bumper mounting bracket.



(6) Remove the front bumper mounting bracket.

■ **Installation**

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing front bumper mounting bracket.**

(1) Install the front bumper mounting bracket to a proper position.

(2) Install 2 fixing bolts to front bumper bracket.

Torque: 5 ± 1 N·m

(3) Install the front bumper assembly.

(4) Install the engine compartment trim cover assembly.

(5) Connect the negative battery cable.

(6) Connect ENGINE START STOP switch and perform running test.

3.4 Replace Front Bumper Crossmember Assembly

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing front bumper crossmember assembly.**
- **Try to prevent body paint surface from being scratched, when removing front bumper crossmember assembly.**
- **Front bumper crossmember and front lower protection crossmember can not be removed at the same time, otherwise the front end plastic frame and cooling module will fall down.**
- **To remove front bumper crossmember and front lower protection crossmember, it is necessary to remove front end module from vehicle, and then remove the front bumper impact beam assembly and front bumper lower crossmember assembly one by one. If front end module is not removed, directly remove the front bumper crossmember or front lower protection crossmember, first remove one of them and then install it properly before removing the other one. If these two are removed at the same time, the front end module assembly will be unsupported and fall off.**

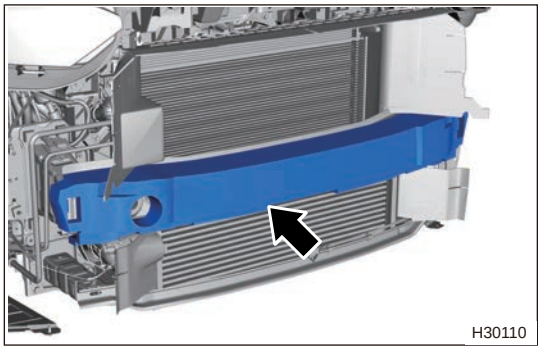
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

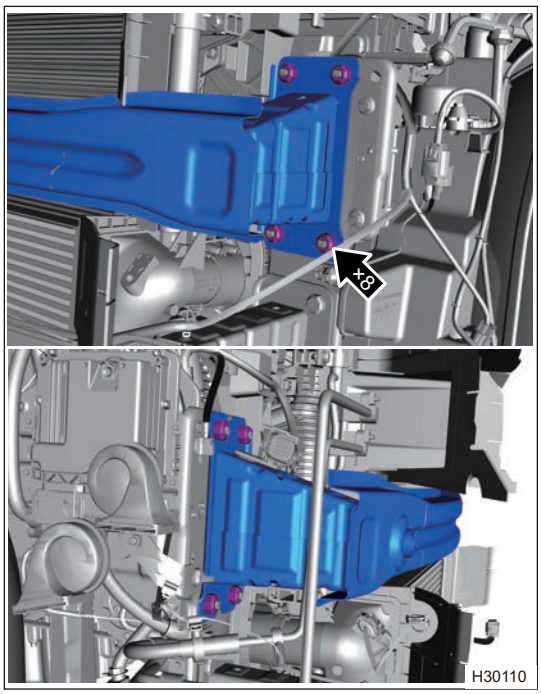
(3) Remove the engine compartment trim cover assembly.

(4) Remove the front bumper assembly.

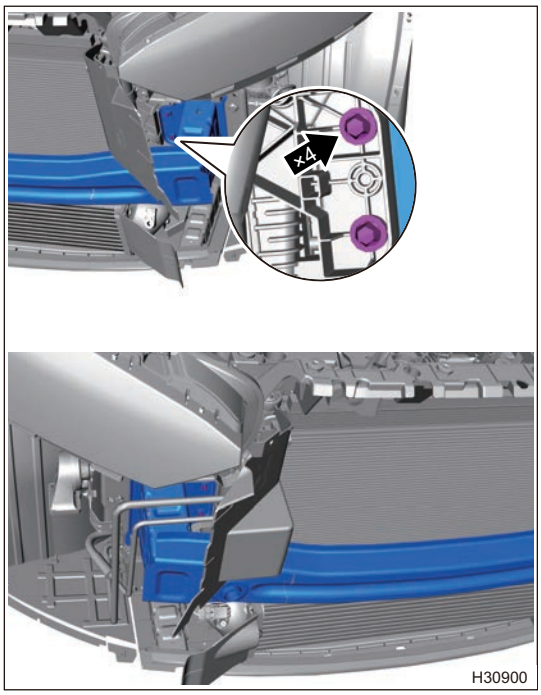
(5) Remove the upper energy absorbing block.



(6) Remove 8 fixing nuts from front bumper crossmember assembly.



(7) Remove 4 fixing bolts between front bumper crossmember assembly and cooler bracket assembly.



(8) Remove the front bumper crossmember assembly.

■ **Installation**

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing front bumper crossmember assembly.**
- **There should be no looseness, shaking and deformation, after installing front bumper crossmember assembly.**

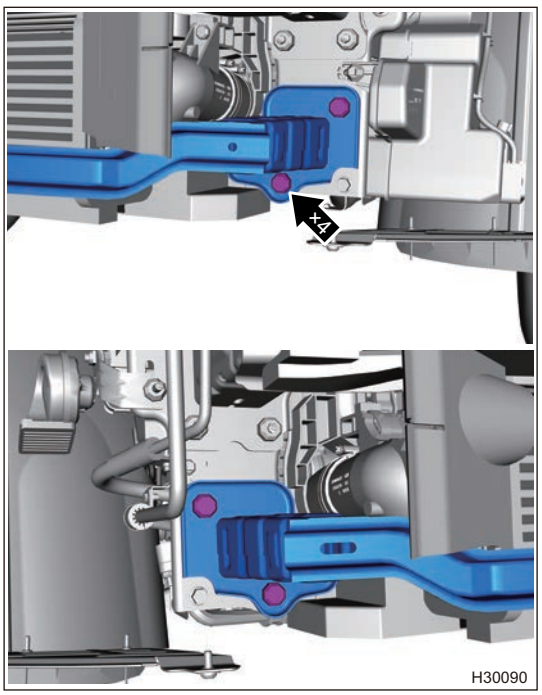
(1) Install the front bumper crossmember assembly to a proper position.
(2) Install 8 fixing nuts of front bumper crossmember assembly.
(3) Install 4 fixing bolts between front bumper crossmember assembly and cooler bracket assembly.
(4) Install the upper energy absorbing block.
(5) Install the front bumper assembly.
(6) Install the engine compartment trim cover assembly.
(7) Connect the negative battery cable.
(8) Connect ENGINE START STOP switch and perform running test.

3.5 Replace Front Lower Protection Crossmember Assembly

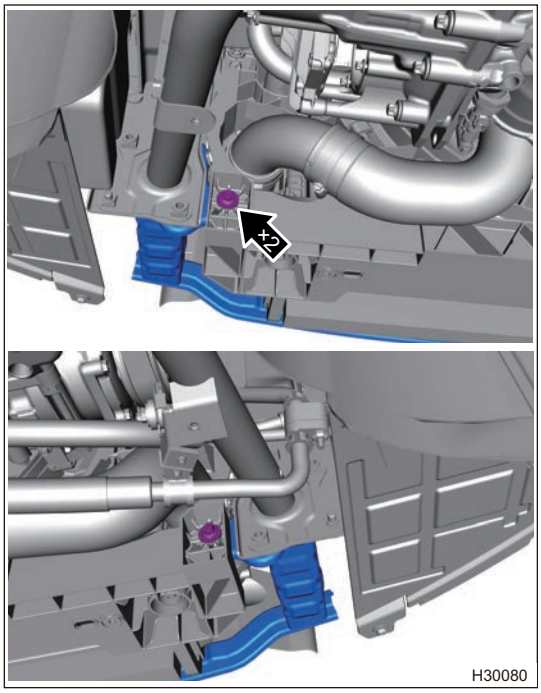
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing front lower protection crossmember assembly.**
- **Try to prevent body paint surface from being scratched, when removing front lower protection crossmember assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.
(4) Remove the front bumper assembly.
(5) Disengage the outside temperature sensor wire harness clip.
(6) Remove 4 fixing bolts from front lower protection crossmember assembly.



(7) Remove 2 fixing bolt between front lower protection crossmember and cooler bracket assembly.



(8) Remove the front lower protection crossmember assembly.

■ **Installation**

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing front lower protection crossmember assembly.**

(1) Install front lower protection crossmember assembly to a proper position .
(2) Install 4 fixing bolts of front lower protection crossmember assembly.
(3) Install 2 fixing bolt between front lower protection crossmember and cooler bracket assembly.
(4) Install the outside temperature sensor wire harness clip.
(5) Install the front bumper assembly.
(6) Install the engine compartment trim cover assembly.
(7) Connect the negative battery cable.
(8) Connect ENGINE START STOP switch and perform running test.

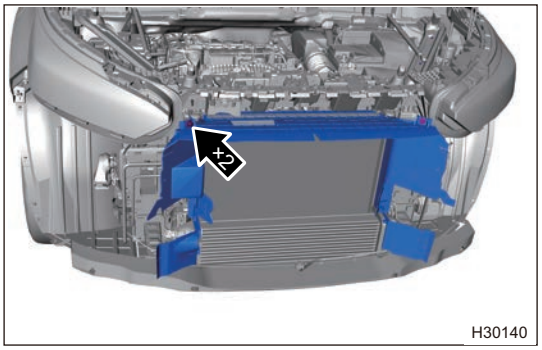
3.6 Replace Air Deflector Assembly

⚠ Warning

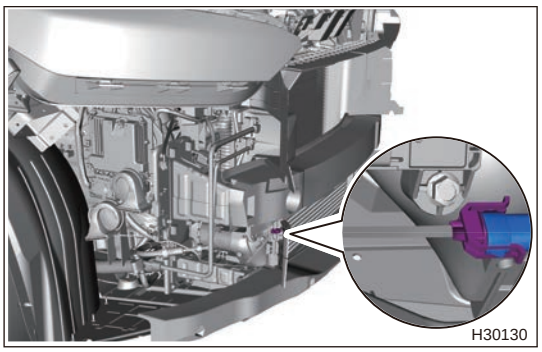
- **Be sure to wear necessary safety equipment to prevent accidents, when removing air deflector assembly.**
- **Try to prevent body paint surface from being scratched, when removing air deflector assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.
(4) Remove the front bumper assembly.
(5) Remove the front bumper crossmember assembly.

(6) Remove 2 fixing clips from upper air deflector.



(7) Disconnect and remove outside temperature sensor.



(8) Remove the air deflector.

■ **Installation**

⚠ **Caution**
• **Try to prevent body paint surface from being scratched, when installing air deflector assembly.**

(1) Install the air deflector.
(2) Connect outside temperature sensor connector and install outside temperature sensor.
(3) Install 2 fixing clips of upper air deflector.
(4) Install the front bumper crossmember.
(5) Install the front bumper assembly.
(6) Install the engine compartment trim cover assembly.
(7) Connect the negative battery cable.
(8) Connect ENGINE START STOP switch and perform running test.

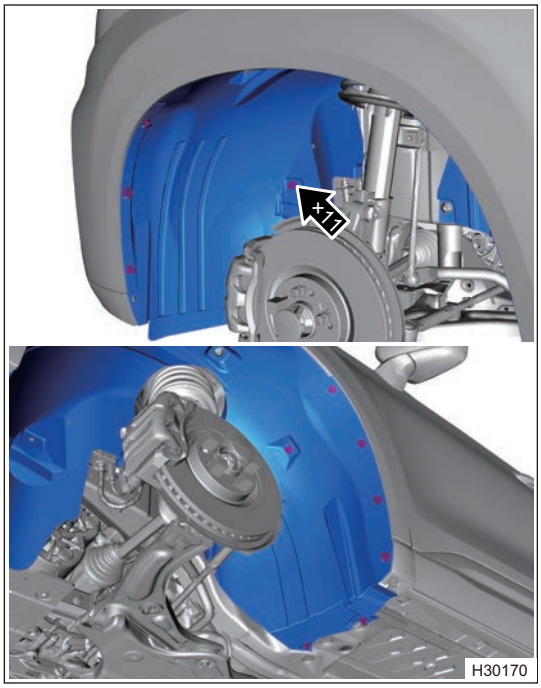
3.7 Replace Front Wheel House Protector Assembly

Hint:

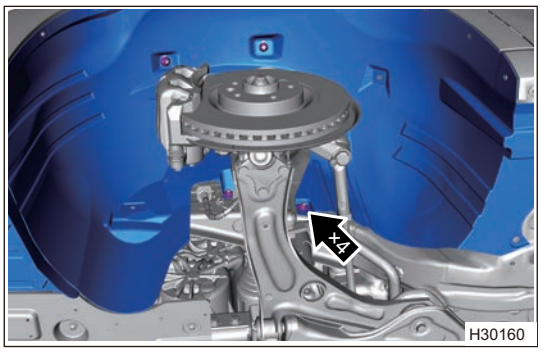
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ **Warning**
• **Be sure to wear safety equipment to prevent accidents, when removing front wheel house protector assembly.** • **Try to prevent body paint surface from being scratched, when removing front wheel house protector assembly.**

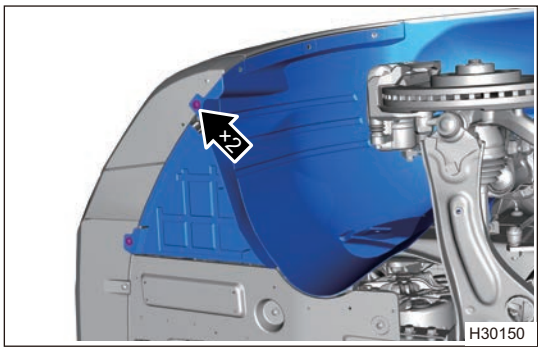
(1) Remove 11 plastic snap fasteners from front wheel house protector.



(2) Remove 4 plastic nuts from upper part of front wheel house protector.



(3) Remove 2 fixing screws from lower part of front wheel house protector.



■ Installation

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing front wheel house protector assembly.**

(1) Install 2 fixing screws to lower part of front wheel house protector.

Torque: 5 ± 1 N·m

(2) Install 4 plastic nuts to upper part of front wheel house protector.

Torque: 4 ± 1 N·m

(3) Install 11 plastic snap fasteners of front wheel house protector.

3.8 Replace Front Windshield Lower Trim Panel Assembly

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing front windshield lower support assembly.**
- **Try to prevent body paint surface from being scratched, when removing front windshield lower support assembly.**

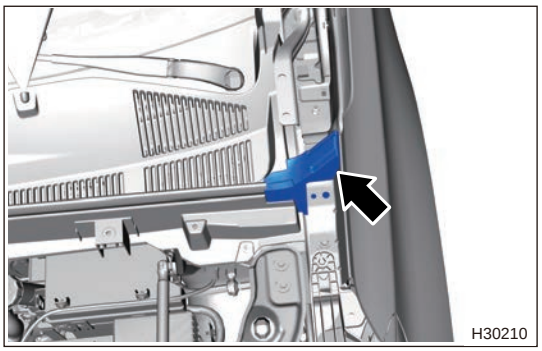
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

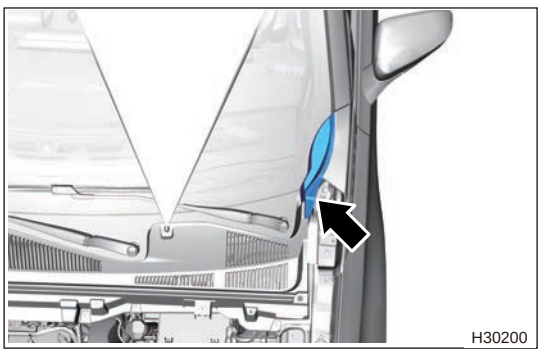
(3) Remove the engine compartment trim cover assembly.

(4) Remove the front wiper arm assembly.

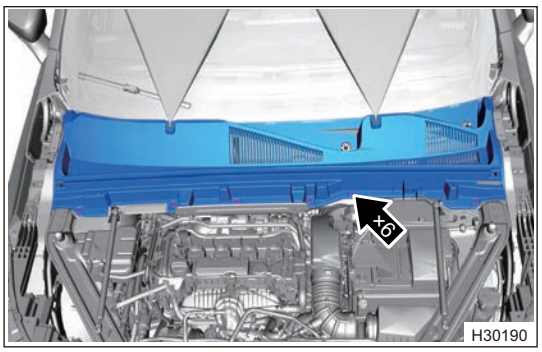
(5) Remove the front windshield lower trim panel left block (take left side as an example).



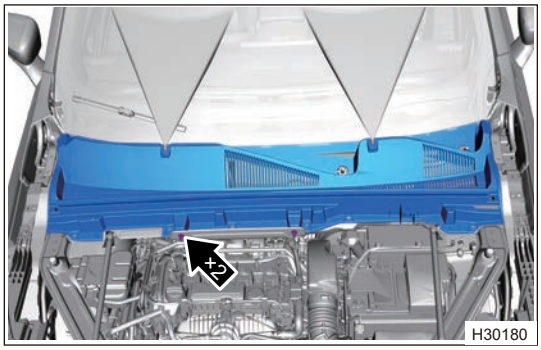
(6) Using an interior crow plate, pry off front windshield lower trim panel left cover plate (take left side as an example).



(7) Remove 6 fixing snap fasteners from front windshield lower trim panel.



(8) Remove 2 fixing clips between front windshield lower trim panel and cowl panel outside isolation pad.



■ **Installation**

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing front windshield lower trim panel assembly.**

(1) Install 2 fixing clips between front windshield lower trim panel and cowl panel outside isolation pad.
(2) Install 6 fixing snap fasteners to front windshield lower trim panel.
(3) Install the front windshield lower trim panel left cover plate.
(4) Install the front windshield lower trim panel left block.
(5) Install the front wiper arm assembly.
(6) Install the engine compartment trim cover assembly.
(7) Connect the negative battery cable.
(8) Connect ENGINE START STOP switch and perform running test.

3.9 Replace Wing Assembly

Hint:

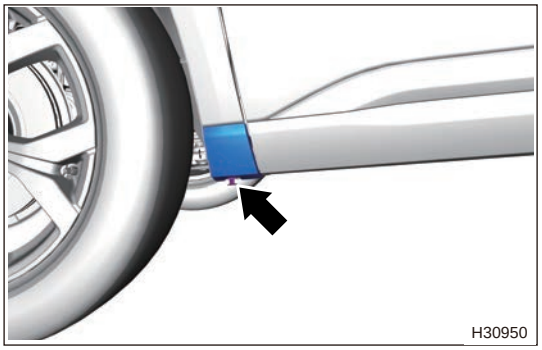
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

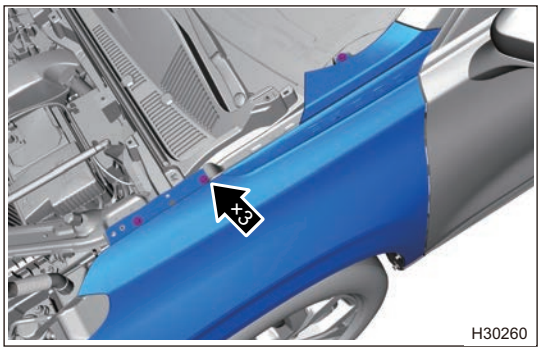
- **Be sure to wear safety equipment to prevent accidents, when removing wing assembly.**
- **Try to prevent body paint surface from being scratched, when removing wing assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the engine compartment trim cover assembly.
(4) Remove the front left wheel assembly.
(5) Remove the front bumper assembly.
(6) Remove the left headlight assembly.
(7) Remove the front left whee house assembly.

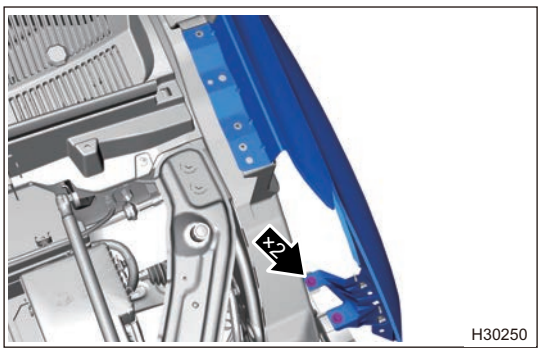
(8) Remove fixing clip between arch ornament and wing, and remove wheel arch.



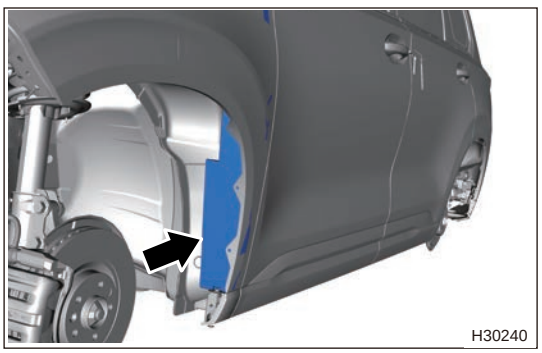
(9) Remove 3 fixing bolts between upper part of wing assembly and body.



(10) Remove 2 fixing bolts between front part of wing assembly and body.

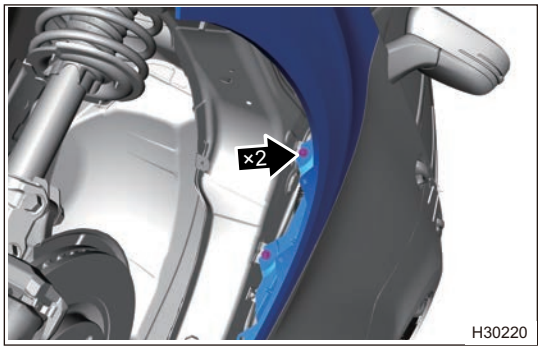


(11) Remove the wing spacer.

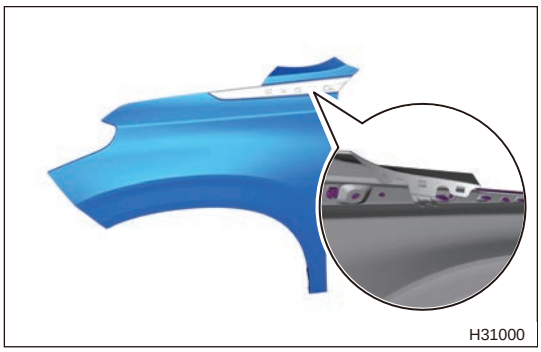


(12) Remove 2 fixing bolts between lower part of wing assembly and body.

(13) Remove 2 fixing bolts between rear part of wing assembly and body.



(14) Remove the wing ornament.



■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing front wing.**
- **Try to prevent body paint surface from being scratched, when installing front wing.**
- **Make sure that front wing is installed correctly and fitting clearance between front wing and body is appropriate, when installing front wing.**
- **After assembly, it is not allowed to exceed the sheet metal flanging, end stay outside, and obstruct the installation hole of front wheel arch ornament.**

(1) Install 2 fixing bolts between rear part of wing assembly and body.
(2) Install 2 fixing bolts between lower part of wing assembly and body.
(3) Install the wing spacer.
(4) Install 2 fixing bolts between front part of wing assembly and body.
(5) Install 3 fixing bolts between upper part of wing assembly and body.
(6) Install fixing clip between arch ornament and wing.
(7) Install the left headlight assembly.
(8) Install the front bumper assembly.
(9) Install wing trim panel.
(10) Install front left wheel assembly.
(11) Install the engine compartment trim cover assembly.
(12) Connect the negative battery cable.
(13) Connect ENGINE START STOP switch and perform running test.

3.10 Replace Roof Rack

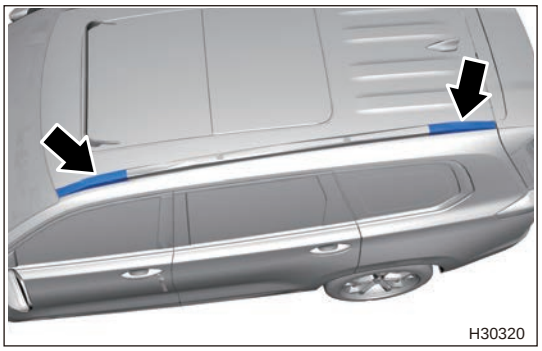
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

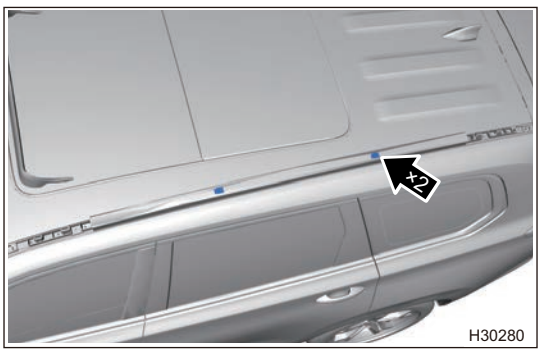
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing roof rack.**
- **Try to prevent body paint surface from being scratched, when removing roof rack.**

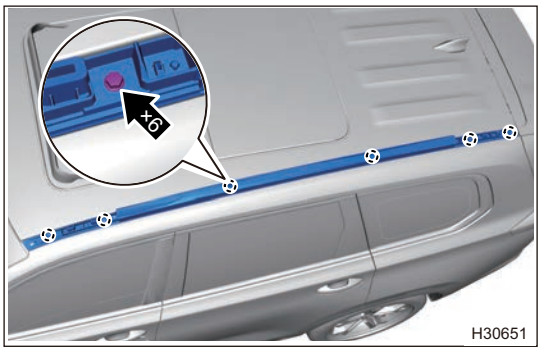
(1) Using an interior crow plate, pry off front and rear end covers of roof rack.



(2) Using an interior crow plate, pry off center trim cover.



(3) Remove 6 fixing bolts from roof rack.



■ Installation

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing roof rack.**
- **Try to prevent body paint surface from being scratched, when installing roof rack.**
- **When installing, make sure that there is no clearance between the rubber pad of roof rack and quarter, roof. Pay attention to the alignment of clearance between rubber pad and roof.**
- **It is essential to check whether the clip is clamped in place.**

(1) Install 6 fixing bolts to roof rack.

Torque: 9.0 ± 1 N·m

(2) Install the center trim cover.

(3) Install front and rear end covers of roof rack.

3.11 Replace Rear Spoiler Assembly

⚠ Warning

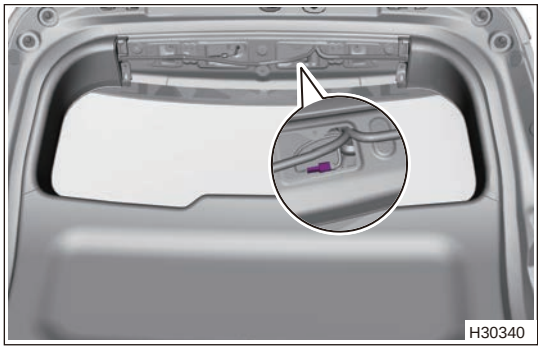
- **Be sure to wear safety equipment to prevent accidents, when removing rear spoiler assembly.**
- **Try to prevent body paint surface from being scratched, when removing rear spoiler assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

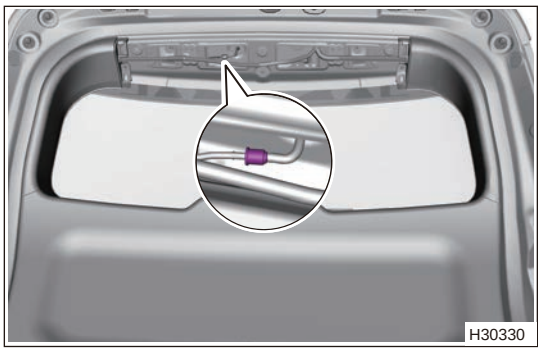
(2) Disconnect the negative battery cable.

(3) Remove back door upper protector assembly.

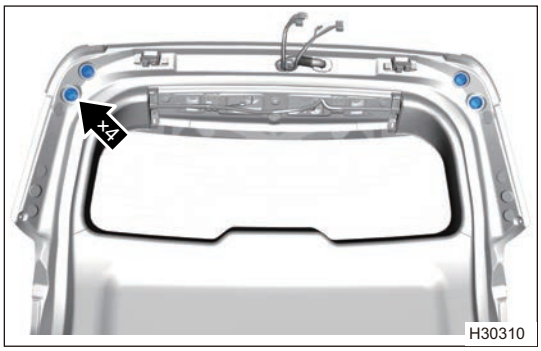
(4) Disconnect wire harness connector from high mounted stop light.



(5) Disconnect the washer pipeline from rear nozzle.

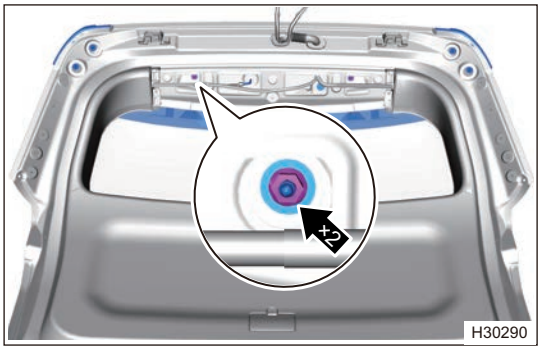


(6) Using an interior crow plate, pry off plug from rear spoiler.

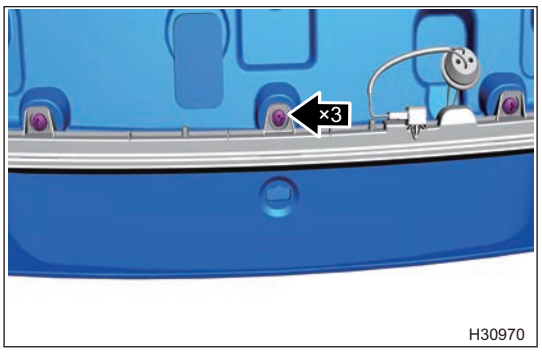


(7) Remove 4 fixing bolts from rear spoiler assembly.

(8) Remove 2 fixing nuts from rear spoiler assembly.



(9) Remove 3 fixing screws from high mounted stop light.



■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing rear spoiler assembly.**
- **Try to prevent body paint surface from being scratched, when installing rear spoiler assembly.**

(1) Install the high mounted stop light.
(2) Install 3 fixing screws to high mounted stop light.
(3) Install 2 fixing nuts to rear spoiler assembly.
(4) Install 4 fixing bolts to rear spoiler assembly.
(5) Install the plug to rear spoiler.
(6) Connect the washer pipeline to rear nozzle.
(7) Connect wire harness connector to high mounted stop light.
(8) Install the back door upper protector assembly.
(9) Connect the negative battery cable.
(10) Connect ENGINE START STOP switch and perform running test.

3.12 Replace Engine Compartment Trim Cover Assembly

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing engine compartment trim cover assembly.**
- **Try to prevent body paint surface from being scratched, when removing engine compartment trim cover assembly.**

(1) Disengage 21 plastic snap fasteners of engine compartment trim cover assembly.

■ **Installation**

⚠ Caution

- **Be sure to wear necessary safety equipment to prevent accidents, when installing engine compartment trim cover assembly.**
- **Try to prevent appearance from being scratched, when installing engine compartment trim cover assembly.**

(1) Secure 21 plastic snap fasteners of engine compartment trim cover assembly.

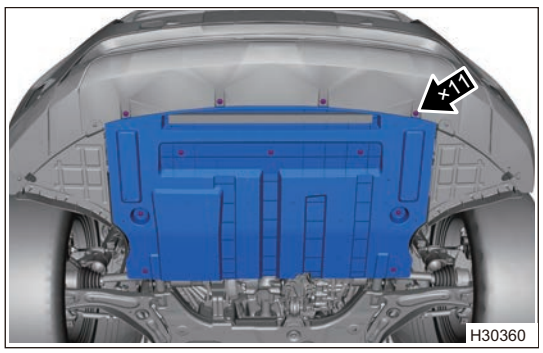
3.13 Replace Engine Compartment Lower Protector Assembly

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing engine compartment lower protector assembly.**
- **Try to prevent body paint surface from being scratched, when removing engine compartment lower protector assembly.**

(1) Raise the vehicle to a proper position.

(2) Remove 11 fixing bolts from engine compartment lower protector assembly.



■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing engine compartment lower protector assembly.**
- **Try to prevent body paint surface from being scratched, when installing engine compartment lower protector assembly.**

(1) Install 11 fixing bolts to engine compartment lower protector assembly.

Torque: 4 ± 0.5 N·m

(2) Lower the vehicle to a proper position.

3.14 Replace Rear Bumper Assembly

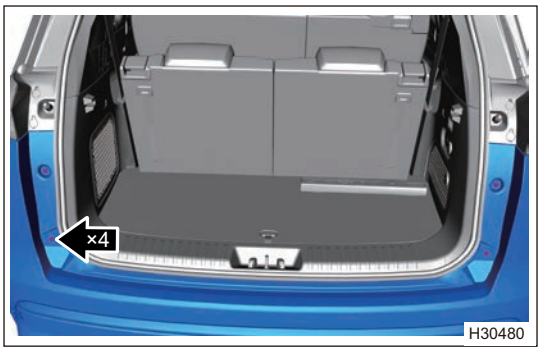
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear bumper assembly.**
- **Appropriate force should be applied, when removing rear bumper assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing rear bumper assembly.**
- **Avoid breaking claws, when disassembling rear bumper assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

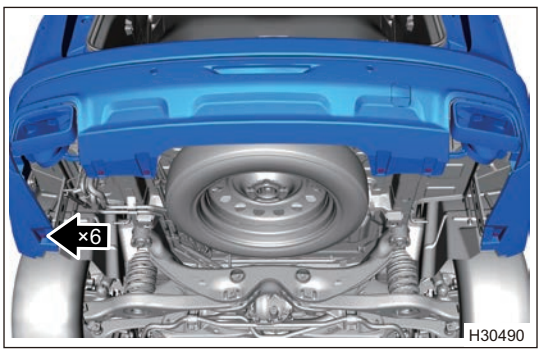
(2) Disconnect the negative battery cable.

(3) Remove 4 fixing screws from upper part of rear bumper assembly.



(4) Remove 3 fixing screws of rear wheel house protector.

(5) Raise vehicle and remove 6 fixing bolts from lower part of rear bumper assembly.



(6) Remove the right luggage compartment protector body.

(7) Disconnect the rear bumper wire harness connector.

(8) Disconnect the main blind spot detection radar connector.

■ Installation

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing rear bumper assembly.**
- **Make sure that rear bumper is installed correctly and fitting clearance between rear bumper and body is appropriate, when installing rear bumper assembly.**

(1) Connect the rear bumper wire harness connector, and install rear bumper to proper position.

(2) Connect the main blind spot detection radar connector.

(3) Raise vehicle and install 6 fixing bolts to lower part of rear bumper assembly.

Torque: 2 ± 1.0 N·m

(4) Install 3 fixing screws to rear wheel house protector.

Torque: 1.5 ± 0.5 N·m

(5) Install 4 fixing screws to upper part of rear bumper assembly. (Take left side as an example)

Torque: 1.5 ± 0.5 N·m

(6) Connect the negative battery cable.

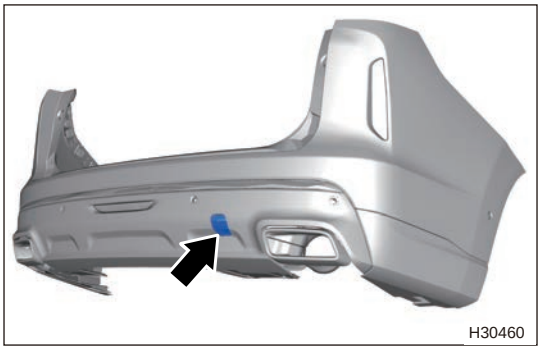
(7) Connect ENGINE START STOP switch and perform running test.

■ Disassembly

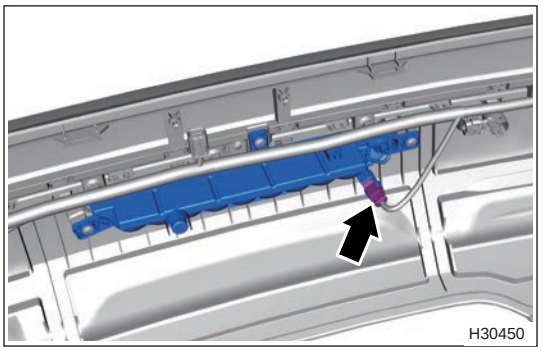
⚠ Caution

- **Appropriate force should be applied, when disassembling rear bumper assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when disassembling rear bumper assembly.**
- **Avoid breaking claws, when disassembling rear bumper assembly.**

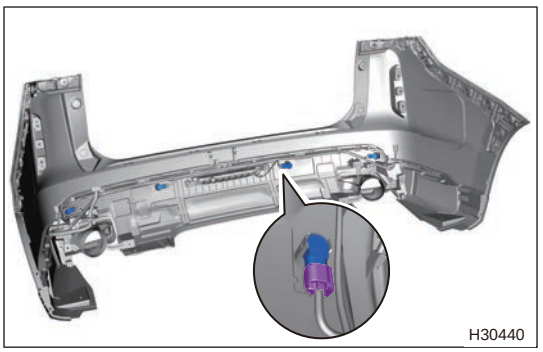
(1) Using an interior crow plate, pry off rear bumper towing hook cover claw and remove the rear bumper towing hook cover.



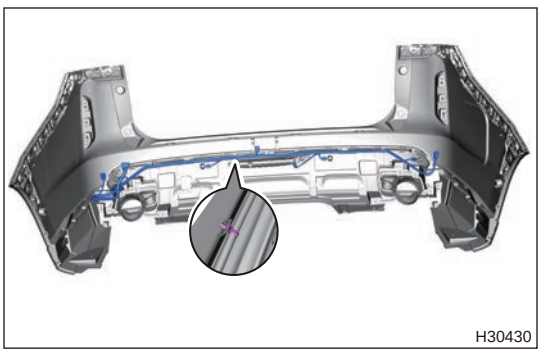
(2) Disconnect the rear fog light connector.



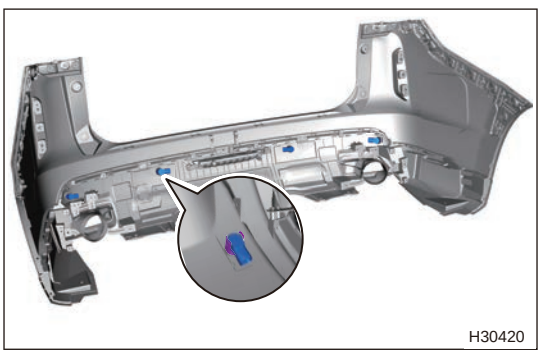
(3) Disconnect the rear bumper sensor connector.



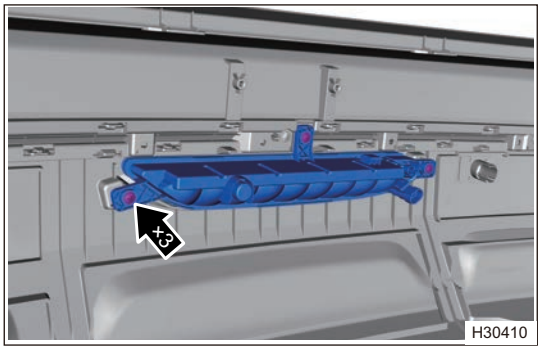
(4) Disengage the rear bumper wire harness fixing clip and remove rear bumper wire harness.



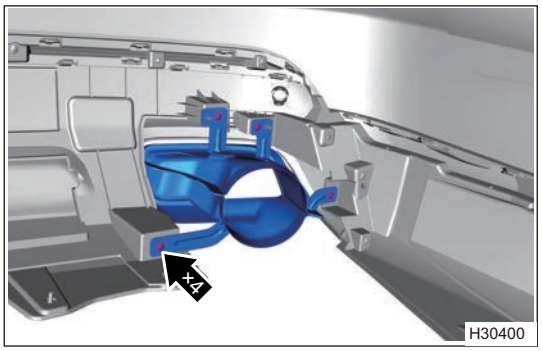
(5) Disengage the clip and remove rear bumper sensor.



(6) Remove 3 fixing screws and rear fog light.

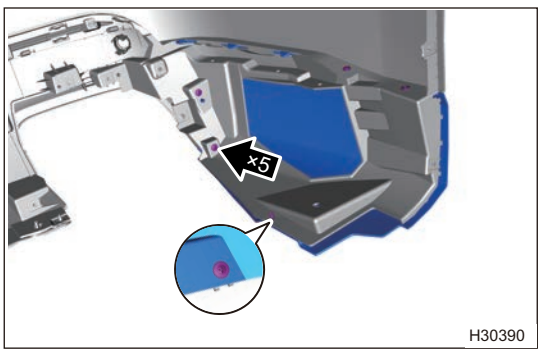


(7) Remove 4 fixing screws from exhaust pipe trim cover and remove exhaust pipe heat insulator steel sleeve (-take left side as an example).

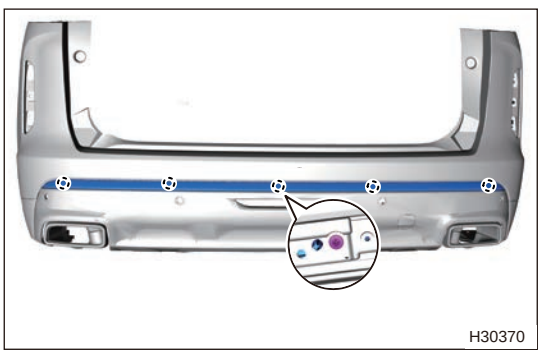


(8) Remove 2 fixing screws and left retro-reflector assembly (take left side as an example).

(9) Remove 5 fixing screws and left end ornament of rear bumper (take left side as an example).



(10) Remove 5 fixing screws and rear bumper center trim strip.



(11) Remove rear bumper lower trim board.

■ **Assembly**

⚠ Caution

- **Appropriate force should be applied, when assembling rear bumper assembly. Be careful not to operate roughly.**
- **Avoid breaking claws, when assembling rear bumper assembly.**

(1) Install the rear bumper lower trim board.

(2) Install rear bumper center trim strip to a proper position and install 5 fixing screws of rear bumper center trim strip.

(3) Install left end ornament of rear bumper to a proper position and install 5 fixing screws to left end ornament of rear bumper (take left side as an example).

(4) Install 2 fixing screws of left retro-reflector assembly (take left side as an example).

(5) Install exhaust pipe heat insulator steel sleeve to a proper position and install 4 fixing screws to exhaust pipe heat insulator steel sleeve (take left side as an example).

(6) Install rear fog light to a proper position and install 3 fixing screws to rear fog light.

(7) Install rear bumper sensor and clip into place.

(8) Install rear bumper wire harness and fixing clip.

(9) Connect the rear bumper sensor connector.

(10) Connect the rear fog light connector.

(11) Install rear bumper towing hook cover and clip into place.

3.15 Replace Rear Bumper Mounting Bracket

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

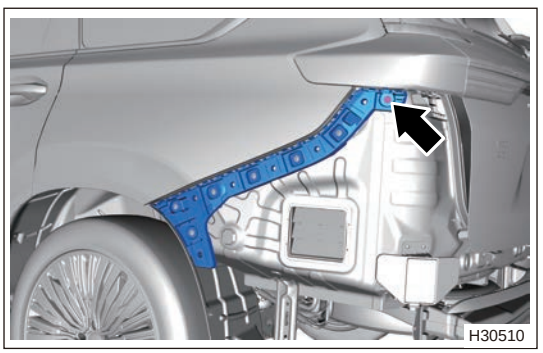
- **Appropriate force should be applied, when removing rear bumper mounting bracket. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing rear bumper mounting bracket.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

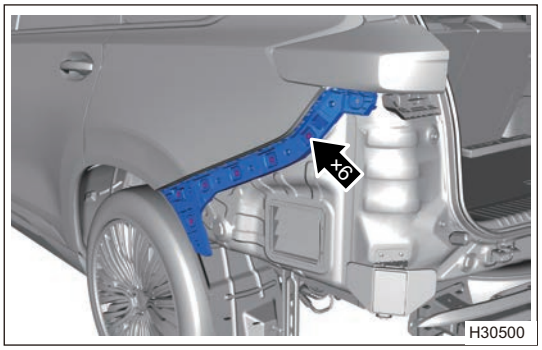
(2) Disconnect the negative battery cable.

(3) Remove the rear bumper assembly.

(4) Remove 1 fixing bolt from rear bumper mounting bracket.

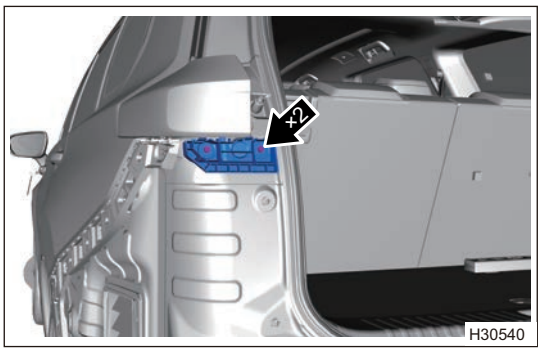


(5) Remove 6 fixing screws from rear bumper mounting bracket.



(6) Remove the front bumper mounting bracket.

(7) Remove 2 fixing bolt from rear bumper combination light lower mounting bracket.



(8) Remove the rear bumper combination light lower mounting bracket.

■ **Installation**

⚠ **Caution**
• **Try to prevent body paint surface from being scratched, when installing rear bumper mounting bracket.**

(1) Install the rear bumper mounting bracket to a proper position.

(2) Install 2 fixing bolts to rear bumper bracket.

Torque: 2 ± 1.0 N·m

(3) Install 6 fixing screws to rear bumper bracket.

Torque: 1.5 ± 0.5 N·m

(4) Install 1 fixing bolt to rear bumper combination light lower mounting bracket.

Torque: 2 ± 1.0 N·m

(5) Install the rear bumper assembly.

(6) Connect the negative battery cable.

(7) Connect ENGINE START STOP switch and perform running test.

3.16 Replace Rear Bumper Crossmember

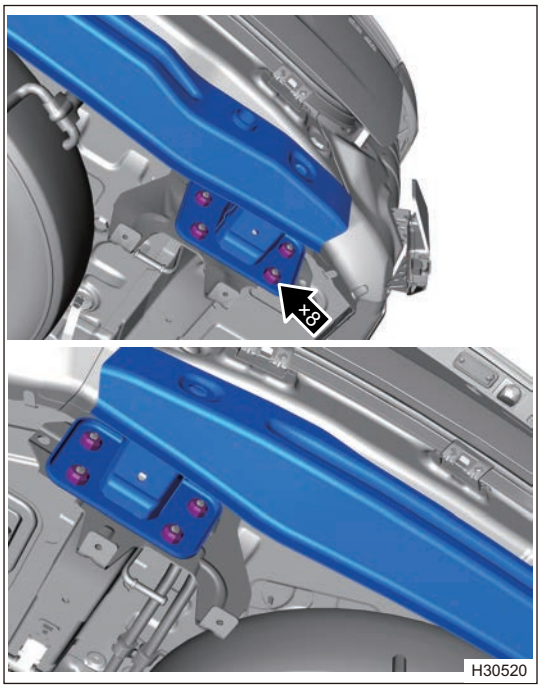
⚠ **Warning**
• **Appropriate force should be applied, when removing rear bumper crossmember. Be careful not to operate roughly.** • **Try to prevent body paint surface from being scratched, when removing rear bumper crossmember.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the rear bumper assembly.

(4) Remove 8 fixing nuts from rear bumper crossmember assembly.



■ **Installation**

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing rear bumper crossmember.**
- **There should be no looseness, shaking and deformation after installing rear bumper crossmember.**

(1) Install the rear bumper crossmember to proper position.

(2) Install 8 fixing nuts to rear bumper bracket.

(3) Install the rear bumper assembly.

(4) Connect the negative battery cable.

(5) Connect ENGINE START STOP switch and perform running test.

3.17 Replace Side Skirt Protector Assembly

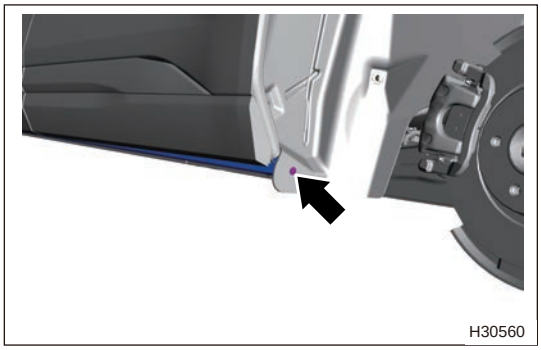
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

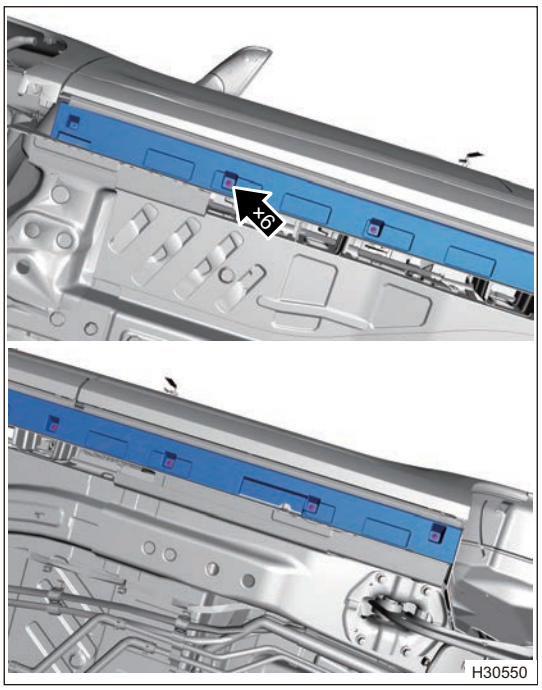
⚠ Warning

- **Appropriate force should be applied, when removing side skirt protector assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing side skirt protector assembly.**

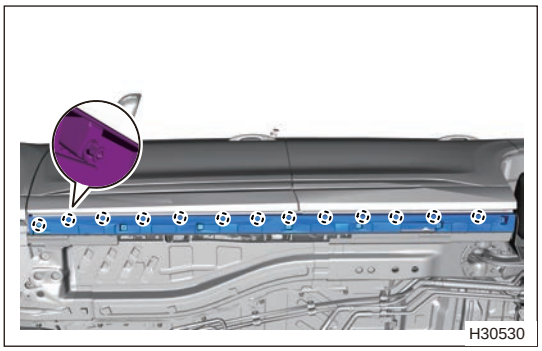
(1) Remove 1 fixing screw from rear left wheel house plate.



(2) Remove 6 fixing screws from left side skirt protector assembly.



(3) Using an interior crow plate, pry off side skirt protector assembly and remove it.



■ Installation

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing side skirt protector assembly.**

(1) Install side skirt protector assembly to proper position and clamp the clip into place.

(2) Install 6 fixing screws to left side skirt protector assembly.

Torque: 1.5 ± 0.5 N·m

(3) Install 1 fixing screw to rear wheel house plate.

Torque: 1.5 ± 0.5 N·m

3.18 Replace Front Door Scuff Plate Assembly

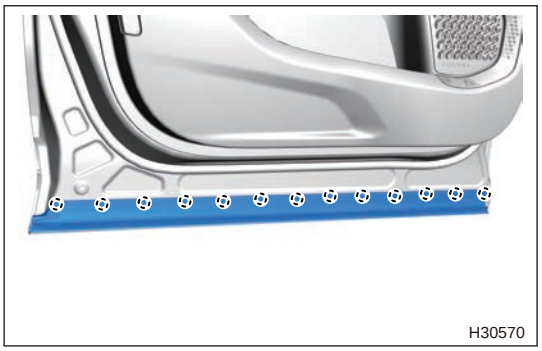
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

- **Appropriate force should be applied when removing front door scuff plate assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing front door scuff plate assembly.**

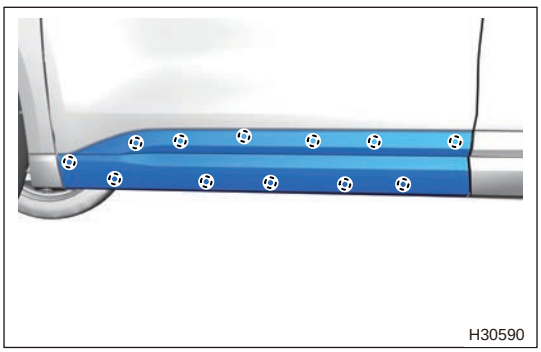
(1) Using an interior crow plate, pry off lower weatherstrip.


H30570

(2) Remove 2 fixing screws from front door scuff plate assembly.


H30580

(3) Using an interior crow plate, pry off fixing clips from front door scuff plate assembly.


H30590

■ **Installation**

⚠ Caution

- **Appropriate force should be applied when installing front door scuff plate assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing front door scuff plate assembly.**
- **After assembly, make sure that the upper edge of scuff plate fits the sheet metal and the two ends of trim board are not sticking out of sheet metal.**

(1) Install front door scuff plate assembly to a proper position and fix the clip.

(2) Install 2 fixing screws to front door scuff plate assembly.

(3) Install lower weatherstrip.

3.19 Replace Rear Door Scuff Plate Assembly

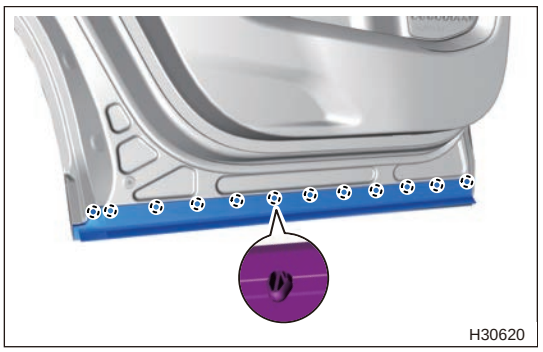
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

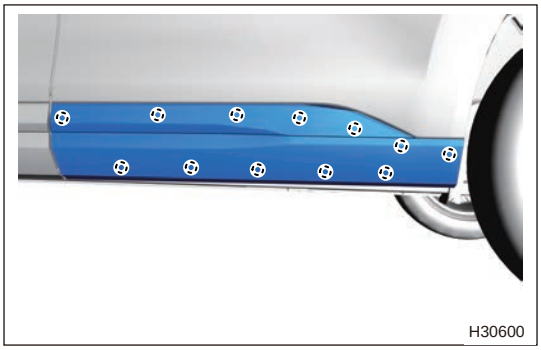
- **Appropriate force should be applied when removing rear door scuff plate assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing rear door scuff plate assembly.**

(1) Using an interior crow plate, pry off lower weatherstrip.



(2) Remove 2 fixing screws from front door scuff plate assembly.

(3) Using an interior crow plate, pry off fixing clips from rear door scuff plate assembly.



■ **Installation**

⚠ Caution

- **Appropriate force should be applied when installing rear door scuff plate assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing rear door scuff plate assembly.**
- **After assembly, make sure that the upper edge of scuff plate fits the sheet metal and the two ends of trim board are not sticking out of sheet metal.**

(1) Install rear door scuff plate assembly to a proper position and fix the clip.

(2) Install 2 fixing screws to rear door scuff plate assembly.

(3) Install lower weatherstrip.

3.20 Replace Rear Wheel House Protector Assembly

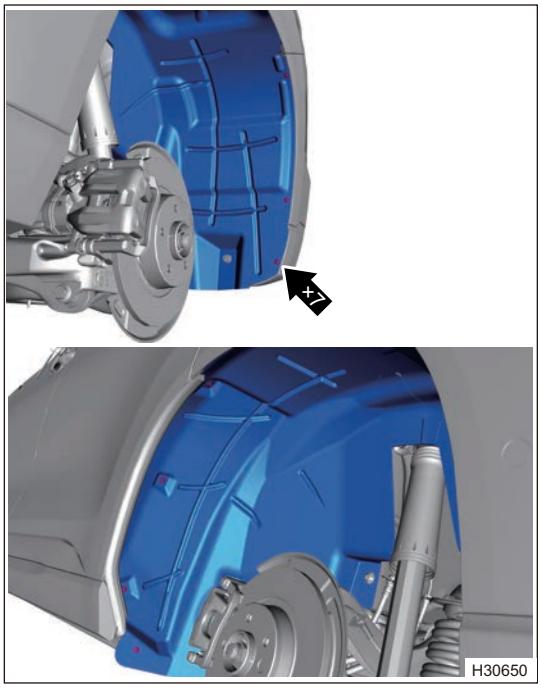
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

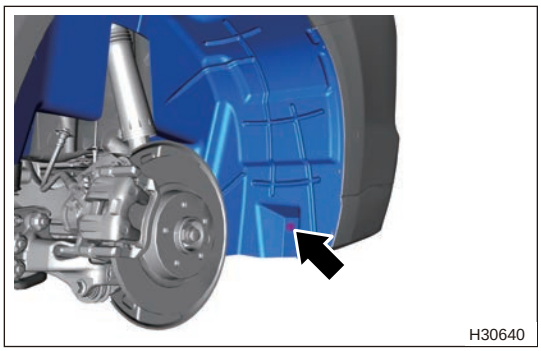
⚠ Warning

- **Appropriate force should be applied, when removing rear wheel house protector assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing rear wheel house protector assembly.**

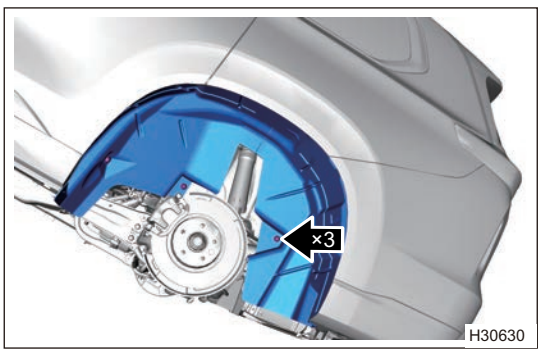
(1) Remove 7 fixing screws from rear left wheel house protector.



(2) Remove 1 snap fastener between rear bumper and rear wheel house protector.



(3) Remove 4 plastic nuts from rear wheel house protector.



■ Installation

⚠ Caution

- **Appropriate force should be applied, when installing rear wheel house protector assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing rear wheel house protector assembly.**

(1) Install 4 plastic nuts to rear wheel house protector.

Torque: 4 ± 1 N·m

(2) Install 1 fixing clips between rear bumper and rear wheel house protector.

(3) Install 7 fixing screws to rear left wheel house protector.

Torque: 1.5 ± 0.5 N·m

3.21 Replace Triangular Trim Board Assembly

Hint:

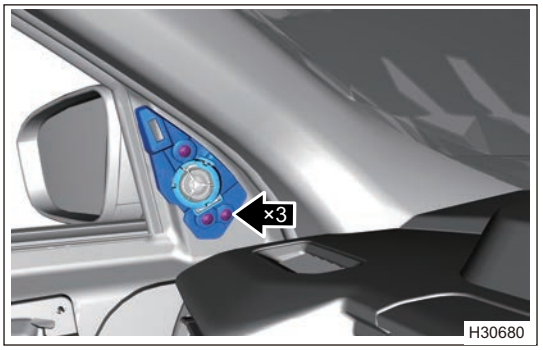
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

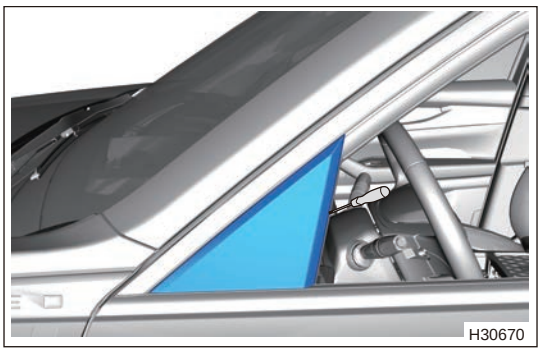
- **Appropriate force should be applied, when removing triangular trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing triangular trim board assembly.**

(1) Remove the front door trim panel assembly.

(2) Remove 3 fixing screws from tweeter speaker.



(3) Using an interior crow plate, pry off triangular trim board.



■ Installation

⚠ Caution

- **Appropriate force should be applied, when installing triangular trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing triangular trim board assembly.**
- **When installing triangular trim board assembly, be careful not to touch the waterproof strip at the lower edge.**

(1) Install triangular trim board to a proper position and install 3 fixing screws.

(2) Install the tweeter.

(3) Install the front door supporting plate assembly.

3.22 Before Replacing B-pillar Trim Board Assembly

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

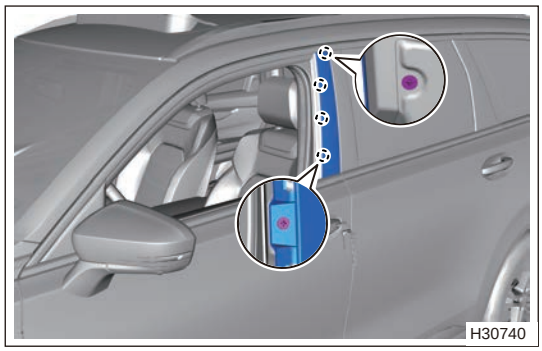
⚠ Warning

- **Appropriate force should be applied, when removing B-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing B-pillar trim board assembly.**

(1) To remove the B-pillar trim board assembly, first remove outer waterproof strip。

(2) Using an interior crow plate, pry off the rear door glass run.

(3) Remove 4 fixing screws from B-pillar trim board assembly.



■ Installation

⚠ Caution

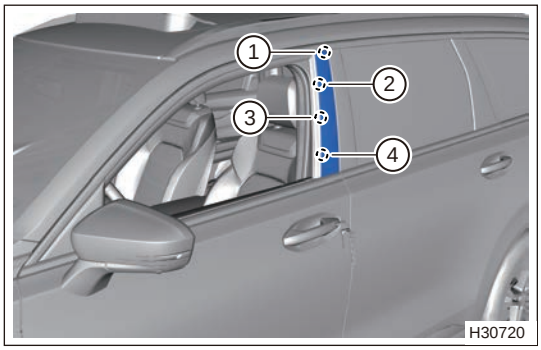
- **Appropriate force should be applied, when installing B-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing B-pillar trim board assembly.**

(1) Install B-pillar trim board assembly to a proper position and install 4 fixing screws.

Hint:

- Tighten the screws in order shown in illustration (1, 4, 2, 3).

Torque: 1.1 ± 0.2 N·m



3.23 After Replacing B-pillar Trim Board Assembly

Hint:

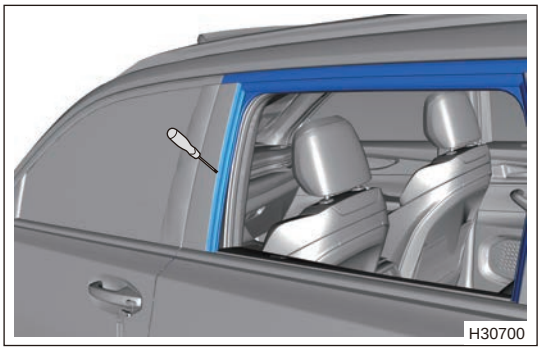
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

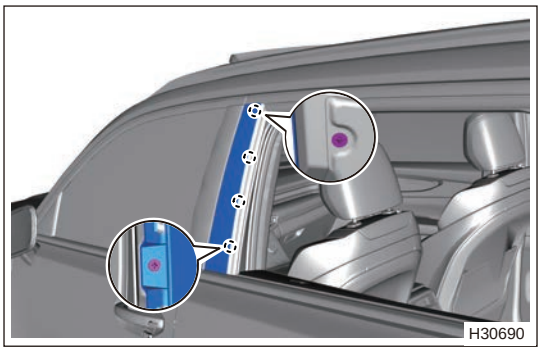
- **Appropriate force should be applied, when removing B-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing B-pillar trim board assembly.**

(1) To remove the B-pillar trim board assembly, first remove outer waterproof strip。

(2) Using an interior crow plate, pry off the rear door glass run.



(3) Remove 4 fixing screws from B-pillar trim board assembly.



■ Installation

⚠ Caution

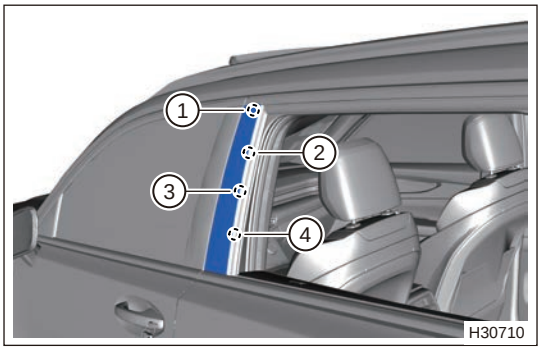
- **Appropriate force should be applied, when installing B-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing B-pillar trim board assembly.**

(1) Install B-pillar trim board assembly to a proper position and install 4 fixing screws.

Hint:

- Tighten the screws in order shown in illustration (1, 4, 2, 3).

Torque: 1.1 ± 0.2 N·m



3.24 Replace C-pillar Trim Board Assembly

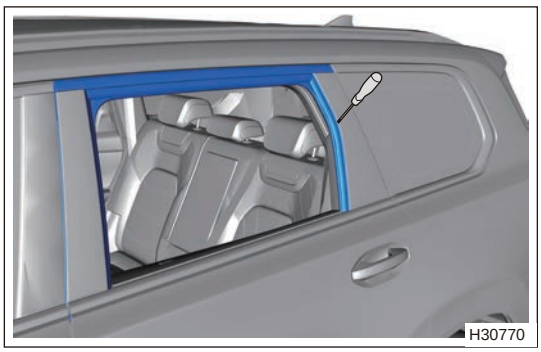
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

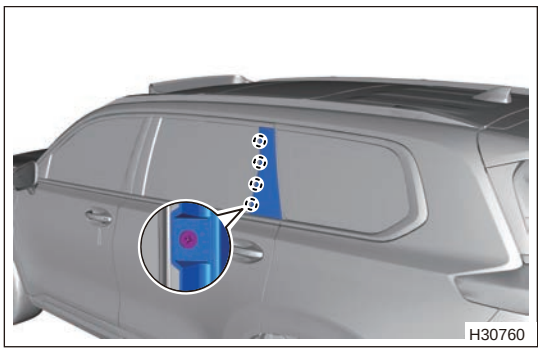
⚠ Warning

- **Appropriate force should be applied, when removing C-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing C-pillar trim board assembly.**

(1) Using an interior crow plate, pry off the rear door glass run.



(2) Remove 4 fixing screws from C-pillar trim board assembly.



■ Installation

⚠ Caution

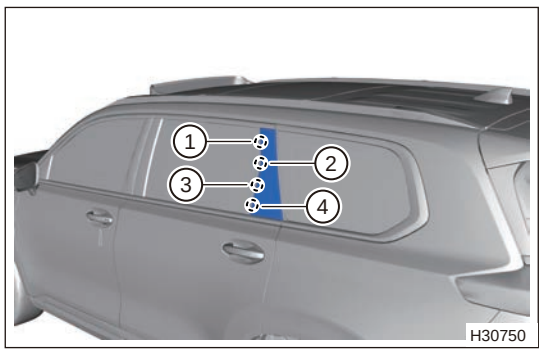
- **Appropriate force should be applied, when installing C-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing C-pillar trim board assembly.**

(1) Install C-pillar trim board assembly to a proper position and install 4 fixing screws.

Hint:

- Tighten the screws in order shown in illustration (1, 4, 2, 3).

Torque: 1.1 ± 0.2 N·m



3.25 Replace D-pillar Trim Board Assembly

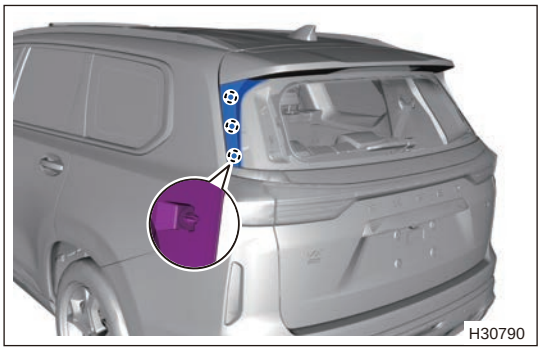
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

- **Appropriate force should be applied, when removing D-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing D-pillar trim board assembly.**

(1) Using an interior crow plate, pry off fixing clips from D-pillar trim board assembly.



■ Installation

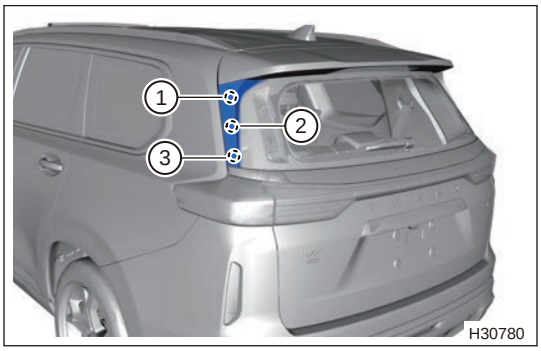
⚠ Caution

- **Appropriate force should be applied, when installing D-pillar trim board assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing D-pillar trim board assembly.**

(1) Install D-pillar trim board assembly and fix the clip on rear door trim board assembly.

Hint:

- Install the fixing clips in order shown in illustration below (1, 3, 2).



3.26 Replace Back Door Upper Ornament Assembly

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

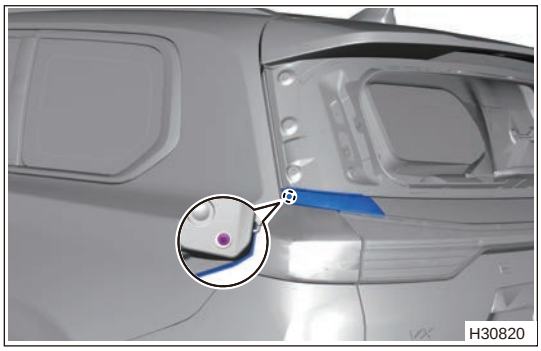
⚠ Warning

- **Appropriate force should be applied, when removing back door upper ornament assembly for cracks. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing back door upper ornament assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the D-pillar trim board assembly.

(4) Remove the back door trim board.

(5) Remove 1 fixing screw and back door upper left trim strip assembly.



(6) Remove 2 fixing screws from back door upper center trim strip assembly.

(7) Remove 2 fixing nuts and back door upper center trim strip assembly.

■ Installation

⚠ Caution

- **Appropriate force should be applied, when installing back door upper trim board assembly for cracks. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when installing back door upper trim board assembly.**
- **Assembly is finished, check whether the back door ornament strip assembly is loose with the door frame.**

(1) Install back door upper center trim strip assembly to a proper position and install 2 fixing nuts of back door upper center trim strip assembly.

(2) Install 2 fixing screws of back door upper center trim strip assembly.

(3) Install back door upper left trim strip assembly to a proper position and install 1 fixing screw of back door upper left trim strip assembly.

(4) Install the rear back door trim board.

(5) Install the D-pillar trim board assembly.

(6) Connect the negative battery cable.

(7) Connect ENGINE START STOP switch and perform running test.

3.27 Replace Name Plate

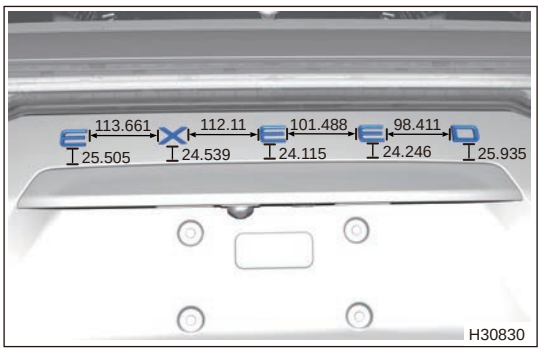
Warning

- **The assembly ambient temperature needs to be above 16 ˚C, if it is below 16 ˚C, the name plate needs to be heated.**

(1) Clean the places where back door outer panel may be in contact with 3M glue. Do not allow any dirt to remain, doing so may affect performance of 3M glue.

(2) Make sure the tape has not failed and clean off release paper on the 3M double-sided tape around name plate, avoid the contact between hands and 3M double-sided tape.

(3) Dimension unit: mm, dimensional tolerance: ±2.



12.4 INTERIOR

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair:

(1) Be sure to wear safety equipment to prevent accidents, when removing doorsill pressure plate assembly, door opening weatherstrip, protector assembly, etc.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle before repair in this section, always follow the instructions below before repair:

(1) Appropriate force should be applied, when removing doorsill pressure plate assembly, door opening weatherstrip, protector assembly, etc. Be careful not to operate roughly.

(2) Try to prevent interior and body paint surface from being scratched, when removing doorsill pressure plate assembly, door opening weatherstrip, protector assembly, etc.

(3) Try to prevent door opening weatherstrip from being damaged by excessive force, when removing door opening weatherstrip.

(4) Replace damaged clips and install doorsill pressure plate assembly in place, when installing doorsill pressure plate assembly.

(5) After installation, check for looseness, neglected installation, etc.

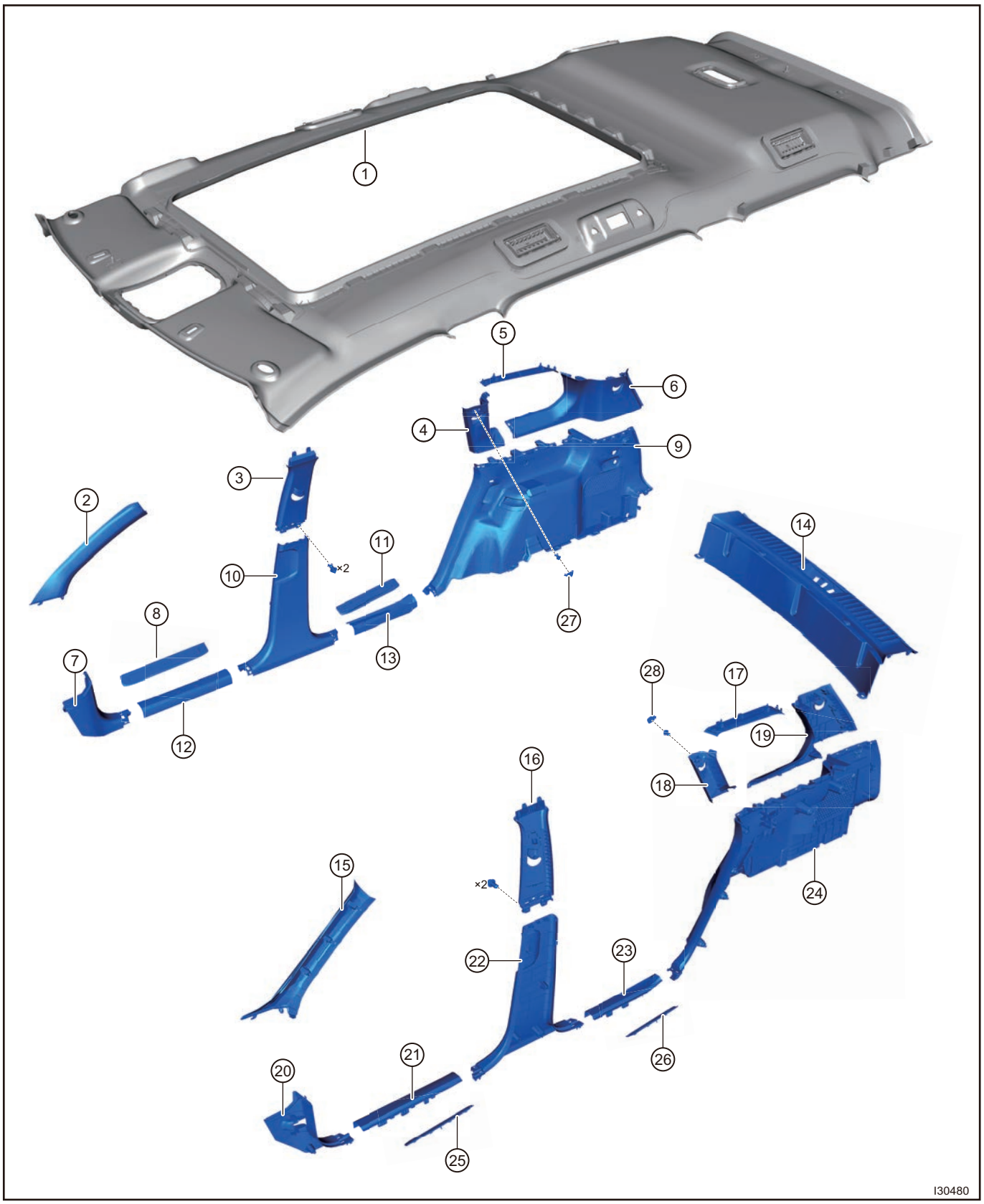
(6) Door opening weatherstrip and body should be fitted with a certain amount of clamping force and the weatherstrip should not fall off easily, when installing door opening weatherstrip.

(7) When installing door opening weatherstrip, tap all around uniformly with a rubber hammer to install it in place. The surface of weatherstrip should have no defects, such as tapped dents, deformation and warpage after installation.

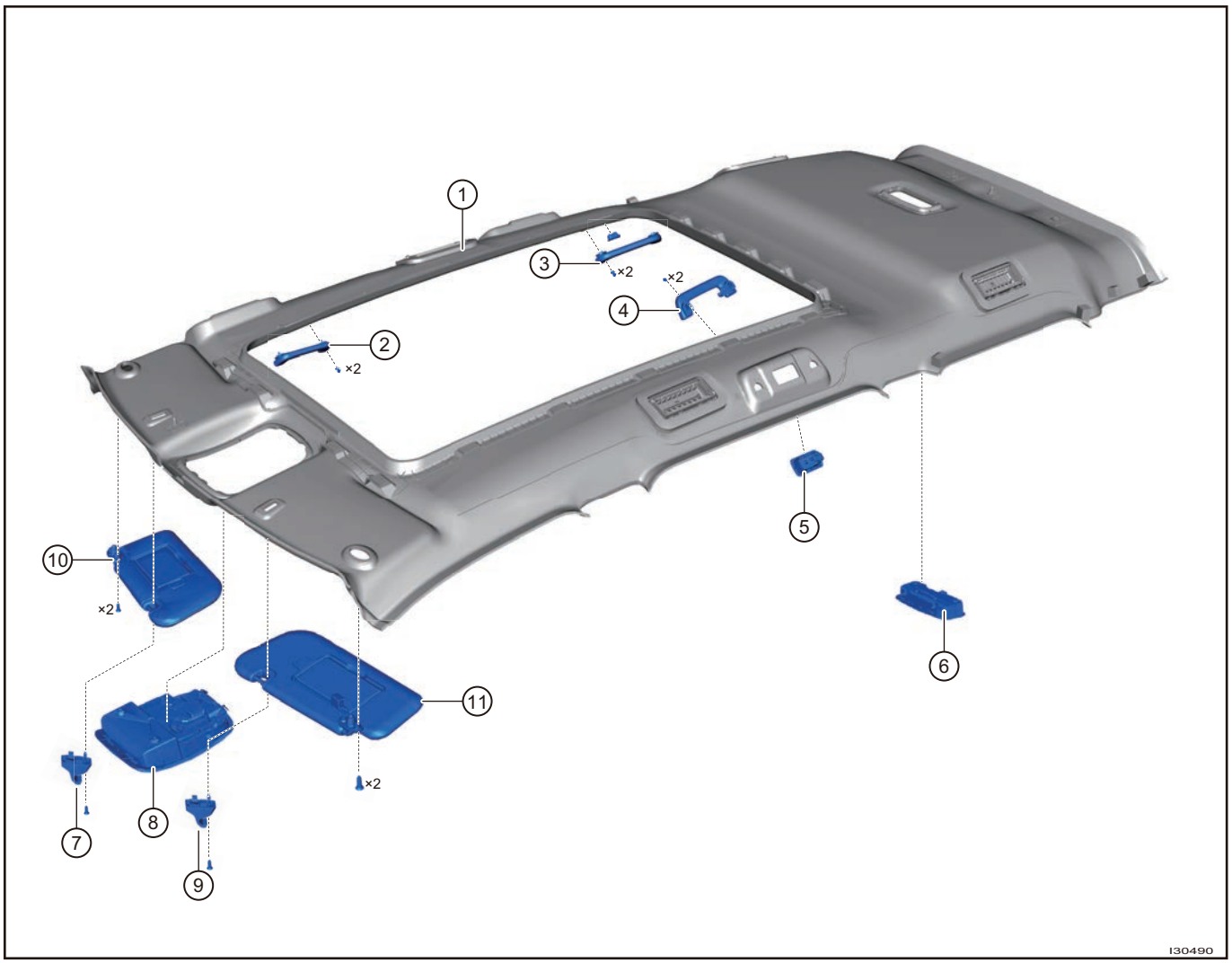
(8) After installing door opening weatherstrip, do not remove or install it unless it is necessary. Otherwise the installation holding force of weatherstrip may be reduced.

2 System Overview

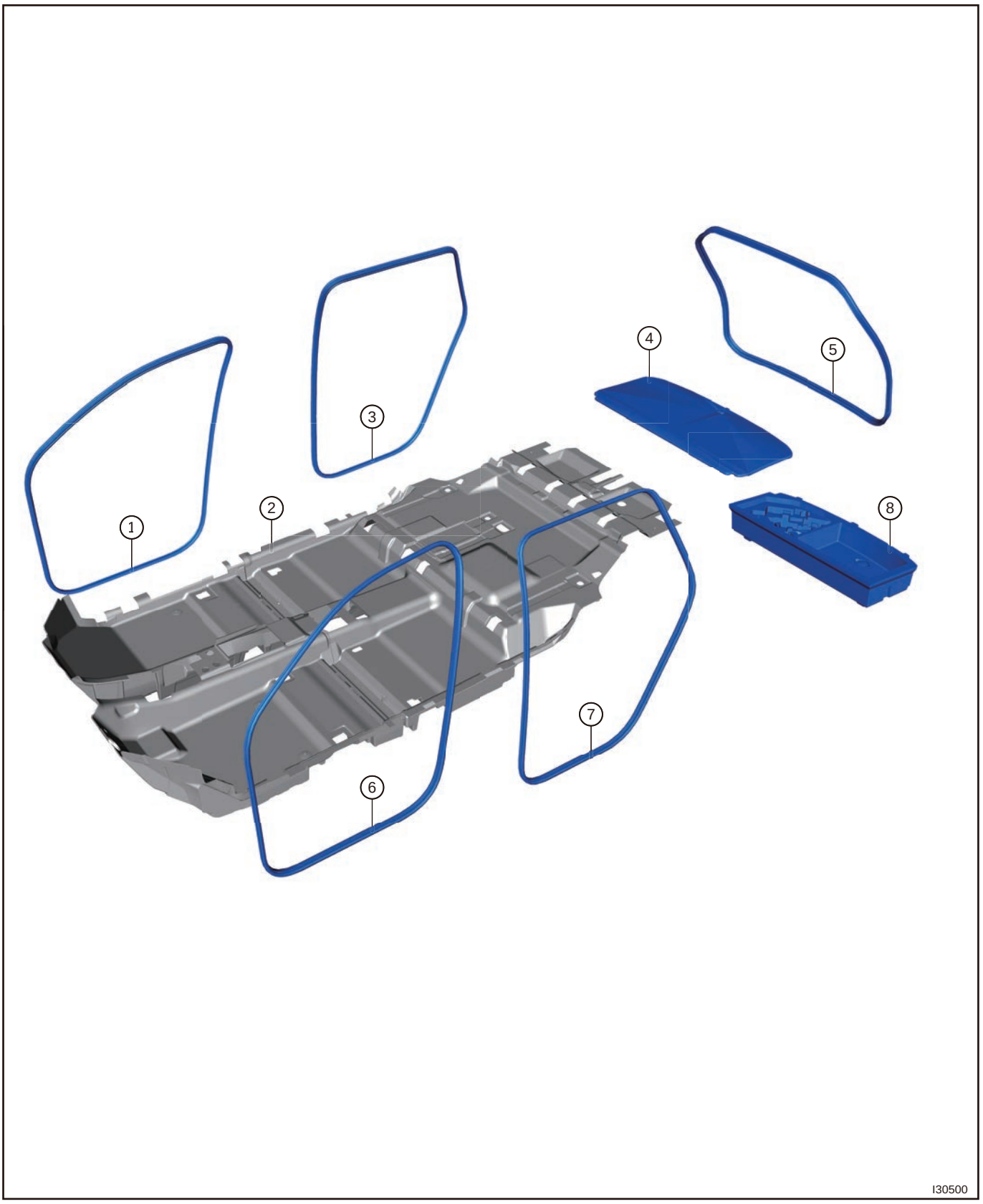
2.1 System Components Diagram



1	Roof Assembly	15	Left A-pillar Upper Protector Assembly
2	Right A-pillar Upper Protector Assembly	16	Left B-pillar Upper Protector Assembly
3	Right B-pillar Upper Protector Assembly	17	Left C/D-pillar Upper Cover Plate
4	Right C-pillar Upper Protector Assembly	18	Left C-pillar Upper Protector Assembly
5	Right C/D-pillar Upper Cover Plate	19	Left D-pillar Upper Protector Assembly
6	Right D-pillar Upper Protector Assembly	20	Left A-pillar Lower Protector Assembly
7	Right A-pillar Lower Protector Assembly	21	Front Left Doorsill Pressure Plate Assembly
8	Front Right Doorsill Pedal Assembly	22	Left B-pillar Lower Protector Assembly
9	Right Luggage Compartment Protector Assembly	23	Rear Left Doorsill Pressure Plate Assembly
10	Right B-pillar Lower Protector Assembly	24	Left Luggage Compartment Protector Assembly
11	Rear Right Doorsill Pedal Assembly	25	Front Left Doorsill Pedal Assembly
12	Front Right Doorsill Pressure Plate Assembly	26	Rear Left Doorsill Pedal Assembly
13	Rear Right Doorsill Pressure Plate Assembly	27	Right C-pillar Upper Protector Upper Screw Block Cover
14	Back Doorsill Pressure Plate Assembly	28	Left C-pillar Upper Protector Upper Screw Block Cover



1	Roof Assembly	7	Right Sun Visor Holder
2	Front Right Passenger Grip	8	Front Interior Dome Light Assembly
3	Rear Right Passenger Grip	9	Left Sun Visor Holder
4	Rear Left Passenger Grip	10	Right Sun Visor Assembly
5	Rear Left Interior Dome Light	11	Left Sun Visor Assembly
6	Rear Interior Dome Light Assembly		



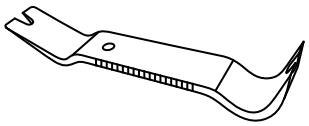
1	Front Right Door Opening Weatherstrip	5	Back Door Weatherstrip
2	Floor Carpet Assembly	6	Front Left Door Opening Weatherstrip

3	Rear Right Door Opening Weatherstrip	7	Rear Left Door Opening Weatherstrip
4	Luggage Compartment Carpet Assembly	8	Luggage Compartment Storage Box Assembly

3 On-Vehicle Service

3.1 Tool

■ General Tool

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

3.2 Replace Front Doorsill Pedal Assembly

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

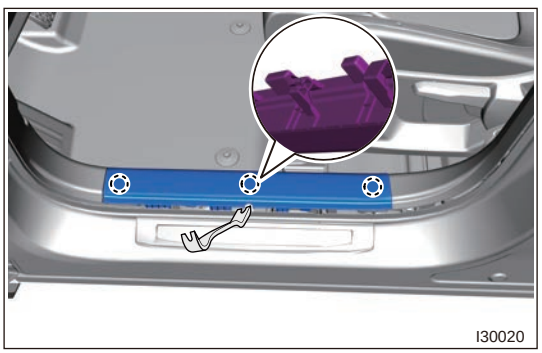
■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing front doorsill pressure plate assembly.**
- **Appropriate force should be applied, when removing front doorsill pressure plate assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing front doorsill pressure plate assembly.**

(1) Remove the front left door opening weatherstrip.

(2) Using an interior crow plate, pry off 3 fixing clips of front left doorsill scuff plate.


I30020

(3) Remove the front left doorsill pressure plate assembly.

■ **Installation**

⚠ Caution

- **Replace damaged clips and install front doorsill pressure plate assembly in place, when installing front doorsill pressure plate assembly.**
- **Make sure that front doorsill pressure plate assembly is well fitted with B-pillar lower protector assembly and A-pillar lower protector assembly, after installing front doorsill pressure plate assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Clamp clip near rear end of doorsill pressure plate into corresponding opening of B-pillar lower protector, then clamp the doorsill claws into 3 doorsill fixing clips from rear to front.

(2) Clamp clip near front end of doorsill pressure plate into corresponding opening of A-pillar lower protector.

(3) Install the front door opening weatherstrip.

3.3 Replace Front Doorsill Pedal Assembly

Hint:

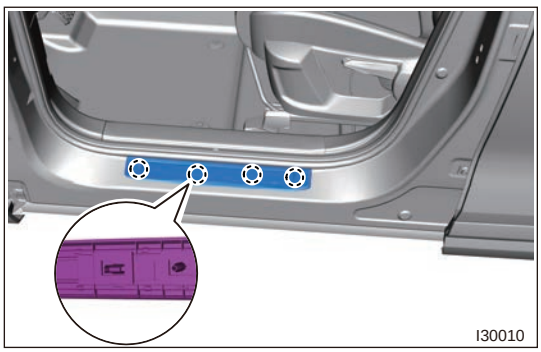
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing front doorsill pedal assembly.**
- **Appropriate force should be applied, when removing front doorsill pedal assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing front doorsill pedal assembly.**

(1) Around the front doorsill pedal assembly, using an interior crow plate to pry off 4 clips from front doorsill pedal assembly.
For pedal in high configuration vehicle, it is necessary to unplug connector connected with body wiring harness.



(2) Remove the front doorsill pedal assembly.

■ **Installation**

⚠ Caution

- **After installation, check for looseness, neglected installation, etc.**

(1) For pedal in high configuration vehicle, it is necessary to install connector connected with body wiring harness.

(2) Connect the clips on 4 front doorsill pedal assemblies to the square holes of sheet metal of body and fix them.

3.4 Replace Rear Doorsill Pressure Plate Assembly

■ **Removal**

Hint:

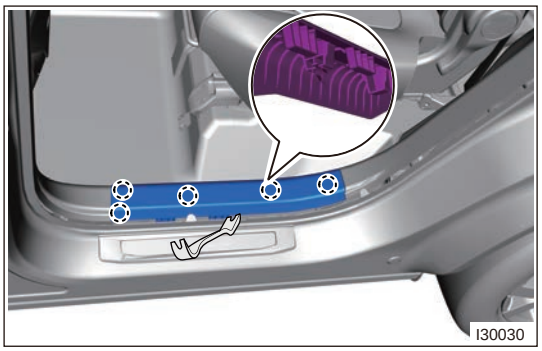
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing rear doorsill pressure plate assembly.**
- **Appropriate force should be applied, when removing rear doorsill pressure plate assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing rear doorsill pressure plate assembly.**

(1) Remove the rear left door opening weatherstrip.

(2) Using an interior crow plate, pry off 5 fixing clips of rear left doorsill scuff plate.



(3) Remove the rear left doorsill pressure plate assembly.

■ Installation

⚠ Caution

- **Replace damaged clips and install rear doorsill pressure plate assembly in place, when installing rear doorsill pressure plate assembly.**
- **Make sure that rear doorsill pressure plate assembly is well fitted with B-pillar lower protector assembly, luggage compartment wheel house assembly and protector assembly, after installing rear doorsill pressure plate assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Clamp clips near front end of doorsill pressure plate into corresponding opening of B-pillar lower protector, then clamp the doorsill claws into 4 doorsill fixing clips from front to rear.

(2) Clamp clips near rear end of rear left doorsill pressure plate into corresponding opening of luggage compartment wheel house protector.

(3) Install the rear door opening weatherstrip.

3.5 Replace Rear Doorsill Pedal Assembly

■ Removal

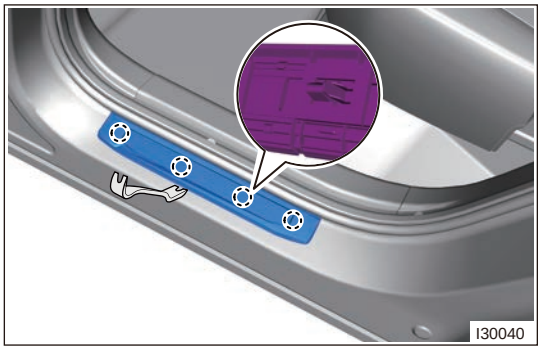
Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing rear doorsill pedal assembly.**
- **Appropriate force should be applied, when removing rear doorsill pedal assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing rear doorsill pedal assembly.**

(1) Around the rear doorsill pedal assembly, using an interior crow plate to pry off 4 clips from rear doorsill pedal assembly.
For pedal in high configuration vehicle, it is necessary to unplug connector connected with body wiring harness.



(2) Remove the rear doorsill pedal assembly.

■ **Installation**

⚠ **Caution**
• **After installation, check for looseness, neglected installation, etc.**

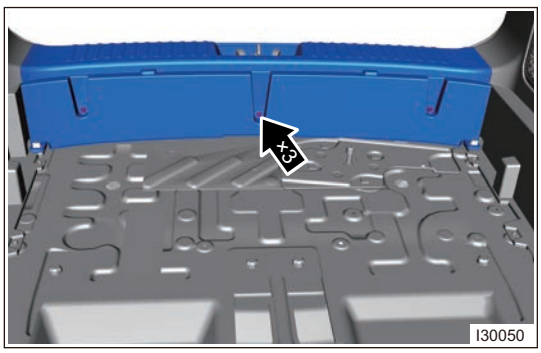
(1) For pedal in high configuration vehicle, it is necessary to connect connector connected with body wiring harness.
(2) Connect the clips on 4 rear doorsill pedal assemblies to the square holes of sheet metal of body and fix them.

3.6 Replace Back Doorsill Pressure Plate Assembly

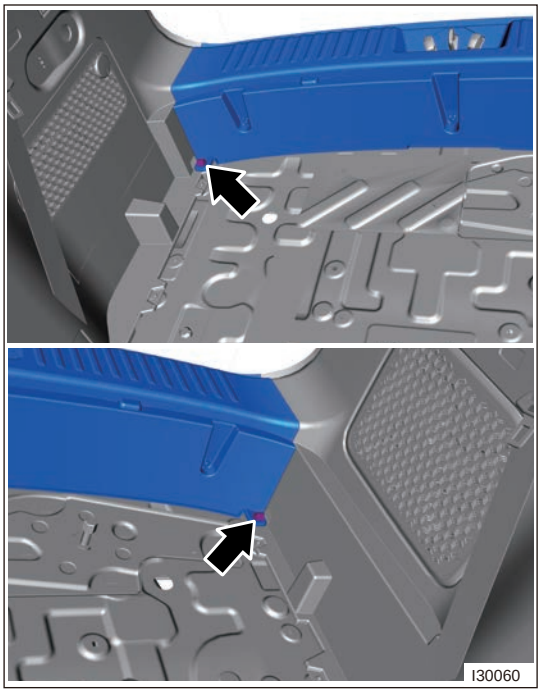
■ **Removal**

⚠ **Warning**
• **Be sure to wear safety equipment to prevent accidents, when removing back doorsill pressure plate assembly.** • **Appropriate force should be applied, when removing back doorsill pressure plate assembly. Be careful not to operate roughly.** • **Prevent interior and body paint from being scratched, when removing back doorsill pressure plate assembly.**

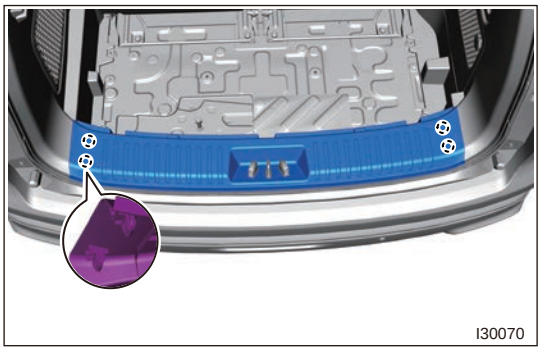
(1) Remove the back door opening weatherstrip.
(2) Remove the luggage compartment carpet assembly.
(3) Remove the luggage compartment storage box.
(4) Remove 3 fixing screws from back doorsill pressure plate assembly.



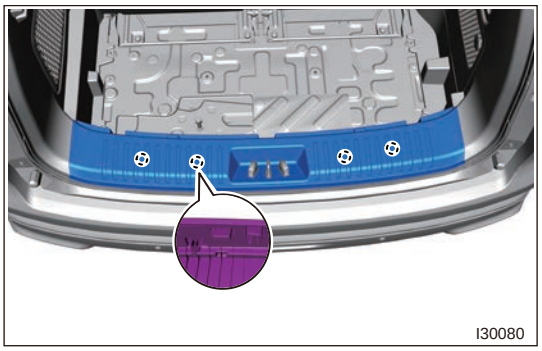
(5) Separate fixing clips of left and right trim plates of luggage compartment.



(6) Using an interior crow plate, careful pry off 4 metal clips from both sides of back doorsill pressure plate assembly.



(7) Using an interior crow plate, careful pry off 4 clips in center of back doorsill pressure plate assembly.



(8) Remove the back doorsill pressure plate assembly.

■ Installation

⚠ Caution

- **Replace damaged clips and install back doorsill pressure plate assembly in place, when installing back doorsill pressure plate assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Install the back doorsill pressure plate assembly to a proper position.

(2) Align the back doorsill pressure plate clip with corresponding opening, and then tap the 4 clips into corresponding holes from left to right.

(3) Install fixing clips of left and right trim plates of luggage compartment.

(4) Install 3 fixing screws of back doorsill pressure plate assembly.

(5) Install the luggage compartment storage box.

(6) Install the luggage compartment carpet assembly.

(7) Install the back door opening weatherstrip.

3.7 Replace Front Door Opening Weatherstrip

Hint:

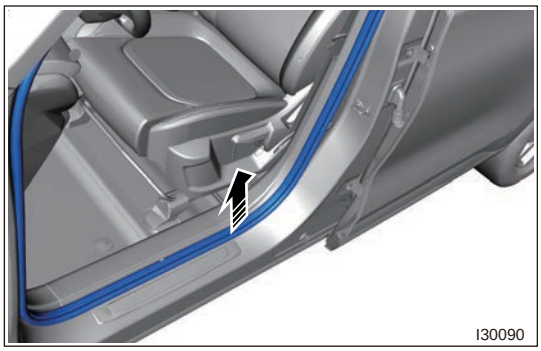
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing front door opening weatherstrip.**
- **Appropriate force should be applied, when removing front door opening weatherstrip. Be careful not to operate roughly.**
- **Try to prevent front door opening weatherstrip from being damaged, when removing front door opening weatherstrip.**

(1) Remove the front left door opening weatherstrip by gently pulling it along edges from one corner of front door opening weatherstrip.



■ Installation

⚠ Caution

- **Front door opening weatherstrip and body should be fitted with a certain amount of clamping force and the weatherstrip should not fall off easily, when installing front door opening weatherstrip.**
- **When installing front door opening weatherstrip, tap all around uniformly with a rubber hammer to install it in place. The surface of weatherstrip should have no defects, such as tapped dents, deformation and warpage after installation.**
- **After installing front door opening weatherstrip, do not remove or install it unless it is necessary. Otherwise the installation holding force of weatherstrip may be reduced.**

(1) Place the front left door opening weatherstrip to a proper position, tap all around uniformly with a rubber hammer to install it in place.

3.8 Replace Rear Door Opening Weatherstrip

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing rear door opening weatherstrip.**
- **Appropriate force should be applied, when removing rear door opening weatherstrip. Be careful not to operate roughly.**
- **Try to prevent rear door opening weatherstrip from being damaged, when removing rear door opening weatherstrip.**

(1) Remove rear left door opening weatherstrip by gently pulling it along edges from one corner of rear door opening weatherstrip.

■ **Installation**

⚠ Caution

- **Rear door opening weatherstrip and body should be fitted with a certain amount of clamping force and the weatherstrip should not fall off easily, when installing rear door opening weatherstrip.**
- **When installing rear door opening weatherstrip, tap all around uniformly with a rubber hammer to install it in place. The surface of weatherstrip should have no defects, such as tapped dents, deformation and warpage after installation.**
- **After installing rear door opening weatherstrip, do not remove or install it unless it is necessary. Otherwise the installation holding force of weatherstrip may be reduced.**

(1) Place the rear left door opening weatherstrip to a proper position, tap all around uniformly with a rubber hammer to install it in place.

3.9 Replace Back Door Opening Weatherstrip

■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing back door opening weatherstrip.**
- **Appropriate force should be applied when removing back door opening weatherstrip. Be careful not to operate roughly.**
- **Try to prevent back door opening weatherstrip from being damaged, when removing back door opening weatherstrip.**

(1) Remove back door opening weatherstrip by gently pulling it along edges from one corner of back door opening weatherstrip.

■ **Installation**

⚠ Caution

- **Back door opening weatherstrip and body should be fitted with a certain amount of clamping force and the weatherstrip should not fall off easily, when installing back door opening weatherstrip.**
- **When installing back door opening weatherstrip, tap all around uniformly with a rubber hammer to install it in place. The surface of weatherstrip should have no defects, such as tapped dents, deformation and warpage after installation.**
- **After installing back door opening weatherstrip, do not remove or install it unless it is necessary. Otherwise the weatherstrip holding force of installation may be reduced.**

(1) Place the back door opening weatherstrip to a proper position, tap all around uniformly with a rubber hammer to install it in place.

3.10 Replace A-pillar Upper Protector Assembly

Hint:

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

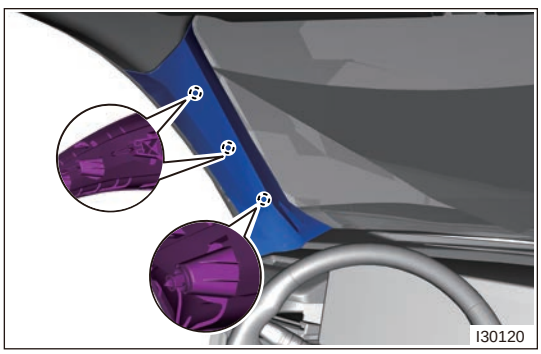
■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing A-pillar upper protector assembly.**
- **Appropriate force should be applied, when removing A-pillar upper protector assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing A-pillar upper protector assembly.**

(1) Remove the front left door opening weatherstrip.

(2) Along the protector and sheet metal matching edge with both hands to apply vertical force until the first metal snap spring is disengaged.



⚠ Caution

- **During the disassembly or reassembly of A-pillar upper protector, use appropriate tools to remove the metal snap spring from protector clip hole or assemble it into the protector clip hole. It is not recommended to replace the metal snap spring when disassembly or reassembly is required.**

(3) Then use appropriate tool to release 2 metal snap springs from protector clip hole and leave them on the sheet metal.

■ **Installation**

⚠ Caution

- **Make sure that damaged clips are replaced and A-pillar upper protector assembly is installed in place, when installing A-pillar upper protector assembly.**
- **A-pillar upper protector assembly should be well fitted with instrument panel and roof headlining, after installing A-pillar upper protector assembly.**
- **A-pillar upper protector assembly and front door opening weatherstrip should be fitted closely, after installing A-pillar upper protector assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Insert A-pillar upper protector clip into matching hole first.

(2) Assemble metal snap spring into protector clip hole with appropriate tools. Finally, forcefully slap the upper protector of A-pillar into 3 clips to ensure the installation is in place.

3.11 Replace A-pillar Lower Protector Assembly

■ **Removal**

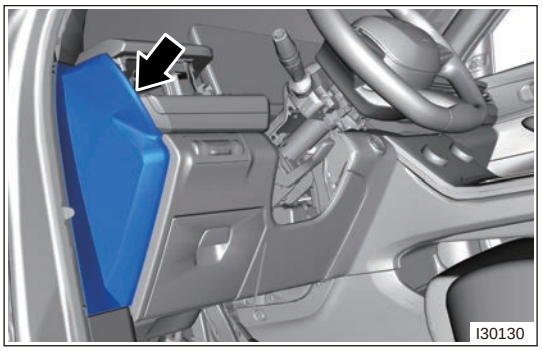
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing A-pillar lower protector assembly.**
- **Appropriate force should be applied, when removing A-pillar lower protector assembly. Be careful not to operate roughly.**
- **Prevent interior and body paint from being scratched, when removing A-pillar lower protector assembly.**

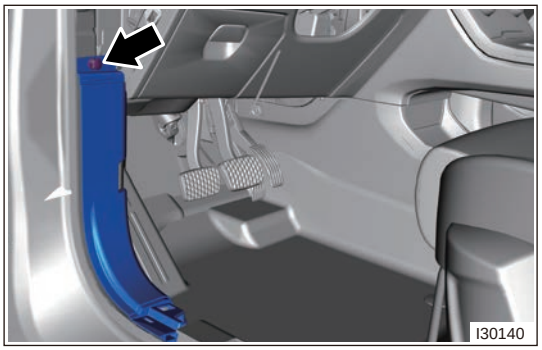
(1) Remove the front left door opening weatherstrip.

(2) Remove the front left doorsill pressure plate assembly.

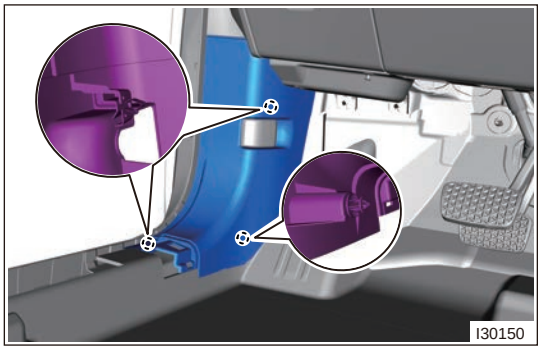
(3) Remove the left end cover body.



(4) Remove 1 fixing snap fastener from left A-pillar lower protector assembly.



(5) Using an interior crow plate, pry off 2 metal fixing clamps and 1 fixing clip from left A-pillar lower protector assembly.



⚠ Caution

- **The metal clip is removed together with the A-pillar lower protector. During removal, the metal clip is detached from the sheet metal hole.**

(6) Remove the left A-pillar lower protector assembly.

■ Installation

⚠ Caution

- **Replace damaged metal clip and install A-pillar lower protector assembly in place, when installing A-pillar lower protector assembly.**
- **A-pillar lower protector assembly and front door opening weatherstrip should be fitted closely, after installing A-pillar lower protector assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Place A-pillar lower protector to a proper position.

⚠ Caution

- **During and after installation, the A-pillar lower protector should be kept inserted into instrument panel body and the instrument panel side end panel.**

(2) Install protector opening into engine hood lock cable release handle assembly,

(3) Rotate 2 metal clamps on the protector into the corresponding sheet metal opening.

(4) Install the front left doorsill pressure plate assembly.

(5) Install the front left door opening weatherstrip.

3.12 Replace B-pillar Lower Protector Assembly

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing B-pillar lower protector assembly.**
- **Appropriate force should be applied, when removing B-pillar lower protector assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing B-pillar lower protector assembly.**

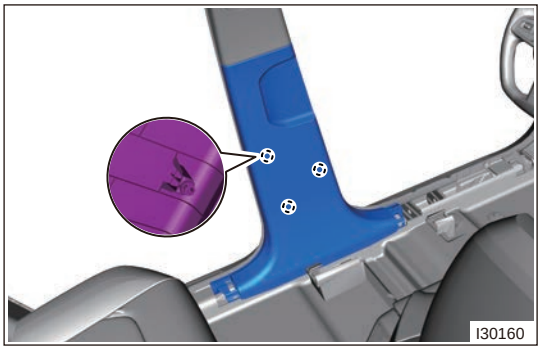
(1) Remove the front left door opening weatherstrip.

(2) Remove the front left doorsill pressure plate assembly.

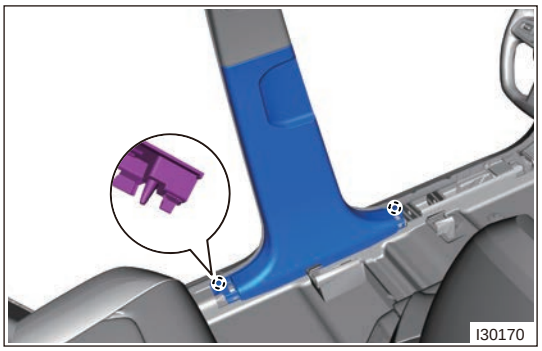
(3) Remove the rear left door opening weatherstrip.

(4) Remove the rear left doorsill pressure plate assembly.

(5) Using an interior crow plate, pry off 3 fixing clips above left B-pillar lower protector assembly.



(6) Using an interior crow plate, pry off 2 fixing metal clips below left B-pillar lower protector assembly.



(7) Remove the left B-pillar lower protector assembly.

■ **Installation**

⚠ Caution

- **Replace damaged clips and install B-pillar lower protector assembly in place, when installing B-pillar lower protector assembly.**
- **B-pillar lower protector assembly should be well fitted with front and rear doorsill pressure plate assemblies, after installing B-pillar lower protector assembly.**
- **B-pillar lower protector assembly and front and rear door opening weatherstrips should be fitted closely, after installing B-pillar lower protector assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Clamp 2 injection-molded clips on upper end of B-pillar lower protector into B-pillar upper protector.
(2) Tap 5 clips of B-pillar lower protector into sheet metal holes, and fix them with the sheet metal.
(3) Install the front left doorsill pressure plate assembly.
(4) Install the front left door opening weatherstrip.
(5) Install the rear left doorsill pressure plate assembly.
(6) Install the rear left door opening weatherstrip.

3.13 Replace B-pillar Upper Protector Assembly

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing B-pillar upper protector assembly.**
- **Appropriate force should be applied, when removing B-pillar upper protector assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing B-pillar upper protector assembly.**

(1) Remove the front left door opening weatherstrip.
(2) Remove the front left doorsill pressure plate assembly.
(3) Remove the rear left door opening weatherstrip.
(4) Remove the rear left doorsill pressure plate assembly.
(5) Remove the left B-pillar lower protector assembly.
(6) Remove pretensioner end plate in lower end of front left seat belt.
(7) Remove 2 fixing screws from lower part of left B-pillar upper protector.

(8) Using an interior crow plate, pry off left B-pillar upper protector assembly.

■ **Installation**

⚠ Caution

- **B-pillar upper protector assembly should be well fitted with B-pillar lower protector assembly and roof headlining, after installing B-pillar upper protector assembly.**
- **B-pillar upper protector assembly and front and rear door opening weatherstrips should be fitted closely, after installing B-pillar upper protector assembly.**
- **After installation, check for looseness, neglected installation, etc.**

(1) Tap 2 injection-molded clips in upper end of B-pillar upper protector into sheet metal holes, and fix them with the sheet metal.
(2) Install 2 fixing screws to lower part of left B-pillar upper protector.
(3) Install pretensioner end plate in lower end of front left seat belt.
(4) Install the left B-pillar lower protector assembly.
(5) Install the front left doorsill pressure plate assembly.
(6) Install the front left door opening weatherstrip.
(7) Install the rear left doorsill pressure plate assembly.
(8) Install the rear left door opening weatherstrip.

3.14 Replace C-pillar Upper Protector Assembly

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

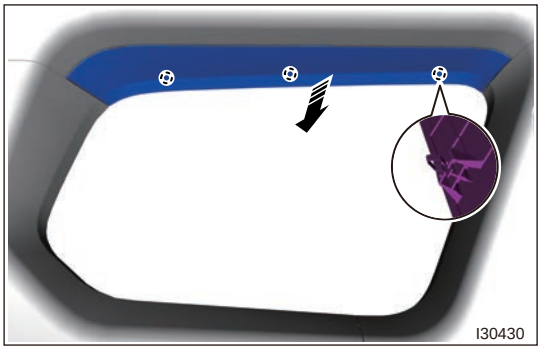
■ **Removal**

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing C-pillar upper protector assembly.**
- **Appropriate force should be applied, when removing C-pillar upper protector assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing C-pillar upper protector assembly.**

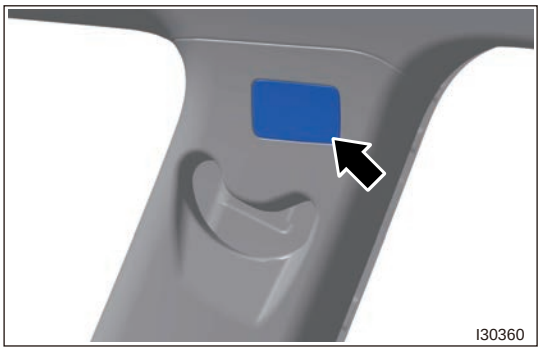
(1) Remove the rear door opening weatherstrip.

(2) Remove the C/D pillar upper cover plate assembly.



(3) Remove the rear left seat belt fixing bolt.

(4) Using a interior crow plate, pry off screw block cover from left C-pillar upper protector.



(5) Remove 1 fixing screw from upper part of left C-pillar upper protector.

(6) Using a interior crow plate, pry off fixing clips from C-pillar upper protector and remove C-pillar upper protector assembly.

■ Installation

⚠ Caution

- **Replace damaged clips and install C-pillar upper protector assembly in place, when installing C-pillar upper protector assembly.**
- **C-pillar upper protector assembly should be well fitted with roof headlining, after installing C-pillar upper protector assembly.**
- **C-pillar upper protector assembly and rear door opening weatherstrip should be fitted closely, after installing C-pillar upper protector assembly.**

(1) Install left C-pillar upper protector assembly to a proper position.
(2) Install 1 fixing screw to upper part of C-pillar upper protector assembly.
(3) Install screw block cover of left C-pillar upper protector.
(4) Install the rear left seat belt fixing bolt.
(5) Install the C/D-pillar upper cover plate assembly.
(6) Install the rear door opening weatherstrip.

3.15 Replace D-pillar Upper Protector Assembly

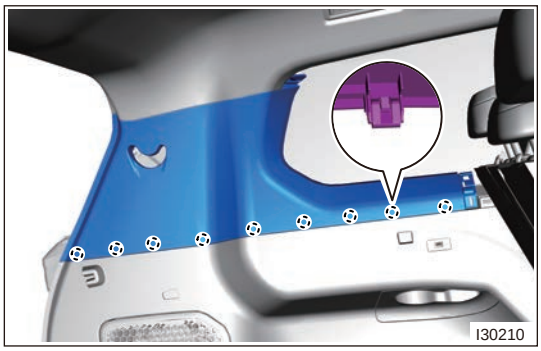
- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing D-pillar upper protector assembly.**
- **Appropriate force should be applied, when removing D-pillar upper protector assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing D-pillar upper protector assembly.**

(1) Remove the rear door opening weatherstrip.
(2) Remove the C/D pillar upper cover plate assembly.
(3) Remove the C-pillar upper protector assembly.
(4) Remove the rear seat.
(5) Remove the luggage compartment carpet.
(6) Remove the rear left seat belt fixing bolt.
(7) Using an interior crow plate, pry off 9 plastic fixing clips below D-pillar upper protector.



(8) Using an interior crow plate, pry off 3 metal fixing clips above D-pillar upper protector.

(9) Using an interior crow plate, pry off 3 fixing clips of D-pillar upper protector.

(10) Remove the D-pillar upper protector assembly.

■ **Installation**

⚠ Caution

- **Replace damaged clips and install D-pillar upper protector assembly in place, when installing D-pillar upper protector assembly.**
- **D-pillar upper protector assembly should be well fitted with roof headlining, after installing D-pillar upper protector assembly.**
- **D-pillar upper protector assembly and rear door opening weatherstrip should be fitted closely, after installing D-pillar upper protector assembly.**

(1) Install left D-pillar upper protector assembly to a proper position.
(2) Tap fixing clips on D-pillar upper protector into the corresponding sheet metal holes in turn along all sides.
(3) Install the rear left seat belt fixing bolt.
(4) Install the luggage compartment carpet.
(5) Install the rear seat.
(6) Install the C-pillar upper protector assembly.
(7) Install the C/D-pillar upper cover plate assembly.
(8) Install the rear door opening weatherstrip.

3.16 Replace Sun Visor Assembly

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

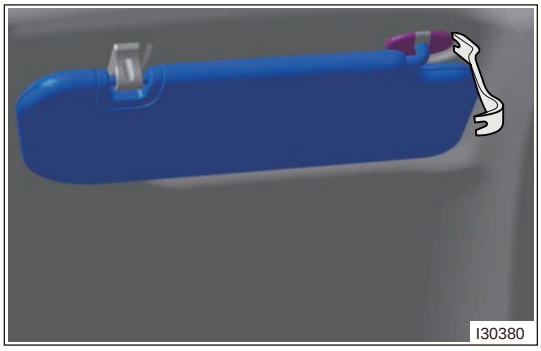
■ **Removal**

⚠ Warning

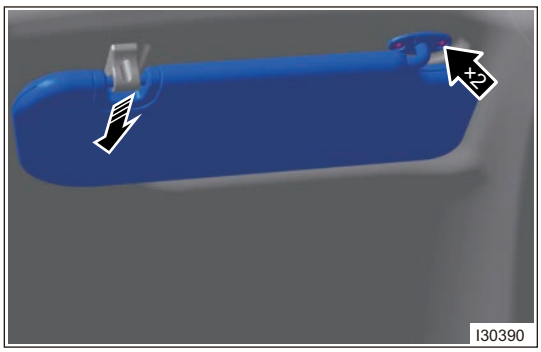
- **Be sure to wear safety equipment to prevent accidents, when removing sun visor assembly.**
- **Appropriate force should be applied, when removing sun visor assembly. Be careful not to operate roughly.**
- **Try to prevent interior and roof from being damaged, when removing sun visor assembly.**

Remove the left sun visor assembly.

(1) Using an interior crow plate, pry off trim cover from sun visor holder.



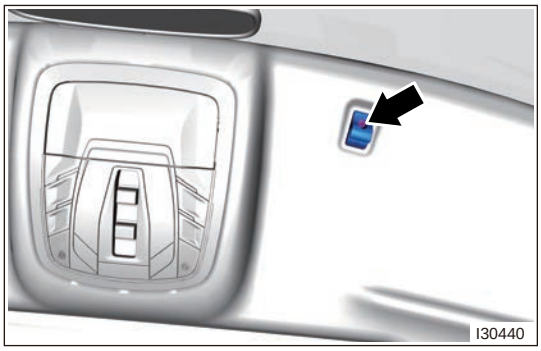
(2) Detach sun visor assembly from the holder to rear side, and remove 2 fixing screws from front left sun visor.



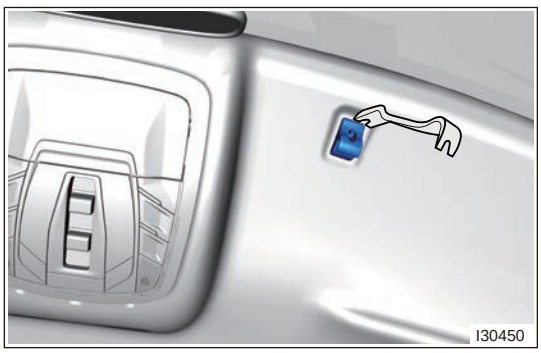
(3) Disconnect sun visor connector and remove sun visor assembly.

Remove the left sun visor holder.

(4) Remove 1 fixing screw from sun visor holder.



(5) Using an interior crow plate, pry off left sun visor holder B.



■ Installation

⚠ Caution

- **During normal operation, sun visor should move normally without any noise, seizing, etc.**
- **Sun visor should be fixed by holder securely without any falling off during use.**
- **Mounting seat, holder should be well fitted with roof with appearance not being affected.**

Install the left sun visor holder B.

(1) Install the sun visor holder to roof.
(2) Install 1 fixing screw to sun visor holder.

Torque: 5 ± 1 N·m

Install the left sun visor assembly.

(3) Fix the left sun visor assembly holder in the body mounting hole with 2 bolts (for high configuration sun visors, connect the wire harness connectors before fixing the screws).

Torque: 5 ± 1 N·m

(4) Clamp the trim cover into holder.
(5) Insert the sun visor half shaft sleeve into the holder normally, and then adjust the sun visor to make it in closed state.

3.17 Replace Passenger Grip Assembly

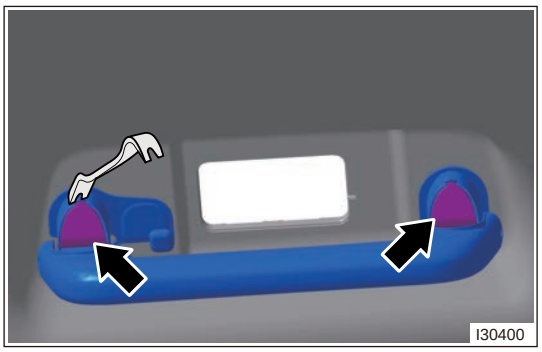
- Use same procedures for right and left sides.
- Procedures listed below are for left side.
- The installation method of front and rear passenger grips are same.

■ Removal

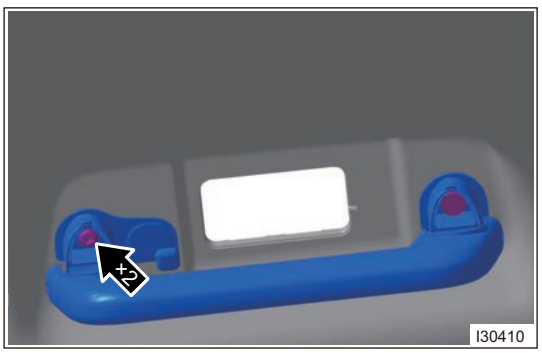
⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing passenger grip assembly.**
- **Appropriate force should be applied, when removing passenger grip assembly. Be careful not to operate roughly.**
- **Try to prevent interior and roof from being damaged, when removing passenger grip assembly.**

(1) Using an interior crow plate, pry off grip fixing screw block cover carefully.



(2) Using a cross screwdriver, remove 2 fixing screws from passenger grip assembly, and remove the front right passenger grip assembly.



■ Installation

⚠ Caution

- **After installation, check for looseness, neglected installation, etc.**
- **Grip should return normally without any noise during operation.**
- **Grip should be well fitted with roof and peripheral clearance should be even when it is not in use.**

(1) Install 2 fixing screws to passenger grip assembly.

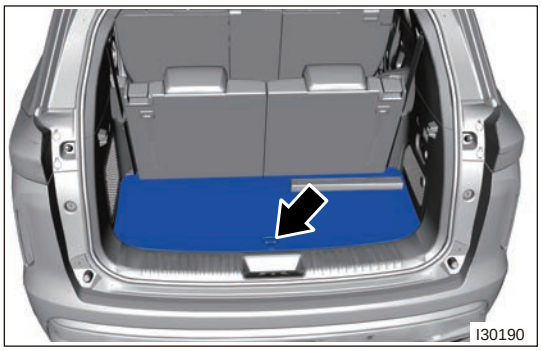
Torque: 3 ± 1 N·m

(2) Install the fixing screw block cover to passenger grip assembly.

3.18 Replace Luggage Compartment Carpet Assembly

■ Removal

(1) Lift the luggage compartment carpet grip and lift the rear end of luggage compartment carpet.



(2) Pull the luggage compartment carpet assembly backward and take it out.

■ Installation

⚠ Caution

- **Make sure that the left and right sides of luggage compartment carpet assembly are fitted in place, when installing luggage compartment carpet assembly.**
- **After installation, check whether the luggage compartment carpet is flat and free of wrinkles.**

(1) Put the luggage compartment carpet into luggage compartment, lap it on the luggage compartment storage box, and push it toward the front of vehicle until the carpet dowel pin is inserted into the hole of doorsill pressure plate.

3.19 Replace Luggage Compartment Storage Box Assembly

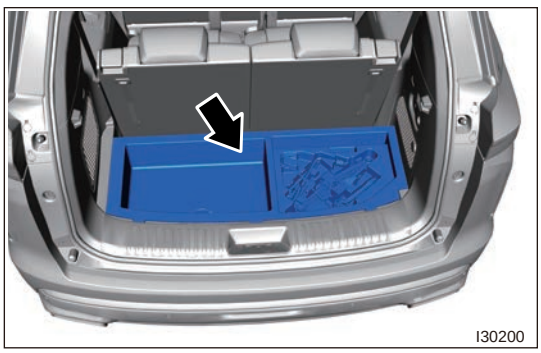
■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing luggage compartment storage box assembly.**
- **Appropriate force should be applied visor assembly when removing luggage compartment storage box assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint from being scratched, when removing luggage compartment storage box assembly.**

(1) Remove the luggage compartment carpet assembly.

(2) The luggage compartment storage box assembly can be removed directly from vehicle.



■ Installation

(1) Place luggage compartment storage box to rear luggage compartment.

(2) Check the fit of luggage compartment storage box and side parts, storage box should not shake.

3.20 Replace Luggage Compartment Wheel House Assembly

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing luggage compartment wheel house assembly.**
- **Appropriate force should be applied, when removing luggage compartment wheel house assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing luggage compartment wheel house assembly.**

(1) Remove the luggage compartment carpet assembly.

(2) Remove the luggage compartment storage box.

(3) Remove the rear seat cushion assembly.

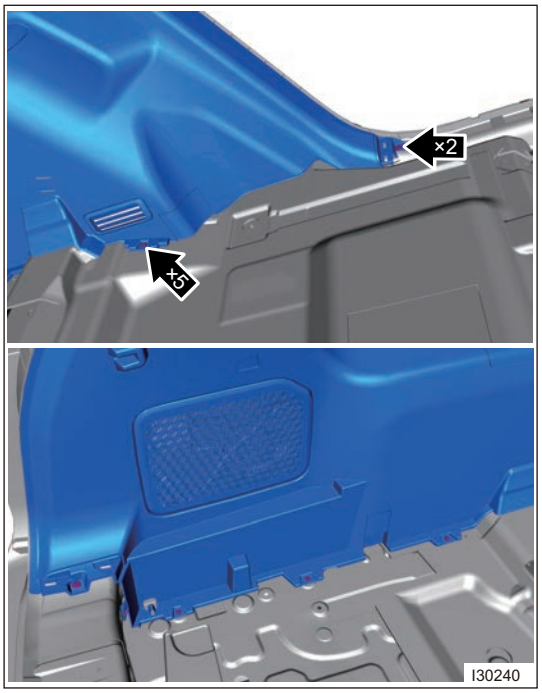
(4) Remove the rear seatback assembly.

(5) Remove the rear door opening weatherstrip.

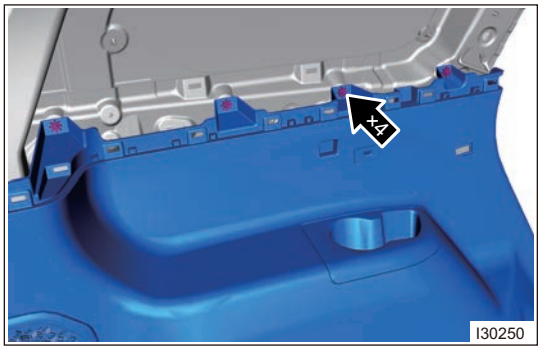
(6) Remove the rear doorsill pressure plate assembly.

(7) Remove the back doorsill pressure plate assembly.

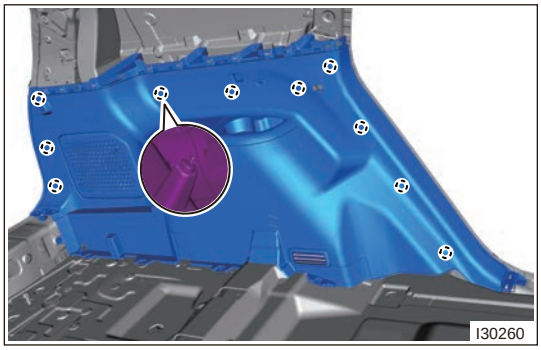
(8) Remove 5 fixing screws and 2 plastic rivets from lower end of luggage compartment left wheel house assembly.



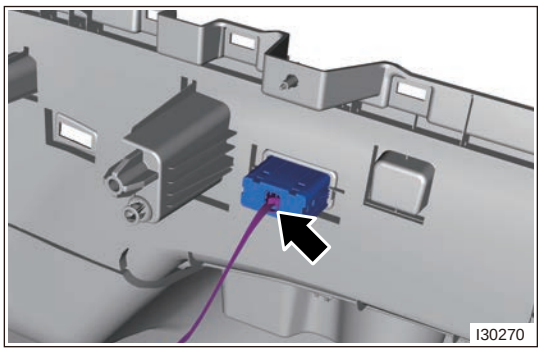
(9) Remove 4 fixing screws from upper end of luggage compartment left wheel house assembly.



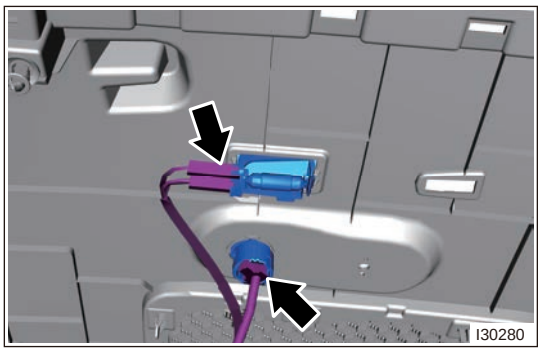
(10) Using an interior crow plate, pry off clips from luggage compartment protector assembly, and separate luggage compartment left wheel house assembly from vehicle body.



(11) Push the USB charging module out from claw of USB charging module inside the wheel house, and remove connector of USB charging module (this step is not performed on the right wheel house).



(12) Push luggage compartment light out from claw of luggage compartment light inside the wheel house, unplug connector of luggage compartment light. Perform the same operation for cigarette lighter power supply. (This step is not performed on the left wheel house).



(13) Remove the luggage compartment left wheel house assembly.

■ Installation

⚠ Caution

- **After installation, check for looseness, neglected installation, etc.**
- **Installation requirements for U-shaped groove: when installing weatherstrip, it is required to check whether U-shaped groove and sheet metal are attached. If not, press the protector to make it attach to sheet metal, and then install weatherstrip. After installing weatherstrip, check whether weatherstrip frame is stuck in U-shaped groove.**

(1) Connect the connector of luggage compartment light and cigarette lighter and clamp luggage compartment light and cigarette lighter into the corresponding hole of wheel house (This step is not performed on the left wheel house).
(2) Connect the connector of USB charging module and clamp USB charging module into the corresponding hole of wheel house (This step is not performed on the right wheel house).
(3) Place luggage compartment left wheel house assembly to a proper position, tap into sheet metal holes from front to back, and fix with the sheet metal.
(4) Install the luggage compartment left wheel house assembly plastic rive.
(5) Install 5 fixing screws in lower part of luggage compartment left wheel house assembly.
(6) Install 4 fixing screws in upper part of luggage compartment left wheel house assembly.
(7) Install the back doorsill pressure plate assembly.
(8) Install the rear doorsil pressure plate assembly.
(9) Install the rear door opening weatherstrip.
(10) Install the rear seatback assembly.
(11) Install the rear seat cushion assembly.
(12) Install the luggage compartment storage box.
(13) Install the luggage compartment carpet assembly.

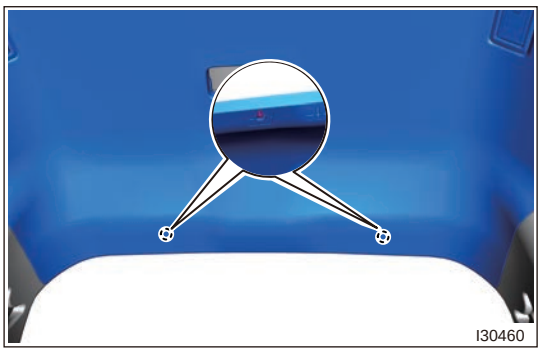
3.21 Replace Roof Assembly

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing roof assembly.**
- **Appropriate force should be applied, when removing roof assembly. Be careful not to operate roughly.**
- **Try to prevent interior and body paint surface from being scratched, when removing roof assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the interior front dome light assembly.
(4) Remove the sun visor assembly.
(5) Remove the sun visor holder B.
(6) Remove the passenger grip assembly.
(7) Remove the rear interior dome light assembly.
(8) Remove the front door opening weatherstrip.
(9) Remove the rear door opening weatherstrip.
(10) Remove the back door opening weatherstrip.
(11) Remove the A-pillar upper protector assembly.
(12) Remove the B-pillar upper protector assembly.
(13) Remove the C-pillar upper protector assembly.
(14) Remove the D-pillar upper protector assembly.
(15) Using an interior crow plate, pry off 2 fixing clips on end of roof assembly.



(16) Disconnect 19 mushroom buckles between the roof and ceiling by force evenly downward around the roof.

Hint:

- There are 2 mushroom buckles on the roof assembly of vehicles without sunroof.

(17) Remove the roof assembly.

■ Installation

⚠ Caution

- **The position of sun visor, passenger grip and roof fixing clip installation hole should correspond to the position of body screw hole to ensure that the sun visor, passenger grip and fixing clip are installed in place without affecting the appearance.**
- **The height and edge of front end of roof should not interfere with the installation of front and rear windshield glass. The front and rear corners of roof should not be visible outside vehicle, and the visual angle should be horizontal with the height of roof.**
- **Replace damaged clips and install roof assembly in place, when installing roof assembly.**
- **Roof assembly and pillar upper protector should be fitted closely, after installing roof assembly.**
- **Roof assembly and door opening weatherstrip should be fitted closely, after installing roof assembly.**
- **After roof assembly is installed, the roof air outlet and air duct interface should be well matched, and the cross section of air duct opening should be pressed on the sponge on the back of air outlet, and there should be no misalignment or leakage.**

(1) Two people hold each end of roof and carefully put the roof into the vehicle.

(2) Install the roof assembly to locating hole.

(3) Install left clip in rear side of roof assembly.

(4) Install holder B in front right side of roof assembly.

(5) Install right clip in rear side of roof assembly.

(6) Install holder B in front left side of roof assembly.

(7) Install the front interior dome light assembly.

(8) Appropriately press the corresponding roof profile of mushroom buckles in sliding roof area to make the mushroom buckle stick tightly on the sliding roof.

(9) Install the rear interior dome light assembly.

(10) Install the B-pillar upper protector assembly.

(11) Install the passenger grip assembly.

(12) Install the C-pillar upper protector assembly.

(13) Install the A-pillar upper protector assembly.

(14) Install the D-pillar upper protector assembly.

(15) Install the back door opening weatherstrip.

(16) Install the rear door opening weatherstrip.

(17) Install the front door opening weatherstrip.

(18) Install the sun visor assembly.

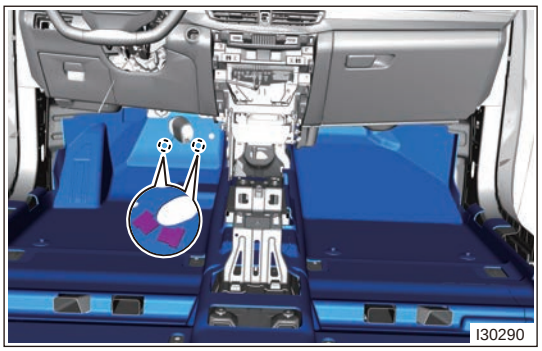
3.22 Replace Floor Carpet Assembly

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing front floor carpet assembly.**
- **Appropriate force should be applied, when removing front floor carpet assembly. Be careful not to operate roughly.**
- **Prevent interior and body paint from being scratched, when removing front floor carpet assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the auxiliary fascia console assembly.
(4) Remove the front seat assembly.
(5) Remove the middle row seat assembly.
(6) Remove the rear seat assembly.
(7) Remove the front doorsill pressure plate assembly.
(8) Remove the front door opening weatherstrip.
(9) Remove the rear doorsill pressure plate assembly.
(10) Remove the rear door opening weatherstrip.
(11) Remove the A-pillar lower protector assembly.
(12) Remove the B-pillar lower protector assembly.
(13) Remove the luggage compartment wheel house assembly.
(14) Remove the brake pedal assembly.
(15) Remove the intermediate shaft assembly.
(16) Loosen 2 magical sticks at the front of carpet.



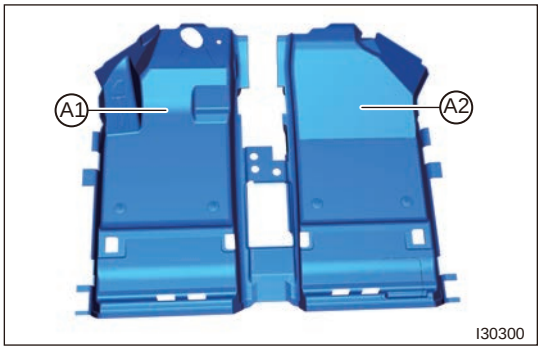
(17) Remove the front carpet assembly.

■ Installation

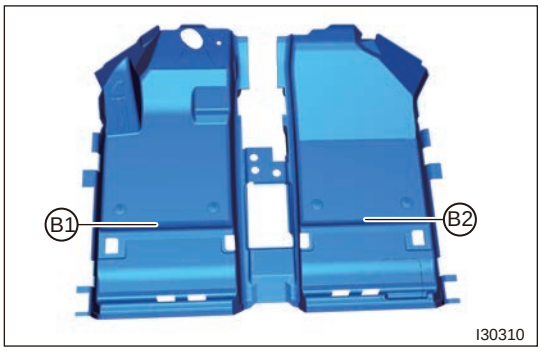
⚠ Warning

- **Always pay attention to the flatness around front floor carpet assembly and the routing of relative body wire harness, when installing front floor carpet assembly.**
- **Spread front floor carpet assembly along the bottom shape, with no obvious bumps and unevenness found. Expose installation holes, and front floor carpet assembly should be firmly abutted against the bottom.**
- **It is not allowed to stand in the area of carpet without protective film to avoid soiling the carpet.**

(1) Attach foam surface of 2 front carpets A1 and A2 in the figure with sheet metal of lower vehicle body.



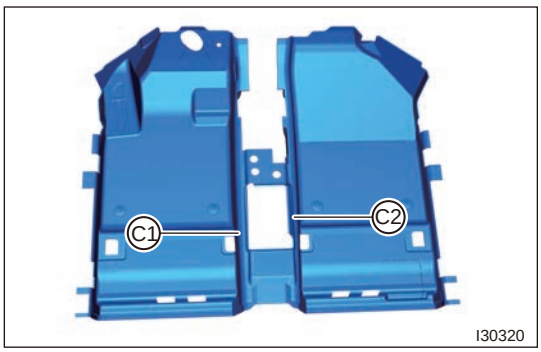
(2) Attach foam surface of 2 front carpets B1 and B2 in the figure with front seat crossmember.



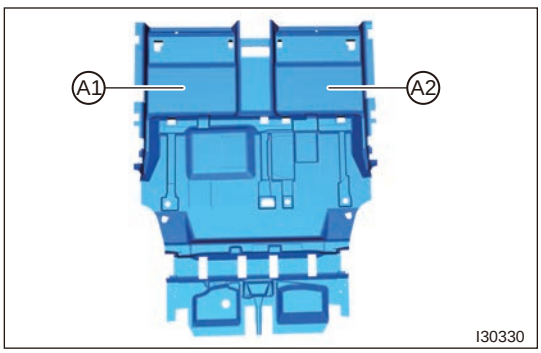
(3) Attach foam surface of 2 front carpets C1 and C2 in the figure with central control floor sheet metal surface.

Hint:

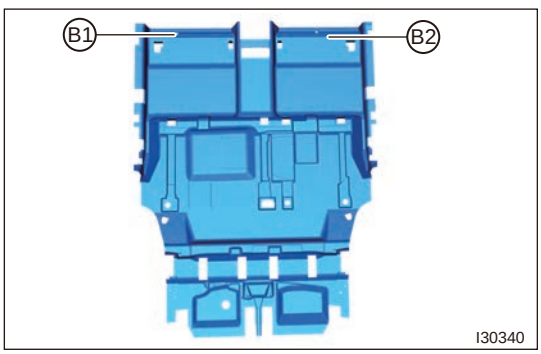
- Take out wire harness and floor air duct from front carpet hole after installing front carpet.



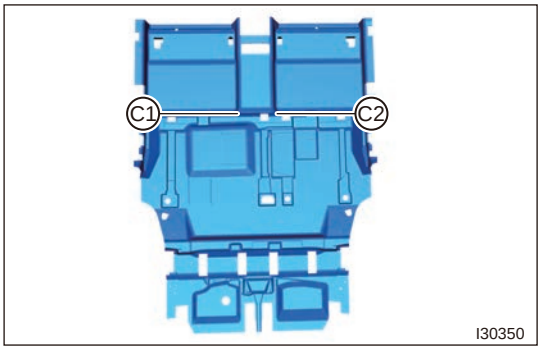
(4) Attach foam surface of 2 rear carpets A1 and A2 in the figure with sheet metal of lower vehicle body.



(5) Attach foam surface of 2 rear carpets B1 and B2 in the figure with rear seat crossmember.



(6) Attach foam surface of 2 rear carpets C1 and C2 in the figure with central control floor sheet metal surface.



(7) Install the intermediate shaft assembly.
(8) Attach 2 magical sticks at the front of carpet and press it flatly.
(9) Install the brake pedal assembly.
(10) Install the luggage compartment wheel house assembly.
(11) Install the B-pillar lower protector assembly.
(12) Install the A-pillar lower protector assembly.
(13) Install the rear door opening weatherstrip.
(14) Install the rear doorsill pressure plate assembly.
(15) Install the front door opening weatherstrip.
(16) Install the front doorsill pressure plate assembly.
(17) Install the rear seat assembly.
(18) Install the front seat assembly.
(19) Install the auxiliary fascia console assembly.
(20) Connect the negative battery cable.

12.5 SEAT

1 Warnings and Precautions

1.1 Warnings

Precautions for Seat Assembly

(1) The whole set of seat fabric has no obvious wrinkles and wear caused by installation;

(2) It is not necessary to remove the plastic protective film provided by the seat during the assembly process so as to protect the seat;

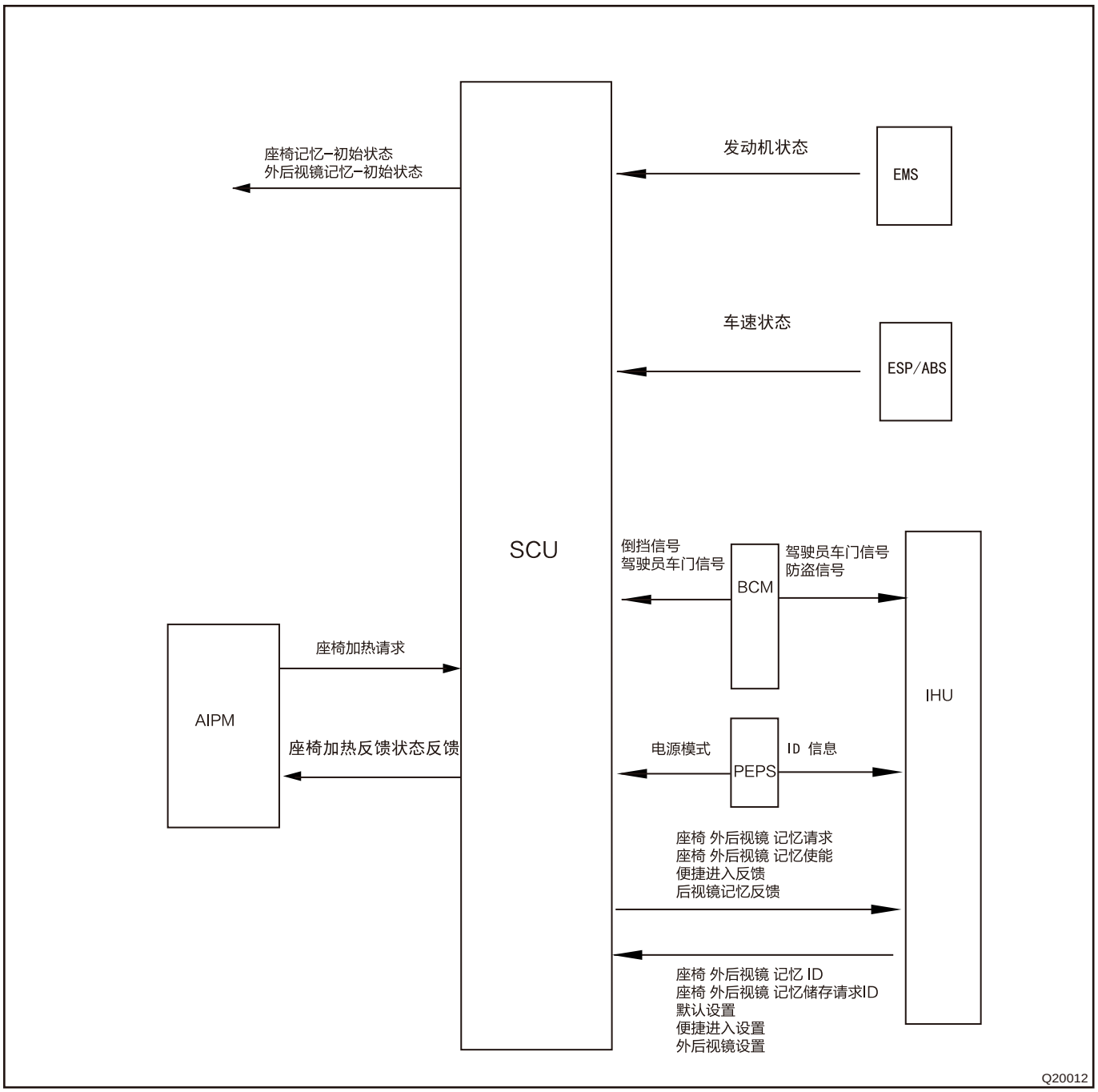
(3) Assembly methods of driver seat and front passenger seat are the same, and there is no difference in the assembly methods of all configured seats. It should be noted that the wire harness installation methods are different in each configuration.

2 System Overview

2.1 System Description

Front seat assembly can be moved forward and backward by front-back adjustment switch, and can be moved upward and downward by seat height adjustment switch (for driver side power seat), and seatback inclination angle can be adjusted by seatback adjustment switch.
Middle row seat assembly can be moved back and forth through the seat adjustment handle, seatback can be folded by pulling seatback unlock mechanism assembly, to help increase the storage space of vehicle. (-EASYENTRY one-button entry function of the middle row left seat, just hold the button located on the outer side of the seatback, you can fold the second row seat forward to facilitate the entrance and exit of the third row seat).
Rear seat cannot be moved forward and backward, however, the rear seatback can be folded by pulling seatback unlock mechanism assembly, to help increase the storage space of luggage compartment.

2.2 System Schematic Diagram

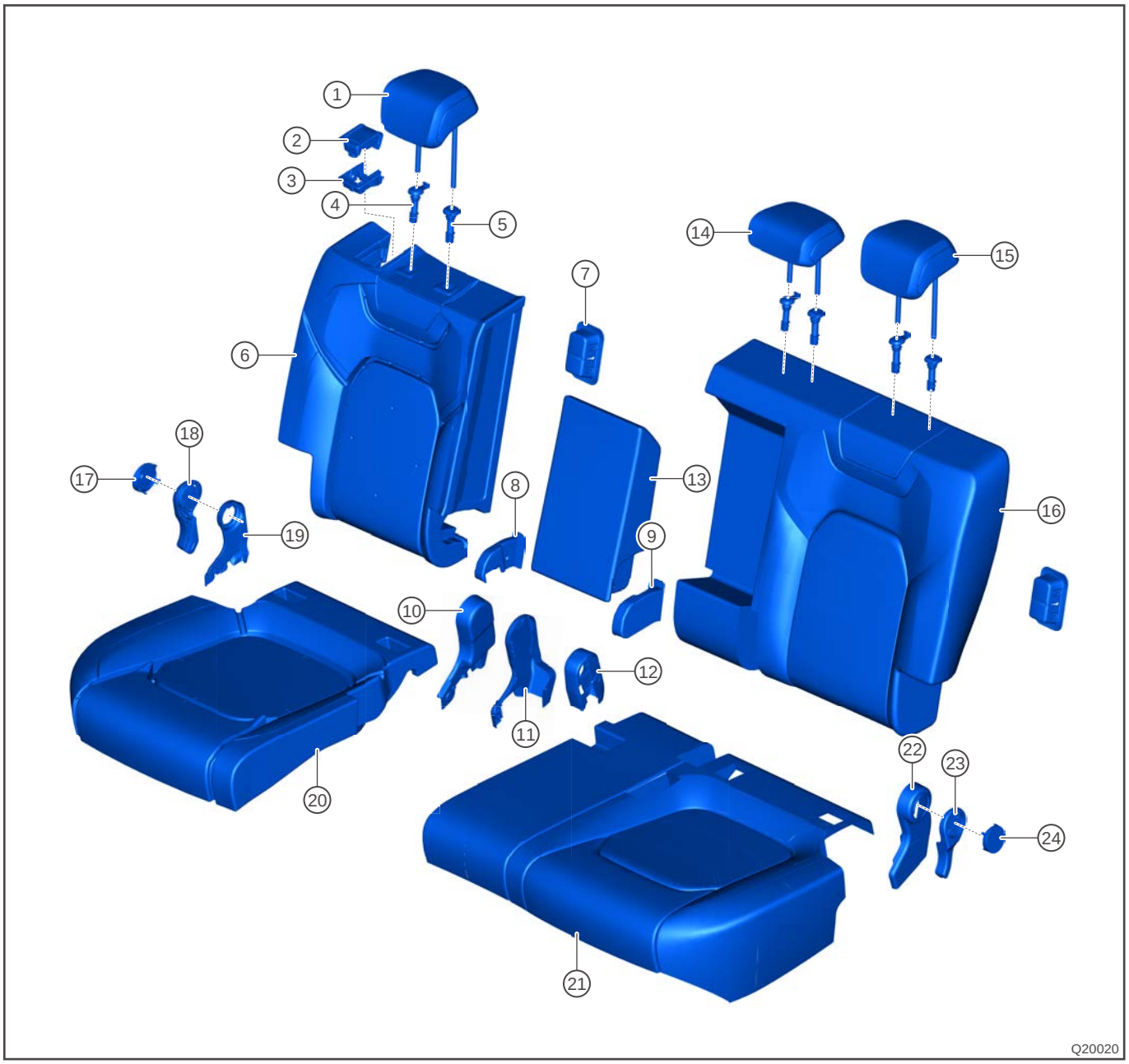


2.3 System Components Diagram

Driver Seat Assembly

1	Front Headrest Assembly	9	Front Left Seat Outside Side Panel
2	Front Headrest Guide Sleeve Free End	10	Driver Seat Side Panel Trim Cover
3	Front Headrest Guide Sleeve Lock End	11	Lumbar Support Switch
4	Front Seat Trim Fabric	12	Seatback Adjustment Button
5	Front Seat Belt Buckle	13	Seat Height and Front-back Adjustment Button
6	Front Left Seat Inside Side Panel	14	Front Left Seat Assembly Front Inner Leg Cover Assembly
7	Front Seat Cushion Sleeve	15	Driver Seat Frame
8	Front Left Seat Adjustment Switch Assembly		

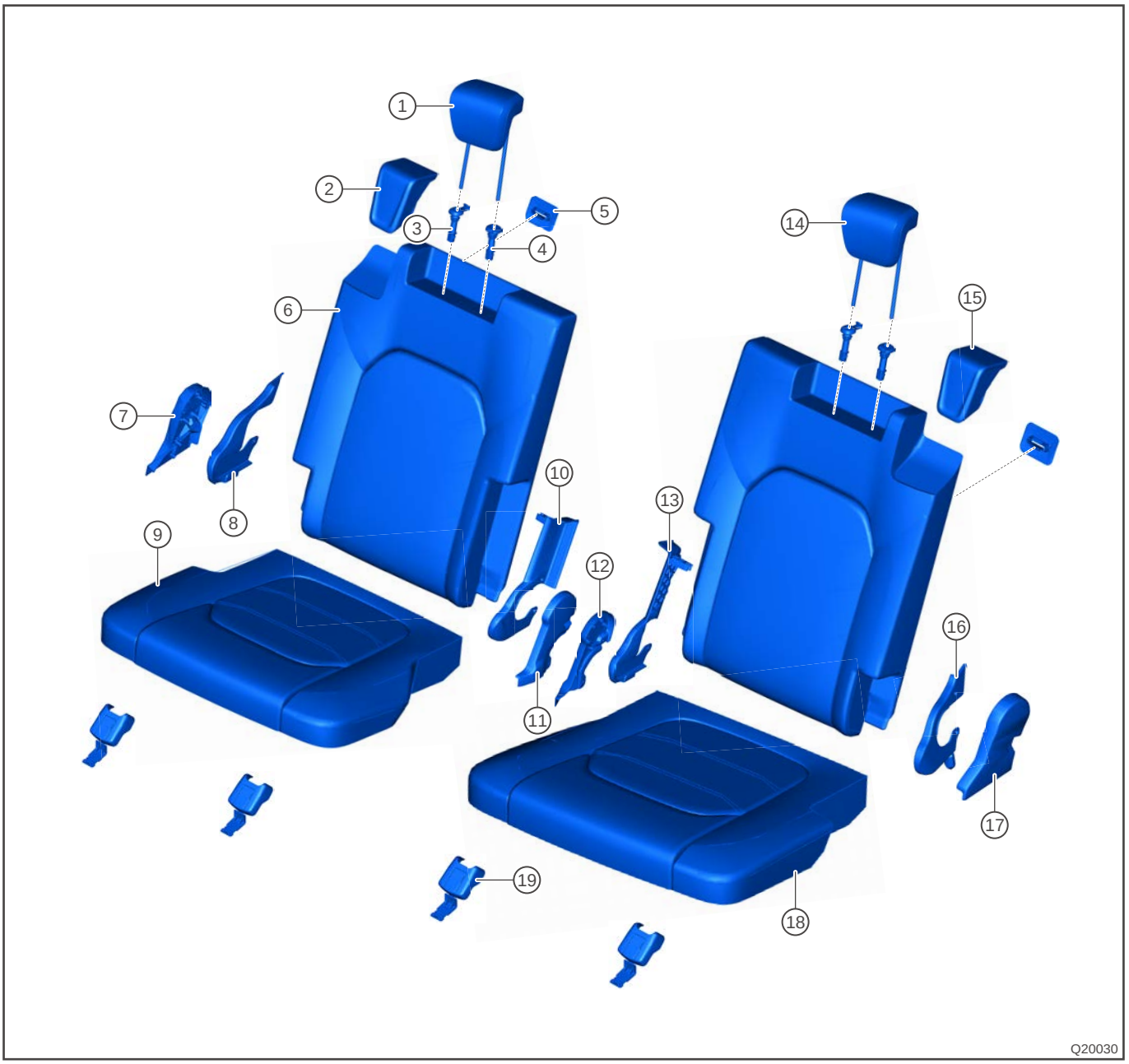
Second Row Seat Assembly



1	Second Row Outside Headrest Assembly	13	Second Row Seat Armrest Assembly
2	Unlock Handle Assembly	14	Second Row Center Headrest Assembly
3	Unlock Handle Base	15	Second Row Outside Headrest Assembly
4	Second Row Headrest Sleeve Free End	16	Second Row Left Seatback Cover Assembly
5	Second Row Headrest Guide Sleeve Lock End	17	Second Row Right Seat Reclining Adjuster Handle cover
6	Second Row Right Seatback Cover	18	Second Row Right Seat Reclining Adjuster Handle
7	Plastic Part	19	Second Row Right Seat Right Protector Assembly

8	Armrest Bracket Right Protector Cover	20	Second Row Right Fabric Cushion Cover
9	Armrest Bracket Left Protector Cover	21	Second Row Left Cushion Cover
10	Second Row Left Seat Right Protector Assembly	22	Second Row Left Seat Left Protector Assembly
11	Second Row Left Seat Left Protector Assembly	23	Second Row Left Seat Reclining Adjuster Handle
12	Second Row Left Seat Center Protector Assembly	24	Second Row Left Seat Reclining Adjuster Handle cover

Third Row Seat Assembly



1	Third Row Outside Headrest Assembly	11	Inside Angle Adjustment Right Lining Plate
2	Seatback Unlock Right Handle	12	Inside Angle Adjustment Left Lining Plate

3	Third Row Headrest Sleeve Free End	13	Left Seatback Lower Inside Baffle Plate
4	Third Row Headrest Guide Sleeve Lock End	14	Third Row Outside Headrest Assembly
5	Seatback Strip Trim Cover	15	Seatback Unlock Left Handle
6	Third Row Right Seatback Cover	16	Outside Left Cover
7	Outside Angle Adjustment Right Lining Plate	17	Outside Angle Adjustment Left Lining Plate
8	Outside Right Cover	18	Third Row Left Cushion Cover
9	Third Row Right Cushion Cover	19	Third Row Front Support Foot Protective Cap
10	Right Seatback Lower Inside Baffle Plate		

2.4 Power Seat Adjustment

No.	Test Case Description	Step Description	Note
1	Horizontal manual adjustment of seat	Battery voltage is 9 to 16 V. Pressing to adjust the seat horizontally forward is continuously effective	Seat moves forward and stops when the switch is released
		Battery voltage is 9 to 16 V. Pressing to adjust the seat horizontally backward is continuously effective	Seat moves backward and stops when the switch is released
		Battery voltage is too high or too low. Press seat front-back adjustment button	Seat does not operate
		Start the vehicle during seat adjustment	Seat stops during vehicle start-up
2	Vertical manual adjustment of seat	Battery voltage is 9 to 16 V. Pressing to adjust the seat upward is continuously effective	Seat moves upward and stops when the switch is released
		Battery voltage is 9 to 16 V. Pressing to adjust the seat downward is continuously effective	Seat moves downward and stops when the switch is released
		Battery voltage is too high or too low. Press seat up/down adjustment button	Seat does not operate
		Start the vehicle during seat adjustment	Seat stops during vehicle start-up
3	Manual adjustment of seatback	Battery voltage is 9 to 16 V.	Seatback moves forward and stops when the switch is released

No.	Test Case Description	Step Description	Note
		Pressing to adjust the seatback forward is continuously effective	
		Battery voltage is 9 to 16 V. Pressing to adjust the seatback backward is continuously effective	Seatback moves backward and stops when the switch is released
		Battery voltage is too high or too low. Press seatback front-back adjustment button	Seat does not operate
		Start the vehicle during seat adjustment	Seat stops during vehicle start-up
4	Manual initialization of seat in horizontal direction	Battery voltage is 9 to 16 V, adjust the seat forward until it reaches mechanical blocking stop position, blockage occurs; adjust the seat backward until it reaches mechanical blocking stop position, blockage occurs	Initialization is completed in the horizontal direction and soft stop range is automatically generated
		After completion of initialization, the seat will stop when it reaches the soft stop position. If the switch is operated again to move it in the same direction, the seat can exceed the soft stop action range	When the seat reaches the mechanical stop position, it will block and stop
5	Manual initialization of seat in vertical direction	Battery voltage is 9 to 16 V, adjust the seat upward until it reaches mechanical blocking stop position, blockage occurs; adjust the seat downward until it reaches mechanical blocking stop position, blockage occurs	Initialization is completed in the vertical direction and soft stop range is automatically generated
		After completion of initialization, the seat will stop when it reaches the soft stop position. If the switch is operated again to move it in the same direction, the seat can exceed the soft stop action range	When the seat reaches the mechanical stop position, it will block and stop

No.	Test Case Description	Step Description	Note
6	Manual initialization of seatback	Battery voltage is 9 to 16 V, adjust the seatback forward until it reaches mechanical blocking stop position, blockage occurs;	Initialization is completed in the seatback direction and soft stop range is automatically generated, and the backward soft stop position is obtained through calibration
		After completion of initialization, the seat will stop when it reaches the soft stop position. If the switch is operated again to move it in the same direction, the seat can exceed the soft stop action range	When the seat reaches the mechanical stop position, it will block and stop
7	Diagnostic initialization	Initialization is completed by issuing diagnostic instructions from the diagnostic tester	After completion of initialization, the seat will stop when it reaches the soft stop position. If the switch is operated again to move it in the same direction, the seat can exceed the soft stop action range, when it reaches the mechanical stop position, it will block and stop

2.5 Seat Adjustment Function

6 or 8 directions adjustment for driver seat: Including seat horizontal front-back adjustment, seat height up-down adjustment, seatback angle front-back adjustment, cushion angle adjustment.

2.6 Seat Horizontal/Height/Seatback/Cushion Angle Manual Adjustment

(1) Manual adjustment operating conditions

- Power supply is not in start gear;
- Normal operating voltage (9-16 V);

(2) Stop conditions

- Seat manual adjustment function stops when the motor is stalling.
- Seat manual adjustment function stops when releasing the switch.
- When the starter starts: Stop the seat manual adjustment function; If the switch input is still detected after the starter starts, it will continue to work.
- Stop the seat manual adjustment function when the seat fails (abnormal voltage, abnormal current, timeout output). When the output is stopped, the Hall signal caused by inertia will be recorded in the seat travel coordinates within 500ms after the output is stopped. The direction of travel counting is the same direction as the last seat output. At this time, Hall signal does not make abnormal judgment and only detects the number of Hall pulses within 500 ms.

(3) Blocking judgment

- Current blocking judgment.
- In the process of SCU output, after starting the output for 100 ms (avoiding starting current), the starting current is blocked and detected. When the output current is greater than 75% of the starting current and lasts for 500ms, the current is blocked.
- Motor blocks: Current blocking and Hall blocking occur at the same time, it determines that system has a motor blocking. (All blocks mentioned in the functional specification satisfy this condition unless otherwise specified).

- The 4-axis motor cannot be blocked or started at the same time.

(4) Action delay

- When the seat moves in one direction and the switch state changes to the switch input in the opposite direction, the SCU will not immediately perform action in reverse direction and the reverse direction output action needs to be delayed by 500 ms.

(5) Position recording strategy

- When the seat moves, the position is not recorded to the EEPROM; When the seat stops, the current position information is written to the EEPROM; When the seat moves, it loses its position when the power cuts off.

(6) Shaft action priority

- Height and level adjustments cannot be made at the same time. Front seat cushion and seaback adjustments cannot be made at the same time. Seaback or front seat cushion adjustments can be made at the same time with height or level adjustments.
- 2 shafts are not allowed to start at the same time: In order to avoid excessive starting current at the same time, when the two shafts are started at the same time, the drive output interval is 200ms, and the priority is the seatback shaft/front seat cushion shaft > horizontal shaft/height shaft.
- Blocking current in 2 shafts are not allowed at the same time: In order to avoid excessive blocking current at the same time, when the two shafts are blocked at the same time (height + seatback or horizontal + seatback), stop the output of shaft with low priority. After the shaft with high priority completes the blocking judgment and stops output, resume the action of the other shaft and continue to complete the blocking judgment. The priority is the seatback shaft/front cushion shaft > horizontal shaft/height shaft.

(7) Seat adjustment soft stop function

- In order to prevent the seat from moving to the mechanical stop position frequently, the SCU has a soft stop function when the seat adjustment is initialized. The specific soft stop position is calibrated according to the real vehicle. The seat will stop when it reaches the soft stop position. If the switch is operated again to move it in the same direction, the seat can exceed the soft stop action range.

2.7 Failure Mode and Malfunction Handling

(1) Current detection

- If the monitored output current is greater than 75% of the starting current and exceeds 500ms (10ms*50), it is considered to be blocked and the output is cut off at this time.

(2) Voltage inspection

- During operation, if the voltage is lower than 9 V or higher than 16 V for more than 500 ms, the default voltage is abnormal, and the output is stopped while the switch input is shielded. After the voltage returns to normal range (9 < V < 16), if the working conditions are still satisfied, the operation will continue.

(3) Timeout detection

- The maximum output time of seat front-back/height/seatback/seat cushion is manually adjusted. When the switch continues to be effective, the output will stop after the maximum continuous output time of 30s.

(4) Seat adjustment failed state output

- When a fault (abnormal voltage, abnormal current, abnormal Hall signal) is detected, the seat module sends the ID of corresponding fault mode to CAN network until the fault is eliminated and the transmission stops.

2.8 Seat Initialization (Learning)

Definition information description during initialization

(1) Mechanical stop position

- Height, front/back shaft and cushion shaft:
  During initialization, blocking point is reached forward, SCU takes this point as 0 and the maximum forward stroke position; or blocking point is reached backward, SCU will take this point as the end point and the maximum backward stroke position (height shaft: forward corresponds to up, backward corresponds to down).

- Seatback shaft
  During initialization, blocking point is reached forward, SCU takes this point as 0 and the maximum forward stroke position.

(2) Mechanical stop fault-tolerant range

- After the SCU records 0 and end point, when blocking occurs again, the reasonable difference between the current blocking point and the already recorded 0 or end point.

(3) Soft stop

- In order to protect the motor and seat system, it is necessary to define the motor action range within the software scope, and the soft stop is within the mechanical stop coordinate range. The soft stop interval can be initialized and automatically generated during initialization. The soft stop position is defined as follows:
  Height shaft: From 0 or end point.
  Front/back shaft: From 0 or end point.
  Seatback shaft: From 0 or end point.

2.9 Manual Initialization

(1) Initialization conditions

- Normal operating voltage (9-16 V).
- Power supply is not in start gear.

(2) Front-back adjustment initialization:

- The seat is adjusted forward until it reaches the mechanical blocking stop position. The blocking has occurred and the current point is taken as 0 point.
- The seat is adjusted backwards until it reaches the mechanical blocking stop position. The blocking has occurred, the coordinate travel and end point are recorded.
- Automatically generates a soft stop range with a distance of 30 Hall units from the mechanical stop (0 or end point).

(3) Height adjustment initialization

- The seat is adjusted upward until it reaches the mechanical blocking stop position. The blocking has occurred and the current point is taken as 0 point.
- The seat is adjusted downwards until it reaches the mechanical blocking stop position. The blocking has occurred, the coordinate travel and end point are recorded.
- Automatically generates a soft stop range with a distance of 30 Hall units from the mechanical stop (0 or end point).

(4) Seatback angle initialization:

- The seatback is adjusted forward until it reaches the mechanical blocking stop position. The blocking has occurred and the current point is taken as 0 point.
- Automatically generates a forward soft stop range with a distance of 30 Hall units from the mechanical stop (0 point).
- Automatically generates a backward soft stop range, and the backward soft stop position is obtained through calibration.

(5) Seat cushion angle initialization:

- The seat cushion is adjusted upward until it reaches the mechanical blocking stop position. The blocking has occurred and the current point is taken as 0 point.
- The seat cushion is adjusted downwards until it reaches the mechanical blocking stop position. The blocking has occurred, the coordinate travel and end point are recorded.
- Automatically generates a forward soft stop range with a distance of 30 Hall units from the mechanical stop (0 point).

2.10 Diagnostic Initialization

(1) Through the diagnostic tester, the front and back adjustment shafts are automatically learned. The seat automatically moves forward to the blocking position and then backward to the blocking position to complete the initialization of the front and rear shafts.

(2) Through the diagnostic tester, the height adjustment shaft is automatically learned. The seat automatically moves upward to the blocking position and then downward to the blocking position to complete the initialization of the height shaft.

(3) Through the diagnostic tester, the seatback angle shaft is automatically learned. The seatback automatically moves forward to the blocking position to complete the initialization of the seatback shaft.

(4) Through the diagnostic tester, the front seat cushion shaft is automatically learned. The front seat cushion automatically moves upward to the blocking position and then downward to the blocking position to complete the initialization of the front seat cushion shaft.

(5) Through the diagnostic tester, all adjustment shafts are automatically learned; The seat automatically completes 4-shaft initialization.

2.11 Clearing Initialization

SCU can clear all shafts or single shaft initialized content, as long as there is one shaft clear is initialized, the current shaft is in manual mode.

(1) Initialize and delete the following information:

- Mechanical stop position (0 and end point).
- Coordinate travel.
- Soft stop position.
- The fault-tolerant range of 0 or end point from the coordinate axis when stopping mechanically.
- Memory positions in all IDs and modes (single shaft clear initialization, clear all shafts memory position).

(2) Trigger clear initialization

- Clear all shafts initializations with the diagnostic tester.
- CAN signal received from IHU is set to the default value = 0x1: Personalization is set to the default value, 0x4: When all is set to the default value, memory positions in IDs and modes will be deleted; After deleting the memory position, set all memory positions under the current ID to the default position.

2.12 Seat Memory and Recall

No.	Test Case Description	Step Description
1	Seat position memory enabling	Enable conditions: Normal operating voltage is 9 to 16 V. Vehicle speed is lower than 5 kph. Power supply is in OFF/ACC/IG ON. If engine starts, gear position is in P or N, SCU initialization is completed. Seat/rear view mirror will not move by manual control. Gear position is not in R. Vehicle is involved in a collision.
2	Seat position memory recall	Memory: If the user adjusts the seat or the outside rear view mirror through the switch in non-R mode, and does not operate the adjustment switch in the next 3 seconds, and seat and rear view mirror do not move, SCU will send a request for seat memory, and IHU will pop up a dialog box.
		Recall: When receiving the IHU recall demand, SCU drives the seat to the memory position in the corresponding mode. If there is no memory position before, SCU drives the seat to the default position.

3	Seat convenient access function	Activate this function in IHU interface
		Power supply is in OFF or remote start condition, when driver door is opened, SCU drives the seat back for a certain distance.

2.13 Seat Position Memory

The seat control module needs to support the storage of 15 groups of seat position information of different postures. The module shall preset the initialization values in memory mode for all seat positions when the vehicle leaves the factory.

(1) Seat position memory conditions
Seat module SCU needs to send out the seat memory enabling signal when all the following conditions are met, otherwise the seat module does not meet the position storage conditions:

- Normal operating voltage is 9 to 16 V.
- SCU initialization is completed.
- SCU adjustment switch is not pressed.
- Vehicle speed is lower than 3 Km/h and vehicle signal is valid. (No judgment when power supply is in OFF or ACC).
- Rear view mirror switch is not pressed (Determine the signal based on the configuration).

(2) Seat position memory

- SCU receives memory request signal via CAN, when receiving CAN signal memory request of IUH (-including requested ID and mode number = 0x0, 0x1, 0x2, 0x3, 0x4, 0x5, 0x6, 0x7, 0x8, 0x9, 0xA, 0xB, 0xC, 0xD, 0xE, 0xF) (0x0 is no action, others correspond to 15 groups of positions).
- SCU stores the current 4-shaft position to the EEPROM. SCU assigns the EEPROM to store 15 sets of position: 5 IDs, each of which has 3 modes corresponding to the ID and MODE number in the memory request. When the current position storage is completed, the seat module feedbacks CAN signal STAT_ seat memory position = "done", otherwise "failed" is feedback.

(3) Clearing and covering memory position

- When the seat module receives the CAN bus: SET_ default = 0X01 and judges the enabling signal of the seat memory at the same time, it sets 3 groups of memory position information under the current ID to the initial default position, non memory position of other ID do not change (the current ID is determined by the ID identified by IHU).
- When the seat module receives the CAN bus: SET_ default = 0X04 and judges the enabling signal of the seat memory at the same time, it sets all ID for 15 groups of memory position information to the initial default position.
- When there is memory information in the stored ID and mode, the memory request in this ID and mode is received again, and the current 4-shaft position overwrites the previous memory information.

(4) Position storage status feedback (Rear view mirror storage status signal is determined according to the configuration).

- After the seat position is successfully stored and the rear view mirror storage success signal is received, three frames of success signals are sent to CAN.
- If the seat position storage fails or the rear view mirror storage failure signal is received, three frames of failure signals will be sent to CAN.
- When the transmission of 3 frames is completed or there is no storage action, the feedback signal is sent to CAN all the time.

2.14 Seat Memory Position Recall

(1) Conditions of seat memory position recall

- Seat memory enabling signal.
- When STAT_ terminal is ON, two conditions of engine condition is "engine running" and transmission gear is "P" do not occur simultaneously.
- Engine status = starter starts.

(2) Position recall:

- When receiving CAN REQ_ seat position = 0x0, 0x1, 0x2, 0x3, 0x4, 0x5, 0x6, 0x7, 0x8, 0x9, 0xA, 0xB, 0xC, 0xD, 0xE, 0xF (0x0 is no action, others correspond to 15 groups of position).
- When the SCU receives the recall position, it determines whether there is a storage position: There is a storage position: Drive the seat to the position remembered in the corresponding mode. No storage position: Drive the seat to default position.

(3) SCU stops driving when the call action reaches the target position:

- When the output is stopped, the Hall signal caused by inertia will be recorded in the seat travel coordinates within 500ms after the output is stopped. The direction of travel counting is the same direction as the last seat output. At this time, Hall signal does not make abnormal judgment and only detects the number of Hall pulses within 500 ms.

(4) Motor runs:

- Height and front-back adjustments cannot be made at the same time. Seatback and seat cushion angle adjustments cannot be made at the same time. Seaback angle or front seat cushion adjustments can be made at the same time with height or front-back adjustments. When the memory position is recalled, after the height shaft and seatback shaft complete the recall action, the front-back shaft and cushion angle shaft actions are performed after 500ms. And you need to avoid simultaneous startup and simultaneous blocking.

(5) Repeat recall:

- In the process of memory recall, a new memory recall command is received again, stop for 500 ms, and a new recall action is executed again. If there are several new recall commands within 500ms pause time, the last recall command is regarded as the execution command after suspension.

(6) Recall action termination conditions:

- When single shaft reaches memory information position, single shaft action terminates (applicable to all shafts).
- Any manual adjustment switch input of 4-shaft, stop recall action of all shafts.
- When single shaft detects short circuit, over-current of related drive motor, stop recall action of all shafts.
- Single shaft reaches maximum output time and stops recall action of all shafts.
- Low voltage or overvoltage (9-16 V is the normal operating voltage), stop recall action of all shafts.
- Memory recall again, stop last recall action and perform this memory recall.
- Pause recall action of all shafts while starting. If the start status is not satisfied, recall action continues to be executed until the recall action meets the termination conditions.

2.15 Power On Automatic Position Recall:

When the power gear switches from non-OFF to OFF, SCM stores the current each shaft position of seat (6 or 8 shafts according to configuration); In the future, each time the power gear switches from non-OFF to OFF, it covers the position of last memory. This group of position exists independently, which is different from 15 groups of storage positions. When the power gear is switched from OFF to ACC or IGN ON and the seat memory enabling signal is automatically recalled to storage position of seat when power off.
Condition 1 of automatic memory when power on:

(1) After switching the IGN status from OFF to ACC or ON, the delay time is 300 ms to determine that the vehicle is in normal mode.

Condition 2 of automatic memory when power on:

(1) After switching the IGN status from OFF to ACC or ON, the delay time is 300 ms to determine that the vehicle is switched from remote mode to normal mode.

(2) IGN status is kept in ON.

(3) The engine is kept running and gear position is in P.

2.16 Position Recall Status Feedback (Rear View Mirror Storage Status Signal is Determined according to Configuration):

- The seat always sends a signal to CAN during the position call or when it receives a rear view mirror signal.

- When engine starts during position recall of seat, pause the recall action. Still sent during pause (continue).
- The seat reaches the recall position and receives the rear view mirror signal, three frames of success signals are sent to CAN.
- The seat does not reach the recall position or receive the rear view mirror signal, three frames of failed signals are sent to CAN.
- When the transmission of 3 frames is completed or there is no recall action, the feedback signal is sent to CAN all the time.

2.17 Seat Position Recall Function Interrupted:

If any of the following conditions is met, the seat will be interrupted during the position recall, and function of position recall will not be resumed even if the conditions are not met.

(1) Manual adjustment has high priority, manual adjustment can interrupt automatic adjustment, automatic adjustment can not be recalled in manual adjustment.

(2) In the process of memory recall, a new memory recall command is received again, and a new recall action is executed again. If there are several new recall commands, the last recall command is regarded as the execution command after suspension. But it is still in the process of a position recall, always sends a signal (cancel signal) to CAN.

(3) Gear shifts from P when engine is running.

(4) CAN signal is received when pressing rear view mirror adjustment switch.

(5) CAN signal is received when rear view mirror position recall is abnormal.

2.18 Seat Position Instant Memory Request Management

If the user adjusts the seat using switch, the seat does not move and the rear view mirror does not move for the next 5 seconds, SCU will send a 3-frame seat request to IHU.

2.19 Seat Comfortable Entry And Exit:

The driver seat comfortable entry and exit function allows the driver to get in and out of the vehicle more conveniently through the seat automatic retreat function. The comfortable entry and exit function only needs to be adjusted in the front and back direction of seat, which can be activated or turned off in the IHU interface.

(1) Driver seat comfortable entry and exit conditions

- Normal operating voltage is 9 to 16 V.
- Initialization is completed.
- Last time for comfortable entry and exit is 0x1: ON or current is 0x1: ON, comfortable entry and exit of SCU system status is 0x1: ON.
- No manual adjustment action and memory recall action.

(2) Seat comfortable entry and exit function logic

- Power supply is in OFF condition, when driver door is opened, SCU drives the seat to move toward the rear shaft to a predefined easy entry position.
- Power supply is in non-OFF condition, when driver door is opened, power gear changes from non-OFF to OFF, SCU drives the seat to move toward the rear shaft to a predefined convenient entry position.

(3) Easy Entry termination conditions

- Reach the target position.
- Any manual adjustment switch input.
- Reach blocking or soft stop position.
- Short circuit, overcurrent of relating drive motor is detected.
- Reach the maximum output time of 30 seconds.
- Low voltage or overvoltage.

2.20 Seat Position Action Status Output

The seat module will store the ID in E2 after receiving the ID signal of IHU setting personal data. The previously stored ID will always be fed back to IHU before receiving the ID signal.

2.21 Seat Position Action Status Output

(1) If the seat motor does not operate, SCU sends a CAN signal to the bus.

(2) If seat motor causes action by pressing the switch, SCU sends CAN signal STAT_SeatMovement = “Movingbyswitch” (0x01) to bus.

(3) If the seat motor causes action by position recall, SCU sends CAN signal STAT_SeatMovement = “Movingbyrecall” (0x02) to bus.

(4) If the seat motor is interrupted during the position recall, SCU sends three frames of CAN signal STAT_SeatMovement = “Moving byrecall interrupt” to bus.

(5) If the seat motor causes action by Easy Entry, SCU sends CAN signal STAT_SeatMovement = “Moving byrecall” (0x02) to bus.

2.22 Seat Heating

No.	Test Case Description	Step Description	Note
1	Activate driver and front passenger seat heating function by heating switch	Operating conditions: Power supply voltage is 9 to 16 V; No seat action (can not operate with seat at the same time); Driver/ front passenger seat heating switch is activated	Driver and front passenger seat heating function does not output
		Press driver and front passenger seat heating switch once	SCM feedbacks heating in 2nd gear
		Press driver and front passenger seat heating switch once again (second time)	SCM feedbacks heating in 1st gear
		Press driver and front passenger seat heating switch once again (third time)	Heating off
		If the seat heating function has been turned on, seat heating function will continue to work when the ENGINE START STOP switch is turned off; If the seat heating function is not turned on, operate the heating switch when the ENGINE START STOP switch is turned off, and the seat heating function will not work	
		Adjust seat during driver/ front passenger seat heating	Heating is off during seat movement. Heating signal will be sent without interruption during seat movement stops and heating recovery
2	Temperature detection	After the seat heating function is turned on, the seat heating is turned off when the target	Seat heating output is off, keep CAN bus temperature feedback

No.	Test Case Description	Step Description	Note
		temperature is reached, and the seat heating is turned on when the temperature is lower than target temperature according to the temperature feedback from temperature sensor	
		Currently set heating in 2nd gear	High gear is 42℃ and low gear is 37℃ (This value is still under calibration and may be adjusted in the future)
3	Remote heating function	Operating conditions: Power supply voltage is 9 to 16 V. Seat does not move Receiving CAN signal for remote heating in high gear	Driver/front passenger seat heating turns on SCM feedback heating gear position is 2nd gear
		Power supply voltage is 9 to 16 V Seat does not move Receiving CAN signal for remote heating in low gear	Driver/front passenger seat heating turns on SCM feedback heating gear position is 1st gear
		Driver/front passenger seat heating turns on SCM feedback heating gear position is 1st gear Receiving CAN signal for turning off remote heating	Driver/front passenger seat heating turns off
		Driver/front passenger seat heating turns on SCM feedback heating gear position is 2nd gear Receiving CAN signal for remote heating in low gear	Driver/front passenger seat heating turns on SCM feedback heating gear position is 1st gear
		Driver/front passenger seat heating turns on SCM feedback heating gear position is 1st gear Receiving CAN signal for remote heating in high gear	Driver/front passenger seat heating turns on SCM feedback heating gear position is 2nd gear
4	Voice heating function	Operating conditions: Power supply voltage is 9 to 16 V. Seat does not move	
		Receiving driver/front passenger seat heating CAN signal via IHU voice	SCM controls driver/front passenger seat heating to the corresponding gear position and feedback the current heating gear signal

No.	Test Case Description	Step Description	Note
5	Heating function interruption	During seat action	Heating interrupts
6	Termination of heating function	If any of the following conditions is satisfied, heating function is terminated.	
		The voltage is not in the normal operating range (9-16 V). When the NTC temperature detects abnormal heating output overcurrent (heating wire is short).	Heating stops

2.23 Realization of Seat Heating

(1) Seat heating conditions

- Normal operating voltage is 9 to 16 V.
- Engine is running.
- Start and stop function off: Engine starts;
- No seat action (can not operate with seat at the same time).

(2) Heating gear

- There are 2 gears, low gear (level 1) is 37°, high gear (level 2) is 42°.
- The temperature detects NTC temperature feedback, and the input is resistance value (see the NTC impedance feedback table for details). The high gear corresponds to 48 ℃ in the NTC resistance temperature table, and the low gear corresponds to 38 ℃ in the NTC resistance temperature table.
- CAN signal provides enabling signal, 2 heating gears, which needs to collect external NTC feedback, maintain the temperature, each temperature feedback from driver seat and front passenger seat, feedback output of seatback and cushion heating according the same seat NTC temperature is consistent.

(3) LEVEL 0 mode

- Driver seat heating:
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 2 is effective; Set to 2.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
  After receiving CAN signal, the heating hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.
- Front passenger seat heating:
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 2 is effective; Set to 2.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
  After receiving CAN signal, the heating hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.

(4) LEVEL 1 mode

- Driver seat heating:
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.

After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
After receiving CAN signal, the heating hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.

- Front passenger seat heating:
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the heating hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
  After receiving CAN signal, the heating hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.

(5) LEVEL 2 mode
Turn off the heating function.

(6) LEVEL 3 mode
Turn off the heating function.

2.24 Heating Hard Switch And Soft Switch Signal Priority

Both hard switch and soft switch belong to local switch mode. If both hard switch and soft switch signals are received, SCU will only respond once. If the time of latter switch signal is less than 300 ms compared to the previous switch signal, the latter switch operation is ignored.

2.25 TBOX Remote Heating Function Logic

LEVEL 0 mode

(1) Driver seat heating:
Receiving CAN signal for remote heating in high gear, gear 2 output is valid; Set to 2.
Receiving CAN signal for remote heating in low gear, gear 1 output is valid; Set to 1.
Receiving CAN signal for remote heating invalid signal, output is turned off; Set to 0.

(2) Front passenger seat heating:
Receiving CAN signal for remote heating in high gear, gear 2 output is valid; Set to 2.
Receiving CAN signal for remote heating in low gear, gear 1 output is valid; Set to 1.
Receiving CAN signal for remote heating invalid signal, output is turned off; Set to 0.

2.26 LEVEL 1 mode

(1) Driver seat heating:
Receiving CAN signal for remote heating in high gear, gear 2 output is valid; Set to 1.
Receiving CAN signal for remote heating in low gear, gear 1 output is valid; Set to 1.
Receiving CAN signal for remote heating invalid signal, output is turned off; Set to 0.

(2) Front passenger seat heating:
Receiving CAN signal for remote heating in high gear, gear 2 output is valid; Set to 2.
Receiving CAN signal for remote heating in low gear, gear 1 output is valid; Set to 1.
Receiving CAN signal for remote heating invalid signal, output is turned off; Set to 0.

(3) LEVEL 2 mode
Turn off the heating function.

(4) LEVEL 3 mode
Turn off the heating function.

2.27 Heating Logic Processing When Starting And Stopping

- When StartStop is not 0, it is determined that the start and stop function is turned on, and then it is determined that engineState is not 03, as a condition to turn off the heating, when StartStop is not 0, it is determined that the start and stop function is turned on, at this time EngineState is not 03, as a condition to turn on the heating, when StartStop switch is stopped, Auto Stopping and Operation, heating is turned on.
- During heating, if ESS signal indicates that stopping automatically is received (StartStop=Auoto Stopping or Stopped), heating function needs to be maintained.
- When not heating, the heating function can be enabled normally when in auto stopping condition (StartStop=Auoto Stopping or Stopped).

- During heating, if ESS signal indicates that stopping automatically is received (StartStop=Auoto Stopping or Stopped), heating function needs to be maintained. When the engine start signal is received (EngineState=activation starter power stage), the actual heating output needs to be turned off, but the bus signal remains in the previous state. After starting, the previous heating output will be restored.
- During heating, it is in start and stop mode and becomes standby after receiving ESS signal. The heating function needs to be turned off.

2.28 Seat Heating Termination Conditions

(1) One of driver seat heating and seat ventilation functions can only be turned on at a time, and the latter operation takes precedence; When driver seat heating function is working, the activation ventilation function is satisfied. Driver seat heating is off, and front passenger seat heating is not affected. Seat heating does not activate even if the ventilation function is turned off again.

(2) One of front passenger seat heating and seat ventilation functions can only be turned on at a time, and the latter operation takes precedence; When front passenger heating function is working, the activation ventilation function is satisfied. Front passenger seat heating is off, and driver seat heating is not affected. Seat heating does not activate even if the ventilation function is turned off again.

(3) Start and stop function turns off and engine is running.

(4) Start and stop function turns on and ESS signal changes to standby.

2.29 Failure Mode and Malfunction Handling

(1) Seat adjustment failed state output:
When a fault (abnormal voltage, abnormal current) is detected, the seat module sends the ID of corresponding fault mode to CAN network until the fault is eliminated and the transmission stops.

2.30 Seat Heating Interruption

(1) When the voltage is not within the normal operating range (9-16 V) and the seat heating is interrupted, set the seat heating driver feedback and SeatHeatPsngFeedbackSts to 0. Heating function will resume when voltage returns to normal range.

(2) When NTC temperature detection is abnormal (within normal temperature change, there is no normal temperature rise or no temperature change after output), the seat heating is interrupted and SeatHeatDriverFeedbackSts and SeatHeatPsngFeedbackSts are set to 0. Heating function will resume after NTC power returns to normal range.

(3) When the seat moves, seat heating is interrupted. The heating function is resumed after the seat stops moving, and the signal is still maintained during interruption.

(4) When start and stop function turns off (StartStopState = Auto Stopping or Stopped), seat heating is interrupted during startup, and heating function is resumed after startup. Signal is still maintained during interruption.

(5) Current diagnostic value exceeds threshold, it is considered overcurrent, seat heating is interrupted. Set SeatHeatDriverFeedbackSts and SeatHeatPsngFeedbackSts to zero at the same time. Heating function will resume after current returns to normal range.

(6) During the heating interruption, heating function can receive CAN signal to turn off, but it cannot receive CAN signal to turn on, and it can not receive CAN signal to change heating gear.

2.31 Seat Heating Priority

Seat local heating, seat remote heating, seat voice heating operation is preferred.

2.32 Seat Ventilation Function

Realization of seat ventilation

(1) Seat ventilation conditions

- Normal operating voltage is 9 to 16 V.
- Engine is running.
- Start and stop function turns off: Engine starts; start and stop function turns on: StartStop=stopped, Auto Stopping, Operation.
- No seat action (can not operate with seat at the same time).

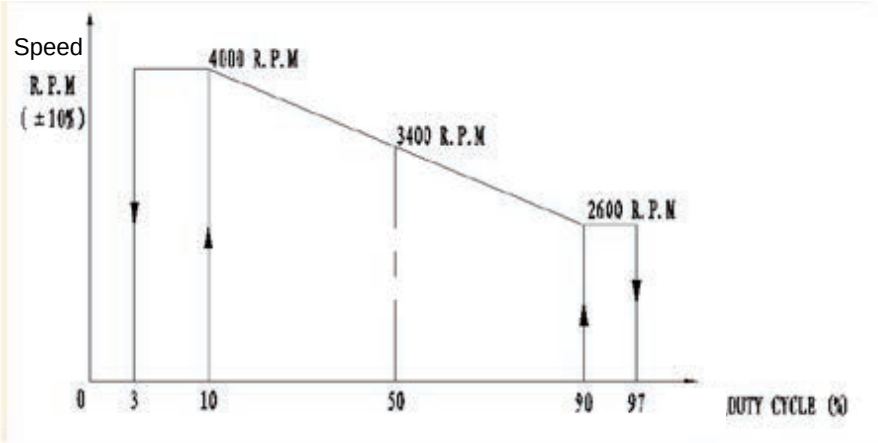
(2) Ventilation strategy

- There are 2 ventilation gears, low gear (level 1) is 2800 rpm, high gear (level 2) is 4000 rpm.

- Low gear (level 1) 2800 rpm corresponds to 80% duty cycle, and high gear (level 2) 4000 rpm corresponds to 10% duty cycle.
- Fan speed is related to PWM.

Voltage: 13.5 V

Frequency: 100 Hz



Relationship Between Fan Speed And Duty Cycle

Duty cycle	0-10%	10%	20%	30%	40%	50%	60%	70%	80%	90%	90%-100%
Speed (rpm)	0	4000 ±10%	3850± 10%	3700± 10%	3650 ±10%	3400 ±10%	3200± 10%	3000± 10%	2800 ±10%	2600± 10%	0

Q20011

2.33 Local Ventilation Function Logic

LEVEL 0 mode:

- Driver seat ventilation:
  After receiving CAN signal, the ventilation hard switch is pressed once or the soft switch is pressed once, and the output of gear 2 is effective; Set to 2.
  After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
  After receiving CAN signal, the ventilation hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.
- Front passenger seat ventilation:
  After receiving CAN signal, the ventilation hard switch is pressed once or the soft switch is pressed once, and the output of gear 2 is effective; Set to 2.
  After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
  After receiving CAN signal, the ventilation hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.

LEVEL 1 mode:

- Driver seat ventilation:

After receiving CAN signal, the ventilation hard switch is pressed once or the soft switch is pressed once, and the output of gear 1 is effective; Set to 1.
After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
After receiving CAN signal, the ventilation hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.

- Front passenger seat ventilation:
  After receiving CAN signal, the ventilation hard switch is pressed once or the soft switch is pressed once, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output of gear 1 is effective; Set to 1.
  After receiving CAN signal, the ventilation hard switch is pressed again or the soft switch is pressed again, and the output is turned off; Set to 0.
  After receiving CAN signal, the ventilation hard switch is pressed exceeding 2 seconds or soft switch is pressed exceeding 2 seconds. Directly turn off the output regardless of the current state; Set to 0.
- LEVEL 2 mode
  Turn off the ventilation function.
- LEVEL 3 mode
  Turn off the ventilation function.

2.34 Ventilation Hard Switch And Soft Switch Signal Priority

Both hard switch and soft switch belong to local switch mode. If both hard switch and soft switch signals are received, SCM will only respond once. If the time of latter switch signal is less than 300 ms compared to the previous switch signal, the latter switch operation is ignored.

2.35 Seat Ventilation Termination Conditions

(1) One of driver seat ventilation and driver seat heating functions can only be turned on at a time, and the latter operation takes precedence; When driver seat ventilation function is working, the activation heating function is satisfied. Driver seat ventilation is off, and front passenger seat ventilation is not affected. Seat ventilation does not activate even if the heating function is turned off again.

(2) One of front passenger seat ventilation and front passenger seat heating functions can only be turned on at a time, and the latter operation takes precedence; When front passenger seat ventilation function is working, the activation heating function is satisfied. Front passenger seat ventilation is off, and driver seat ventilation is not affected. Seat ventilation does not activate even if the heating function is turned off again.

(3) Start and stop function turns on (StartStop ≠ 0) and ESS signal changes to standby.

(4) Start and stop function turns off (StartStop=0) and EngineState ！ = “engine running”.

2.36 Seat Ventilation Interruption

(1) When the voltage is not within the normal operating range (9-16 V) and the seat ventilation function is interrupted, set STAT_SeatVentPassenger and STAT_SeatVentDriver to 0. Ventilation function will resume when voltage returns to normal range.

(2) When the seat moves, seat ventilation function is interrupted. The ventilation function is resumed after the seat stops moving, and the signal is still maintained during interruption. 3) When start and stop function turns off, seat heating function is interrupted when starting engine, and heating function is resumed after Cranking, and the signal is still maintained during interruption.

2.37 Seat Ventilation Priority

Seat local ventilation, seat remote ventilation, seat voice ventilation operation is preferred.
Impedance feedback form

T/ ℃	Rmin/KΩ	Rcen/KΩ	Rmax/KΩ
25	9.900	10.000	10.100
26	9.535	9.634	9.734
27	9.184	9.284	9.384

T/ ℃	Rmin/KΩ	Rcen/KΩ	Rmax/KΩ
28	8.849	8.948	9.048
29	8.527	8.626	8.725
30	8.219	8.318	8.416
31	7.924	8.021	8.119
32	7.640	7.737	7.835
33	7.368	7.465	7.561
34	7.108	7.203	7.299
35	6.857	6.952	7.047
36	6.617	6.711	6.805
37	6.387	6.479	6.572
38	6.165	6.257	6.349
39	5.953	6.043	6.134
40	5.748	5.838	5.928
41	5.552	5.640	5.730
42	5.364	5.451	5.539
43	5.182	5.268	5.355
44	5.008	5.093	5.179
45	4.841	4.924	5.009
46	4.680	4.762	4.846
47	4.525	4.606	4.688
48	4.376	4.456	4.537
49	4.232	4.311	4.391
50	4.094	4.172	4.251
51	3.961	4.037	4.115
52	3.832	3.907	3.984
53	3.708	3.783	3.858
54	3.598	3.662	3.736
55	3.475	3.546	3.619
56	3.364	3.435	3.506

2.38 Seat Adjustment Data

Front seat
The whole stroke for forward and backward adjustment is 240 mm. The seat is adjustable from 180 mm forward and 60 mm backward; The designed seatback angle is 72° and it is adjustable within 22° forward and 50° backward; (Only for driver seat); The whole stroke for height adjustment is 55 mm. The seat is adjustable from 25 mm upward and 30 mm downward.
Rear seat
The designed seatback angle is 10° and it is adjustable within 6° forward and 4° backward.

3 System Circuit Diagram

3.1 Module Terminal Definition

Seat control module-A

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A1	Body ground	15 power detection	Power supply “ON”	13V
A2	Body ground	Front left seat height adjustment switch	Power supply “ON”	12 V when not adjusted; 2.8 V for upward adjustment and 6.9 V for downward adjustment
A3	Body ground	Front left seat front-back adjustment switch	Power supply “ON”	11 V when not adjusted; 6.9 V for forward adjustment and 2.9 V for backward adjustment
A4	Body ground	Front left seatback adjustment switch	Power supply “ON”	12V when not adjusted; 2.7V for forward adjustment and 6.9V for backward adjustment
A5	Body ground	Front left seat cushion adjustment switch	Power supply “ON”	12 V when not adjusted; 2.7 V for downward adjustment and 6.9 V for upward adjustment
A6	/	/	/	/
A7	/	/	/	/
A8	/	/	/	/
A9	/	/	/	/
A10	/	/	/	/
A11	/	/	/	/
A12	/	/	/	/
A13	/	/	/	/
A14	/	/	/	/
A15	/	/	/	/
A16	Body ground	Front right seat NTC feedback	Power supply “ON”	6V
A17	Body ground	Front left seat NTC feedback	Power supply “ON”	6V

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A18	/	/	/	/
A19	Body ground	Switch ground	Power supply “ON”	0V
A20	/	/	/	/
A21	/	/	/	/
A22	/	/	/	/
A23	/	/	/	/
A24	/	/	/	/
A25	/	/	/	/
A26	/	/	/	/
A27	/	/	/	/
A28	/	/	/	/
A29	/	/	/	/
A30	/	/	/	/
A31	/	/	/	/
A32	/	/	/	/
A33	Body ground	Seat height HALL signal	Power supply “ON”	Changes between 4.1 V (lowest) and 7.1 V (highest)
A34	Body ground	Seat horizontal HALL signal	Power supply “ON”	Changes between 4.1 V (foremost) and 6.9 V (rearmost)
A35	Body ground	Seatback HALL signal	Power supply “ON”	Changes between 4.6V (foremost) and 6.9 V (rearmost)
A36	Body ground	Seat cushion HALL signal	Power supply “ON”	6.9V
A37	/	/	/	/
A38	/	/	/	/
A39	/	/	/	/
A40	Body ground	Front left seatback ventilation	Power supply “ON”	-
A41	Body ground	Front right seatback ventilation	Power supply “ON”	-
A42	Body ground	Front left seat cushion ventilation	Power supply “ON”	12 V when unventilated
A43	Body ground	Front right seat cushion ventilation	Power supply “ON”	12 V when unventilated

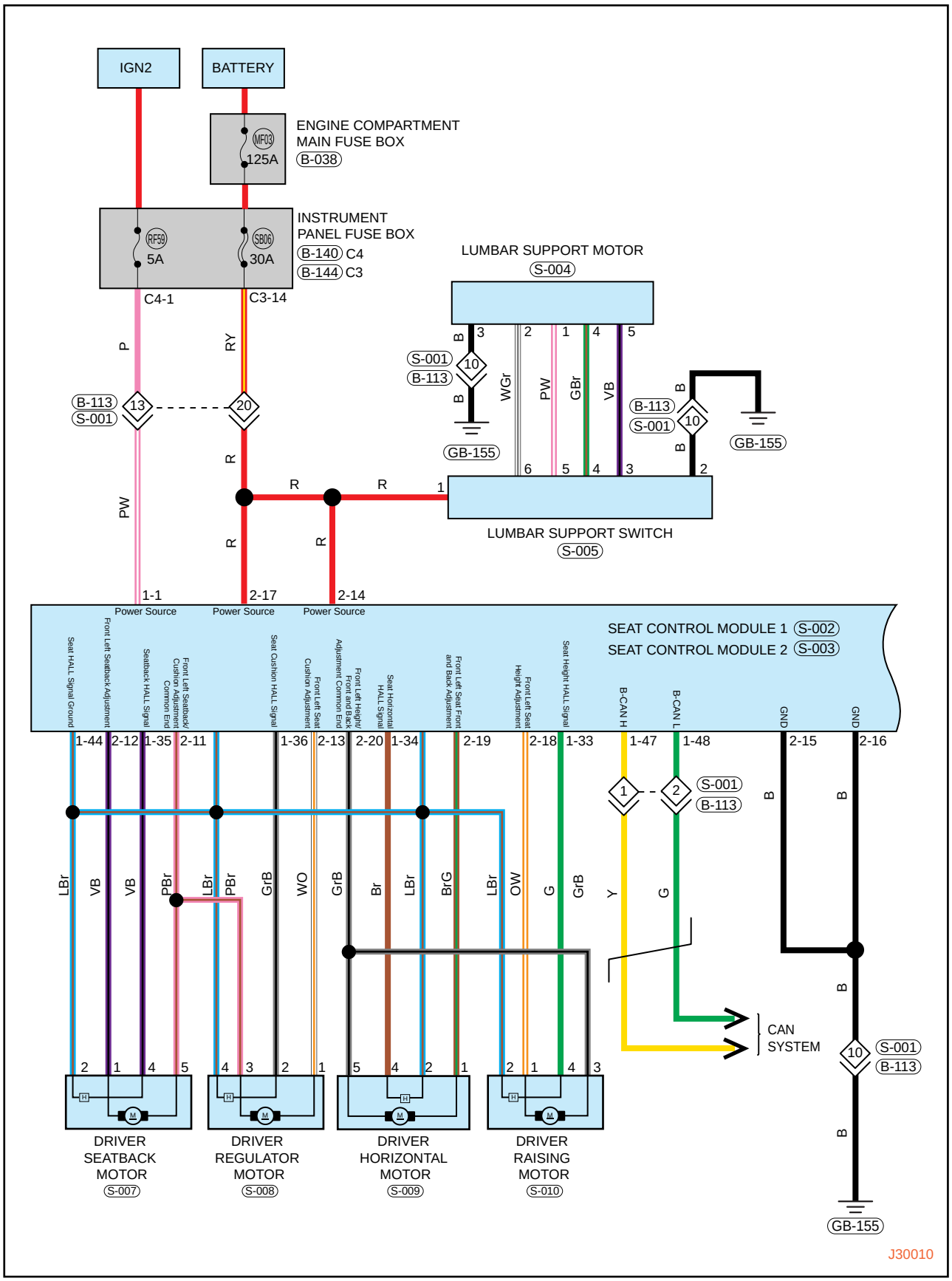
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A44	Body ground	Seat HALL signal ground	Power supply “ON”	0V
A45	Body ground	Front left seat NTC ground	Power supply “ON”	0V
A46	Body ground	Front right seat NTC ground	Power supply “ON”	0V
A47	Body ground	CANH	Power supply “ON”	2.68V
A48	Body ground	CANL	Power supply “ON”	2.36V
A49	/	/	/	/
A50	/	/	/	/
A51	/	/	/	/
A52	/	/	/	/

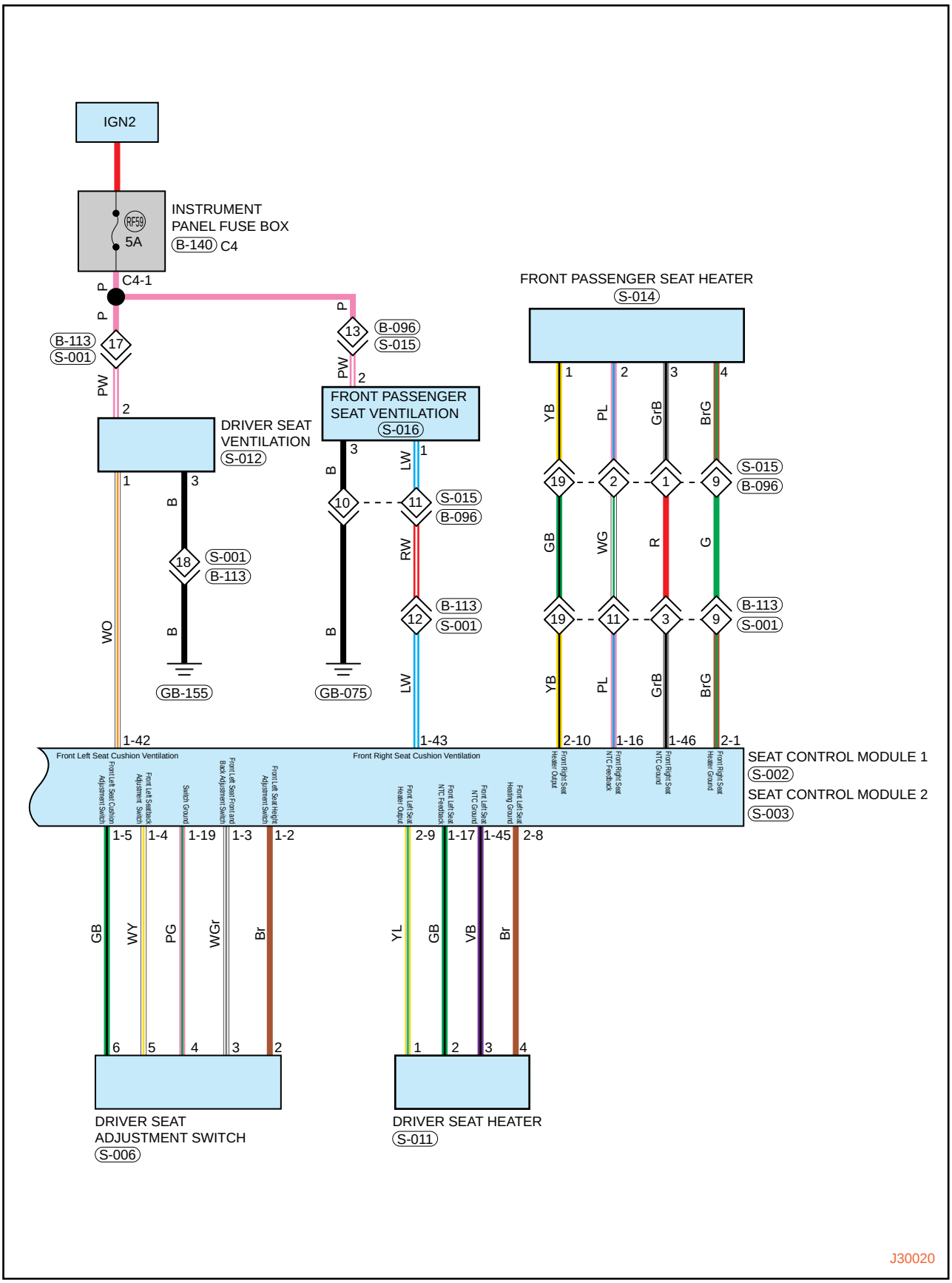
Seat control module - B

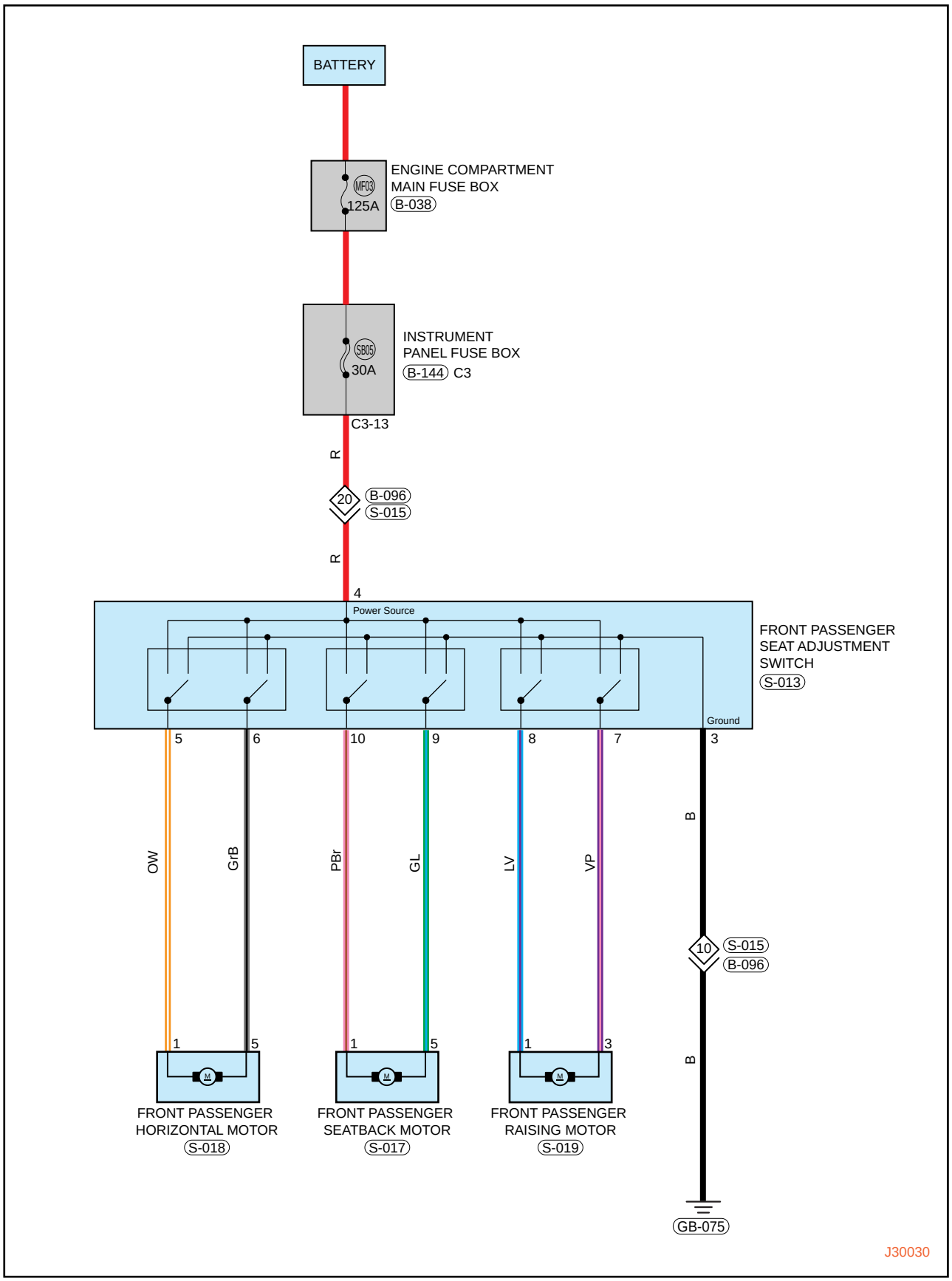
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
B1	Body ground	Front right seat heating ground	Power supply “ON”	0V
B2	/	/	/	/
B3	/	/	/	/
B4	/	/	/	/
B5	/	/	/	/
B6	/	/	/	/
B7	/	/	/	/
B8	Body ground	Front left seat heating ground	Power supply “ON”	0V
B9	Body ground	Front left seat heating output	Power supply “ON”	0 V when not heated
B10	Body ground	Front right seat heating output	Power supply “ON”	0 V when not heated
B11	Body ground	Front left seatback / cushion adjustment common terminal	Power supply “ON”	12V
B12	Body ground	Front left seatback adjustment	Power supply “ON”	12 V when not adjusted; 0 V when adjusted forward

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
B13	Body ground	Front left seatback adjustment	Power supply “ON”	12 V when not adjusted; 0 V when adjusted downward
B14	Body ground	VBAT	Power supply “ON”	12V
B15	Body ground	GND	Power supply “ON”	0V
B16	Body ground	GND	Power supply “ON”	0V
B17	Body ground	VBAT	Power supply “ON”	12V
B18	Body ground	Front left seat height adjustment	Power supply “ON”	12 V when not adjusted; 0 V when adjusted downward
B19	Body ground	Front left seat front-back adjustment	Power supply “ON”	12 V when not adjusted; 0 V when adjusted forward
B20	Body ground	Front left height/ front-back adjustment common terminal	Power supply “ON”	12V

3.2 Circuit Diagram




IGN2
INSTRUMENT PANEL FUSE BOX
B-140 C4
RF59
5A
C4-1
P
B-113
S-001
17
PW
2
DRIVER SEAT VENTILATION
S-012
1
3
B
18
S-001
B-113
WO
GB-155
13
B-096
S-015
FRONT PASSENGER SEAT VENTILATION
S-016
3
LW
1
10
11
S-015
B-096
RW
12
B-113
S-001
GB-075
FRONT PASSENGER SEAT HEATER
S-014
YB
PL
GrB
BrG
GB
WG
R
G
19
2
1
9
11
3
2-10
1-16
1-46
2-1
1-42
1-43
Front Left Seat Cushion Ventilation
Front Right Seat Cushion Ventilation
SEAT CONTROL MODULE 1
S-002
SEAT CONTROL MODULE 2
S-003
1-5
1-4
1-19
1-3
1-2
2-9
1-17
1-45
2-8
GB
WY
PG
WGr
Br
YL
VB
DRIVER SEAT ADJUSTMENT SWITCH
S-006
DRIVER SEAT HEATER
S-011
J30020


BATTERY
MF03
125A
ENGINE COMPARTMENT
MAIN FUSE BOX
B-038
SB05
30A
INSTRUMENT
PANEL FUSE BOX
B-144 C3
C3-13
R
20
B-096
S-015
R
4
Power Source
FRONT PASSENGER
SEAT ADJUSTMENT
SWITCH
S-013
Ground
5
6
10
9
8
7
3
OW
GrB
PBr
GL
LV
VP
B
1
5
1
5
1
3
FRONT PASSENGER
HORIZONTAL MOTOR
S-018
FRONT PASSENGER
SEATBACK MOTOR
S-017
FRONT PASSENGER
RAISING MOTOR
S-019
10
S-015
B-096
B
GB-075
J30030

4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Seat positions cannot be memorized and portable functions are disabled	Manual learning seat position
	Seat module assembly
	Wire harness connector
Seat position cannot be adjusted	Fuse
	Wire harness or connector
	Switch
	Actuator motor

4.2 Diagnostic Help

- Connect diagnostic tester (the latest software) to diagnostic interface, and make it communicate with vehicle electronic module through data network.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If Diagnostic Trouble Code (DTC) cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all system grounds related to the latest DTCs.
- If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

4.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate the conditions under which DTC was reset.
- Look for data that has changed or DTC to reset during wiggling test.
- Look for broken, bent, protruded or corroded terminals.

- Inspect the mounting areas of instrument cluster, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- Remove instrument cluster from malfunctioning vehicle, then install it to a new vehicle and perform a test. If this DTC cannot be cleared, instrument cluster is malfunctioning. If DTC can be cleared, reinstall instrument cluster to original vehicle.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Groundings are very important to entire circuit system, which are normal or not can seriously affect the entire circuit system. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) and oxidation may increase load resistance. This case will seriously affect normal operation of circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the system.

1	**Vehicle brought to workshop**

Next

2	**Examine vehicle and check basic items**

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK

3	**Using a diagnostic tester, read related DTC and data stream information**

Result

Result	Go to
No DTC	A
DTC occurs	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B

5	**According to airbag system malfunction repair completion inspection and delivery, confirm that malfunction is resolved**

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A → **Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

4.7 Diagnostic Trouble Code (DTC) Chart

Description

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1B70 – 16	Power Supply Circuit Voltage Below Threshold	The voltage is less than 8.5V for 5s, which is stored as current fault.	Power supply is not stable, and some loads may decrease suddenly.	• Check battery voltage; • Check alternator power supply system; • Check wire harness connector.
B1B70-17	Power Supply Circuit Voltage Above Threshold	The voltage is less than 16.5V for 5s, which is stored as current fault.	Power supply is not stable, and load fails suddenly.	

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1B71 – 18	Abnormal Driver Seat Heating Current - Low Current of Driver Heating Control Circuit	When output is activated, detected current is lower than 1A for 250 ms, stores as current fault.	Load is open or abnormal.	• Check wire harness connector; • Check heating load.
B1B71-19	Abnormal Driver Seat Heating Current - High Current of Driver Heating Control Circuit	When output is activated, detected current is higher than 9A for 250 ms, stores as current fault.	Load is short or abnormal.	
B1B72 – 18	Abnormal Front Passenger Seat Heating Current - Low Current of Front Passenger Heating Control Circuit	When output is activated, detected current is lower than 1A for 250 ms, stores as current fault.	Load is open or abnormal.	• Check wire harness connector for open; • Check if heating load is normal.
B1B72-19	Abnormal Front Passenger Seat Heating Current - High Current of Front Passenger Heating Control Circuit	When output is activated, detected current is higher than 9A for 250 ms, stores as current fault.	Load is short or abnormal.	• Check wire harness connector for short; • Check if heating load is normal.
B1B73 – 18	Abnormal Seat Adjustment Height and Horizontal Control Circuit - Low Current of Height Adjustment Control Circuit	When output is activated, detected current is lower than 0.3A for 1000 ms, stores as current fault.	Motor is open or abnormal	• Check wire harness connector for open; • Check if motor load is normal.
B1B73-19	Abnormal Seat Adjustment Height and Horizontal Control Circuit - High Current of Height Adjustment Control Circuit	When output is activated, detected current is higher than 16A for 1000 ms, stores as current fault.	Motor is blocked or short	• Check whether there is a foreign body stuck in the seat, which causes the motor to stall; • Check wire harness connector for short.
B1B74 – 18	Abnormal Seat Adjustment Height and Horizontal Control Circuit - Low Current of Horizontal Adjustment Control Circuit	When output is activated, detected current is lower than 0.3A for 1000 ms, stores as current fault.	Motor is open or abnormal	• Check wire harness connector for open; • Check if motor load is normal.
B1B74-19	Abnormal Seat Adjustment Height and	When output is activated, detected current is higher	Motor is blocked or short	• Check whether there is a foreign body stuck in

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Horizontal Control Circuit - High Current of Horizontal Adjustment Control Circuit	than 16A for 1000 ms, stores as current fault.		the seat, which causes the motor to stall; • Check wire harness connector for short.
B1B75－49	Abnormal Seat Adjustment Height and Horizontal Control Circuit - Seat Adjustment Height and Horizontal Control Circuit Inside Fault	When output is invalid, it detects that circuit output current is higher than 2A for 5000 ms, stores as current fault.	Actuator stuck or feedback circuit fault	• Check wire harness connector for fault; • Check module (internal relay fault).
B1B76－18	Abnormal Seatback Adjustment Control Circuit - Low Current of Seatback Adjustment Control Circuit	When output is activated, detected current is lower than 0.3A for 1000 ms, stores as current fault.	Motor is open or abnormal	• Check wire harness connector for open; • Check if motor load is normal.
B1B76-19	Abnormal Seatback Adjustment Control Circuit - High Current of Seatback Adjustment Control Circuit	When output is activated, detected current is higher than 16A for 1000 ms, stores as current fault.	Motor is blocked or short	• Check whether there is a foreign body stuck in the seat, which causes the motor to stall; • Check wire harness connector for short.
B1B77－18	Abnormal Seatback Adjustment Control Circuit - Low Current of Cushion Adjustment Control Circuit	When output is activated, detected current is lower than 0.3A for 1000 ms, stores as current fault.	Motor is open or abnormal	• Check wire harness connector for open; • Check if motor load is normal.
B1B77-19	Abnormal Seatback Adjustment Control Circuit - High Current of Cushion Adjustment Control Circuit	When output is activated, detected current is higher than 16A for 1000 ms, stores as current fault.	Motor is blocked or short	• Check whether there is a foreign body stuck in the seat, which causes the motor to stall; • Check wire harness connector for short.
B1B7A－49	Abnormal Seatback Adjustment Control Circuit - Seatback and Cushion Adjustment	When output is invalid, it detects that circuit output current is higher than 2A for 5000 ms, stores as current fault.	Actuator stuck or feedback circuit fault	• Check wire harness connector for fault; • Check module (internal relay fault).

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Control Circuit Inside Fault			
B1B80 – 1A	Abnormal Heating NTC Input Feedback Value - Driver Heating NTC Input Feedback Value too Small	When output is activated for 25 minutes, it detects that NTC input resistance is lower than 500 Ω for 250 ms, stores as current fault.	Resistance is short	• Check if resistance of seat heating NTC is normal.
B1B80 – 1B	Abnormal Driver Heating NTC Input Value - Driver Heating NTC Input Value too Large	/	Resistance is abnormal	• Check if resistance of seat heating NTC is normal; • Check if wire harness connector is normal.
B1B80 – 1E	Abnormal Heating NTC Input Feedback Value - Driver Heating NTC Input Feedback Value No Change	When output is activated for 25 minutes, it detects that NTC input resistance is lower than 100 Ω for 1 minute, stores as current fault.	Resistance is abnormal	• Check if resistance of seat heating NTC is normal.
B1B81 – 1A	Abnormal Heating NTC Input Feedback Value - Front Passenger Heating NTC Input Feedback Value too Small	When output is activated for 25 minutes, it detects that NTC input resistance is lower than 500 Ω for 250 ms, stores as current fault.	Resistance is short	• Check if resistance of seat heating NTC is normal.
B1B81 – 1B	Abnormal Passenger Heating NTC Input Value - Passenger Seat Heating NTC Input Value too Large	/	Resistance is abnormal	• Check if resistance of seat heating NTC is normal; • Check if wire harness connector is normal.
B1B81 – 1E	Abnormal Heating NTC Input Feedback Value - Front Passenger Heating NTC Input Feedback Value No Change	When output is activated for 25 minutes, it detects that NTC input resistance is lower than 100 Ω for 1 minute, stores as current fault.	Resistance is abnormal	• Check if resistance of seat heating NTC is normal.
B1B82 – 29	Abnormal HALL Signal Input Signal - Height Adjustment HALL Input Signal Missing	When the output is activated, the number of Hall received within 2 seconds is less than 90% of the normal value, stores as current fault.	Motor is abnormal or HALL unit is damaged.	• Check if height adjustment motor is normal. • Check if height adjustment Hall sensor is normal.

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1B83 – 29	Abnormal HALL Signal Input Signal - Front-back Adjustment HALL Input Signal Missing	When the output is activated, the number of Hall received within 2 seconds is less than 90% of the normal value, stores as current fault.	Motor is abnormal or HALL unit is damaged.	• Check if front-back adjustment motor is normal. • Check if front-back adjustment Hall sensor is abnormal.
B1B84 – 29	Abnormal HALL Signal Input Signal - Seatback Adjustment HALL Input Signal Missing	When the output is activated, the number of Hall received within 2 seconds is less than 90% of the normal value, stores as current fault.	Motor is abnormal or HALL unit is damaged.	• Check if seatback adjustment motor is normal. • Check if seatback adjustment Hall sensor is normal.
B1B85 – 29	Abnormal HALL Signal Input Signal - Cushion Adjustment HALL Input Signal Missing	When the output is activated, the number of Hall received within 2 seconds is less than 90% of the normal value, stores as current fault.	Motor is abnormal or HALL unit is damaged.	• Check if cushion adjustment motor is normal. • Check if cushion adjustment Hall sensor is normal.
B1B85-54	No Learning by Seat	When learning matching of module and seat in any shaft of height shaft, horizontal shaft, seatback shaft is not performed or learning is not successful, stores as current fault.	Learning is not performed	Perform seat self-learning.
U134F-88	CAN Bus Off	Short circuit and grounding occur in vehicle CAN, this DTC will be generated when disconnecting, and this DTC is cleared after resuming.	• Control module is damaged; • Wire harness is broken.	Refer to CAN network system for troubleshooting
U1160 – 87	Lost Communication With AIPM	If the AIPM message is not received within 10 ms, this DTC will be generated. If the AIPM message is received for 3 consecutive times, the DTC will be cleared.		
U0140-87	Lost Communication With BCM	If BCM message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared		
U0199-87	Lost Communication With DCM	If the DCM message is not received within 10 ms, this DTC will be generated. If the DCM message is received for 3 consecutive times, the DTC will be cleared.		
U0100-87	Lost Communication With EMS	If EMS message is not received within 10 ms, this DTC will be generated, if this message is received for 3		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		consecutive times, DTC will be cleared		
U0122-87	Lost Communication With ESC	If ESC message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared		
U0245-87	Lost Communication With IHU	If IHU message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared		
U0248-87	Lost Communication With PEPS	If PEPS message is not received within 10 ms, this DTC will be generated, if this message is received for 3 consecutive times, DTC will be cleared		
U0101-87	Lost Communication With TCU	If TCU information is not received within 10 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U1471-81	Invalid Data from AIPM	This DTC will be generated when the data received by AIPM is incorrect. This DTC will be cleared after the data is normal.		
U0422-81	Invalid Data from BCM	If incorrect data is received from BCM, this DTC will occur, the DTC will be cleared after data is normal		
U049A-81	Invalid Data from DCM	This DTC will be generated when the data received by DCM is incorrect. This DTC will be cleared after the data is normal.		
U0401-81	Invalid Data Received from EMS	If incorrect data is received from EMS, this DTC will occur, the DTC will be cleared after data is normal		

4.8 DTC Diagnosis Procedure

DTC	B1B70 – 16	Power Supply Circuit Voltage Below Threshold
DTC	B1B70-17	Power Supply Circuit Voltage Above Threshold

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuse

(a) Check if fuses MF03, SB06 and RF59 are blown out.

NG → **Replace fuse.**

OK ↓

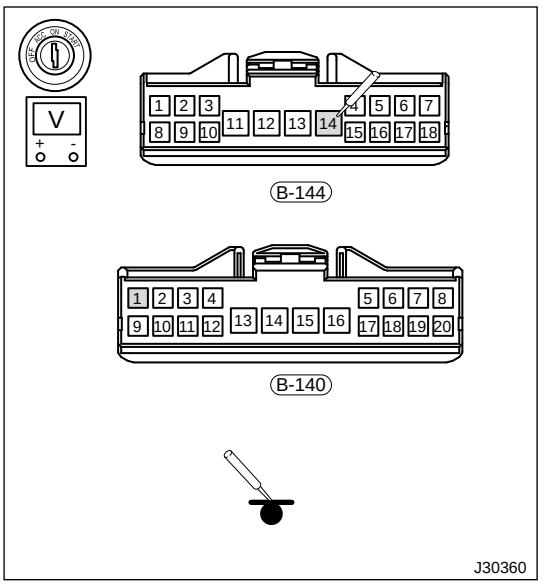
2	Check output voltage of instrument panel fuse and relay box

(a) Turn ENGINE START STOP switch to ON.

(b) Disconnect instrument panel fuse and relay box connectors B-140, B-144.

(c) Using a digital multimeter, measure voltage between connectors B-140 (1), B-060 (14) and body ground.

Multimeter Connection	Condition	Operating Voltage
B-140 (1) - Body ground	ENGINE START STOP switch "ON"	⩽ 12 V
B-144 (14) - Body ground	ENGINE START STOP switch "ON"	⩽ 12 V



NG → **Replace instrument panel fuse and relay box assembly.**

OK ↓

3	Check wire harness for open

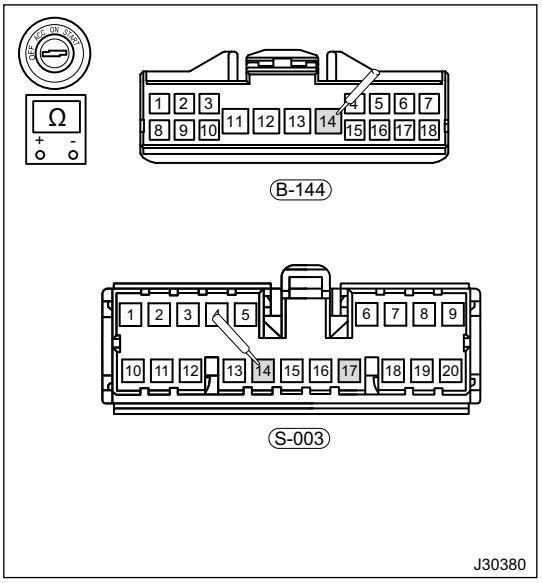
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect seat control module connectors S-002, S-003, instrument panel fuse and relay box connectors B-140 and B-144.

(d) Using digital multimeter, measure resistance among S-002 (1) - B-140 (1), S-003 (14) - B-144 (14) and S-003 (17) - B-144 (14) to check if the resistance is normal, so as to check wire harness for open.

Multimeter Connection	Condition	Specified Condition
S-002 (1) - B-140 (1)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
S-003 (14) - B-144 (14)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
S-003 (17) - B-144 (14)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



OK	**Replace the seat control module assembly.**
NG	**Handle and repair related wire harness.**

DTC	**B1B71 - 18**	**Abnormal Driver Seat Heating Current - Low Current of Driver Heating Control Circuit**
DTC	**B1B72 - 18**	**Abnormal Front Passenger Seat Heating Current - Low Current of Front Passenger Heating Control Circuit**
DTC	**B1B73 - 18**	**Abnormal Seat Adjustment Height and Horizontal Control Circuit - Low Current of Height Adjustment Control Circuit**
DTC	**B1B74 - 18**	**Abnormal Seat Adjustment Height and Horizontal Control Circuit - Low Current of Horizontal Adjustment Control Circuit**
DTC	**B1B76 - 18**	**Abnormal Seatback Adjustment Control Circuit - Low Current of Seatback Adjustment Control Circuit**
DTC	**B1B77 - 18**	**Abnormal Seatback Adjustment Control Circuit - Low Current of Cushion Adjustment Control Circuit**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
If the seat control module has similar faults, please refer to "Abnormal Driver Seat Heating Current - Low Current of Driver Seat Heating Control Circuit" for troubleshooting.

1	**Driver seat heating control circuit low current**

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

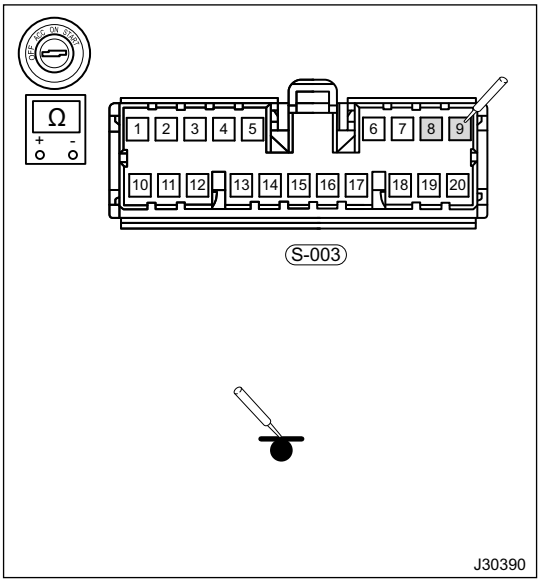
(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(d) Disconnect the seat control module connector S-003.

(e) Using resistance band of multimeter, detect S-003 (8) - ground and S-003 (9) - ground separately.

Multimeter Connection	Condition	Specified Condition
S-003 (8) - Ground	ENGINE START STOP switch "OFF"	∞
S-003 (9) - Ground	ENGINE START STOP switch "OFF"	∞



OK	**Replace the seat control module assembly.**
NG	**Handle and repair related wire harness.**

DTC	**B1B71-19**	**Abnormal Driver Seat Heating Current - High Current of Driver Heating Control Circuit**
DTC	**B1B72-19**	**Abnormal Front Passenger Seat Heating Current - High Current of Front Passenger Heating Control Circuit**
DTC	**B1B73-19**	**Abnormal Seat Adjustment Height and Horizontal Control Circuit - High Current of Height Adjustment Control Circuit**
DTC	**B1B74-19**	**Abnormal Seat Adjustment Height and Horizontal Control Circuit - High Current of Horizontal Adjustment Control Circuit**
DTC	**B1B76-19**	**Abnormal Seatback Adjustment Control Circuit - High Current of Seatback Adjustment Control Circuit**
DTC	**B1B77-19**	**Abnormal Seatback Adjustment Control Circuit - High Current of Cushion Adjustment Control Circuit**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
If the seat control module has similar faults, please refer to "Abnormal Driver Seat Heating Current - Low Current of Driver Seat Heating Control Circuit" for troubleshooting.

1	**Driver seat heating control circuit high current**

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

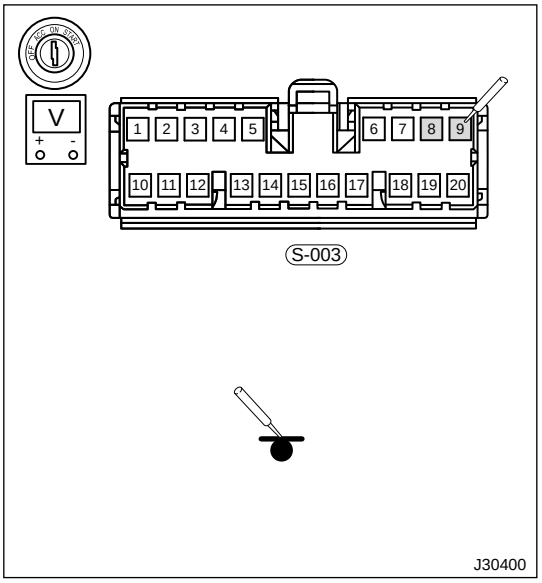
(c) Turn ENGINE START STOP switch to "OFF", disconnect the negative battery cable.

(d) Disconnect the seat control module connector S-003.

(e) Turn ENGINE START STOP switch to ON and make all accessories operate.

(f) Using voltage band of multimeter, detect S-003 (8) - ground and S-003 (9) - ground separately.

Multimeter Connection	Condition	Specified Condition
S-003 (8) - Ground	ENGINE START STOP switch "ON"	0V
S-003 (9) - Ground	ENGINE START STOP switch "ON"	0V



OK	**Replace the seat control module assembly.**
NG	**Handle and repair related wire harness.**

DTC	**B1B75 - 49**	**Abnormal Seat Adjustment Height and Horizontal Control Circuit - Seat Adjustment Height and Horizontal Control Circuit Inside Fault**
DTC	**B1B7A - 49**	**Abnormal Seatback Adjustment Control Circuit - Seatback and Cushion Adjustment Control Circuit Inside Fault**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
If the seat control module has similar faults, please refer to "Abnormal Seat Height and Horizontal Adjustment Control Circuit - Seat Adjustment Height and Horizontal Control Circuit Internal Failure" for troubleshooting.

1	**Driver seat heating control circuit high current**

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

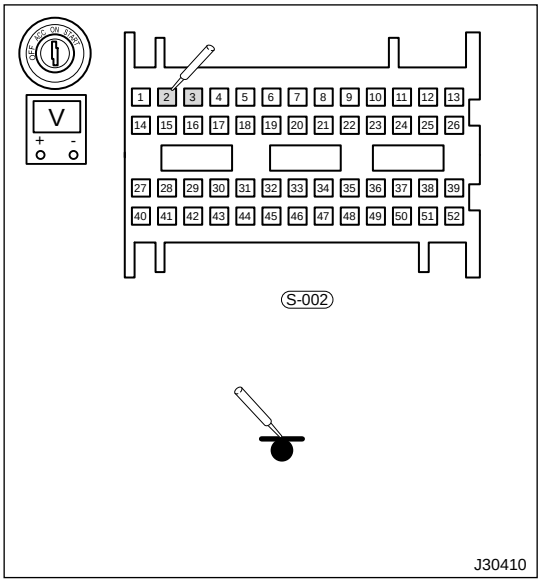
(c) Turn ENGINE START STOP switch to "OFF", disconnect the negative battery cable.

(d) Disconnect the seat control module connector S-002.

(e) Turn ENGINE START STOP switch to ON and make all accessories operate.

(f) Using voltage band of multimeter, detect S-002 (2) - ground and S-002 (3) - ground separately.

Multimeter Connection	Condition	Specified Condition
S-002 (2) - Ground	ENGINE START STOP switch “ON”	12V
S-002 (3) - Ground	ENGINE START STOP switch “ON”	12V



OK	**Replace the seat control module assembly.**
NG	**Handle and repair related wire harness.**

DTC	**B1B80 - 1A**	**Abnormal Heating NTC Input Feedback Value - Driver Heating NTC Input Feedback Value too Small**
DTC	**B1B81 - 1A**	**Abnormal Heating NTC Input Feedback Value - Front Passenger Heating NTC Input Feedback Value too Small**
DTC	**B1B80 - 1B**	**Abnormal Driver Heating NTC Input Value - Driver Heating NTC Input Value too Large**
DTC	**B1B81 - 1B**	**Abnormal Passenger Heating NTC Input Value - Passenger Seat Heating NTC Input Value too Large**
DTC	**B1B80 - 1E**	**Abnormal Heating NTC Input Feedback Value - Driver Heating NTC Input Feedback Value No Change**
DTC	**B1B81 - 1E**	**Abnormal Heating NTC Input Feedback Value - Front Passenger Heating NTC Input Feedback Value No Change**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
If the seat control module has similar faults, please refer to "Abnormal Heating NTC Input Feedback Value - Driver Heating NTC Input Feedback Value too Small" for troubleshooting.

1	**Driver seat heating NTC input feedback value is too small**

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

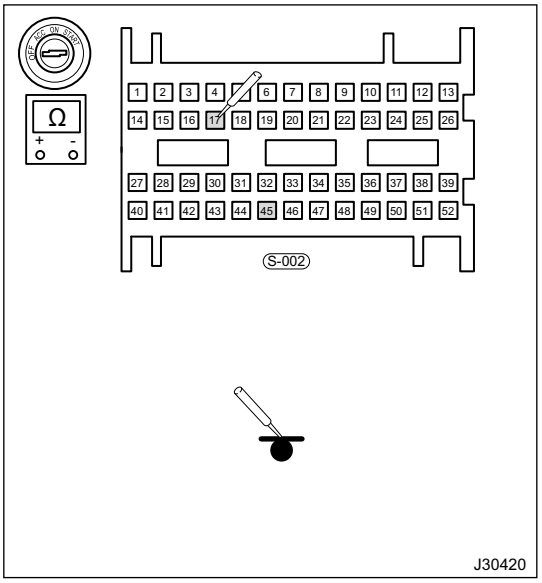
(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(d) Disconnect the seat control module connector S-002.

(e) Turn ENGINE START STOP switch to ON and make all accessories operate.

(f) Using resistance band of multimeter, detect S-002 (17) - ground and S-002 (45) - ground separately.

Multimeter Connection	Condition	Specified Condition
S-002 (17) - Ground	ENGINE START STOP switch “OFF”	∞
S-002 (45) - Ground	ENGINE START STOP switch “OFF”	∞



OK	**Replace the seat control module assembly.**
NG	**Handle and repair related wire harness.**

DTC	**B1B82 - 29**	**Abnormal HALL Signal Input Signal - Height Adjustment HALL Input Signal Missing**
DTC	**B1B83 - 29**	**Abnormal HALL Signal Input Signal - Front-back Adjustment HALL Input Signal Missing**
DTC	**B1B84 - 29**	**Abnormal HALL Signal Input Signal - Seatback Adjustment HALL Input Signal Missing**
DTC	**B1B85 - 29**	**Abnormal HALL Signal Input Signal - Cushion Adjustment HALL Input Signal Missing**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
If the seat control module has similar faults, please refer to "Abnormal HALL Input Signal - Height Adjustment HALL Input Signal Missing" for troubleshooting.

1	**Height adjustment HALL input signal is missing**

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

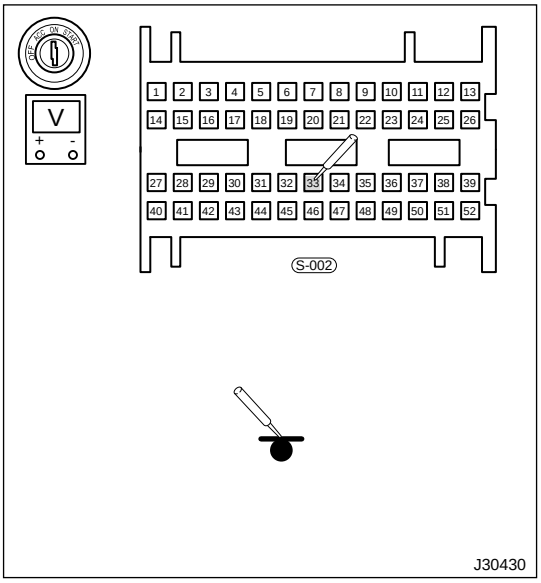
(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(d) Disconnect the seat control module connector S-002.

(e) Turn ENGINE START STOP switch to ON and make all accessories operate.

(f) Using voltage band of multimeter, detect S-002 (33) - ground.

Multimeter Connection	Condition	Specified Condition
S-002 (33) - Ground	ENGINE START STOP switch "ON"	6V



OK	Replace the seat control module assembly.
NG	Handle and repair related wire harness.

DTC	B1B85-54	No Learning by Seat

1	Seat self-learning

(a) Perform self-learning with diagnostic tester.

OK	Perform running test after clearing DTCs

DTC	U134F-88	CAN Bus Off
DTC	U1160 – 87	Lost Communication With AIPM
DTC	U0140-87	Lost Communication With BCM
DTC	U0199-87	Lost Communication With DCM
DTC	U0100-87	Lost Communication With EMS
DTC	U0122-87	Lost Communication With ESC
DTC	U0245-87	Lost Communication With IHU
DTC	U0248-87	Lost Communication With PEPS
DTC	U0101-87	Lost Communication With TCU
DTC	U1471-81	Invalid Data from AIPM
DTC	U0422-81	Invalid Data from BCM
DTC	U049A-81	Invalid Data from DCM
DTC	U0401-81	Invalid Data Received from EMS
DTC	U0416-81	Invalid Data from ESC
DTC	U0546-81	Invalid Data from IHU
DTC	U0426-81	Invalid Data from PEPS

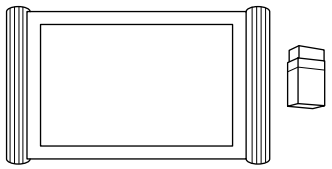
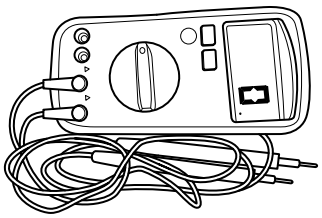
DTC	U0402-81	Invalid Data from TCU
DTC	U1300-55	Software Configuration Error

1	Refer to “CAN COMMUNICATION” for troubleshooting

5 ON-VEHICLE SERVICE

5.1 Tool

■ General Tools

Tool Name	Tool Drawing
Diagnostic Tester	 S00001
Digital Multimeter	 S00002

5.2 Replace Front Seat Assembly

■ Removal

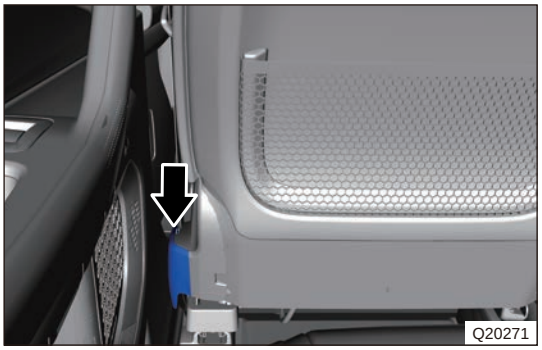
⚠ Warning

- **When removing driver seat assembly, be sure to wear safety equipment to prevent accidents.**
- **When removing driver seat assembly, appropriate force should be applied. Be careful not to operate roughly.**
- **DO NOT scratch interior and body paint when removing driver seat assembly.**
- **Removal method of front right seat and front left side is same.Take the left side as an example.**

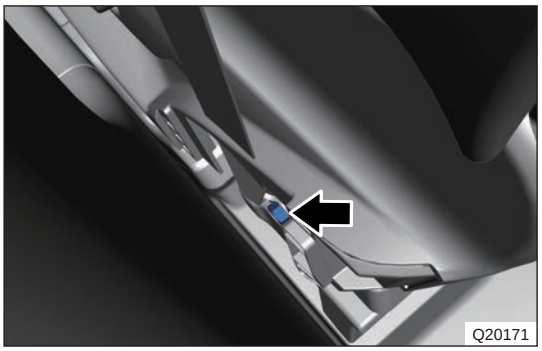
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Using an interior crow plate, pry off side panel trim cover carefully.

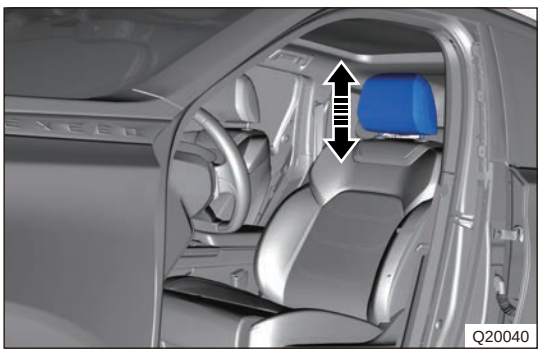


(4) Remove 1 fixing bolt from seat belt lower end plate (14# socket wrench).



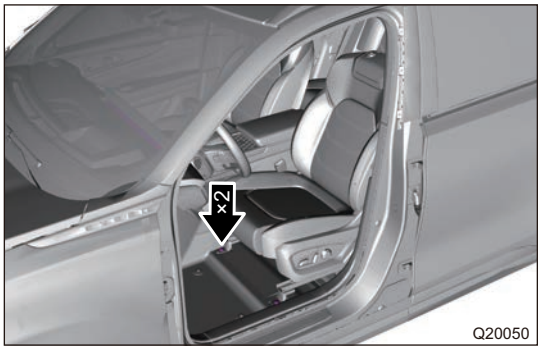
(5) Press power seat front-back adjustment switch, and move seat assembly to rearmost position.

(6) When the seatback is adjusted to a higher angle backward, press the release button of seat headrest guide at the same time, and remove driver seat headrest assembly.



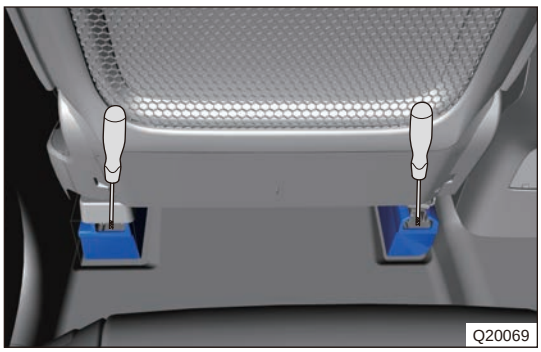
(7) Remove 2 inner support foot cover assemblies from front part of seat assembly.

(8) Remove 2 fixing bolts from front part of seat assembly.

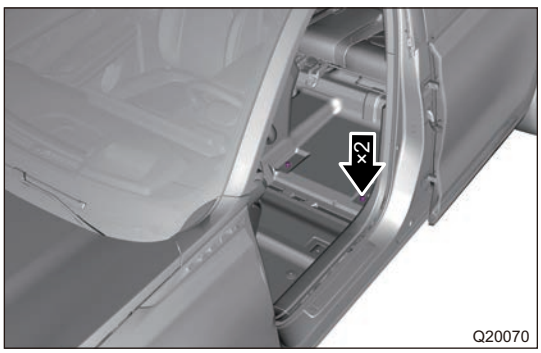


(9) Press power seat front-back adjustment switch, and move seat assembly to foremost position.

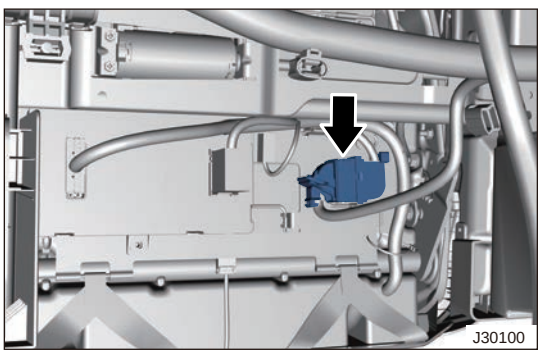
(10) Remove 2 inner support foot cover assemblies from rear part of seat assembly with a flat tip screwdriver.



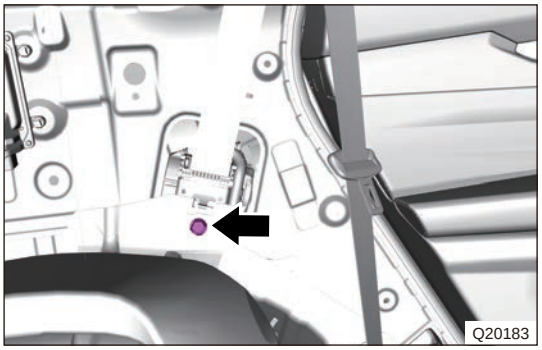
(11) Remove 2 fixing bolts from rear side of seat assembly.



(12) Disconnect the wire harness connector associated with driver seat assembly, and remove the driver seat assembly.

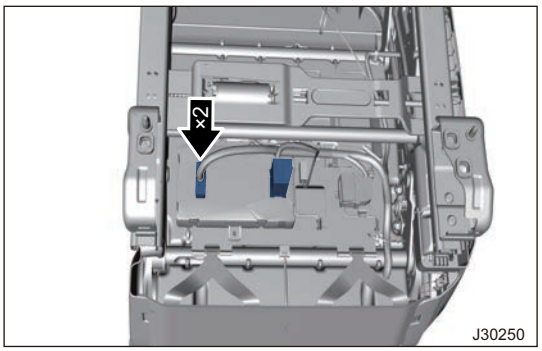


(13) Using a screwdriver wrapped with protective tape, remove seat height front-back adjustment button, seatback adjustment button.

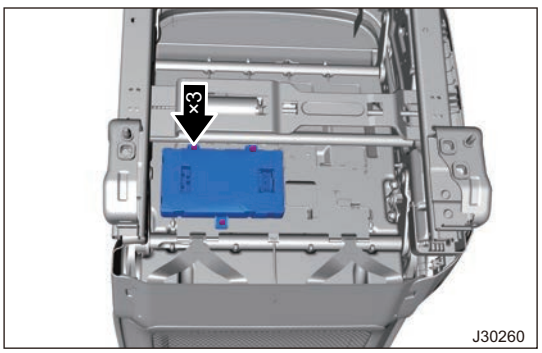


(14) Using an interior crow plate, pry off front left seat outside side panel.

(15) Disconnect the driver seat control module wire harness.



(16) Remove 3 fixing bolts from driver seat control module.



■ Inspection

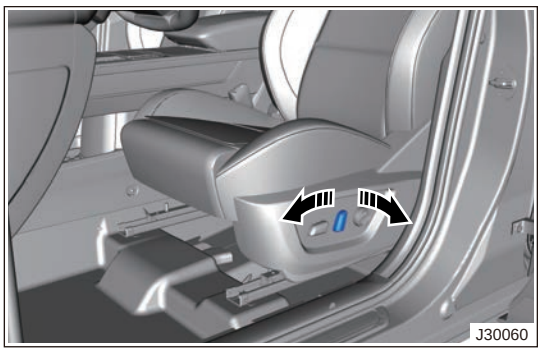
(1) Installation of driver seat and front passenger seat should be firm and reliable. Driver seat belt and front passenger seat belt should be complete and effective.

(2) Check the old and new degree of the seat, the seat surface should be flat, clean and free from damage.

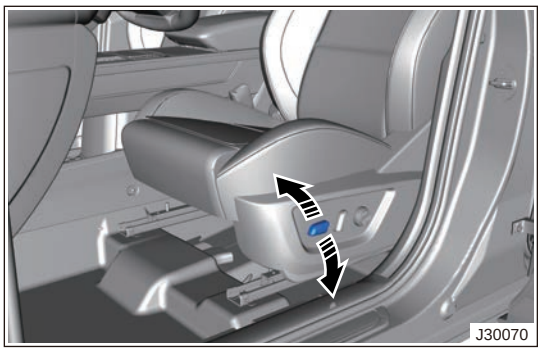
(3) After installation of seat assembly is completed, check the basic functions of seat assembly, and confirm that the following functions operate normally:

(4) When sliding seat to the foremost and rearmost positions by pressing the power seat adjustment switch, check if the following malfunctions of seat occur: heavy operation, high sliding resistance, stuck and motor noise. If above conditions occur, repair or replace in time.

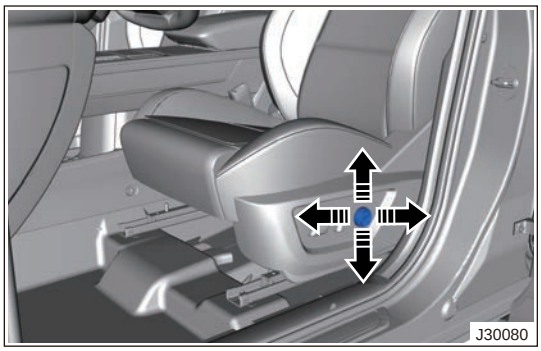
(5) Adjust the seat reclining to the maximum and minimum angles by pressing the power seat reclining adjustment switch, to check if seatback is heavily turned over and stuck, motor noise, etc. If above conditions occur, repair or replace in time.



(6) Adjust seat to the highest position and the lowest position by pressing power seat height adjustment switch (for driver side), to check if the operation of seat is heavy and stuck, and motor noise, etc. If above conditions occur, repair or replace in time.



(7) Press 4-way lumbar support adjustment switch (for driver side) to adjust seat to the limit positions of up, down, left and right to check if lumbar support stretches or retracts difficultly, air pocket is leaked and there is abnormal sound in air pump, etc. If above conditions occur, repair or replace in time.



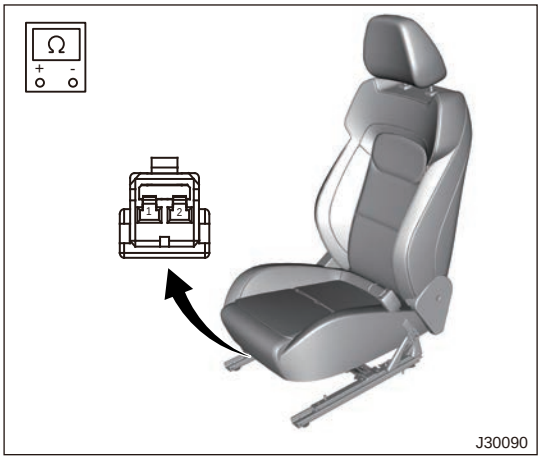
(8) Turn power switch to ON, seat belt reminder warning light on instrument cluster should be illuminated, after inserting the front seat belt tab into front seat belt buckle, seat belt reminder warning light should go off (only for seat with Seat Belt Unfasten Reminder (SBR)).

(9) For front passenger seat with SBR, when a passenger is detected in front passenger seat but the seat belt is not fastened, warning light on instrument cluster should be illuminated, after inserting the seat belt tab into seat belt buckle, seat belt reminder warning light should go off.

(10) Check the seat occupancy sensor (for front passenger side).

(11) Measure the resistance of occupancy sensor with a digital multimeter, standard resistance is shown in the table below:

Multimeter Connection	Condition	Specified Condition
Terminal 1 and Terminal 2	Occupied	< 100 Ω
Terminal 1 and Terminal 2	No occupied	> 400 Ω



■ Installation

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing front left seat assembly.**
- **When installing front left seat assembly, be careful not to damage the body paint surface.**
- **Try to prevent carpet from being scratched or damaged, when installing front left seat assembly.**

(1) Install 3 fixing bolts of driver seat control module.

Torque: 2.5 ± 0.5 N·m

(2) Install the driver seat control module wire harness.

(3) Install the driver seat assembly outside side panel.

(4) Install seat height front-back adjustment button, seatback adjustment button.

(5) Install driver seat assembly, connect wire harness connector associated with driver seat assembly.

(6) Push front-back adjustment button forward, and pull the left and right slide rails to foremost end, so that the positioning pin at the rear fixing point of the seat track is aligned with the positioning pin hole on the body floor. First, pre-screw the bolt into the front installation hole of the seat track, and then tighten 2 bolts at the rear installation point to install the seat rear inner leg protector assembly.

Torque: 50 ± 5 N·m

(7) Slide the seat to the rearmost position, first pre-screw the bolt into the front installation hole of the seat track, and then tighten 2 bolts at the rear installation point. (Note: For manual seats, adjust the seat forward or backward and the seatback angle by adjusting the seat release lever).

Torque: 50 ± 5 N·m

(8) Connect the negative battery cable.

(9) Connect EXEED special diagnostic tester, read and clear DTCs.

■ Self-learning

(1) Turn ENGINE START STOP switch to OFF.

(2) Connect the diagnostic tester (the latest software).

(3) Turn ENGINE START STOP switch to ON.

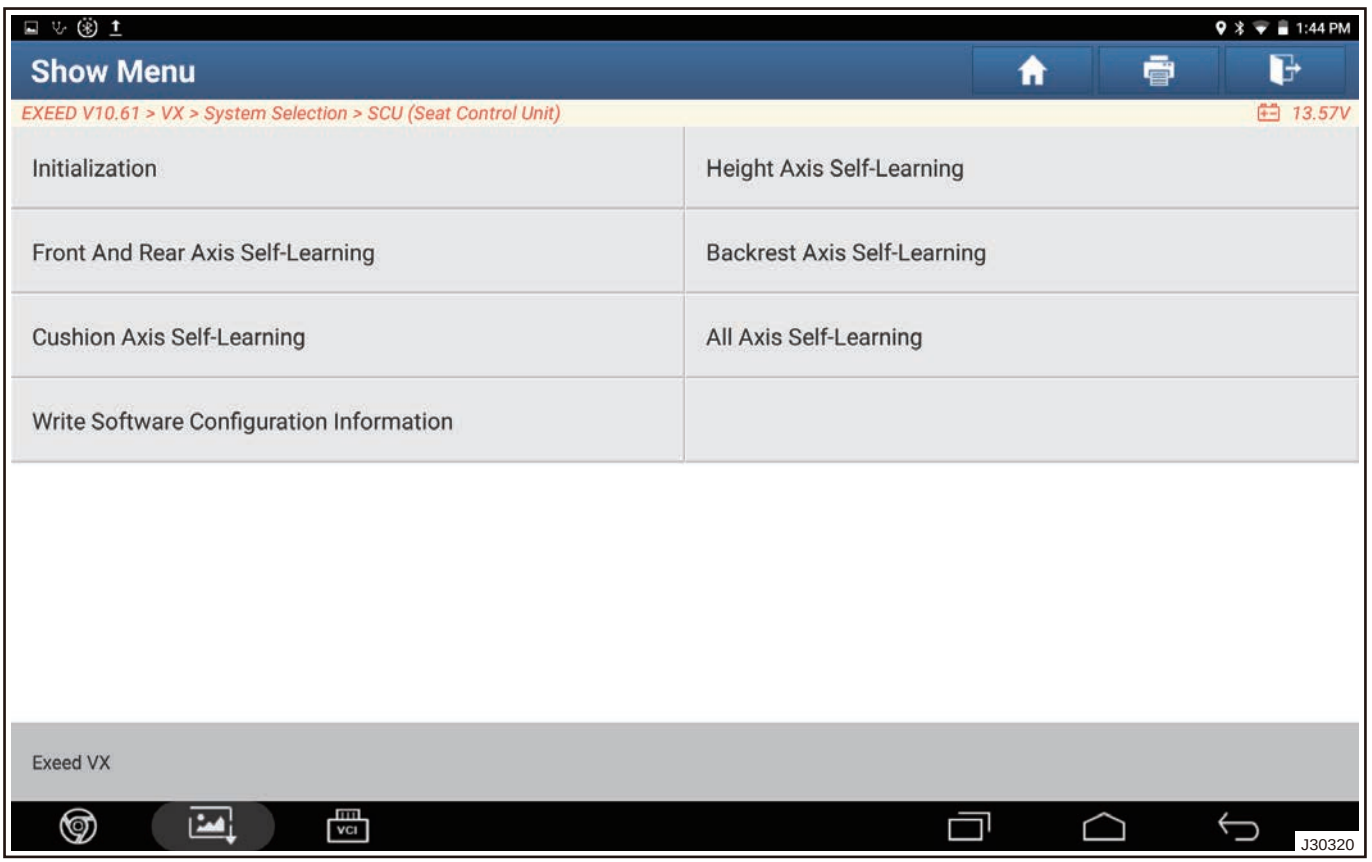
(4) Click “Traditional Diagnosis”.

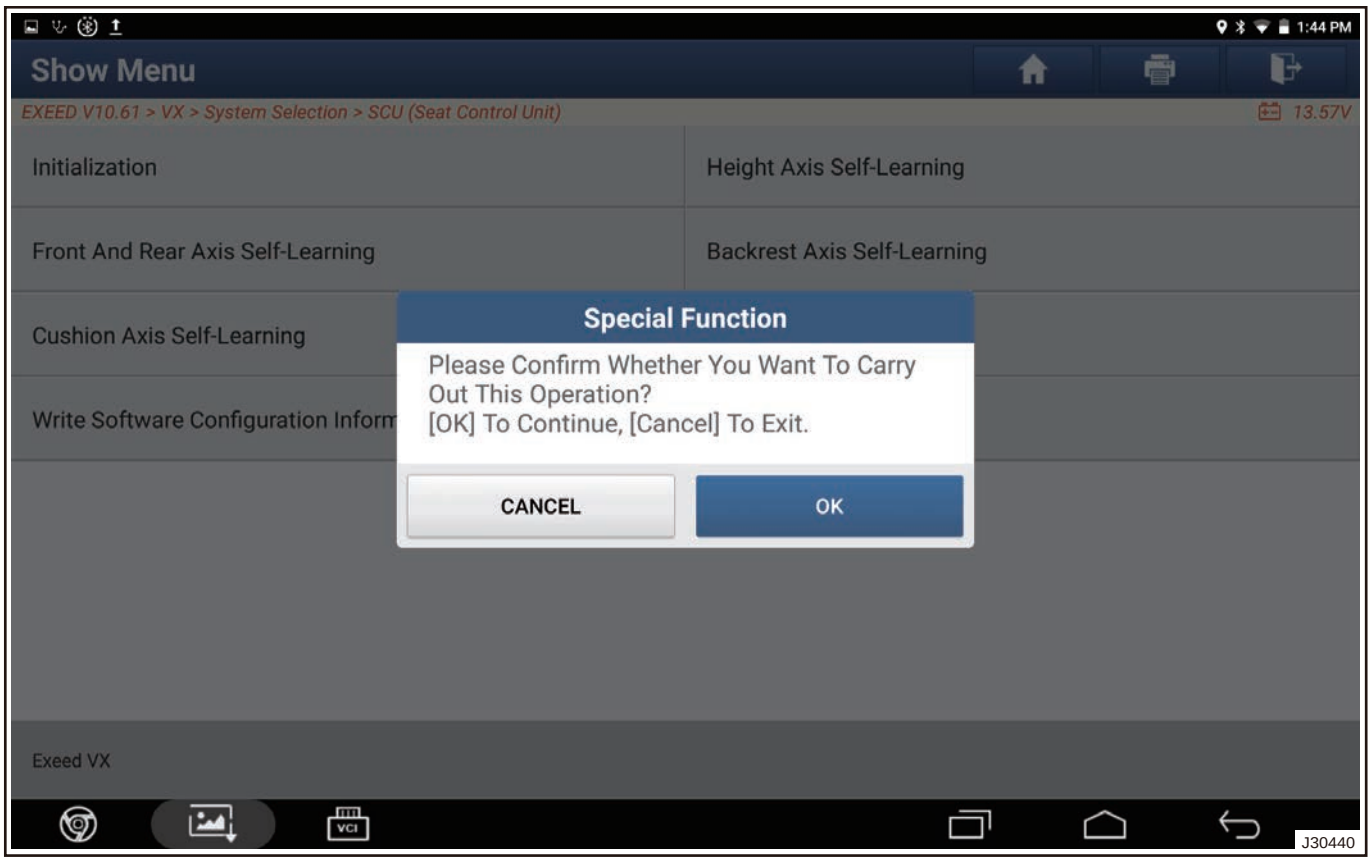
(5) Click “VX”.

(6) Click “SCU (Seat Control Unit)”.

(7) Click “Special Function”.

(8) Click “Height Axis Self Learning”.

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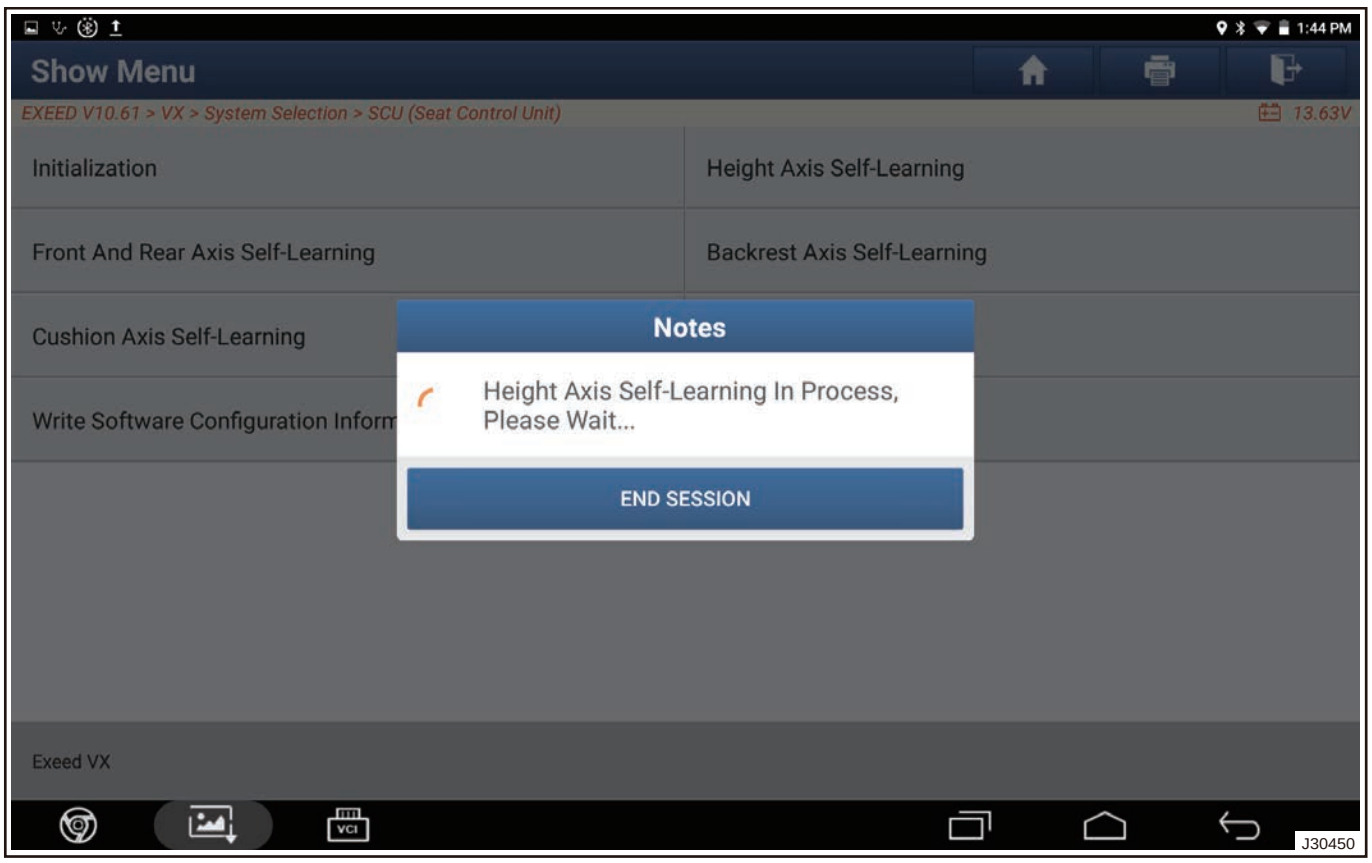
Show Menu
EXEED V10.61 > VX > System Selection > SCU (Seat Control Unit)
13.57V
Initialization
Height Axis Self-Learning
Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Special Function
Please Confirm Whether You Want To Carry Out This Operation?
[OK] To Continue, [Cancel] To Exit.
CANCEL
OK
Exeed VX
VCI
J30440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Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
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VCI
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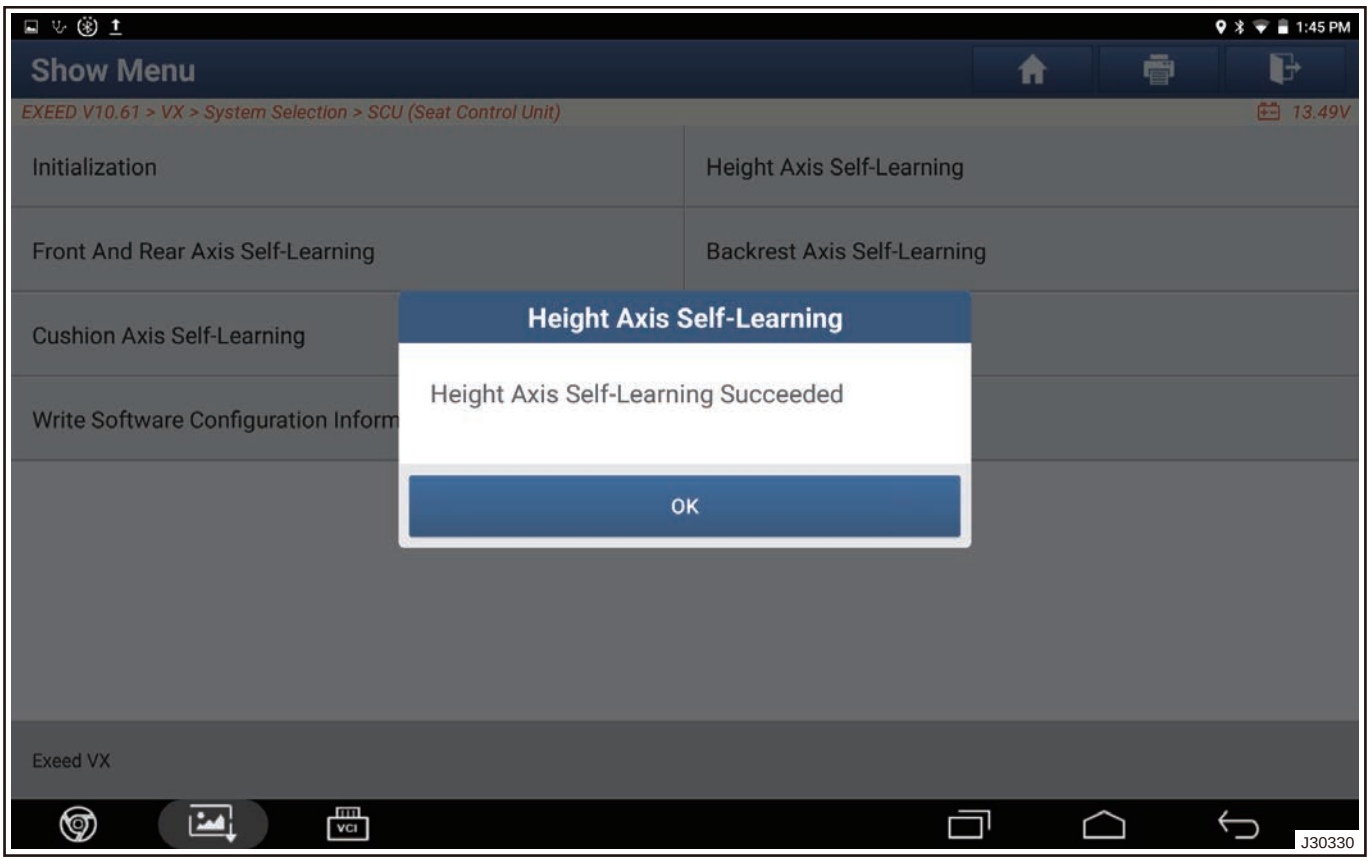
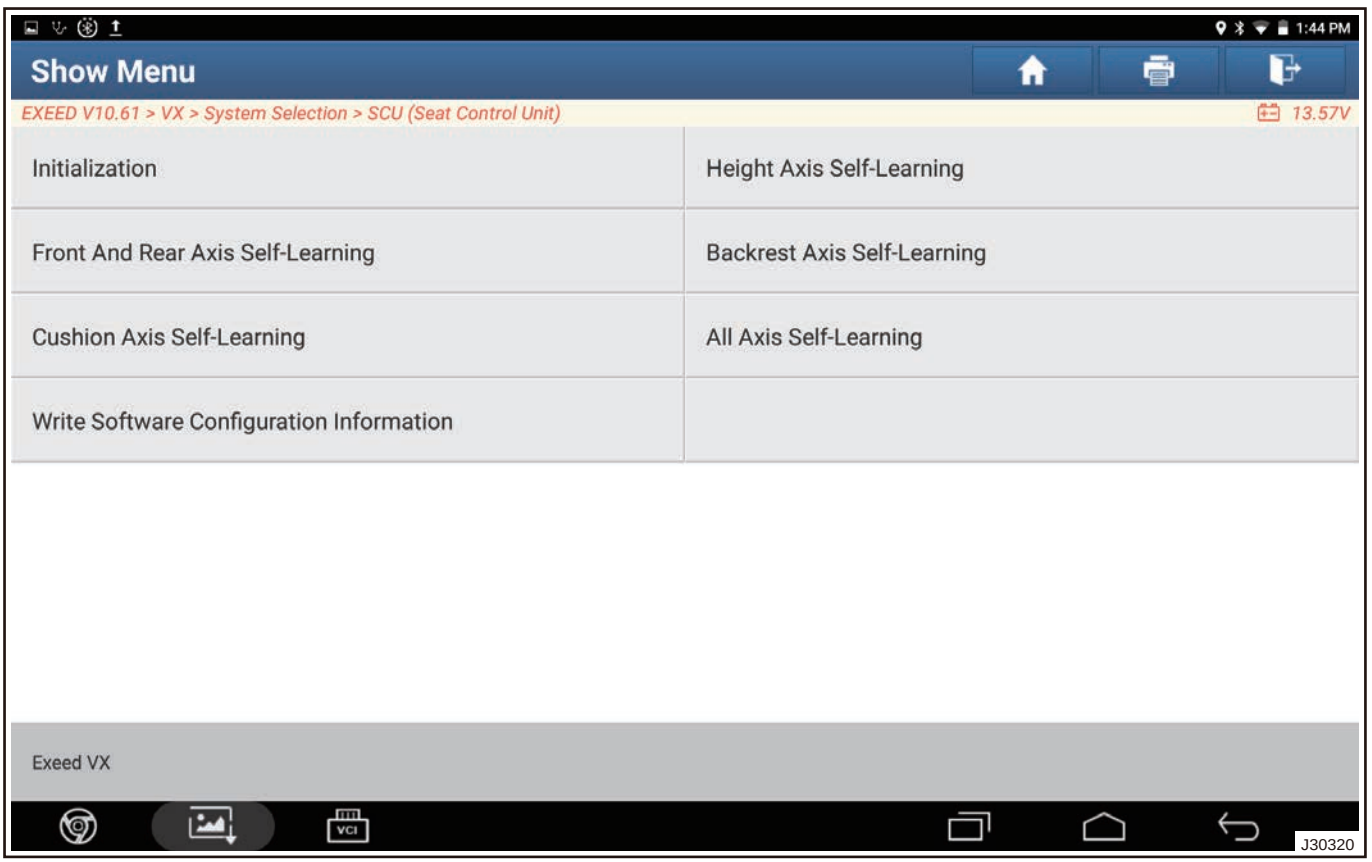
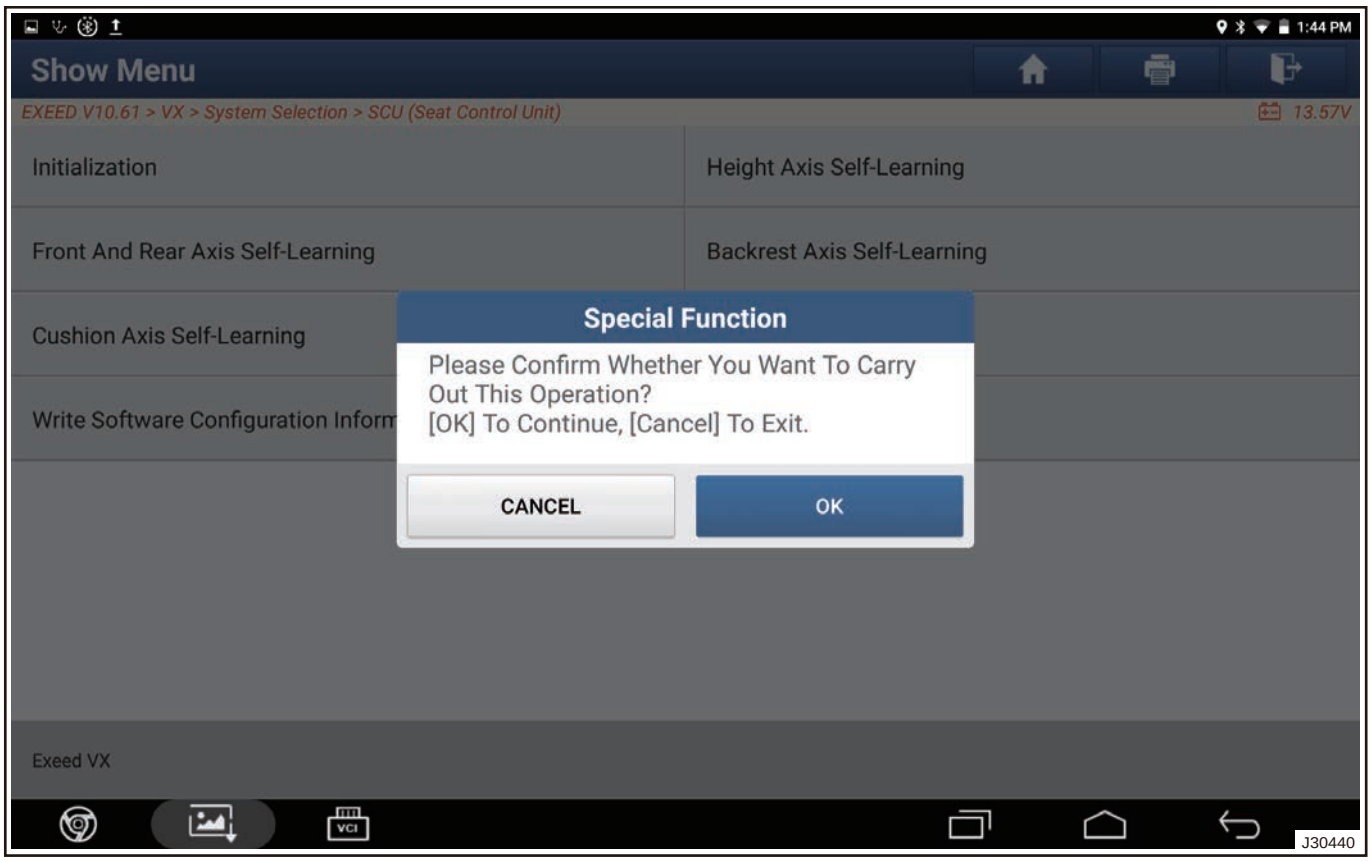


(9) Click “Front And Rear Axis Self Learning”.

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Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Special Function
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OK
Exeed VX
VCI
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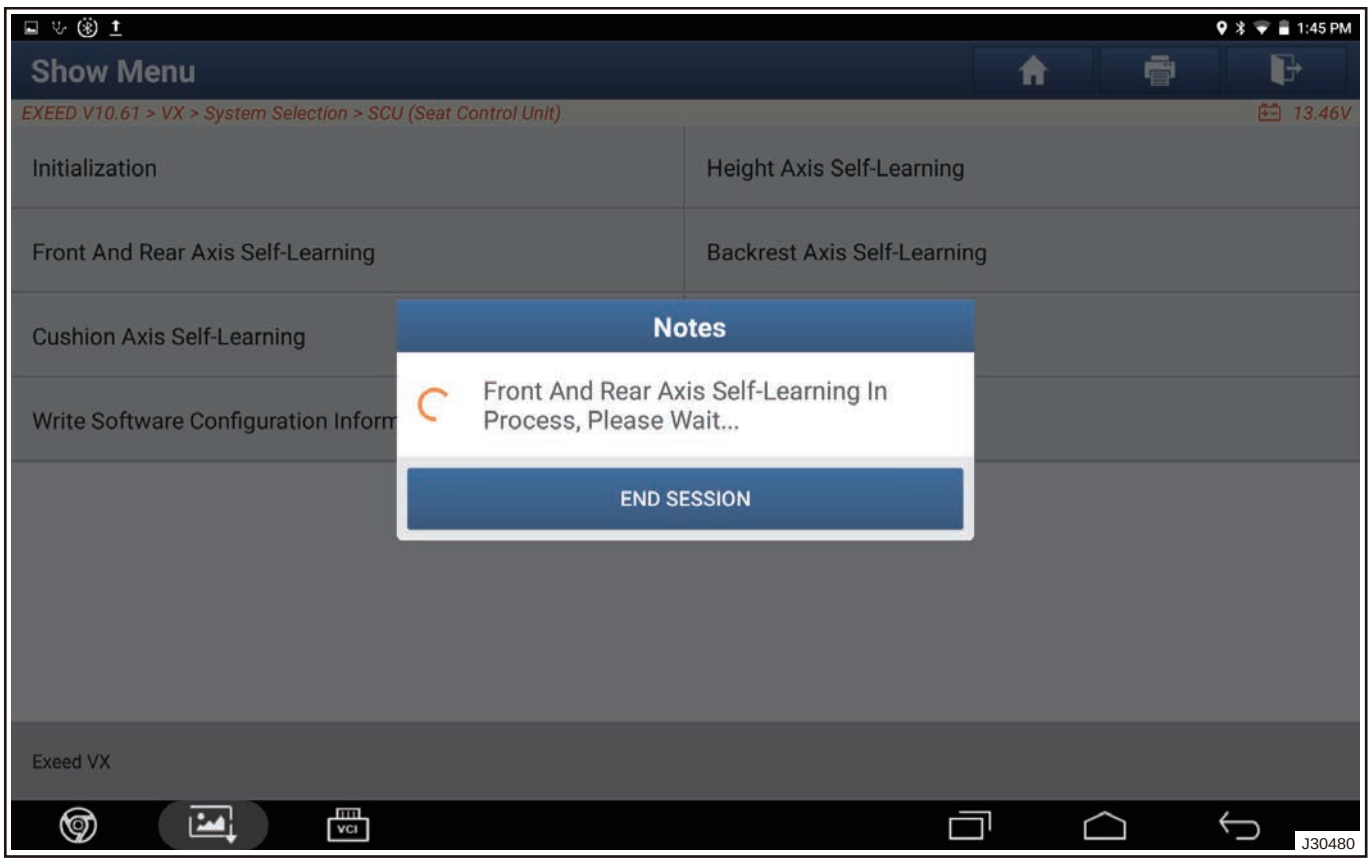
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Height Axis Self-Learning
Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Notes
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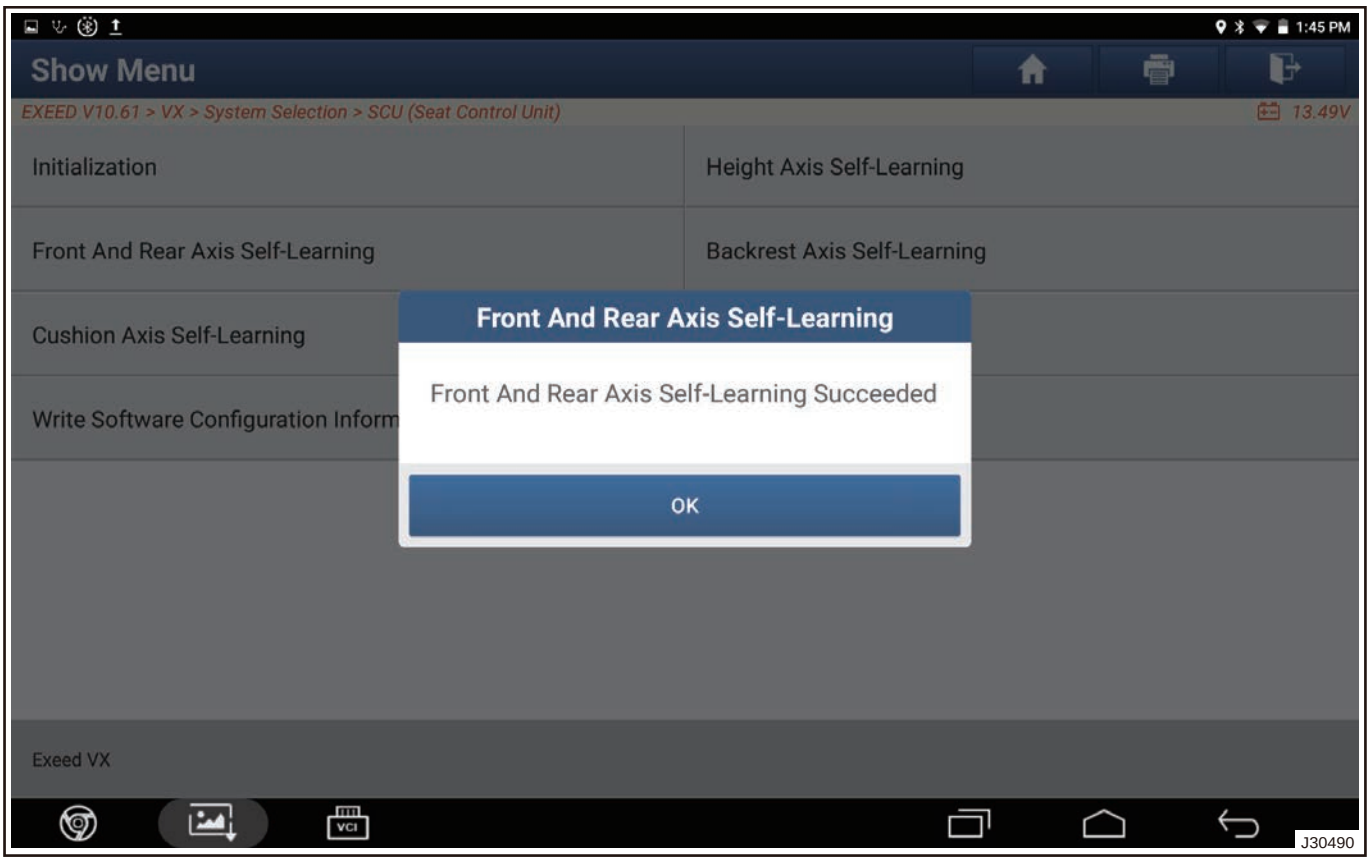
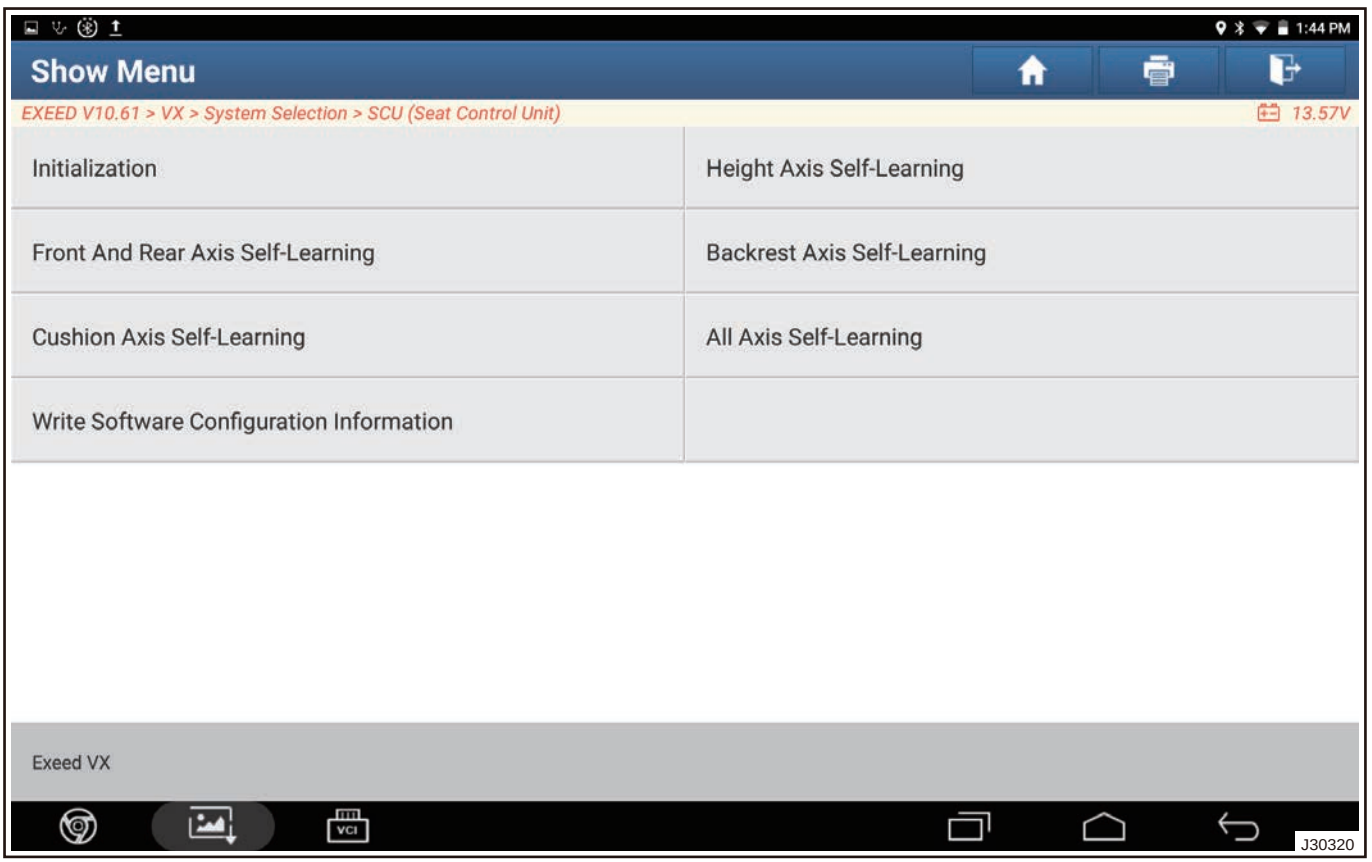
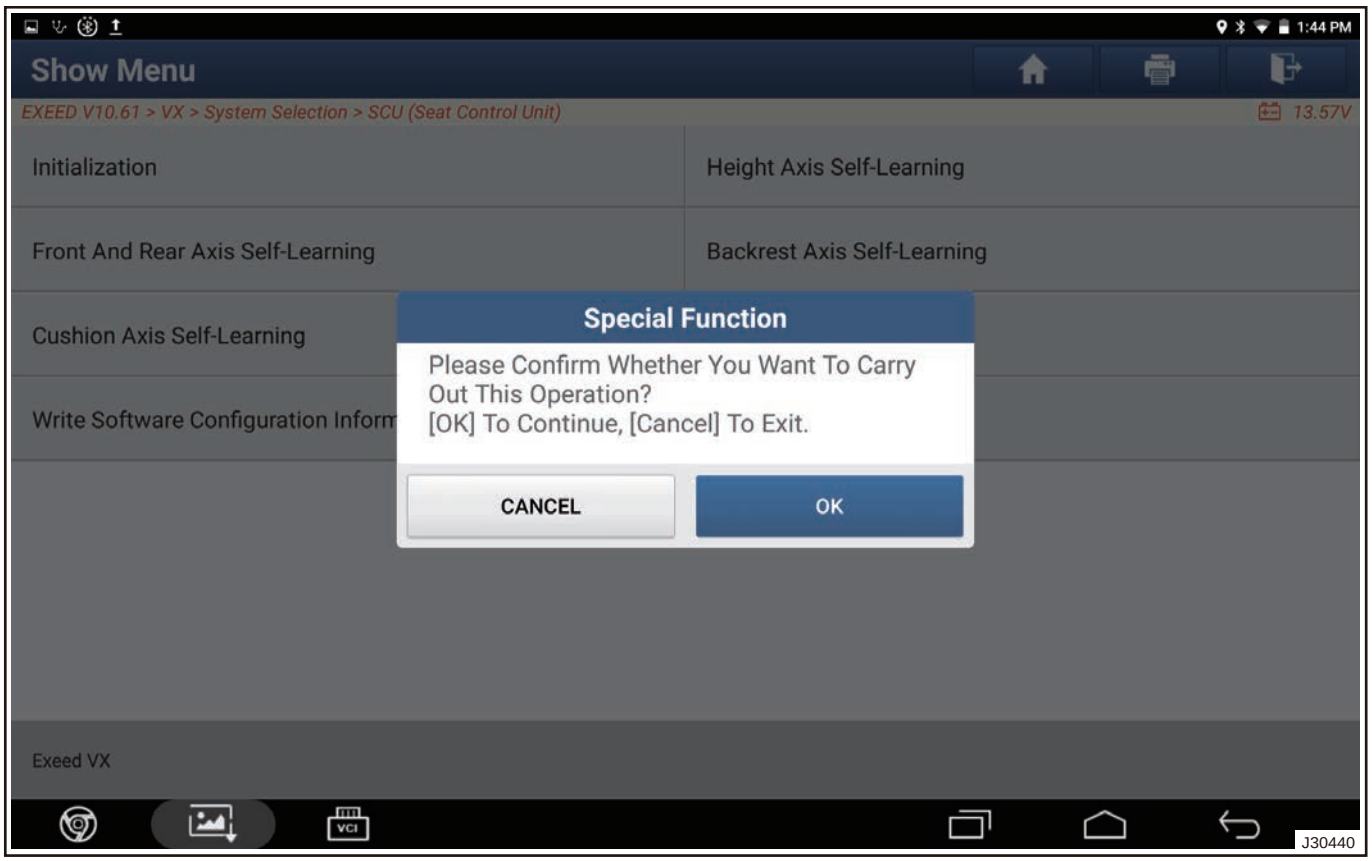
VCI
J30480



(10) Click “Backrest Axis Self Learning”.

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Initialization
Height Axis Self-Learning
Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Special Function
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CANCEL
OK
Exeed VX
VCI
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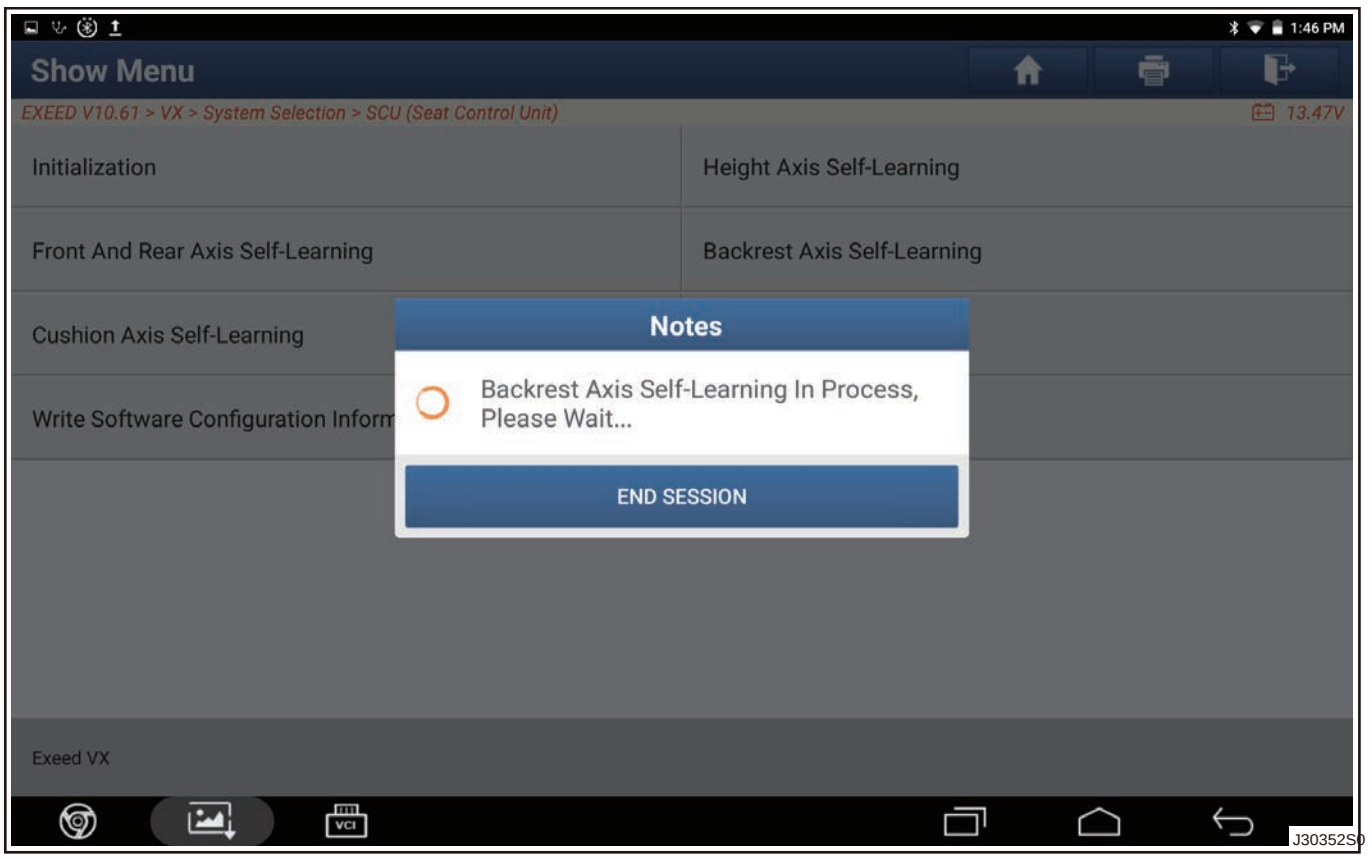
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Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
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VCI
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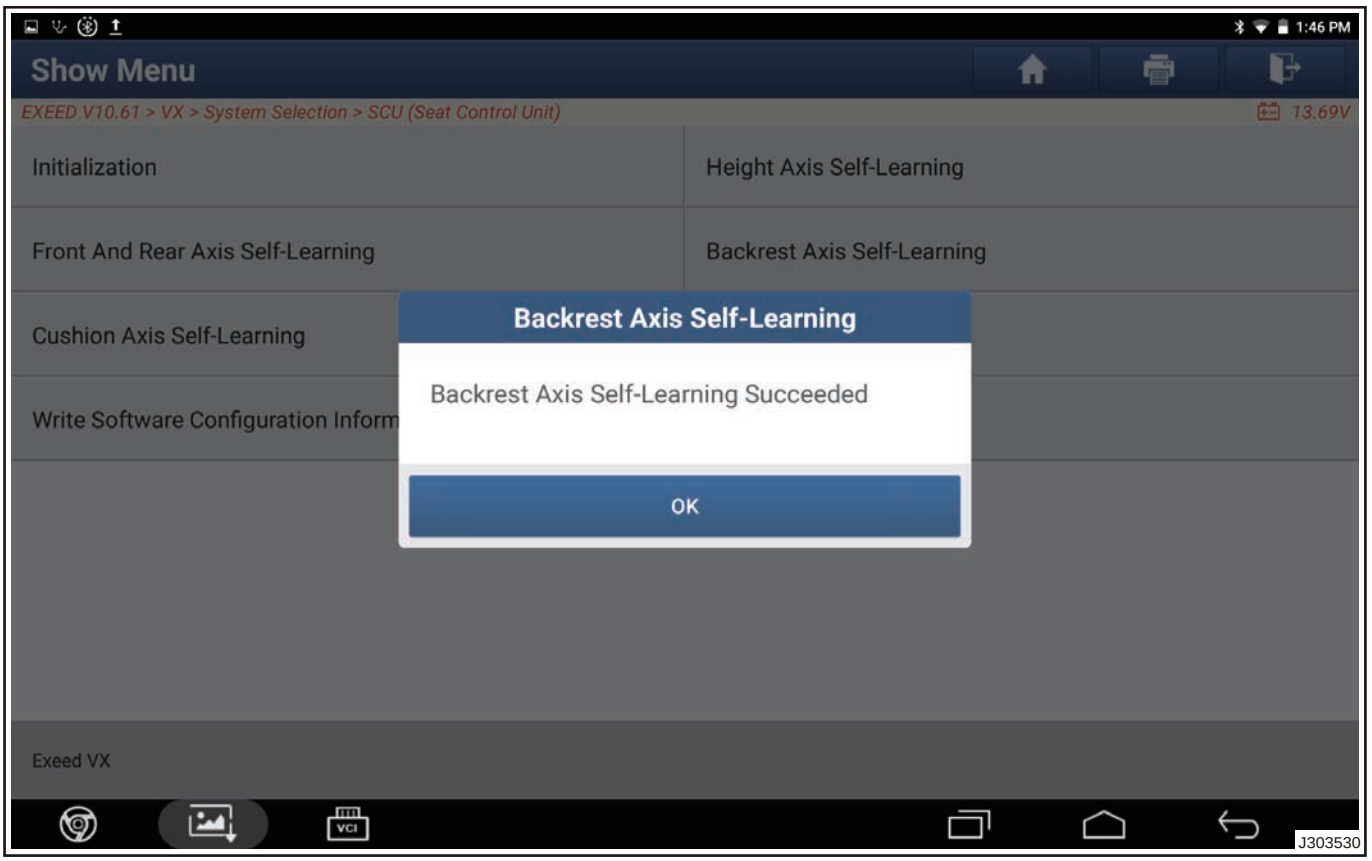
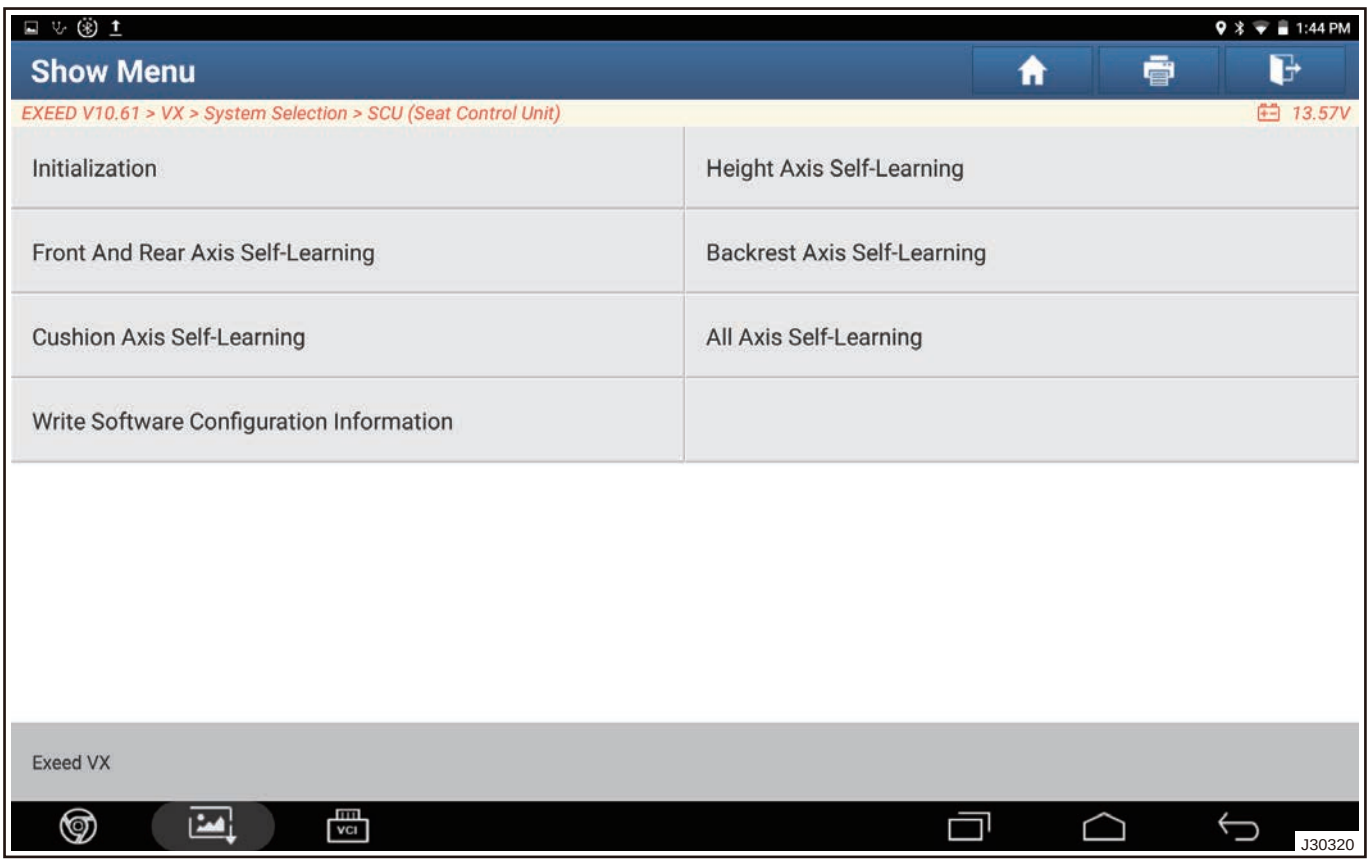
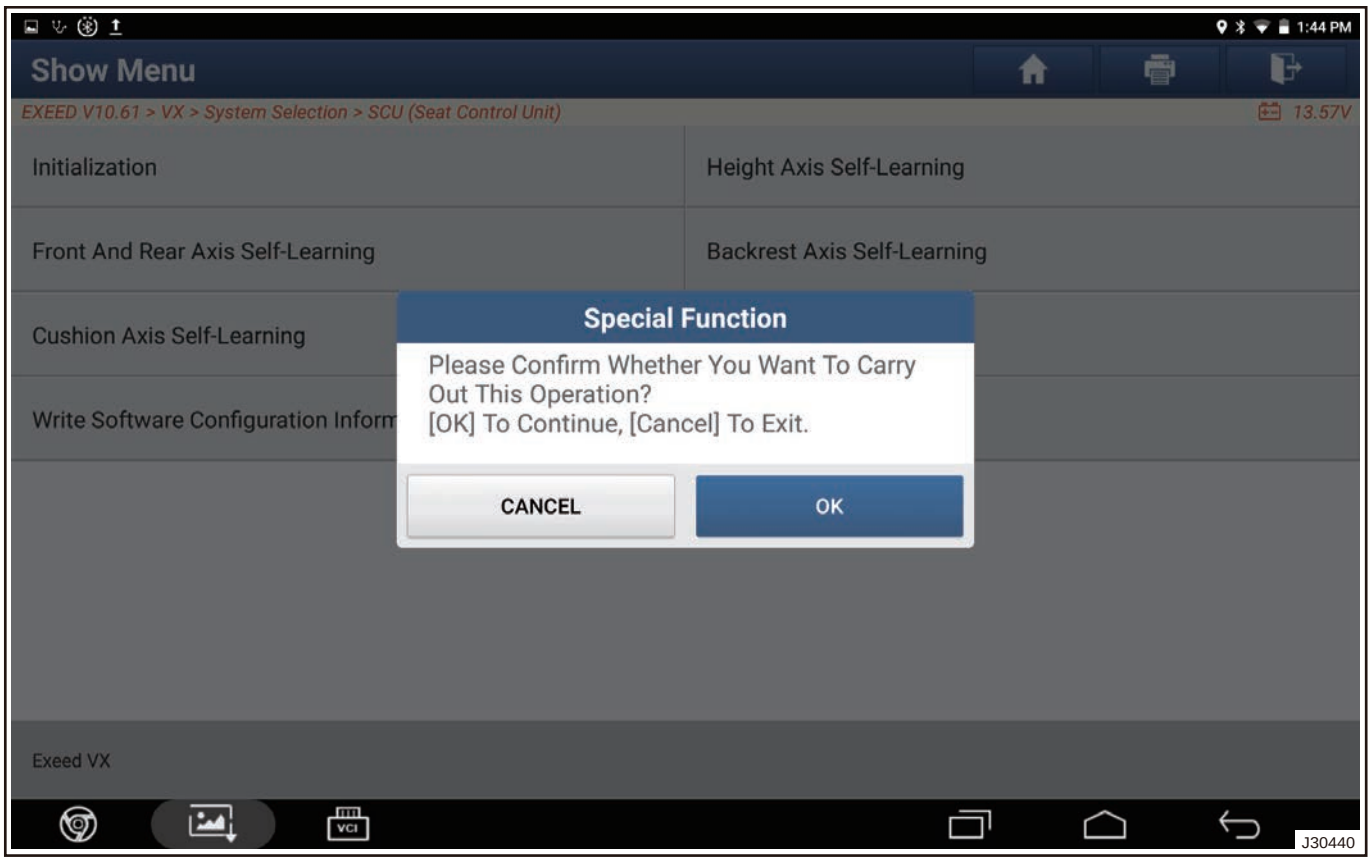


(11) Click “Cushion Axis Self Learning”.

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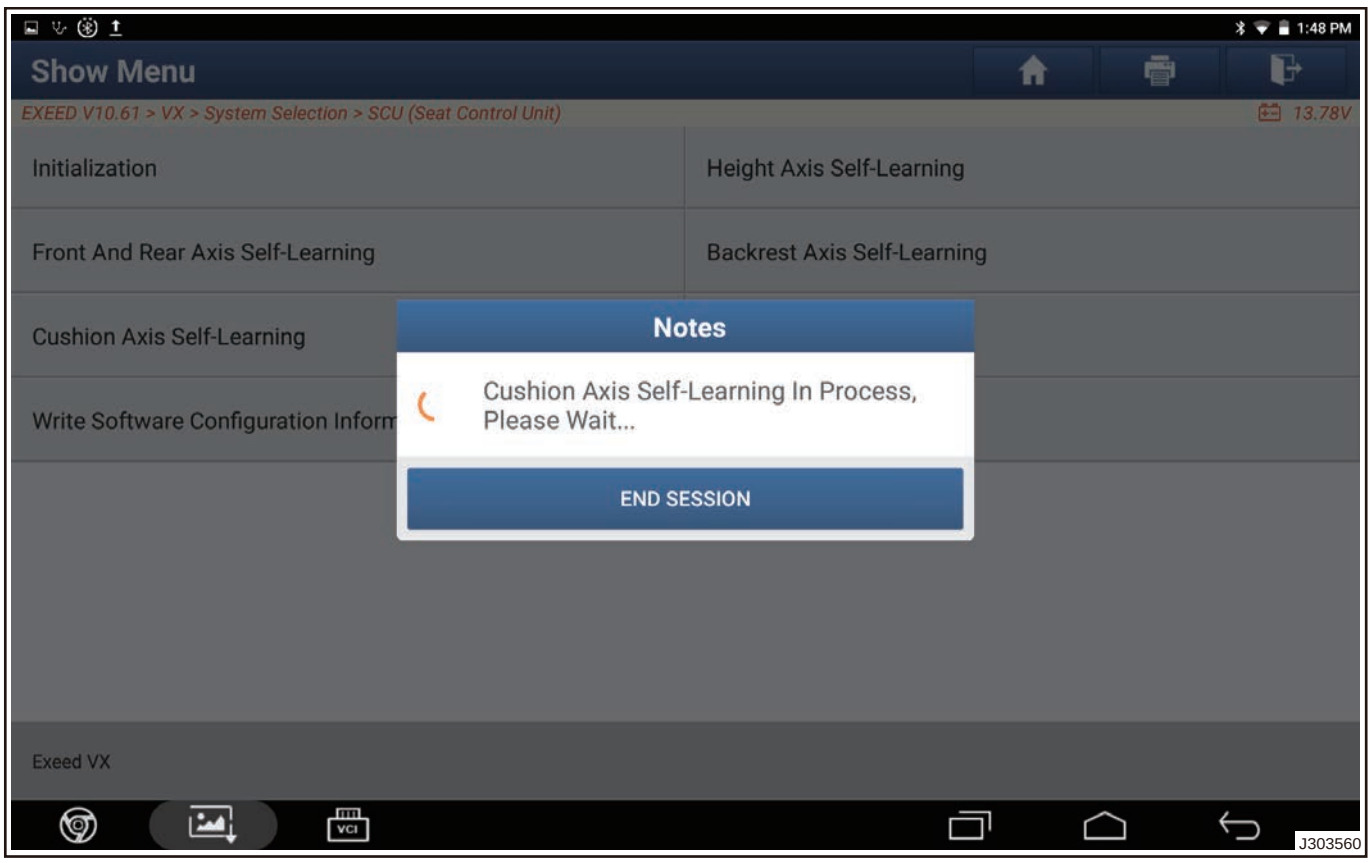
Initialization
Height Axis Self-Learning
Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Special Function
Please Confirm Whether You Want To Carry Out This Operation?
[OK] To Continue, [Cancel] To Exit.
CANCEL
OK
Exeed VX
VCI
J30440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Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
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Notes
Cushion Axis Self-Learning In Process, Please Wait...
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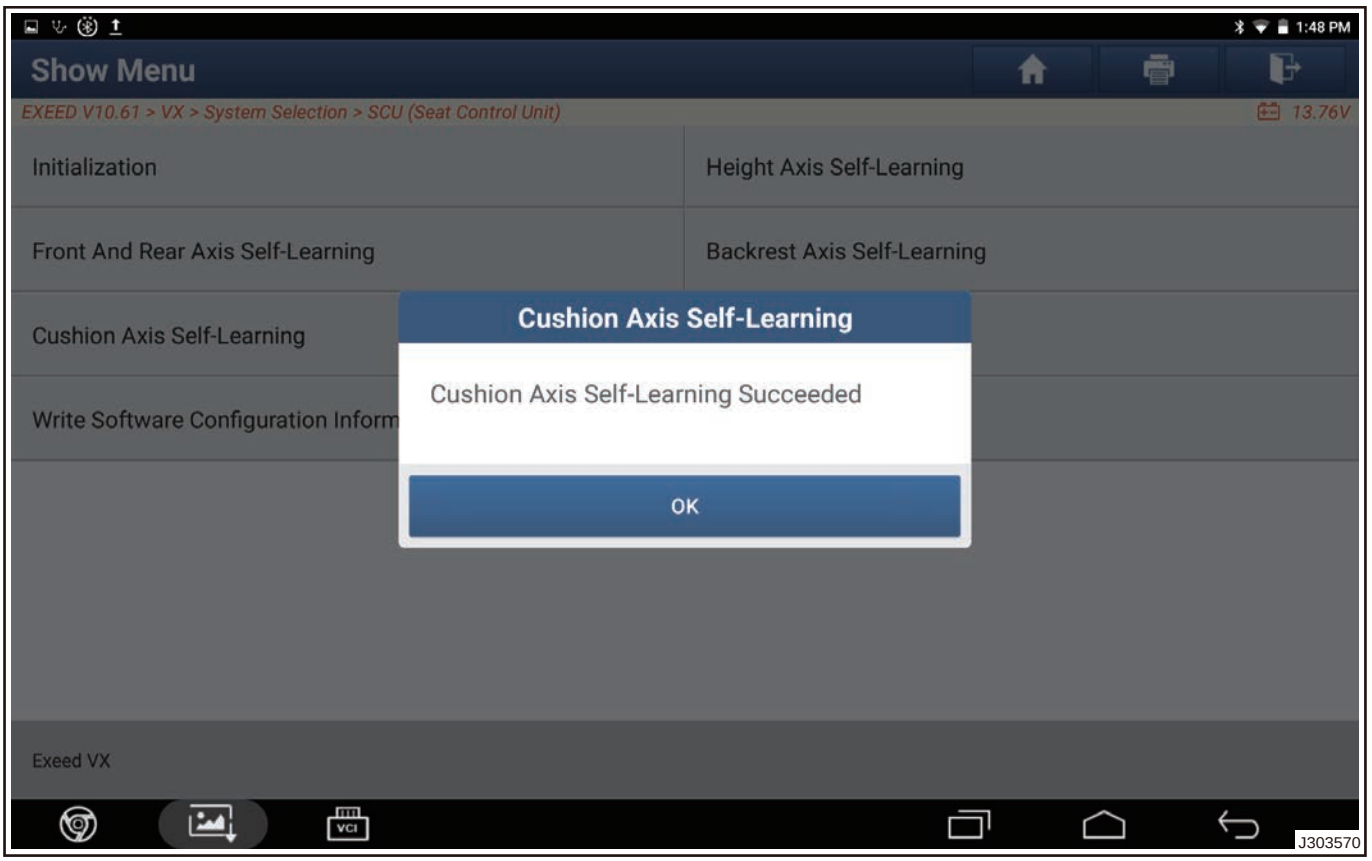
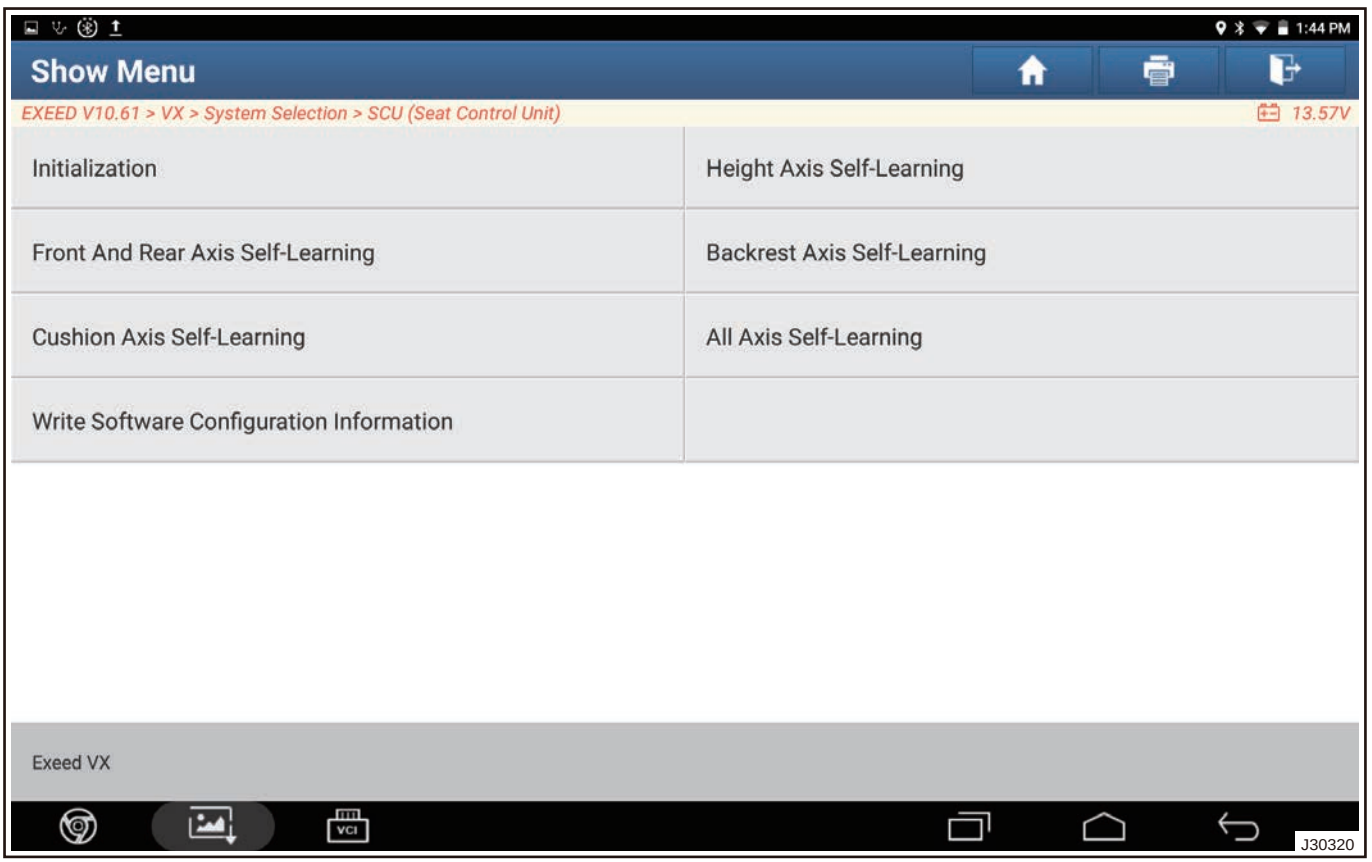
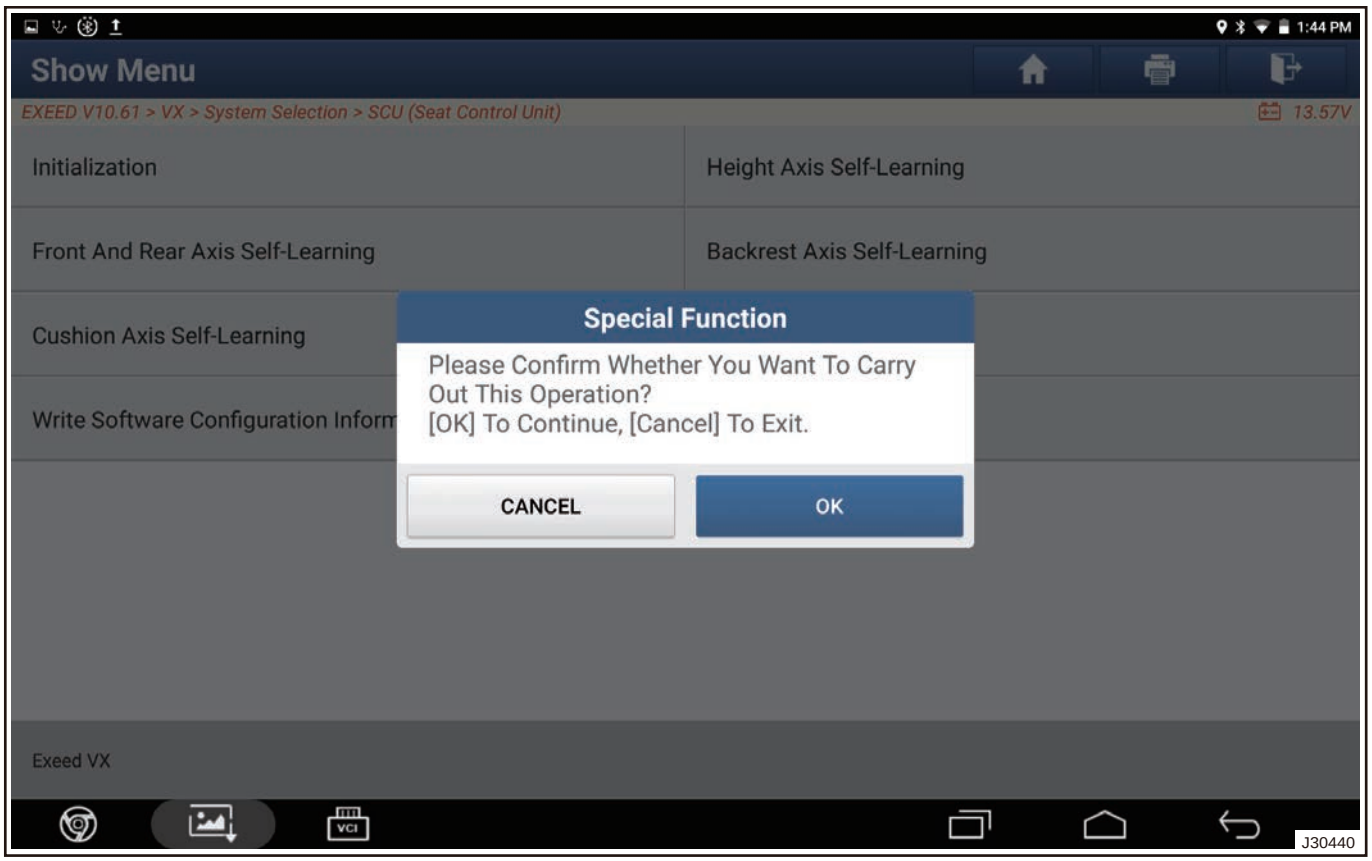
Exeed VX
VCI
J303560



(12) Click “Aii Axis Self Learning”.

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EXEED V10.61 > VX > System Selection > SCU (Seat Control Unit)
13.57V
Initialization
Height Axis Self-Learning
Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Special Function
Please Confirm Whether You Want To Carry Out This Operation?
[OK] To Continue, [Cancel] To Exit.
CANCEL
OK
Exeed VX
VCI
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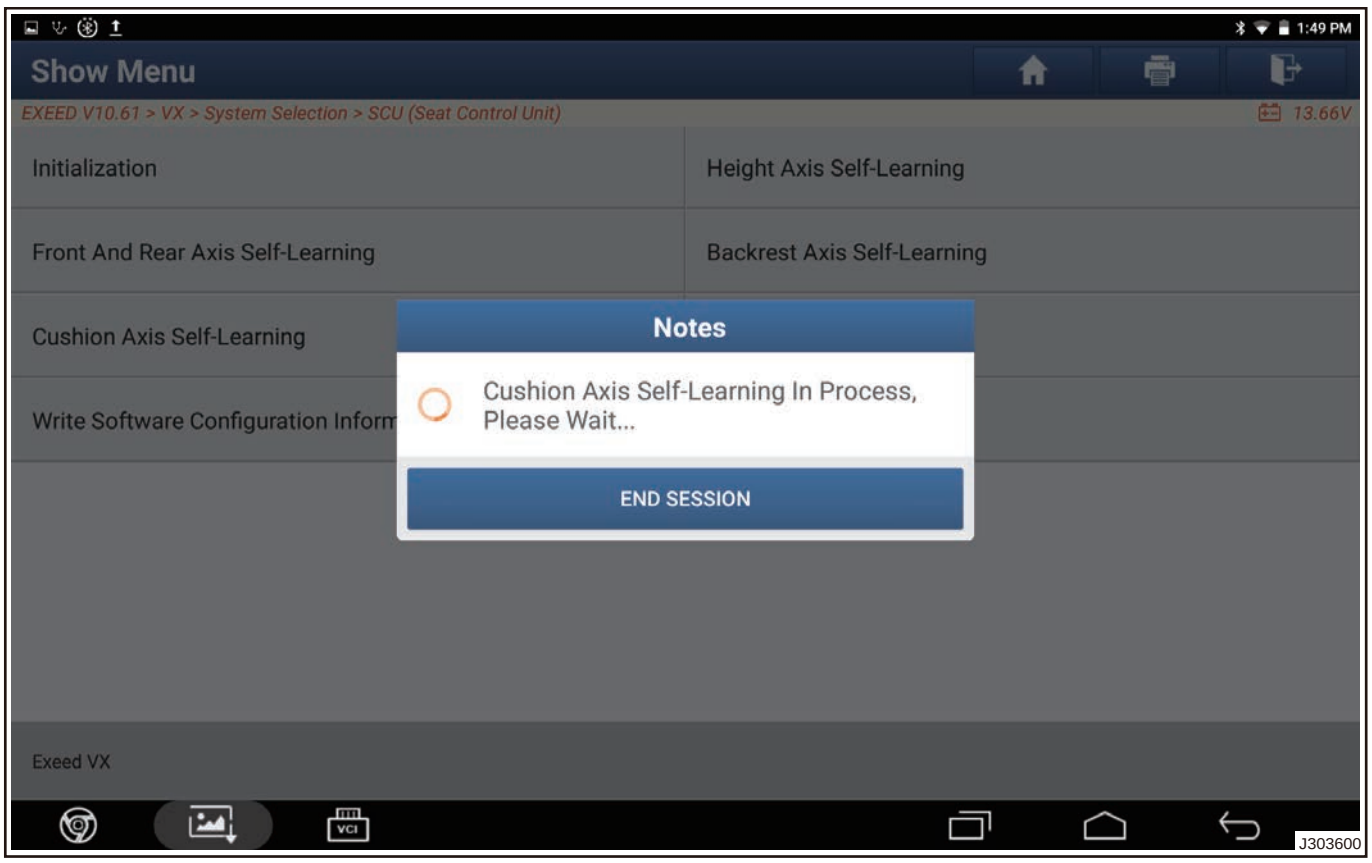
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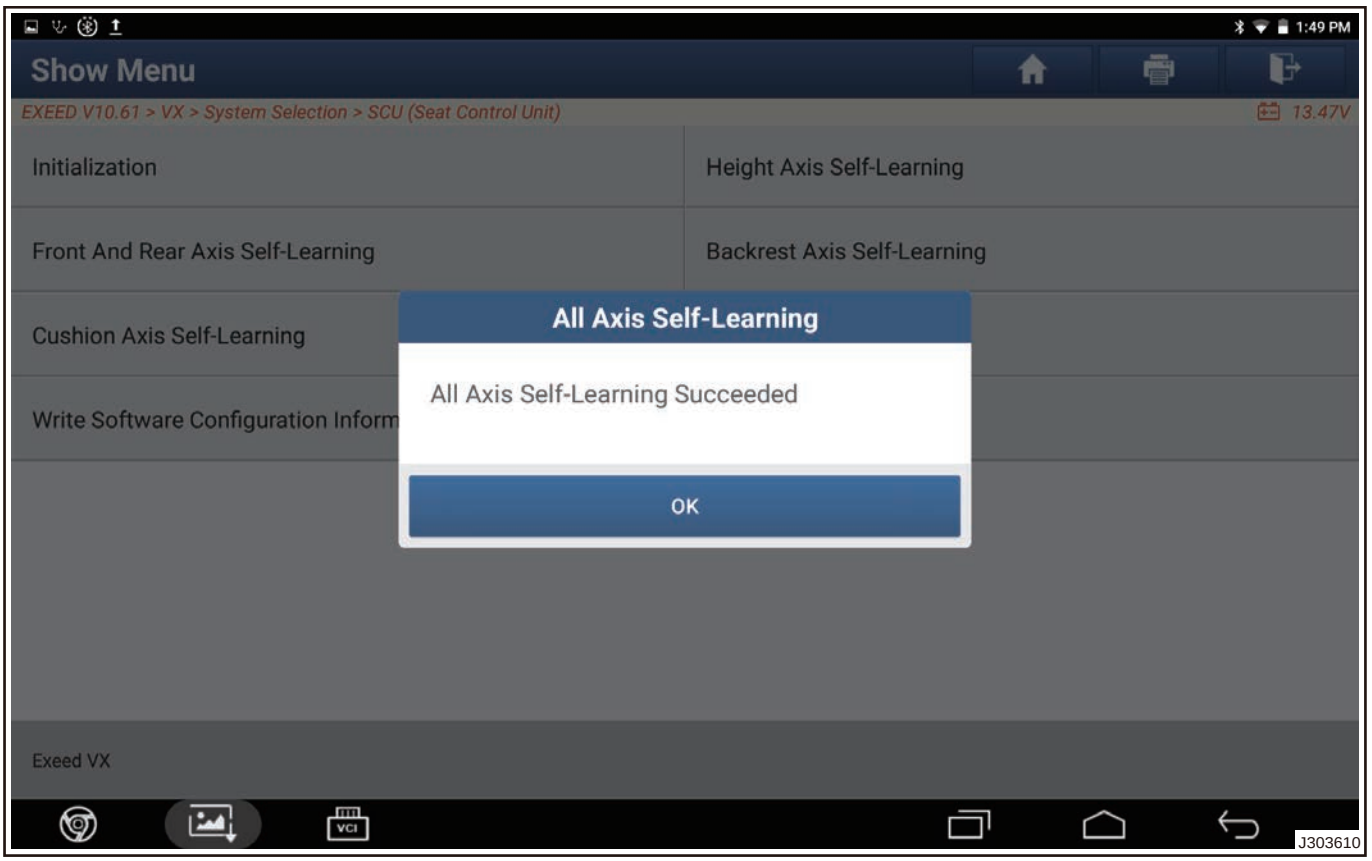
13.66V
Initialization
Height Axis Self-Learning
Front And Rear Axis Self-Learning
Backrest Axis Self-Learning
Cushion Axis Self-Learning
Write Software Configuration Inform
Notes
Cushion Axis Self-Learning In Process, Please Wait...
END SESSION
Exeed VX
VCI
J303600



5.3 Replace Second Row Seat Assembly

■ Removal

⚠ Warning

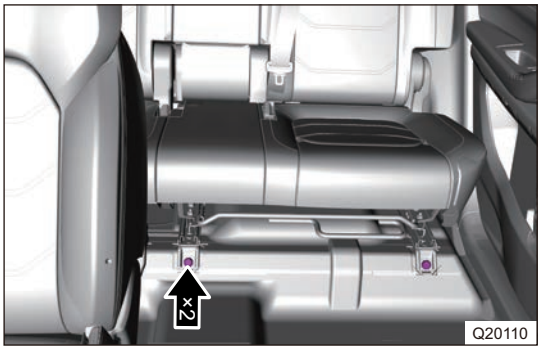
- **Removal method of right second row seat assembly and left side is same.Take the left side as an example.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

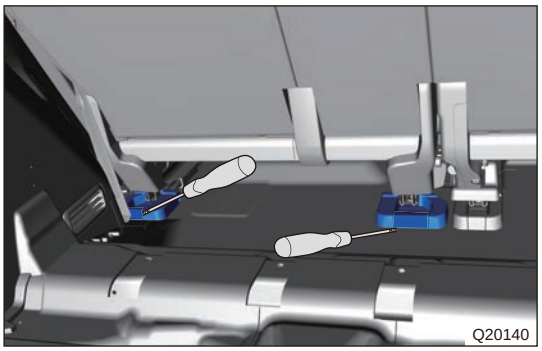
(2) Disconnect the negative battery cable.

(3) Pull up seat unlock bar, pull left and right guide rails to the end, and remove second row front support foot protector using a flat tip screwdriver.

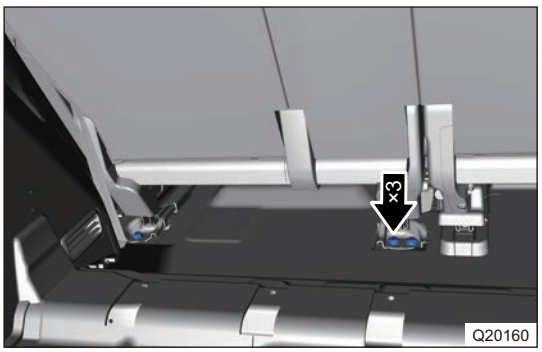
(4) Remove 2 fixing bolts from front part of third row seat.



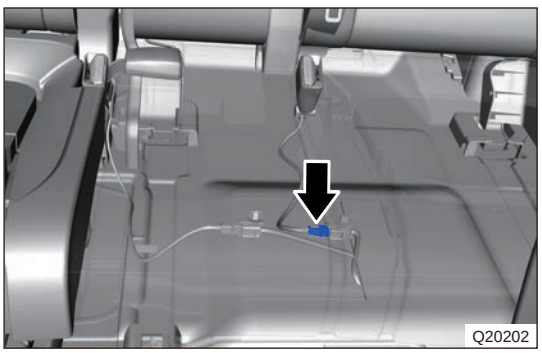
(5) Pull left and right guide rails to foremost, and remove second row rear support foot protector using a flat tip screwdriver.



(6) Remove 3 fixing bolts from rear part of second row seat.



(7) Disconnect wire harness connector of second row left buckle assembly and corresponding connector of floor wire harness, remove the seat assembly.



■ Inspection

(1) Installation of second row seat should be firm and reliable. Seat belt should be complete and effective.

(2) Check the old and new degree of the seat, the seat surface should be flat, clean and free from damage.

■ Installation

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing seat assembly.**
- **When installing seat assembly, be careful not to damage the body paint surface.**
- **Try to prevent carpet from being scratched or damaged, when installing seat assembly.**

(1) Install the seat, install wire harness connector of second row left buckle assembly and corresponding connector of floor wire harness.
(2) Install and tighten 3 fixing bolts in rear part of second row seat.

Torque: 50 ± 5 N·m

(3) Install the second row rear support foot protector.
(4) Install and tighten 2 fixing bolts in front part of second row seat.

Torque: 50 ± 5 N·m

(5) Install the second row front support foot protector.
(6) Connect the negative battery cable.

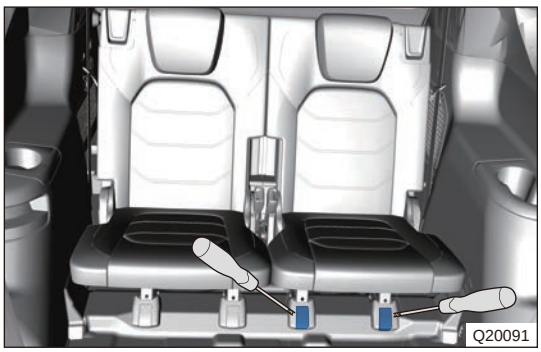
5.4 Replace Third Row Seat Assembly

■ Removal

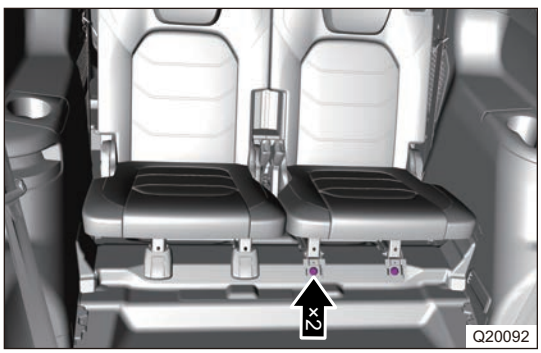
⚠ Warning

- **Removal method of right third row seat assembly and left side is same.Take the left side as an example.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Pull up seat unlock bar, pull left and right guide rails to the end, and remove third row front support foot protector using a flat tip screwdriver.

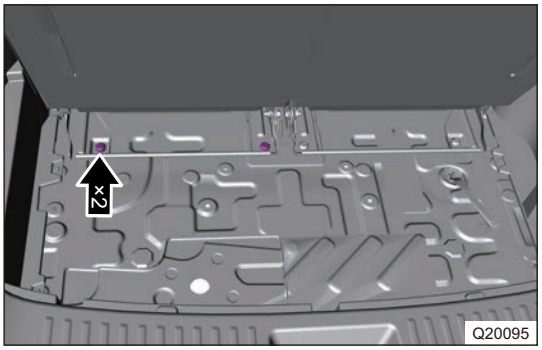


(4) Remove 2 fixing bolts from front part of third row seat.



(5) Remove the luggage compartment carpet assembly.

(6) Remove 2 fixing bolts from rear part of third row seat.



■ **Inspection**

(1) Installation of third row seat should be firm and reliable. Seat belt should be complete and effective.

(2) Check the old and new degree of the seat, the seat surface should be flat, clean and free from damage.

■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing seat assembly.**
- **When installing seat assembly, be careful not to damage the body paint surface.**
- **Try to prevent carpet from being scratched or damaged, when installing seat assembly.**

(1) Install and tighten 2 fixing bolts in rear part of third row seat.

Torque: 50 ± 5 N·m

(2) Install and tighten 2 fixing bolts in front part of third row seat.

Torque: 50 ± 5 N·m

(3) Install the third row rear support foot protector.

(4) Install the luggage compartment carpet assembly.

(5) Connect the negative battery cable.

12.6 DOOR LOCK

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Be sure to wear necessary safety equipment to prevent accidents, when removing engine hood lock assembly.

(2) Be sure to wear necessary safety equipment to prevent accidents, when removing engine hood cable assembly.

(3) Be sure to wear necessary safety equipment to prevent accidents, when removing front door lock assembly.

(4) Be sure to wear necessary safety equipment to prevent accidents, when removing front door key cylinder assembly.

(5) Be sure to wear necessary safety equipment to prevent accidents, when removing front door lock striker assembly.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Side door lock is secured to door inner panel with 3 bolts, evenly apply appropriate amount of thread lock adhesive to 5 to 7 teeth of 3 door lock mounting bolts in advance; pay attention to keep child lock locking when assembling rear door lock.

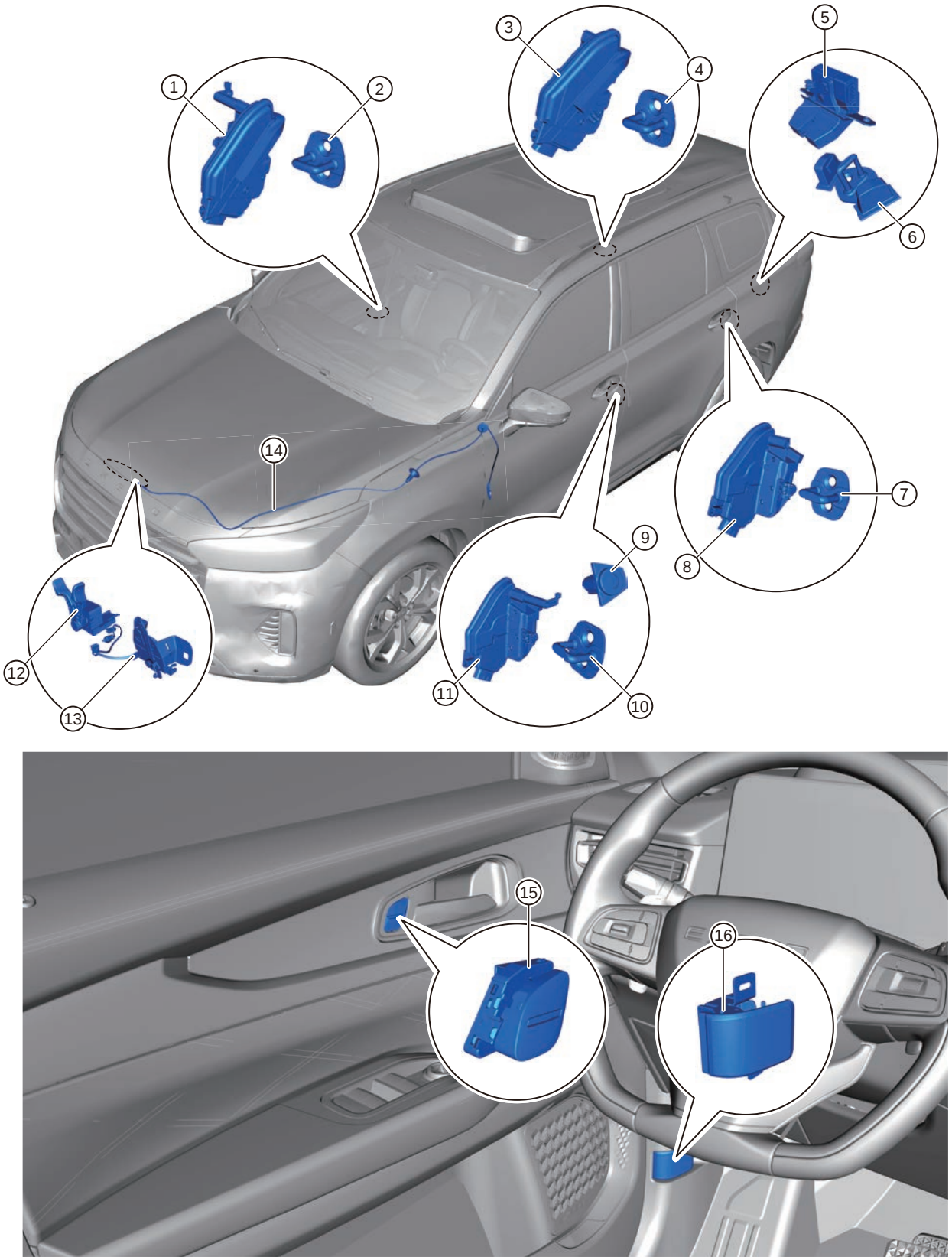
(2) Align middle lines in up-down and left-right directions on lock striker with line on quarter, which should be ensured at the center of lock mechanism to ensure flexible locking and unlocking.

2 System Overview

2.1 System Description

Door lock system is a device mounted on the door and its pillar, which can reliably lock the door and realize the opening and locking functions through its internal mechanism. It is a very important accessory of body. It has safety protection function, which must guarantee reliable locking of door in the normal use, preventing the door accident/unintentional recognition to open. It also guarantee that door needs to open smoothly, to ensure that door can open in normal or when an emergency occurs, so as not to cause casualties and property losses which belongs to safety regulations.

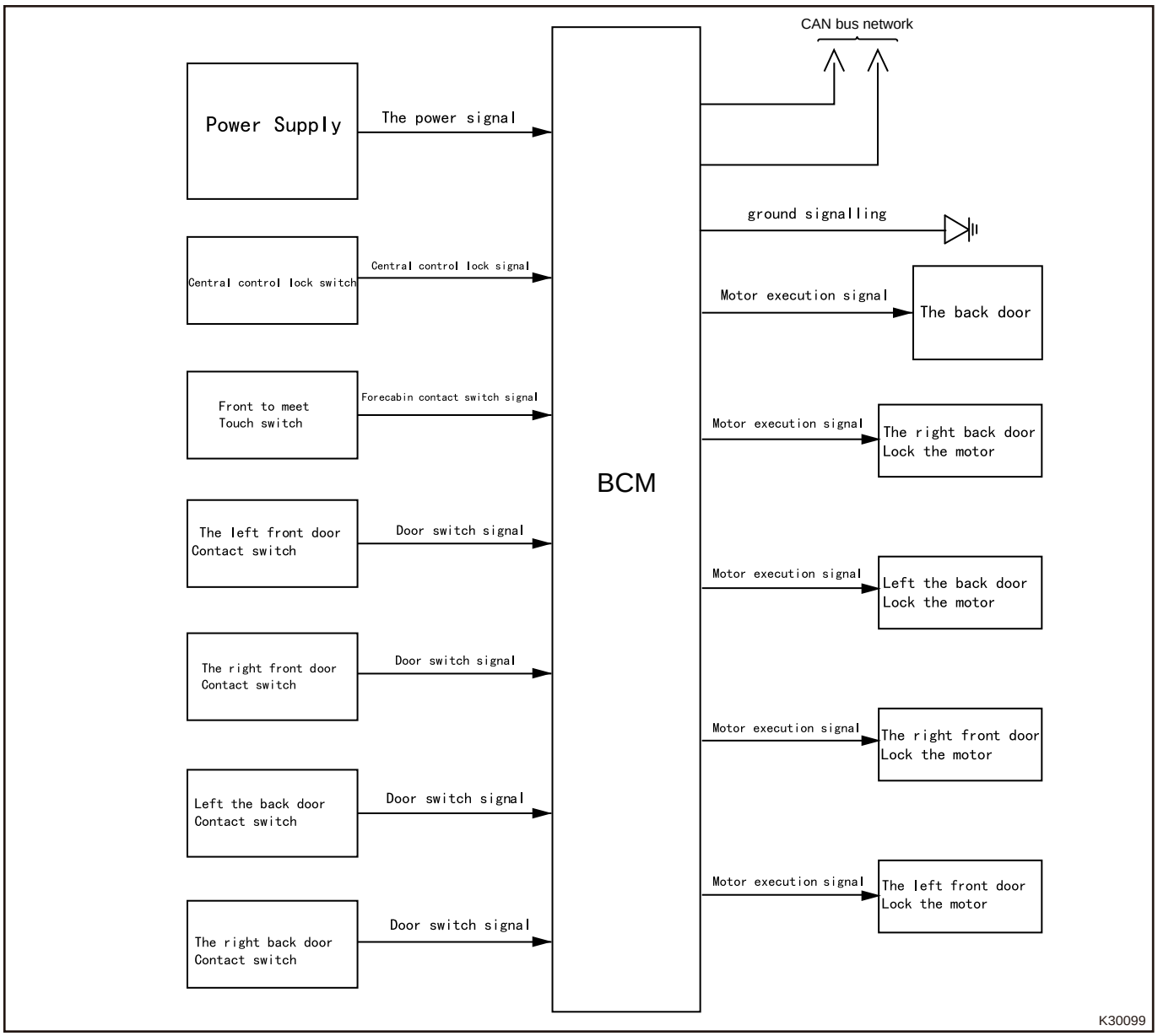
2.2 System Components Diagram



1	Front Right Door Lock Assembly	9	Front Left Door Key Cylinder Assembly
2	Front Right Door Lock Striker	10	Front Left Door Lock Striker
3	Rear Right Door Lock Assembly	11	Front Left Door Lock Assembly
4	Rear Right Door Lock Striker	12	Engine Hood Secondary Lock Opening Mechanism Assembly
5	Back Door Lock Assembly	13	Engine Hood Lock Assembly
6	Back Door Lock Striker Assembly	14	Engine Hood Cable
7	Rear Left Door Lock Striker	15	Central Control Lock Switch
8	Rear Left Door Lock Assembly	16	Engine Hood Lock Grip Assembly

2.3 System Schematic Diagram

Battery provides 12 V power supply to BCM, and BCM controls motor operation. After working, the feedback signal is sent to BCM, and then BCM sends the door closing and opening signals to the instrument cluster via CAN system. At this time, the instrument cluster will display if door lock is closed.



2.4 Anti-theft Management

(1) Fortifying mode

- IGN = OFF (it is not in IGN ON or ACC position).
- Four doors & two covers are closed.
- BCM receives remote control lock command.
- BCM feedbacks when fortifying mode is entered.
- Turn signal light flashes once (turn on for 500 ms) and sends the corresponding LHTurnsignalSts and RHTurnsignalSts.
- Anti-theft indicator flashes at a frequency of 100 ms on, 1900 ms off.
- Actuate the anti-theft horn for 50 ms and high and low pitched horns for 15 ms.

(2) Fortifying Failure Mode

- Trigger conditions.
- IGN = OFF.
- Any of four doors & two covers is opened.
- BCM receives remote control lock command.

- BCM light feedbacks when fortifying failure mode is entered.
- Turn signal light flashes two times (flashing for 500 ms, interval time is 1s) and sends the corresponding LHTurnsignalSts and RHTurnsignalSts signals.
- When entering fortifying failure mode: If four doors are closed and any of the two covers is opened, BCM will perform central control lock command once; If two covers are closed and any of the doors is opened, BCM will perform central control lock command and then perform unlock command (the interval time is 500 ms).

(3) Intrusion mode

- Trigger conditions: BCM will enter to alarm status after the following conditions are met when the vehicle is in fortifying mode.
- Doors or engine hood is opened.
- Key is turned to IGN ON.
- Luggage compartment is opened forcibly.
- After entering to intrusion mode, BCM feedback the conditions within one alarm cycle (30 s).
- Anti-theft horn (high and low pitched horns sound at frequency of 500 ms on and 500 ms off) operates for 28 ± 2 s, and pauses for 5 s.
- Left and right turn signal lights flash for 28s at frequency of 75 times/min (400 ms on, 400 ms off) and pause for 5 s, and send the corresponding LHTurnsignalSts and RHTurnsignalSts.
- Anti-theft indicator continuously flashes at frequency of 100 ms on, 200 ms off, 100 ms on, 600 ms off.
- Four doors & two covers and IGN ON illegal activation action are alarm trigger sources.
- In the same alarm source, a single trigger source can trigger 3 alarm cycles at most.
- In multiple alarm trigger sources, BCM can trigger 8 alarm cycles at most (after 8 alarm cycles, the sound and light alarm will stop).
- If the intrusion ends, BCM will stop alarm after the current alarm cycle. If the same alarm source is triggered again after the alarm is over, BCM will perform the remaining alarm cycles.
- If the four doors & two covers are closed at the end of the alarm, BCM will enter fortifying mode.
- Fortifying deactivation mode.
- Activation conditions: Vehicle is in alarm mode; BCM receives RF unlock command or BCM detects IMMOCodeWarningLightSts=0 for 1 s continuously after the key is switched to IGN ON for 2 seconds.
- When the alarm is released: vehicle exits anti-theft function mode; anti-theft horn (high and low pitched horns (if equipped)) stops working, and the turn signal light stops flashing.
- After alarm is released, if key is not in IGN ON, anti-theft indicator light still flashes at a frequency of 100 ms on, 200 ms off, 100 ms on and 600 ms off; if the key is in IGN ON, anti-theft indicator light stops flashing.
- Pre-rearming mode.
- Trigger conditions.
- Vehicle is in fortifying mode.
- BCM receives remote control unlock command.
- BCM feedbacks when fortifying mode is released.
- Anti-theft indicator turns off immediately.
- Turn signal light flashes 2 times at frequency of 500 ms on and 500 ms off, and sends the corresponding LHTurnsignalSts and RHTurnsignalSts.
- Within 30±2 s after fortifying mode is released.
- If any of four doors & two covers are open, BCM exits anti-theft mode.
- If all four doors & two covers are always closed, BCM will lock automatically and enter the fortifying state after 30 s, and anti-theft indicator will flash at the frequency of 100 ms on and 1900 ms off.
- Luggage compartment opening mode.
- Trigger conditions.
- Vehicle is in fortifying mode.
- BCM receives the remote control luggage compartment open command for more than 1.5 s.
- BCM feedbacks when luggage compartment opening mode is triggered.

- Turn signal light illuminates and sends the corresponding LHTurnsignalSts and RHTurnsignalSts.
- Luggage compartment is open and no alarm is triggered.
- Then close the luggage compartment, vehicle returns to the fortifying state, and if there is no legal key, the luggage compartment switch cannot open luggage compartment.
- After using remote control to open the luggage compartment: After BCM receives remote control lock command, vehicle will immediately lock and return to fortifying state, but the turn signal light prompts fortifying failure.
- After using remote control to open the luggage compartment and close it again: After BCM receives remote control lock command, vehicle will immediately lock and return to fortifying state, but the turn signal light prompts fortifying successfully. If there is no registered key after the luggage compartment closed, the switch will not open the luggage compartment.

(4) Luggage compartment opening management (without PLG)

- When the central control lock is in unlock state.
- When the luggage compartment opening switch is activated, the luggage compartment opens.
- When the central control lock is in lock state.
- Luggage compartment is opened.
- IGN OFF.
- BCM receives RF luggage compartment command for more than 1.5 s.
- Turn signal light illuminates and sends the corresponding LHTurnsignalSts and RHTurnsignalSts.
- Luggage compartment is opened.
- After luggage compartment is opened by remote control, close it manually, if there is no registered key (PKE), the luggage compartment will not open by the luggage compartment button.

⚠ Caution

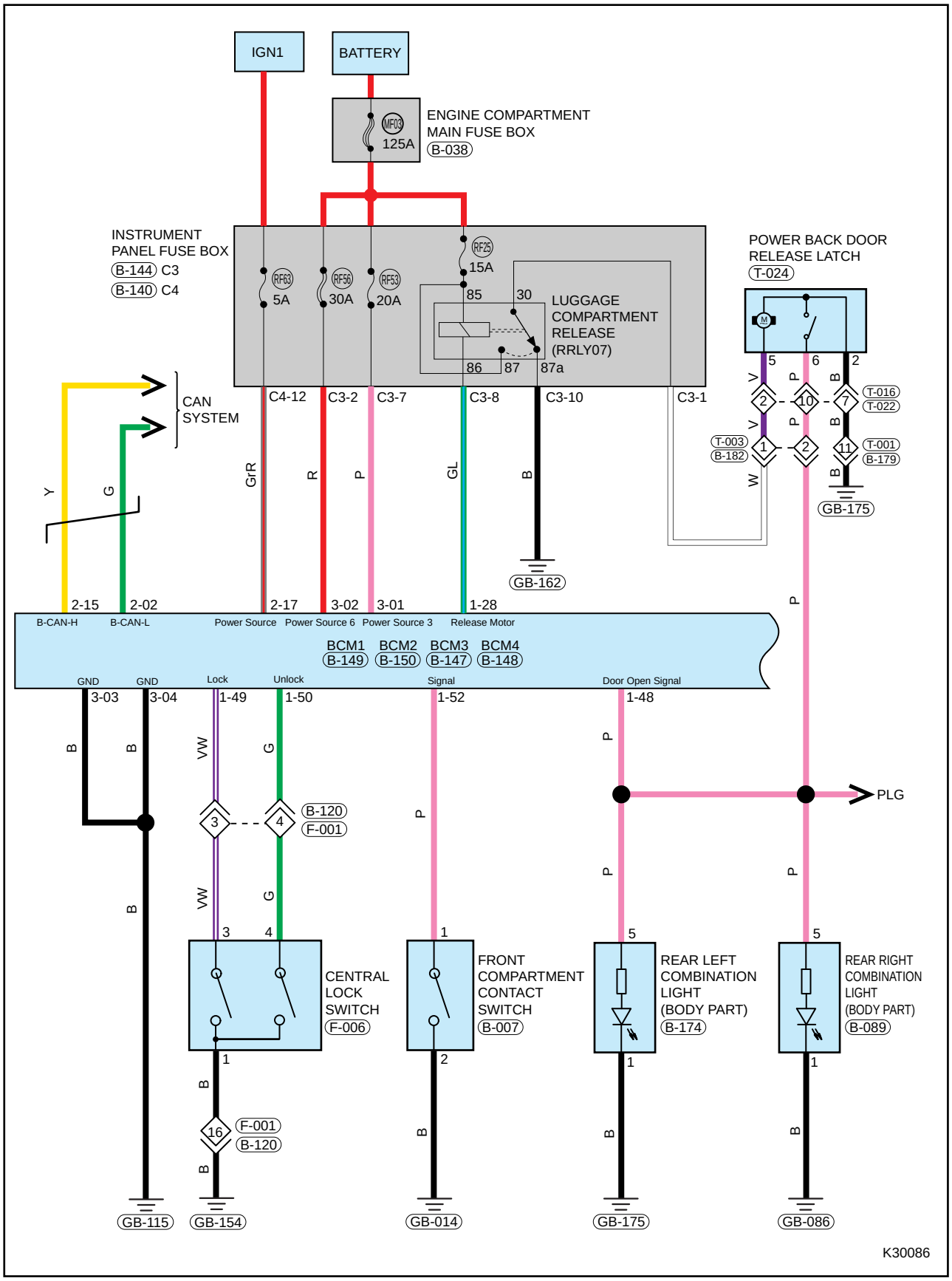
- **When luggage compartment is opened, the luggage compartment light turns on.**
- **When luggage compartment is opened, the actuate time of motor is 200 ms.**
- **When the vehicle speed reaches 10 km/h, the luggage compartment will not be opened (please note that the ignition remains in IGN while testing - BSM is 15 nodes).**

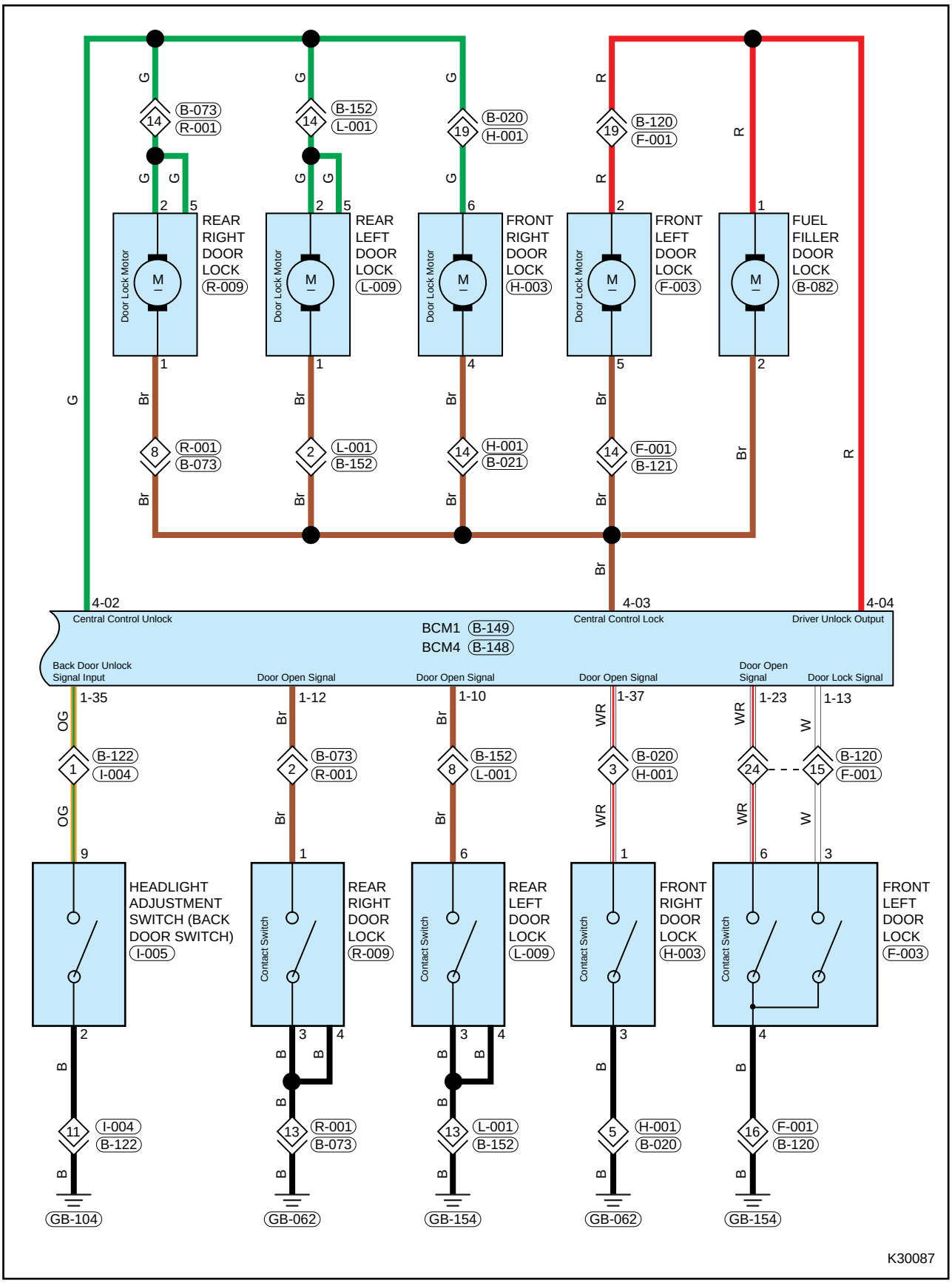
(5) Luggage compartment opening management (with PLG)

- When vehicle is in fortifying deactivation mode.
- When the luggage compartment switch is activated, the luggage compartment opens/closes; turn signal light flashes twice, 200ms ON - 200ms OFF.
- During the process of opening / closing back door, press remote control briefly to stop the current action of back door.
- Global fortifying.
- When GlobaSW is pressed and following conditions are met, BCM performs vehicle fortifying.
- IGN OFF.
- Four doors and engine hood are closed.
- Back door is locked within 10 s.
- When the vehicle is in fortifying mode.
- Luggage compartment is open/closed.
- IGN OFF/ACC position.
- BCM receives remote control luggage compartment command for more than 1.5 s.
- Turn signal light flashes twice, 200ms ON - 200ms OFF.
- During the process of opening / closing back door, press remote control briefly to stop the current action of back door.
- After back door is closed, the vehicle returns to fortifying state.

3 System Circuit Diagram

3.1 Circuit Diagram




G
B-073
R-001
B-152
L-001
B-020
H-001
R
B-120
F-001
REAR RIGHT DOOR LOCK
R-009
REAR LEFT DOOR LOCK
L-009
FRONT RIGHT DOOR LOCK
H-003
FRONT LEFT DOOR LOCK
F-003
FUEL FILLER DOOR LOCK
B-082
Door Lock Motor
Br
R-001
B-073
L-001
B-152
H-001
B-021
F-001
B-121
4-02
Central Control Unlock
4-03
Central Control Lock
4-04
Driver Unlock Output
BCM1 B-149
BCM4 B-148
Back Door Unlock Signal Input
Door Open Signal
Door Lock Signal
1-35
1-12
1-10
1-37
1-23
1-13
OG
WR
W
B-122
I-004
B-120
F-001
HEADLIGHT ADJUSTMENT SWITCH (BACK DOOR SWITCH)
I-005
Contact Switch
B
GB-104
GB-062
GB-154
K30087

4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.
Power door lock control system:

Symptom	Suspected Area
All door lock/unlock functions do not operate	Body control module (BCM) fuse
	Power door unlock/lock switch button
	Wire harness or connector
	Body Control Module (BCM)
Only driver side door lock/unlock function does not operate	Front left door lock assembly
	Wire harness or connector
Only passenger side door lock/unlock function does not operate	Front right door lock assembly
	Wire harness or connector
Only rear left door lock/unlock function does not operate	Rear left door lock assembly
	Wire harness or connector
Only rear right door lock/unlock function does not operate	Rear right door lock assembly
	Wire harness or connector
Only back door open/close function does not operate	Back door lock assembly
	Wire harness or connector

Wireless Door Lock Control System:

Symptom	Suspected Area
Only wireless control function does not operate	Wireless key battery
	Anti-theft matching
	Wire harness or connector
	Body Control Module (BCM)

4.2 Diagnostic Help

- Connect diagnostic tester (the latest software) to diagnostic interface, and make it communicate with vehicle electronic module through data network.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If Diagnostic Trouble Code (DTC) cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all system grounds related to the latest DTCs.
- If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

4.3 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate the conditions under which DTC was reset.
- Look for data that has changed or DTC to reset during wiggling test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect the mounting areas of instrument cluster, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- Remove instrument cluster from malfunctioning vehicle, then install it to a new vehicle and perform a test. If this DTC cannot be cleared, instrument cluster is malfunctioning. If DTC can be cleared, reinstall instrument cluster to original vehicle.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Groundings are very important to entire circuit system, which are normal or not can seriously affect the entire circuit system. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) and oxidation may increase load resistance. This case will seriously affect normal operation of circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

4.6 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the system.

1	**Vehicle brought to workshop**

Next

2	Examine vehicle and check basic items

Check system power supply voltage, and check that fuse, wire harness and connector are connected normally.

OK

Standard voltage: Not less than 12 V.

Result

NG → **Check and replace malfunctioning parts**

OK ↓

3	Using a diagnostic tester, read related DTC and data stream information

Result

Result	Go to
No DTC	A
DTC occurs	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B ↓

4	Troubleshoot according to DTCs troubleshooting procedure

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B ↓

5	According to airbag system malfunction repair completion inspection and delivery, confirm that malfunction is resolved

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A	**Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

4.7 Diagnostic Trouble Code (DTC) Chart

Description

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1018-71	Driver Unlock Built-in Relay Stuck Fault	When the output is OFF and ignition switch is OFF, output voltage is more than 7 V, (- error is within 10% and duration is more than 100 MS, software will detect once every 10 MS, and it will be determined after at least 3 consecutive detections, detection starts after being powered on for 2 seconds, regardless of the key position, the detection can be performed as long as load working conditions are met and load is output.) It is stored as the current DTC.	Relay problem	• Relay • Check BCM
B1013-71	Central Control Lock Built-in Relay Stuck Fault			
B1014-71	Central Control Unlock Built-in Relay Stuck Fault			
B1024-71	Luggage Compartment Unlock Relay Stuck	/		

4.8 DTC Diagnosis Procedure

DTC	**B1018-71**	**Driver Unlock Built-in Relay Stuck Fault**
DTC	**B1013-71**	**Central Control Lock Built-in Relay Stuck Fault**
DTC	**B1014-71**	**Central Control Unlock Built-in Relay Stuck Fault**
DTC	**B1024-71**	**Luggage Compartment Unlock Relay Stuck**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

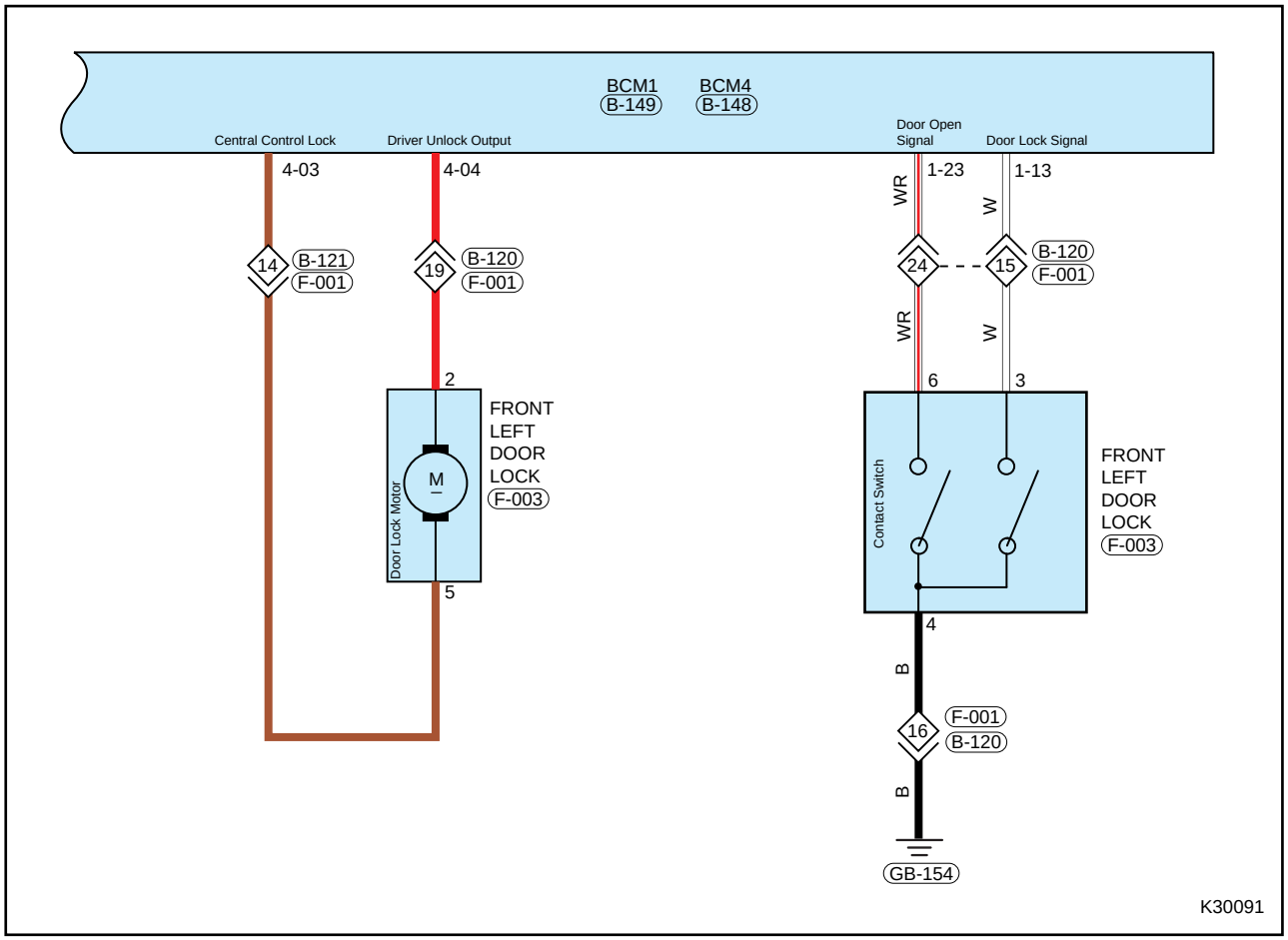
1	**Check relay**

(a) Check if relay terminal is corroded or broken.

(b) Directly apply battery voltage to 2 relay control terminals, check if relay closes.

OK	**Replace BCM**
NG	**Replace relay**

DTC	/	Only Driver Side Door Lock/Unlock Function does not Operate



Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check front left door lock motor

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the door lock motor connector.

(c) Apply voltage no less than 12 V to door lock motor, and check if door lock operates.

NG → **Replace front left door lock motor**

OK

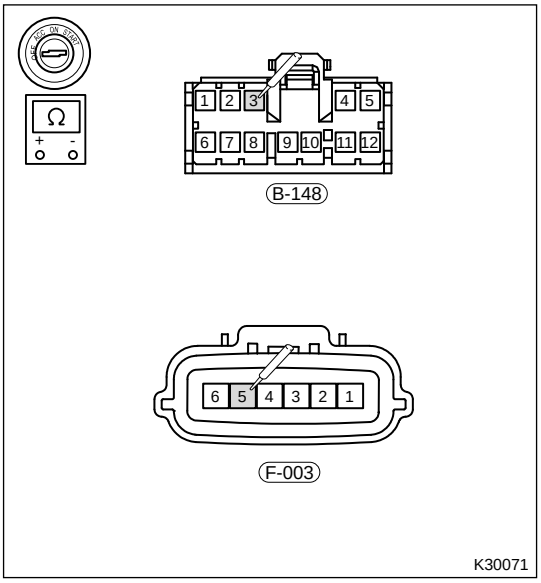
2	Check front left door lock motor and wire harness connector

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the negative battery cable.

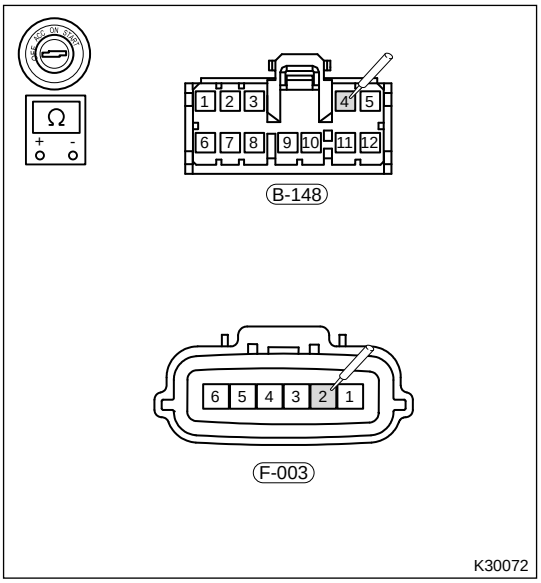
(c) Using ohm band of multimeter, check for continuity between connector B-148 (3) and front left door lock motor connector F-003 (5).

Multimeter Connection	Condition	Specified Condition
B-148 (3) - F-003 (5)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



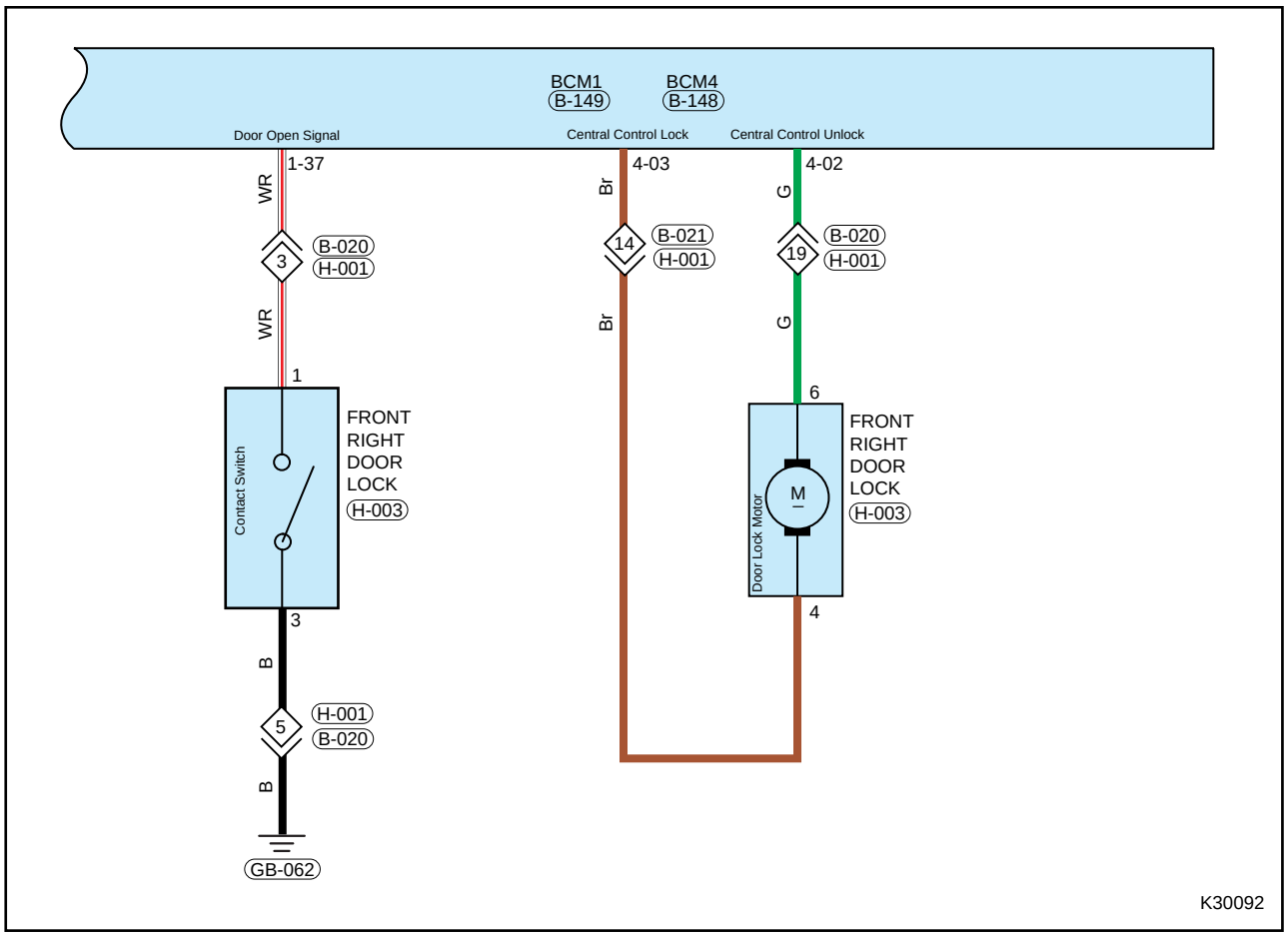
(d) Using ohm band of multimeter, check for continuity between connector B-148 (4) and F-003 (2).

Multimeter Connection	Condition	Specified Condition
B-148 (4) - F-003 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



OK	**End**
OK	**Repair or replace front left door lock related wire harness.**

DTC	**/**	**Only Front Passenger Side Door Lock/Unlock Function does not Operate**



Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check front right door lock motor**

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the door lock motor connector.

(c) Apply voltage no less than 12 V to door lock motor, and check if door lock operates.

NG → **Replace front right door lock motor**

OK

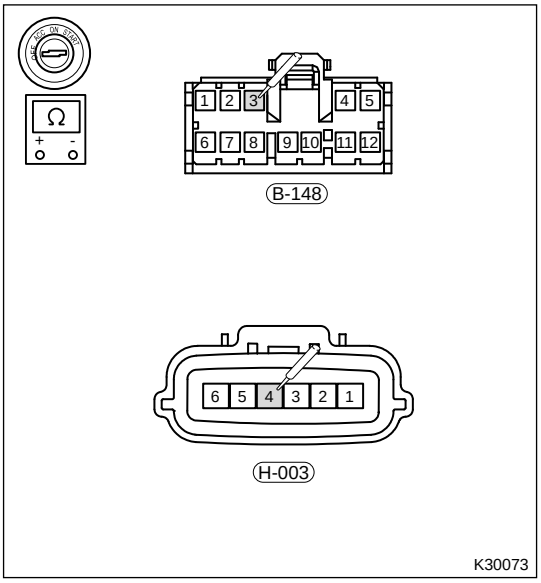
2	**Check front right door lock motor and wire harness connector**

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the negative battery cable.

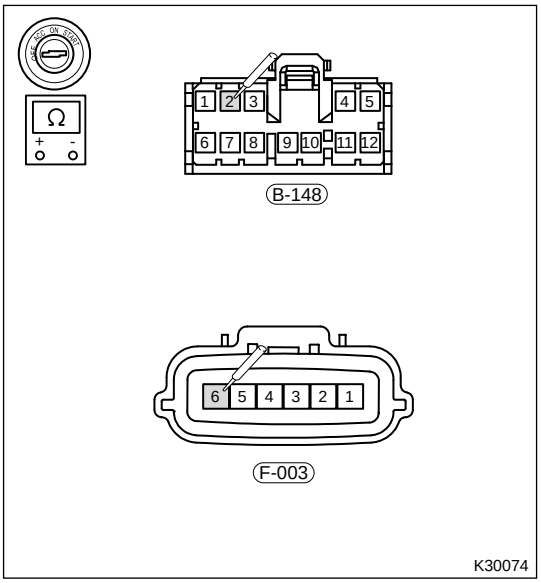
(c) Using ohm band of multimeter, check for continuity between front right door lock connector H-003 (4) and BCM connector B-148 (3).

Multimeter Connection	Condition	Specified Condition
B-148 (3) - H-003 (4)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between front right door lock connector H-003 (6) and BCM connector B-148 (2).

Multimeter Connection	Condition	Specified Condition
B-148 (2) - H-003 (6)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



NG → **Repair or replace front right door lock related wire harness**

OK →

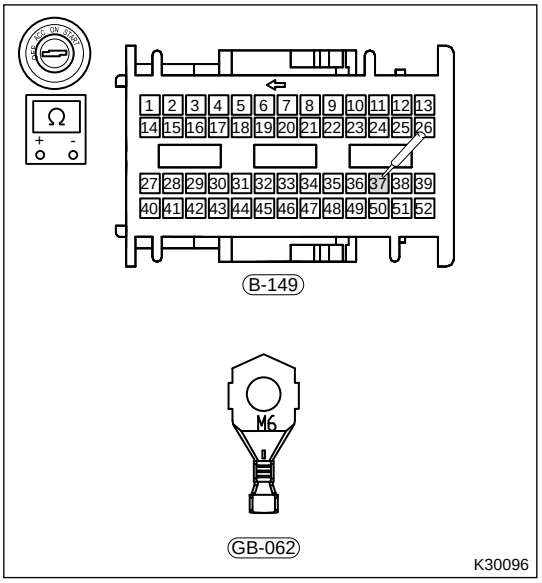
3	Check front right door lock contact switch signal circuit

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the BCM connector B-149.

(c) Using ohm band of multimeter, check for continuity between B-149 (37) terminal and front right door contact switch ground point GB-062.

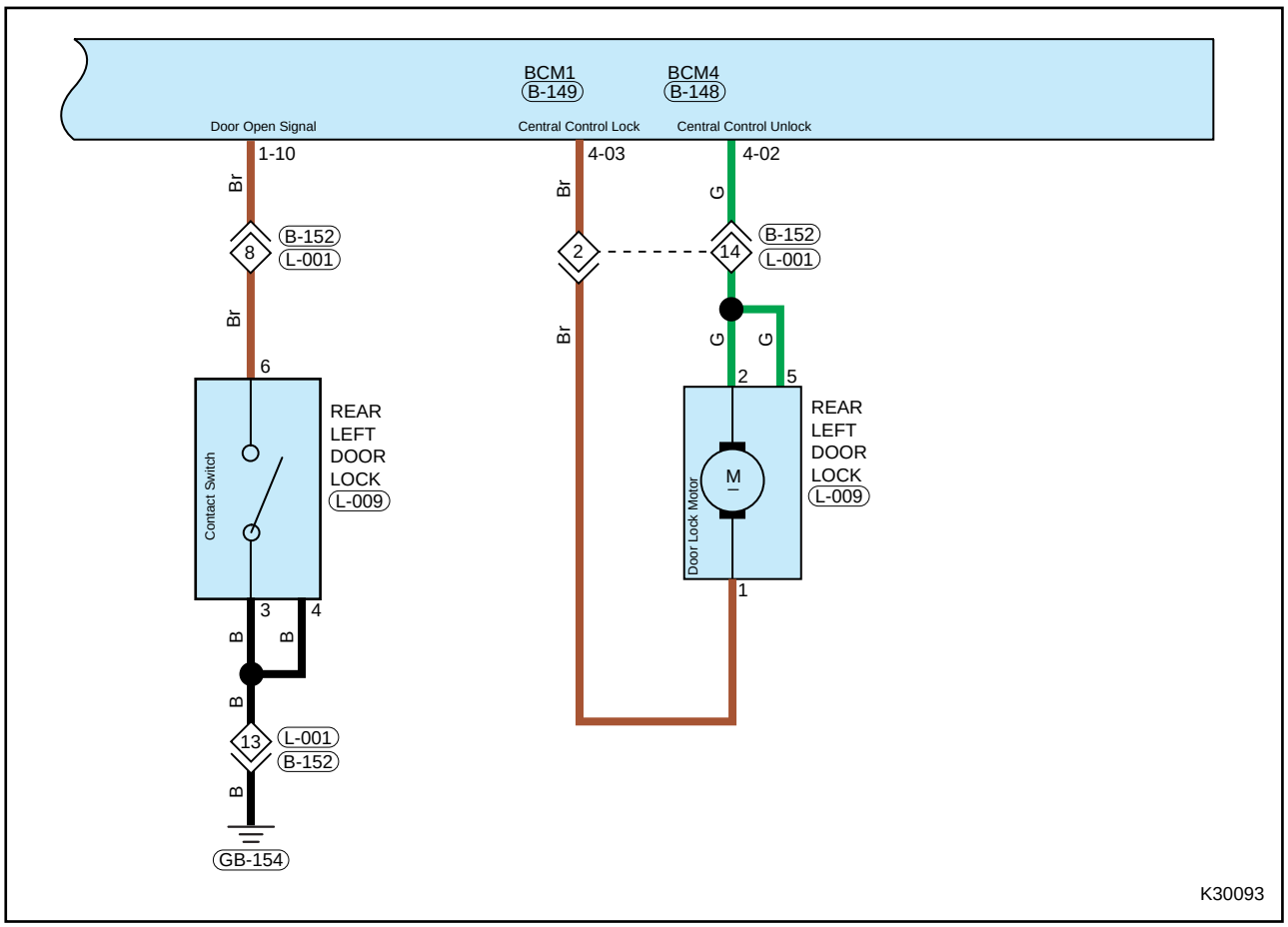
Multimeter Connection	Condition	Specified Condition
B-149 (37) - GB-062	Always	⩽ 1 Ω



OK → **End**

OK → **Repair or replace front right door lock contact switch ground wire harness**

DTC	/	Only Rear Left Door Lock/Unlock Function does not Operate



Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check rear left door lock motor

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the door lock motor connector.

(c) Apply voltage no less than 12 V to door lock motor, and check if door lock operates.

NG → **Replace rear left door lock motor**

OK ↓

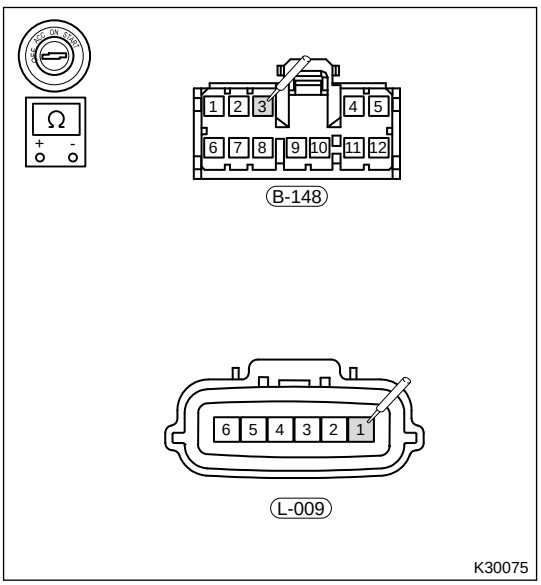
2	Check rear left door lock motor and wire harness connector

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the negative battery cable.

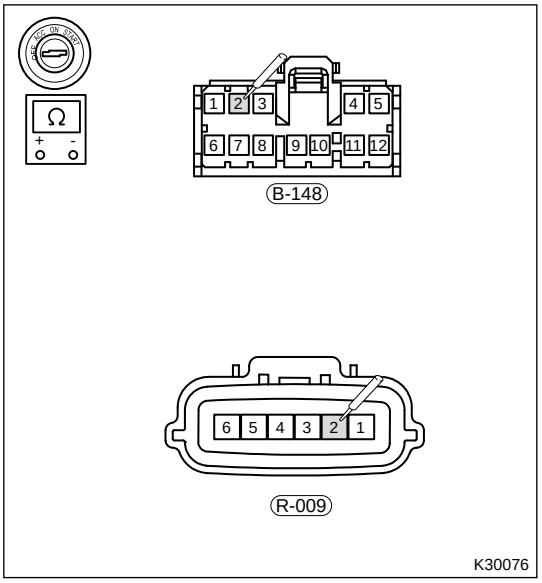
(c) Using ohm band of multimeter, check for continuity between rear left door lock connector L-009 (1) and BCM connector B-148 (3).

Multimeter Connection	Condition	Specified Condition
B-148 (3) - L-009 (1)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between rear left door lock connector L-009 (2) and BCM connector B-148 (2).

Multimeter Connection	Condition	Specified Condition
B-148 (2) - L-009 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



NG → **Repair or replace rear left door lock related wire harness**

OK

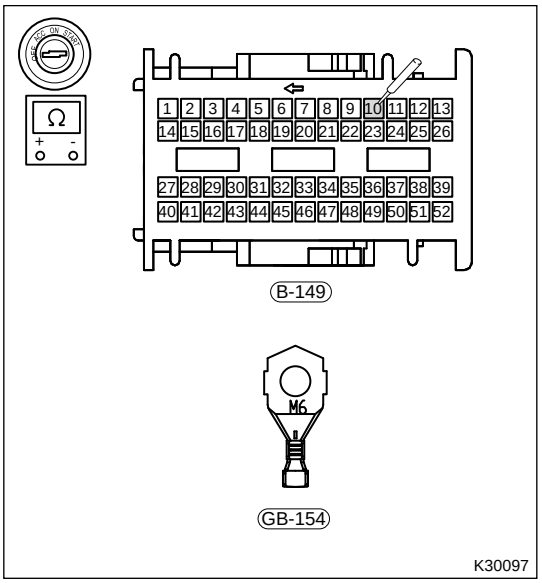
3	Check rear left door lock contact switch signal circuit

(a) Turn ENGINE START STOP switch to "OFF".

(b) Disconnect the BCM connector B-149.

(c) Using ohm band of multimeter, check for continuity between B-149 (10) terminal and rear left door contact switch ground point GB-154.

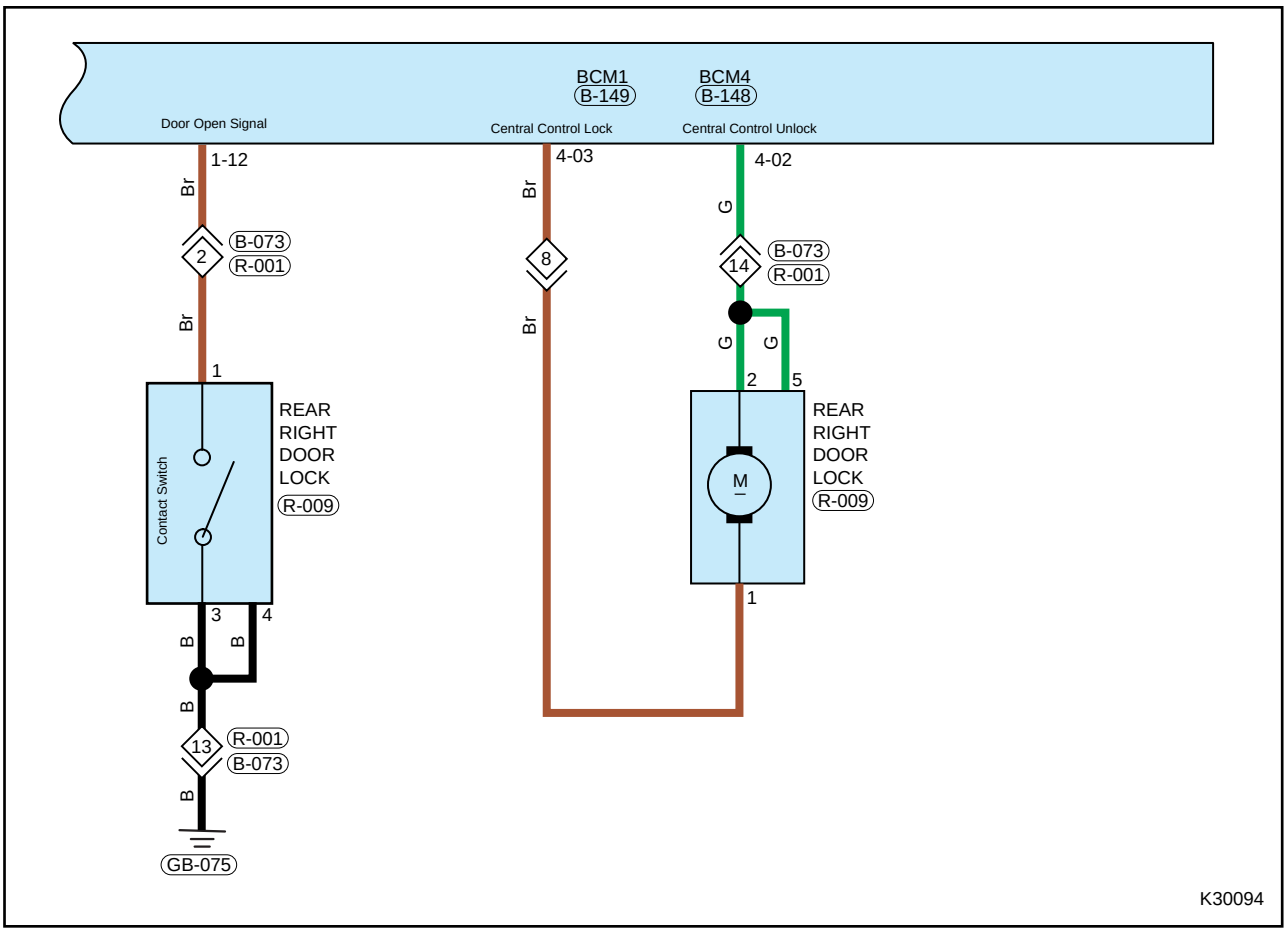
Multimeter Connection	Condition	Specified Condition
B-149 (10) - GB-154	Always	⩽ 1 Ω



OK → **End**

OK → **Repair or replace rear left door lock contact switch ground wire harness**

DTC	/	Only Rear Right Door Lock/Unlock Function does not Operate



Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check rear right door lock motor**

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the door lock motor connector.

(c) Apply voltage no less than 12 V to door lock motor, and check if door lock operates.

NG → **Replace rear right door lock motor**

OK

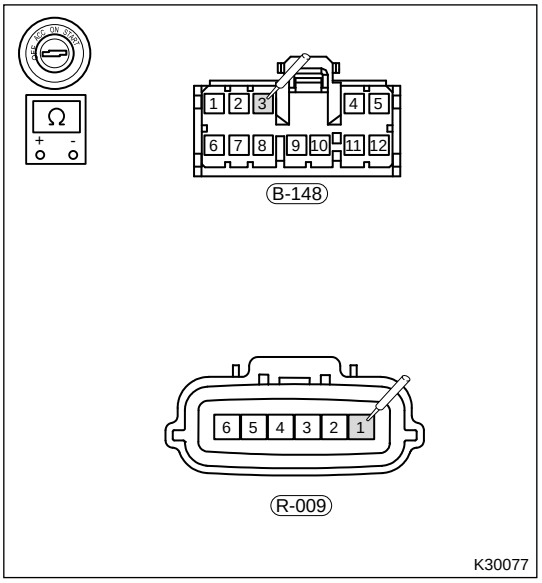
2	**Check rear right door lock motor and wire harness connector**

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the negative battery cable.

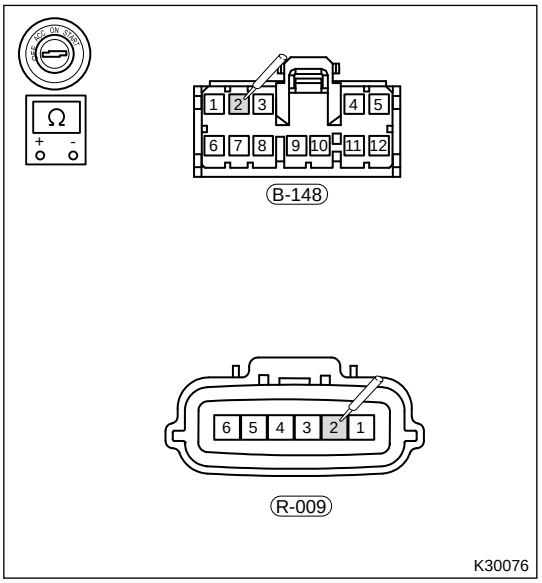
(c) Using ohm band of multimeter, check for continuity between rear right door lock connector R-009 (1) and BCM connector B-148 (3).

Multimeter Connection	Condition	Specified Condition
R-009 (1) - B-148 (3)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



(d) Using ohm band of multimeter, check for continuity between rear right door lock connector R-009 (2) and BCM connector B-148 (2).

Multimeter Connection	Condition	Specified Condition
R-009 (2)- B-148 (2)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



NG → **Repair or replace rear right door lock related wire harness**

OK →

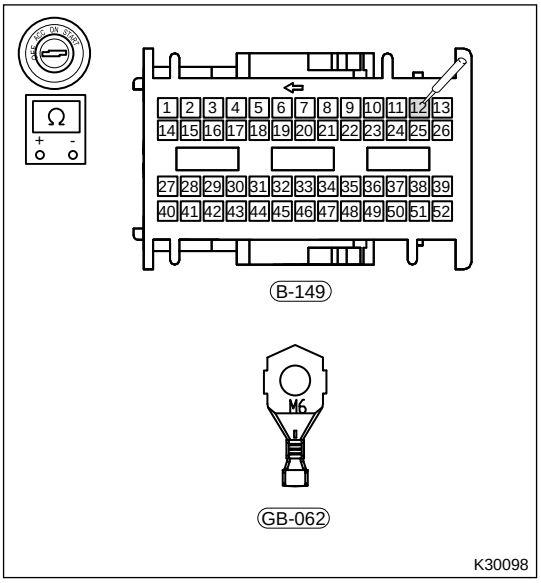
3	Check rear right door lock contact switch signal circuit

(a) Turn ENGINE START STOP switch to “OFF”.

(b) Disconnect the BCM connector B-149.

(c) Using ohm band of multimeter, check for continuity between B-149 (12) terminal and rear right door contact switch ground point GB-062.

Multimeter Connection	Condition	Specified Condition
B-149 (12) - GB-062	Always	⩽ 1 Ω

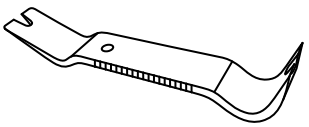
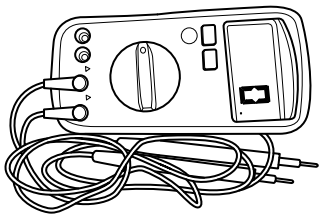


OK	**End**
OK	**Repair or replace rear right door lock contact switch ground wire harness**

5 On-Vehicle Service

5.1 Tools

■ **General Tools**

Tool Name	Tool Drawing
Interior Crow Plate	 S00020
Digital multimeter	 S00002

5.2 Replacement of Engine Hood Lock Assembly

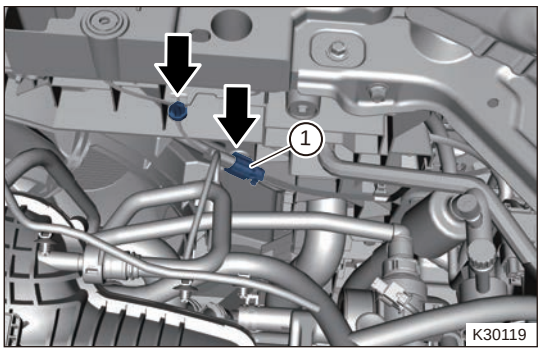
■ Removal

⚠ Warning

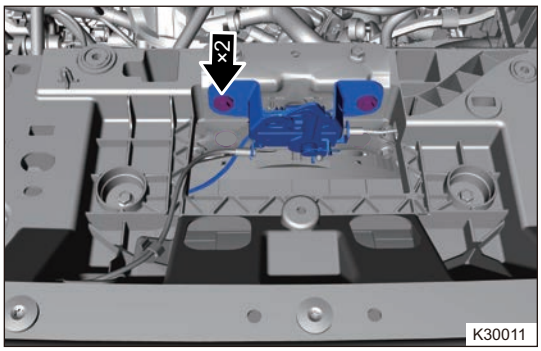
- **Be sure to wear necessary safety equipment to prevent accidents, when removing engine hood lock assembly.**
- **Try to prevent body paint surface from being scratched, when removing engine hood lock assembly.**

(1) Remove the engine compartment trim cover assembly.

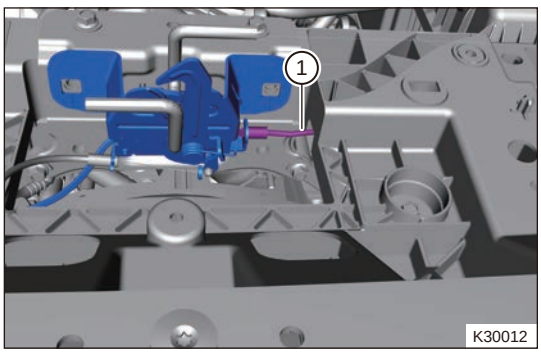
(2) Disconnect connector (1) from engine hood lock assembly, and remove 2 fixing clips from engine hood lock.



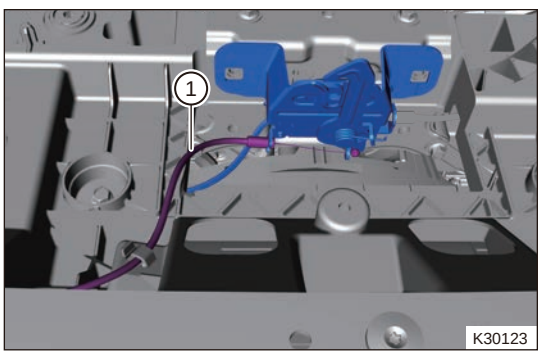
(3) Remove 2 fixing bolts from engine hood lock assembly.



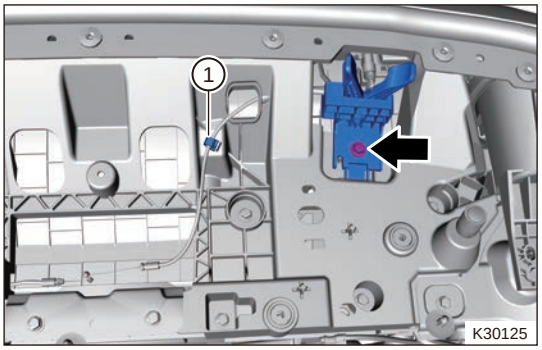
(4) Release clip, disengage engine hood lock cable assembly (1) from slot.



(5) Release clip, disengage engine hood secondary lock cable assembly (1) from slot and remove engine hood lock assembly.



(6) Release clip, disengage engine hood secondary lock cable assembly (1) from slot and remove 1 fixing bolt from engine hood secondary lock opening mechanism assembly.



(7) Remove the engine hood secondary lock opening mechanism assembly.

■ **Inspection**

(1) Check if engine hood lock operates properly.

(2) Check if engine hood secondary lock assembly operates properly.

■ **Installation**

⚠ Caution

- **Check if engine hood lock operates properly after installing engine hood lock assembly.**
- **Be sure to install it in place, otherwise, there will be a risk of falling off.**

(1) Install engine hood secondary lock opening assembly, install and tighten 1 fixing bolt to engine hood secondary lock opening mechanism assembly.

Torque: 10 ± 1.5 N·m

(2) Connect engine hood secondary lock cable to engine hood lock, and secure engine hood secondary lock cable clip.

(3) Connect engine hood lock cable to engine hood lock and secure clip.

(4) Install and tighten 2 fixing bolts to engine hood lock assembly (10# socket wrench).

Torque: 10 ± 1.5 N·m

(5) Connect the engine hood lock assembly connector.

5.3 Replacement of Engine Hood Cable Assembly

■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing engine hood cable assembly.**
- **Try to prevent interior and body paint from being scratched, when removing engine hood cable assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the engine compartment trim cover assembly.

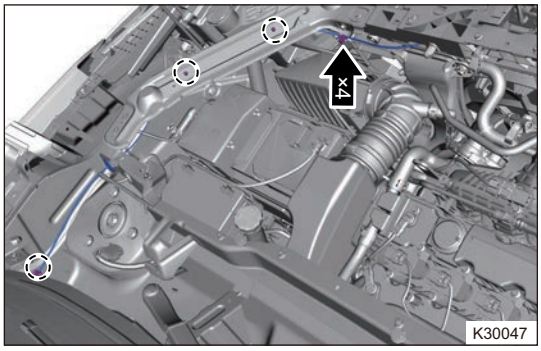
(4) Remove the wing assembly.

(5) Remove the front windshield lower trim board assembly.

(6) Remove the front wiper motor and connecting rod assembly.

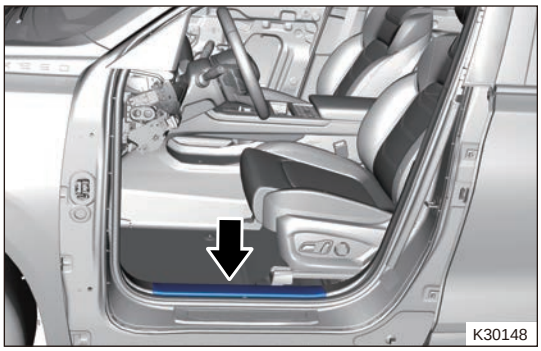
(7) Remove the engine hood lock assembly.

(8) Disengage 4 fixing clips from engine hood cable assembly.

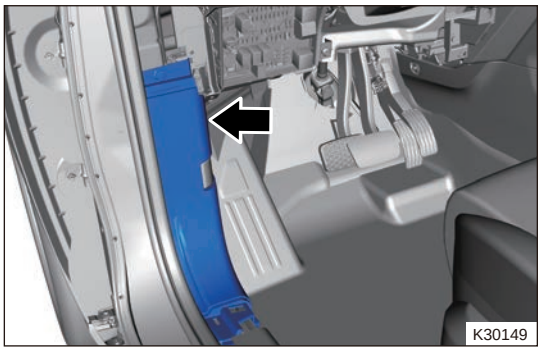


(9) Remove the instrument panel lower left protector assembly.

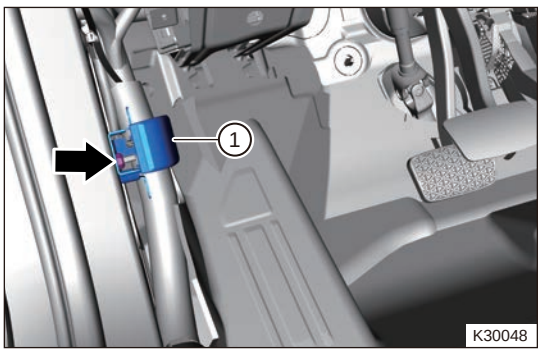
(10) Remove the front left doorsill pedal body assembly.



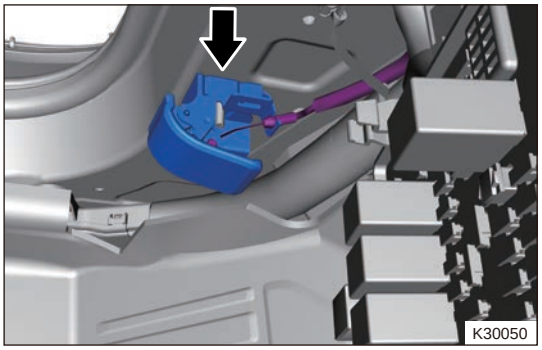
(11) Remove the left A-pillar lower protector body assembly.



(12) Remove 1 fixing bolt from engine hood lock cable release handle assembly, and remove engine hood lock cable release handle assembly (1) from cable.



(13) Disengage engine hood cable and engine hood lock cable release handle assembly.



(14) Remove the engine hood cable assembly.

■ **Inspection**

(1) Check if engine hood cable is stuck in back and forth movement.

(2) Check if fixing clip on engine hood cable is complete.

■ **Installation**

⚠ Caution

- **Check if engine hood lock operates properly after installing engine hood lock.**
- **Be careful not to install cable with anti-misoperation mark reversed.**
- **Be sure to clamp in place, otherwise, there will be a risk of falling off.**

(1) Install the engine hood cable assembly to a proper position.

(2) Connect engine hood cable and engine hood lock cable release handle assembly.

(3) Install engine hood lock cable release handle assembly, install and tighten1 fixing bolt to engine hood lock cable release handle assembly.

Torque: 9 ± 1 N·m

(4) Install 4 fixing clips to engine hood cable assembly.

(5) Install the left A-pillar lower protector body assembly.

(6) Install the front left doorsill pedal body assembly.

(7) Install the instrument panel lower left protector assembly.

(8) Install fixing clip to engine hood cable assembly.

(9) Install the engine hood lock assembly.

(10) Install the front wiper motor and connecting rod assembly.

(11) Install the front windshield lower trim board assembly.

(12) Install the wing assembly.

(13) Install the engine compartment trim cover assembly.

(14) Connect the negative battery cable.

5.4 Replacement of Front Door Lock Assembly

■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing front door lock assembly.**
- **Try to prevent interior and body paint surface from being scratched, when removing front door lock assembly.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

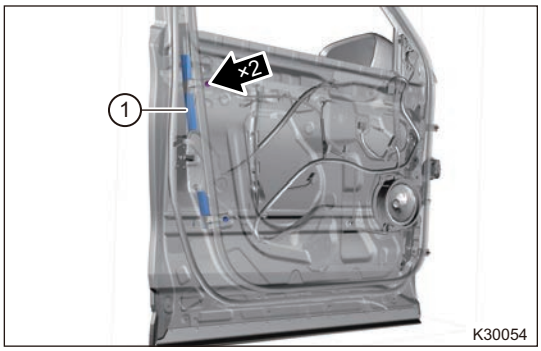
(2) Disconnect the negative battery cable.

(3) Remove the front left door protector assembly.

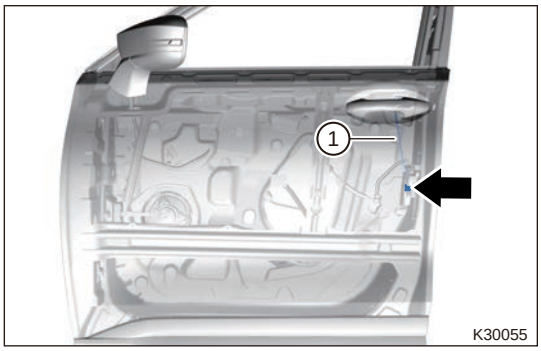
(4) Remove the door control module assembly.

(5) Remove the front left door protective film assembly.

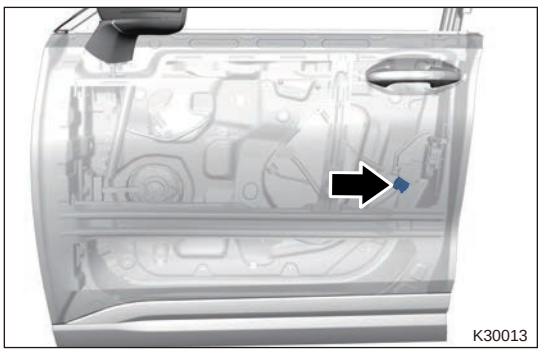
(6) Remove 2 fixing bolts from rear left side of front left door glass guide rail, and move away glass guide rail (1).



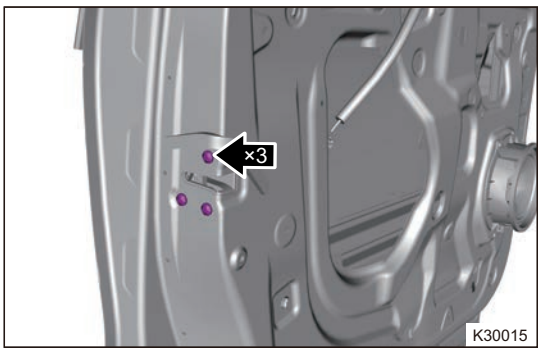
(7) Remove clip and front left door outside handle rod assembly (1).



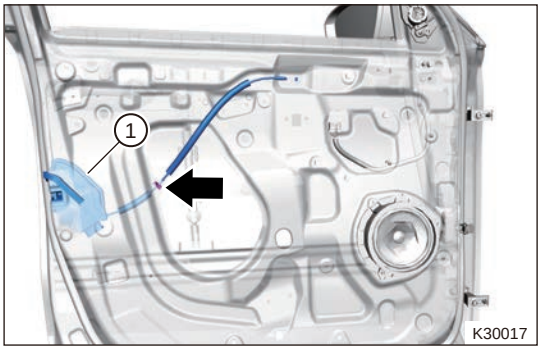
(8) Disconnect connector from front left door lock assembly.



(9) Remove 3 fixing bolts from door lock assembly.



(10) Pry off inside handle cable fixing clip with interior crow plate, and remove front left door lock assembly (1).



■ Inspection

(1) Check if front left door lock is stuck during opening and closing.

(2) Check if appearance of front left door lock is complete.

■ Installation

⚠ Caution

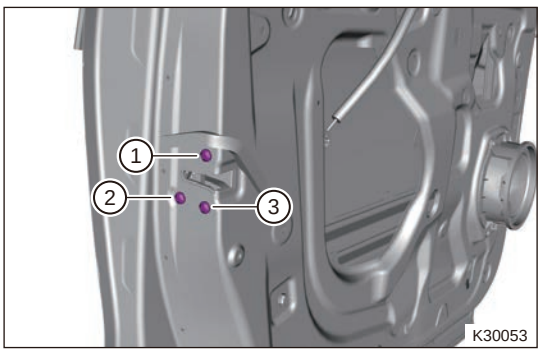
- **Check if connector is installed correctly, when installing front door lock assembly.**
- **Install clips and cables in place, when installing front door lock assembly.**
- **Check if front door lock operates properly, after installing front door lock assembly.**

(1) Check if cable on lock body is stuck in place before installing, evenly apply appropriate amount of thread lock adhesive to 5 to 7 teeth of 3 door lock mounting bolts in advance.

(2) Put assembled front left door lock module into the installation position through front left door inner panel with one hand, place key cylinder lever well, and take out handle end of cable from inner panel.

(3) Pretighten bolts to door inner panel in the order of ①, ②, ③ in direction of arrow as shown in illustration with the other hand (screw in 2 to 3 teeth) and be careful not to fully tighten it. Then tighten mounting bolts of door lock with a tool in the order of ①, ②, ③.

Torque: 9.5 ± 1 N·m



(4) Clamp outside push rod into corresponding clip on lock body. When clamping sound is heard, it indicates that it is clamped in place. Continue to press clip to reconfirm if it is clamped in place.

(5) Clamp key cylinder lever into clip on key cylinder. When clamping sound is heard, it indicates that it is clamped in place. Continue to press clip to reconfirm if it is clamped in place.

(6) Connect wire harness connector to the corresponding lock body connector (the number of pins inside different connectors of lock body is different, and only the corresponding wire harness connector can be inserted).

(7) Secure inner cable to fixing part on door panel with a fixing clip.

(8) Install front left door glass guide rail, then install and tighten 2 fixing bolts.

(9) Install the front left door protective film assembly.

(10) Install the front left door inner protector assembly.

(11) Connect the negative battery cable.

5.5 Replacement of Front Door Key Cylinder Assembly

■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing front door key cylinder assembly.**
- **Try to prevent body paint surface from being scratched, when removing front door key cylinder assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

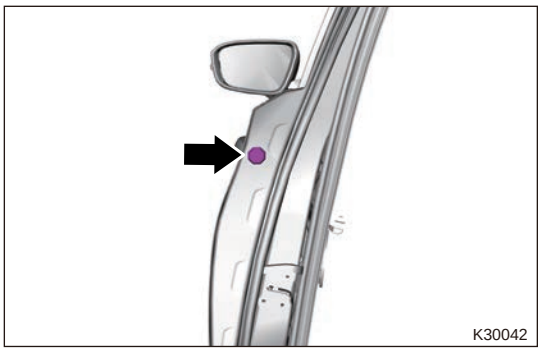
(2) Disconnect the negative battery cable.

(3) Remove the front left door protector assembly.

(4) Remove the door control module assembly.

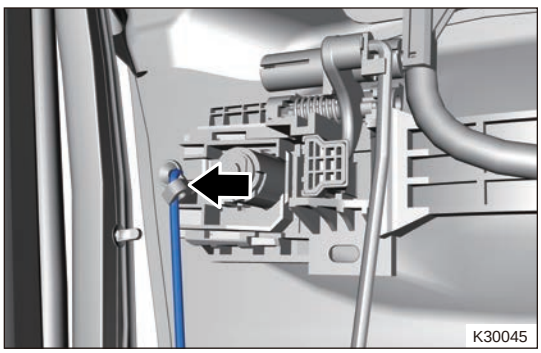
(5) Remove the front left door protective film assembly.

(6) Remove the front door outside handle protective cover block cover.

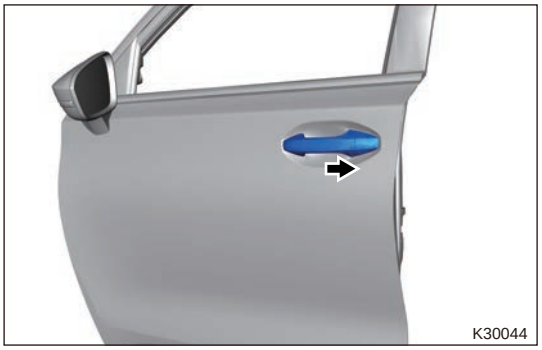


(7) Loosen 1 fixing screw from front door outside handle.

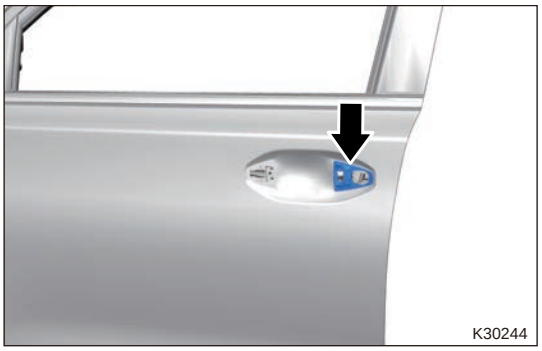
(8) Disengage the key cylinder lever.



(9) Slide and pull the front door outside handle in direction of arrow to remove it.



(10) Remove the outside handle gasket.



(11) Remove the key cylinder assembly.

■ **Installation**

⚠ Caution

- **Install clip on lever in place when installing front door key cylinder assembly.**
- **Check if front door key cylinder operates properly, after installing front door key cylinder assembly.**

(1) Install key cylinder assembly to a proper position on door.
(2) Install the outside handle gasket.
(3) Install the key cylinder lever.
(4) Install the front door outside handle.
(5) Install 1 fixing screw to front door outside handle.
Torque: 5 ± 1 N·m
(6) Install the front door outside handle protective cover block cover.
(7) Install the front left door protective film assembly.
(8) Install the door control module assembly.
(9) Install the front left door protector assembly.
(10) Connect the negative battery cable.

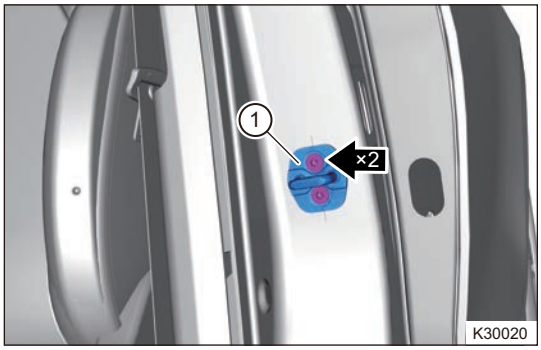
5.6 Replacement of Front Door Lock Striker

■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing front door lock striker assembly.**
- **Try to prevent body paint surface from being scratched, when removing front door lock striker assembly.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Remove 2 fixing screws from front door lock striker assembly, and remove front left door lock striker assembly (1).



■ **Installation**

⚠ Caution

- **After installing lock striker to body, make left side of lettering face up and right side face down.**

(1) Install lock striker to quarter with screw, pay attention to align middle line of lock striker with line on quarter, and then pretighten bolt.

Torque: 2.5 ± 1 N·m

(2) After lock striker position is adjusted, ensure that lock cylinder of lock striker is engaged with lock body in the center line of lock mouth, so as to ensure that the door can be normally opened and closed, finally, tighten it.

Torque: 2.5 ± 1 N·m

5.7 Replacement of Rear Left Door Lock Assembly

■ **Removal**

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear door lock assembly.**
- **Try to prevent interior and body paint surface from being scratched, when removing rear door lock assembly.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

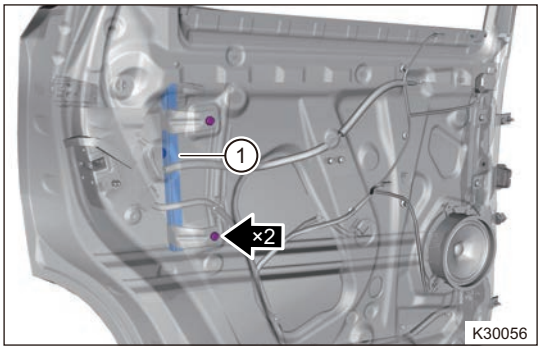
(2) Disconnect the negative battery cable.

(3) Remove the rear left door protector assembly.

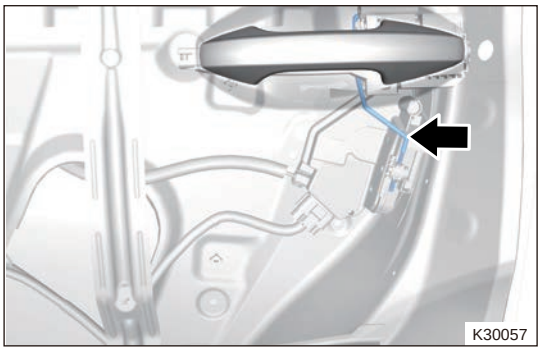
(4) Remove the rear left door handle metal bracket.

(5) Remove the rear left door protective film assembly.

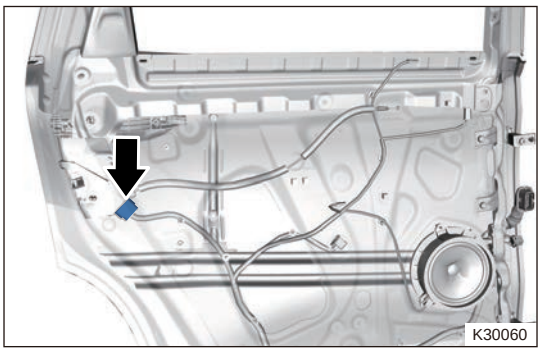
(6) Remove 2 fixing bolts from rear left door rear glass guide rail assembly, and move away glass guide rail assembly (1).



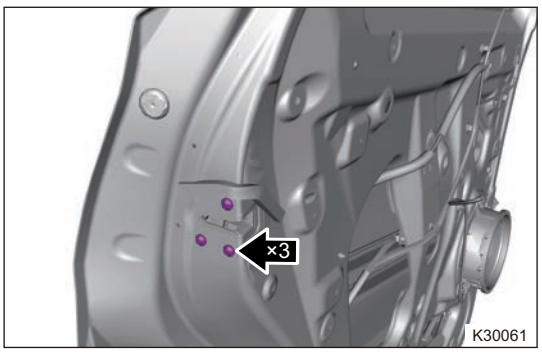
(7) Remove the rear left door outside handle lever.



(8) Disconnect connector from rear door lock assembly.



(9) Remove 3 fixing screws from rear door lock assembly, and remove rear door lock assembly.



■ Installation

⚠ Caution

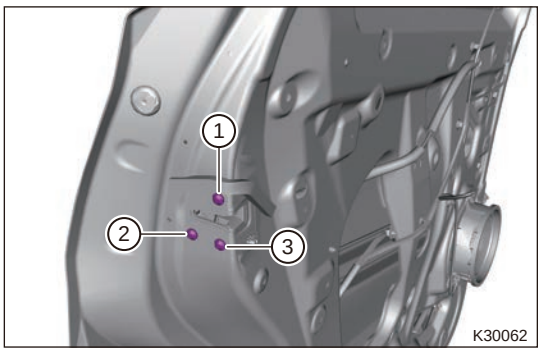
- **Check if connector is installed correctly, when installing rear door lock assembly.**
- **Install clips and cables in place, when installing rear door lock assembly.**
- **Check if rear door lock operates properly, after installing rear door lock assembly.**
- **Pay attention to keep child lock closing when assembling rear door lock.**

(1) Check if cable on lock body is stuck in place before installing, evenly apply appropriate amount of thread lock adhesive to 5 to 7 teeth of 3 door lock mounting bolts in advance.

(2) Put assembled rear left door lock module into the installation position through rear left door inner panel with one hand, and take out handle end of cable from inner panel.

(3) Pretighten bolts to door inner panel in the order of ①, ②, ③ in direction of arrow as shown in illustration with the other hand (screw in 2 to 3 teeth) and be careful not to fully tighten it. Then tighten mounting bolts on door lock with a tool in the order of ①, ②, ③.

Torque: 9 ± 1 N·m



(4) Clamp outside push rod into corresponding clip on lock body. When clamping sound is heard, it indicates that it is clamped in place. Continue to press clip to reconfirm if it is clamped in place.

(5) Connect wire harness connector to corresponding connector on lock body (the number of pins inside different connectors on lock body is different, and only the corresponding wire harness connector can be inserted).

(6) Secure inner cable to fixing part on door panel with a fixing clip.

(7) Install the rear left door glass rear guide rail assembly.

(8) Install the rear left door protective film assembly.

(9) Install the rear left door handle metal bracket.

(10) Install the rear left door protector assembly.

(11) Connect the negative battery cable.

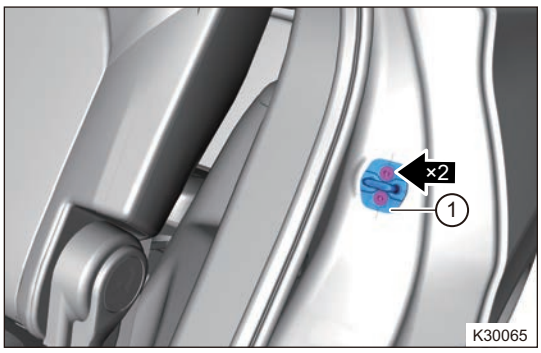
5.8 Replacement of Rear Door Lock Striker

■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear door lock striker.**
- **Try to prevent body paint surface from being scratched, when removing rear door lock striker.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Remove 2 fixing screws from rear door lock striker, and remove rear door lock striker assembly (1).



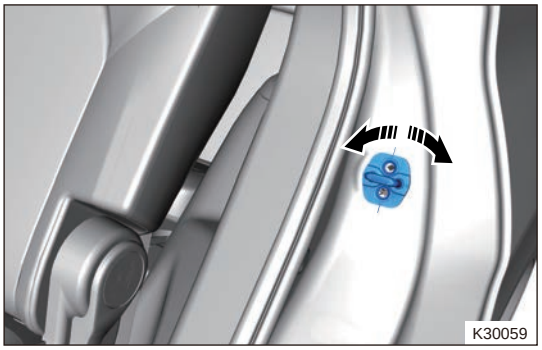
■ Installation

⚠ Caution

- **After installing lock striker to body, make left side of lettering face up and right side face down.**

(1) Install lock striker to quarter with screw, pay attention to align middle line of lock striker with line on quarter, and then pretighten bolt.

Torque: 2.5 ± 1 N·m



(2) After lock striker position is adjusted, ensure that lock cylinder of lock striker is engaged with lock body in the center line of lock mouth, so as to ensure that the door can be normally opened and closed, finally, tighten it.

Torque: 23 ± 2 N·m

5.9 Replacement of Rear Left Door Outside Handle Assembly

■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing rear left door outside handle assembly.**
- **Try to prevent interior and body paint surface from being scratched, when removing rear left door outside handle assembly.**

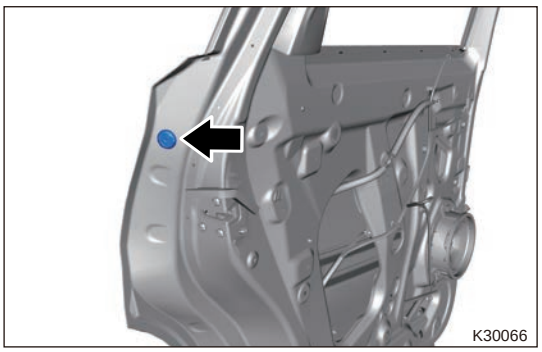
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

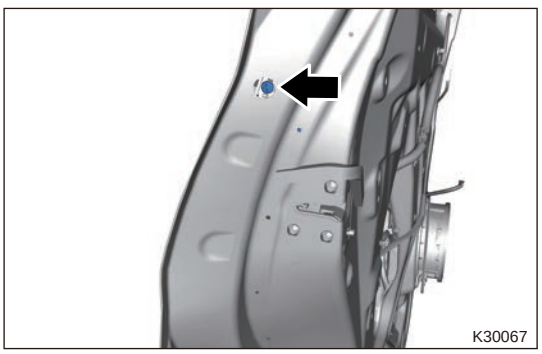
(3) Remove the rear left door protector assembly.

(4) Remove the rear left door protective film assembly.

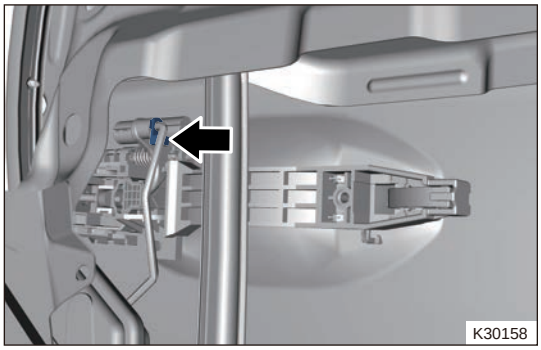
(5) Remove the rear left door outside handle protective cover block cover.



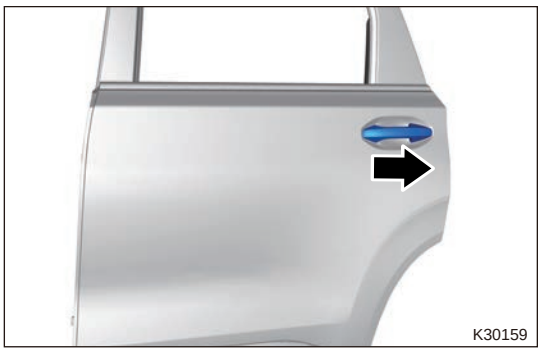
(6) Loosen 1 fixing screw from rear left door outside handle.



(7) Disengage the outside handle lever.



(8) Slide and pull the rear left door outside handle in direction of arrow to remove it.



■ **Installation**

⚠ Caution

- **Install clip on lever in place when installing rear left door outside handle assembly.**
- **Check if rear left door key cylinder operates properly after installing rear left door outside handle assembly.**

(1) Install the rear left door outside handle.
(2) Install outside handle lever to a proper position on door.
(3) Install 1 fixing screw to rear left door outside handle.
Torque: 5 ± 1 N·m
(4) Install the rear left door outside handle protective cover block cover.
(5) Install the rear left door protective film assembly.
(6) Install the rear left door protector assembly.
(7) Connect the negative battery cable.

5.10 Replacement of Back Door Lock Assembly

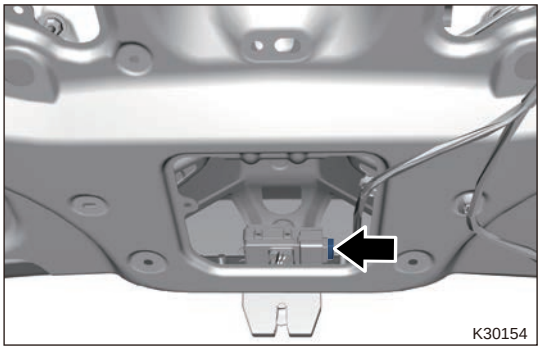
■ **Removal**

⚠ Warning

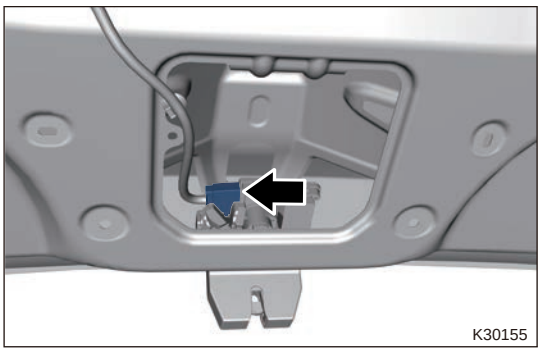
- **Be sure to wear necessary safety equipment to prevent accidents, when removing back door lock assembly.**
- **Try to prevent interior and body paint from being scratched, when removing back door lock assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the back door lower protector assembly.

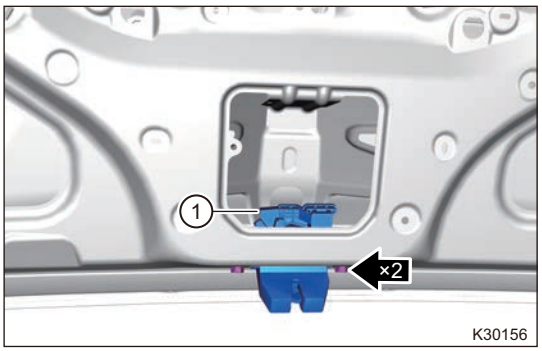
(4) Disconnect connector from back door lock assembly (low configuration).



(5) Disconnect connector from back door lock assembly (-high configuration).



(6) Remove 2 fixing bolts from back door lock assembly, and remove back door lock assembly (1).



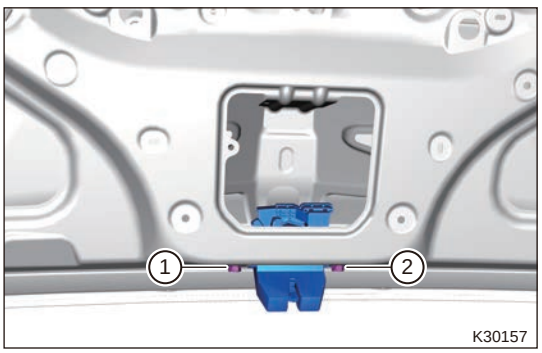
■ Installation

⚠ Caution

- **Check if connector is installed correctly, when installing back door lock assembly.**
- **Check if back door lock assembly operates properly, after installing back door lock assembly.**

(1) Install back door lock assembly to back door sheet metal with 2 bolts (Tighten (1) first, and then tighten (2)).

Torque: 23 ± 2 N·m



(2) Connect connector to back door lock assembly.

(3) Install the back door lower protector assembly.

(4) Connect the negative battery cable.

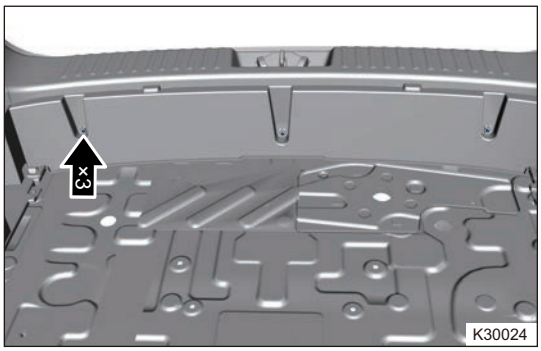
5.11 Replacement of Back Door Lock Striker Assembly

■ Removal

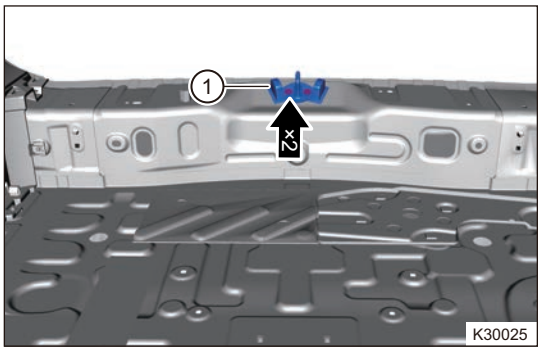
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing back door lock striker assembly.**
- **Try to prevent body paint surface from being scratched, when removing back door lock striker assembly.**

(1) Remove 3 fixing screws from back door protector assembly, and remove back door protector assembly.



(2) Remove 2 fixing screws from back door lock striker assembly, and remove back door lock striker assembly (1).



■ Installation

(1) Install lock striker to rear panel assembly with bolt (first perform visual aligning with line and pre-install according to pre-tightening torque), close back door to check matching condition between lock and lock body, if back door is difficult to close, adjust lock striker (adjustment amount: ± 2 mm in Y direction, ± 3 mm in Z direction) until matching surface between lock body and lock striker meets the difference and clearance requirements (no obvious door opening noise), and then tighten bolts.

Torque: 23 ± 2 N·m

(2) Install back door protector assembly, install and tighten 3 fixing screws.

5.12 Replacement of Central Control Lock Switch

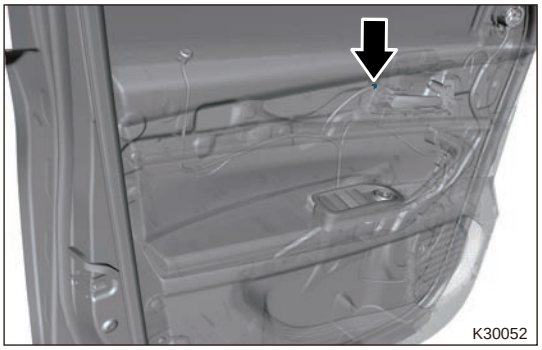
■ Removal

⚠ Warning

- **Be sure to wear safety equipment to prevent accidents, when removing central control lock switch assembly.**
- **Try to prevent interior from being scratched, when removing central control lock switch assembly.**

(1) Remove the front left door protector assembly.

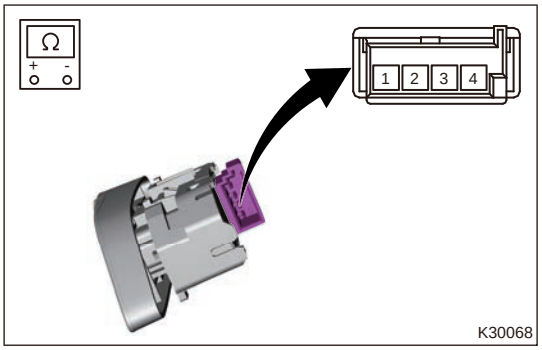
(2) Press and push switch from back.



■ **Inspection**

(1) Using ohm band of digital multimeter, measure central control lock switch terminal.

Multimeter Connection	Switch Condition	Specified Condition
Terminal 1 - Terminal 3	Press to lock	⩽ 1 Ω
Terminal 1 - Terminal 4	Press to unlock	⩽ 1 Ω



(2) If measurement result is not as specified, replace central control lock switch.

■ **Installation**

(1) Install central control lock switch assembly to a proper position on door, and connect central control lock switch connector.
(2) Install the front left door protector assembly.

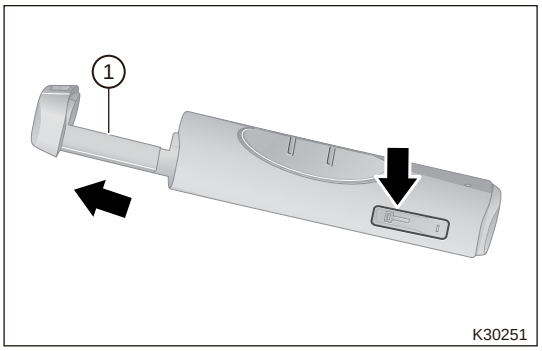
5.13 Replacement of Smart Key Battery

■ **Removal**

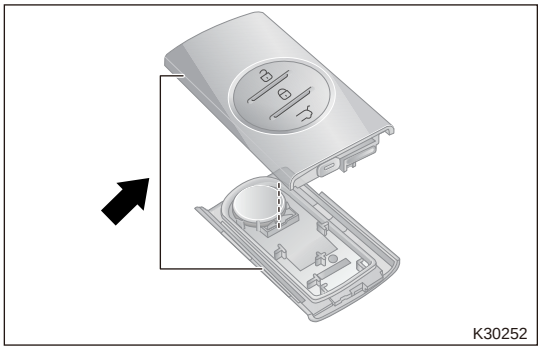
⚠ Warning

- **DO NOT push the terminals with your hands, when removing smart key cover.**
- **Make sure battery positive and negative are installed correctly, when removing smart key cover.**
- **DO NOT pry up battery forcibly, after removing smart key cover. Otherwise, terminals may be damaged.**
- **DO NOT touch battery with wet hands, after removing smart key cover. Otherwise, water may cause rust.**
- **DO NOT touch or move any components inside transmitter, after removing smart key cover. Failure to do so may interfere with proper operation.**

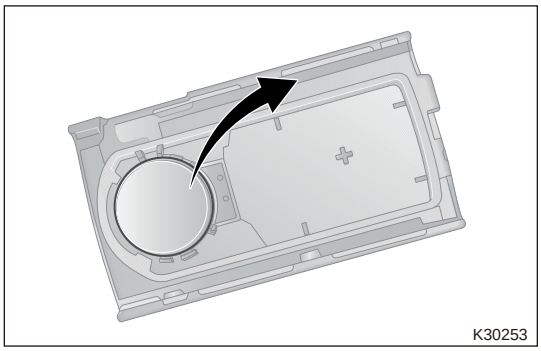
(1) Press release button (arrow) and remove mechanical key (1).



(2) Separate smart key cover with a flat tip screwdriver wrapped with protective tape.



(3) Remove battery from battery holder, and then install new battery with positive (+) facing up.



■ **Installation**

⚠ Caution

- **Check that smart key operates properly, after installing wireless key.**

(1) Install new key to battery holder with positive facing up.

(2) Assemble the smart key cover.

(3) Install the mechanical key.

12.7 DOOR

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) When removing front door assembly, an assistant is needed to hold it, to prevent front door from falling down during operation, resulting in accidents.

(2) When removing rear door assembly, an assistant is needed to hold it, prevent rear door from falling down during operation, resulting in accidents.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Replace damaged clips and install front door inner protector assembly in place, when installing inner protector assembly.

(2) Install connectors in place, when installing inner protector assembly.

(3) Check that each function can operate properly, after installing inner protector assembly.

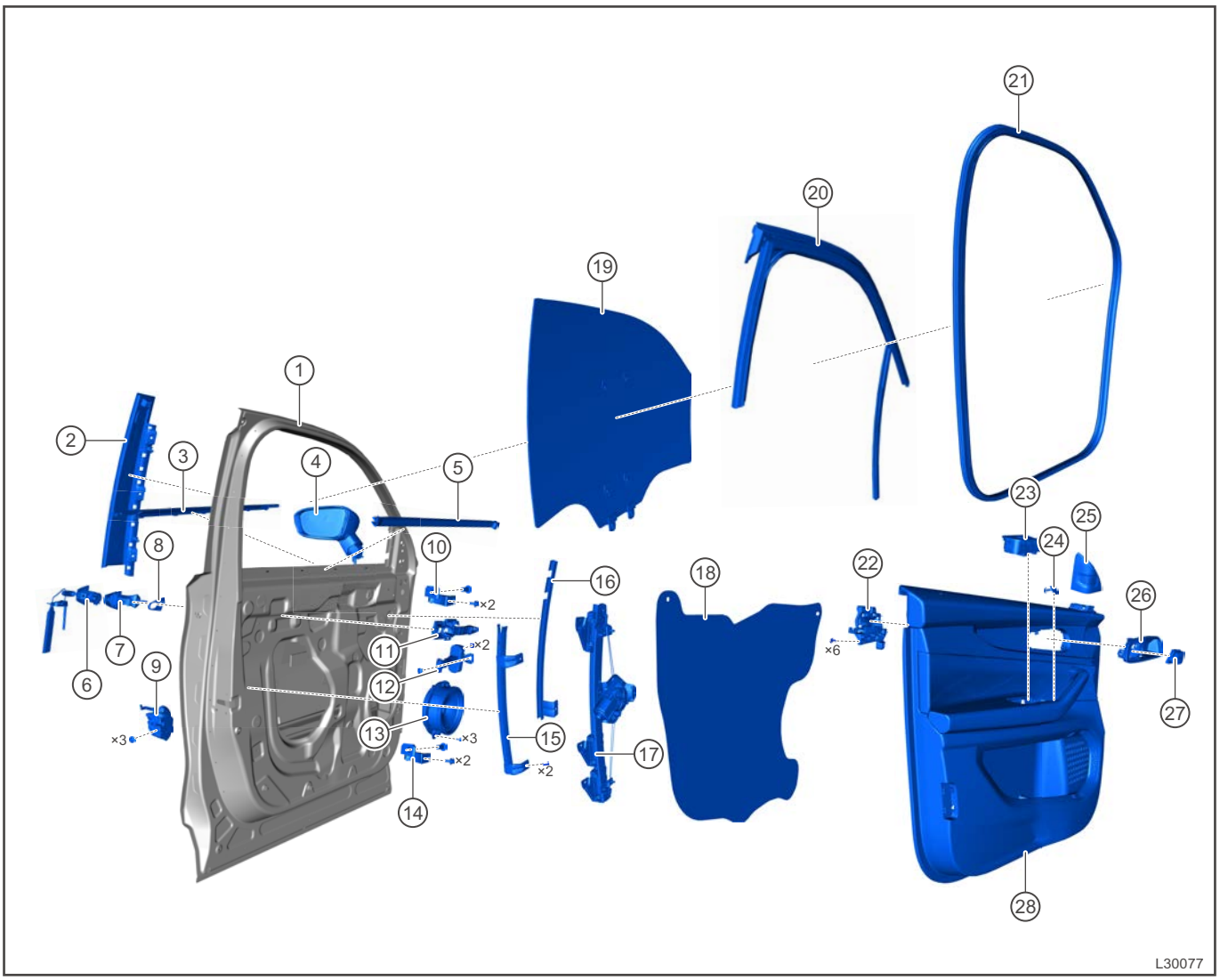
2 System Overview

2.1 System Description

Doors provide driver and passengers with access to and from vehicles, and insulate the outside interference, reduce the side impact to a certain extent, thus protecting passenger. Aesthetic of vehicle is also related to the door modeling. The quality of doors is mainly reflected in anti-collision performance, sealing performance and opening & closing convenience of doors, of course, and there are other usage function targets, etc. Anti-collision performance is particularly important, as when vehicle is involved in a side collision, it is easy to cause inside personal injury due to the very short buffer distance.

2.2 System Components Diagram

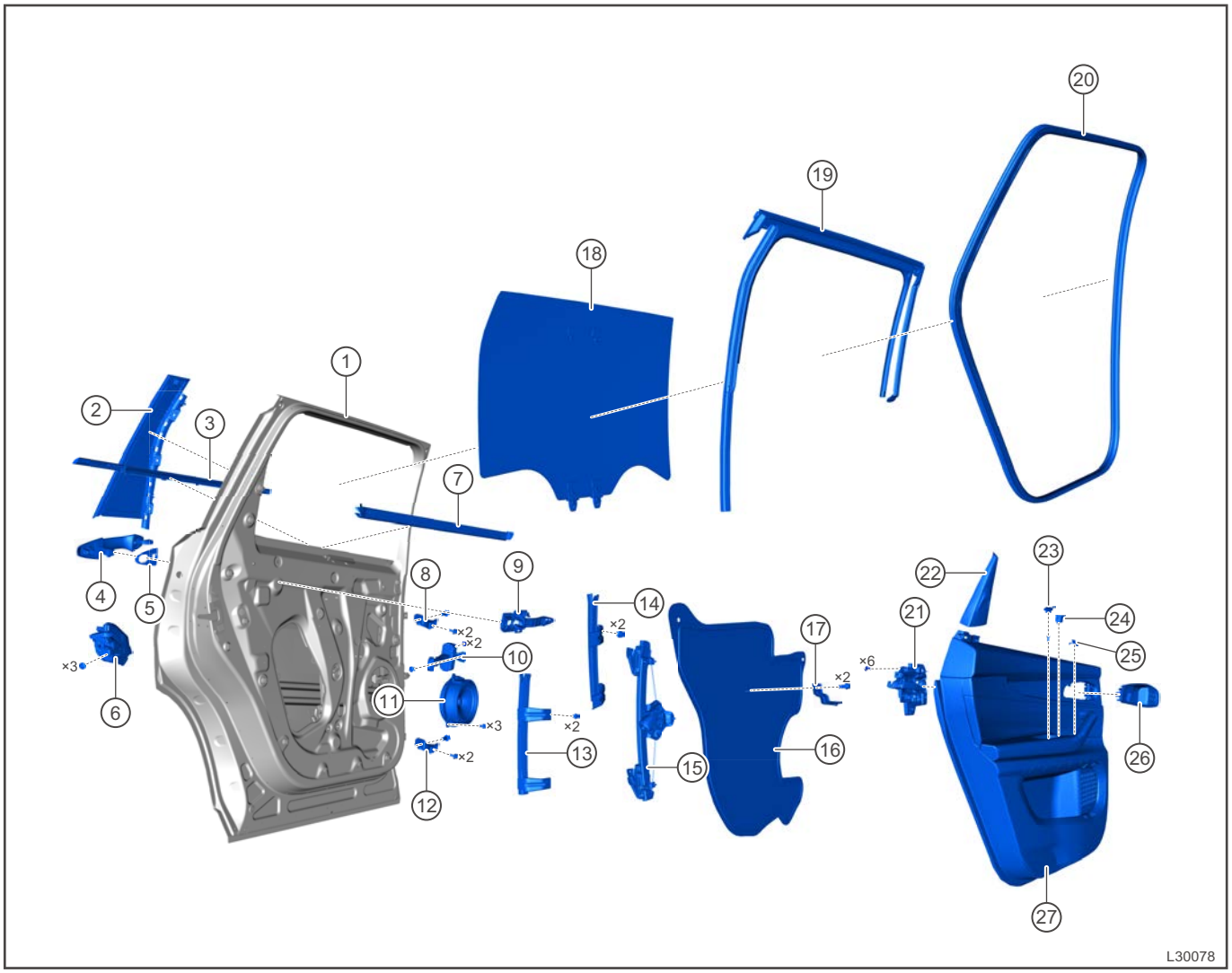
Front Door Assembly



1	Front Left Door Assembly	15	Front Left Door Glass Guide Rail
2	Front Left Door Cover Plate	16	Front Left Door Glass Run
3	Front Left Door Outer Weatherstrip	17	Front Left Door Glass Regulator Assembly
4	Left Rear View Mirror	18	Front Left Door Protective Film Assembly
5	Front Left Door Inner Weatherstrip	19	Front Left Door Glass Assembly
6	Lock Cylinder Key Assembly	20	Front Left Door Weather Bar
7	Front Left Door Outside Handle	21	Front Left Door Frame Weatherstrip
8	Outside Handle Rear Gasket	22	Front Left Door Inside Handle Assembly
9	Front Left Door Lock Assembly	23	Front Left Door Glass Regulator Switch Assembly
10	Front Left Door Upper Hinge Assembly	24	Block Cover
11	Front Left Door Outside Handle Seat Assembly	25	Front Left Door Inner Triangular Block Assembly
12	Front Left Door Check Assembly	26	Front Left Door Inside Handle Protective Cover

13	Front Left Door Woofer	27	Central Control Lock Assembly
14	Front Left Door Lower Hinge Assembly	28	Front Left Door Protector Assembly

Rear Door Assembly



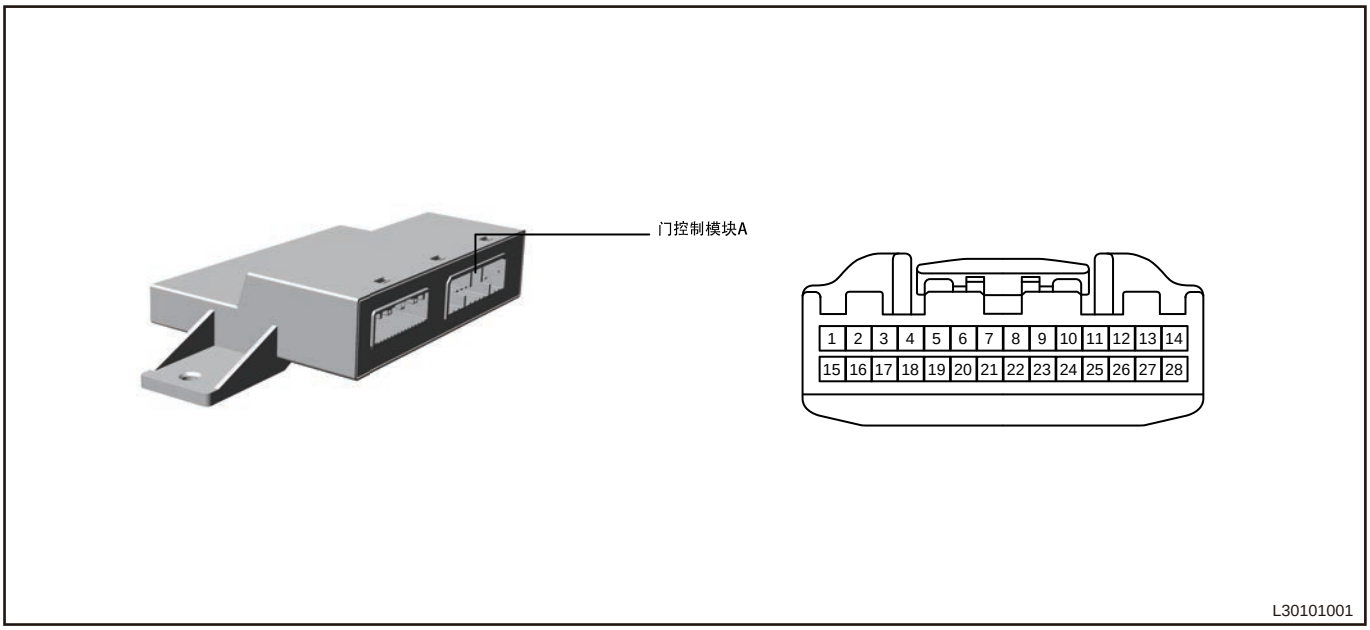
1	Rear Left Door Assembly	15	Rear Left Door Glass Regulator Assembly
2	Rear Left Door Cover Plate	16	Rear Left Door Protective Film Assembly
3	Rear Left Door Outer Weatherstrip	17	Rear Left Door Armrest Bracket
4	Rear Left Door Outside Handle	18	Rear Left Door Glass Assembly
5	Outside Handle Rear Gasket	19	Rear Left Door Weather Bar
6	Rear Left Door Lock Assembly	20	Rear Left Door Frame Weatherstrip
7	Rear Left Door Inner Weatherstrip	21	Rear Left Door Inside Handle Assembly
8	Rear Left Door Upper Hinge Assembly	22	Rear Left Door Inner Triangular Block Assembly
9	Rear Left Door Outside Handle Seat Assembly	23	Protector Screw Cover Plate

10	Rear Left Door Check Assembly	24	Rear Left Door Glass Regulator Switch Assembly
11	Rear Left Door Woofer	25	Screw Cover Plate
12	Rear Left Door Lower Hinge Assembly	26	Rear Left Door Inside Handle Protective Cover
13	Rear Left Door Glass Guide Rail	27	Rear Left Door Protector Assembly
14	Rear Left Door Glass Run		

3 System Schematic Diagram

3.1 Module Terminal Definition

Door Control Module - A

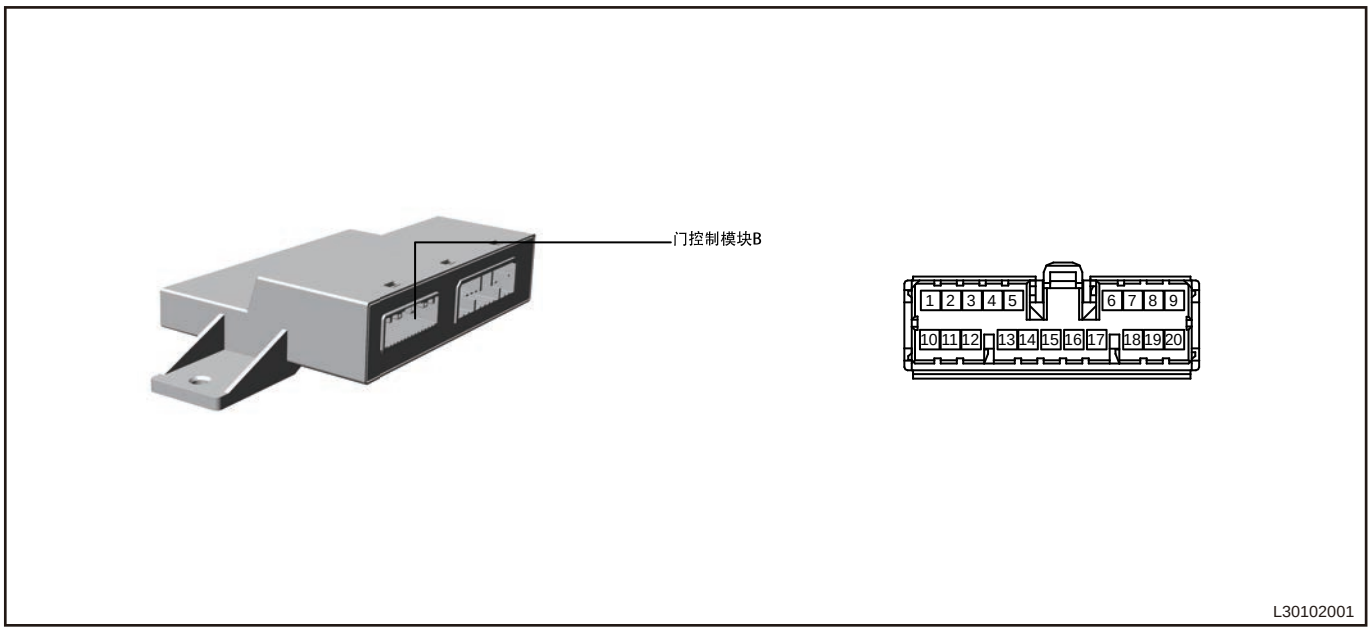


Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A1	Body ground	Driver glass regulator switch	Power supply “ON”	12V
A2	Body ground	Driver glass regulator switch	Power supply “ON”	12V
A3	Body ground	Right rear view mirror upper and lower position signal	Power supply “ON”	With the change of position, the voltage is 0.9 V-4 V from bottom to top
A4	Body ground	Right rear view mirror left and right position signal	Power supply “ON”	With the change of position, the voltage is 1.4 V-3.4 V from left to right
A5	Body ground	Driver (front left) glass regulator switch	Power supply “ON”	12 V with switch not pushed; 3 V with 1st gear pushed; 0 V

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
				with 2nd gear pushed; 9 V with 1st gear pulled up; 6 V with 2nd gear pulled up
A6	Body ground	Driver (front right) glass regulator switch	Power supply “ON”	12 V with switch not pushed; 3 V with 1st gear pushed; 0 V with 2nd gear pushed; 9 V with 1st gear pulled up; 6 V with 2nd gear pulled up
A7	Body ground	IGN power supply	Power supply “ON”	12V
A8	Body ground	Rear view mirror folding input	Power supply “ON”	12 V with switch not pushed; 0 V with switch pushed and held
A9	/	/	/	/
A10	Body ground	Rear view mirror adjustment switch 1	Power supply “ON”	0 V with switch not pushed; 12 V with both left and right sides upwards/ rightwards
A11	Body ground	Rear view mirror adjustment switch 2	Power supply “ON”	0V
A12	Body ground	Rear view mirror adjustment switch 3	Power supply “ON”	7.2 V at left; 0 V with right side not pushed, 12 V with right side leftwards/ downwards
A13	Body ground	Rear view mirror adjustment switch 4	Power supply “ON”	7.2 V at right; 0 V with left side not pushed, 12 V with left side leftwards/ downwards
A14	Body ground	Rear view mirror adjustment switch 5	Power supply “ON”	7.2 V at middle and right side; 0 V with left side not adjusted, 12 V with left side downwards/ rightwards
A15	Body ground	Left rear view mirror upper and lower position signal	Power supply “ON”	With the change of position, the voltage is 1.1 V - 4 V from bottom to top

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
A16	Body ground	Left rear view mirror left and right position signal	Power supply “ON”	With the change of position, the voltage is 1.5V-3.3V from left to right
A17	Body ground	Body CAN_H	Power supply “ON”	2.7V
A18	Body ground	Body CAN_L	Power supply “ON”	2.3V
A19	Body ground	LIN	Power supply “ON”	-
A20	Body ground	GND	Power supply “ON”	0V
A21	Body ground	Sensor ground	Power supply “ON”	0V
A22	/	/	/	/
A23	/	/	/	/
A24	Body ground	Rear view mirror position sensor power supply	Power supply “ON”	5 V
A25	/	/	/	/
A26	Body ground	Central control lock input	Power supply “ON”	12 V with switch not pushed; 0 V with switch pushed
A27	Body ground	Central control unlock input	Power supply “ON”	12 V with switch not pushed; 0 V with switch pushed
A28	Body ground	Driver glass regulator switch backlight	Power supply “ON”	12V

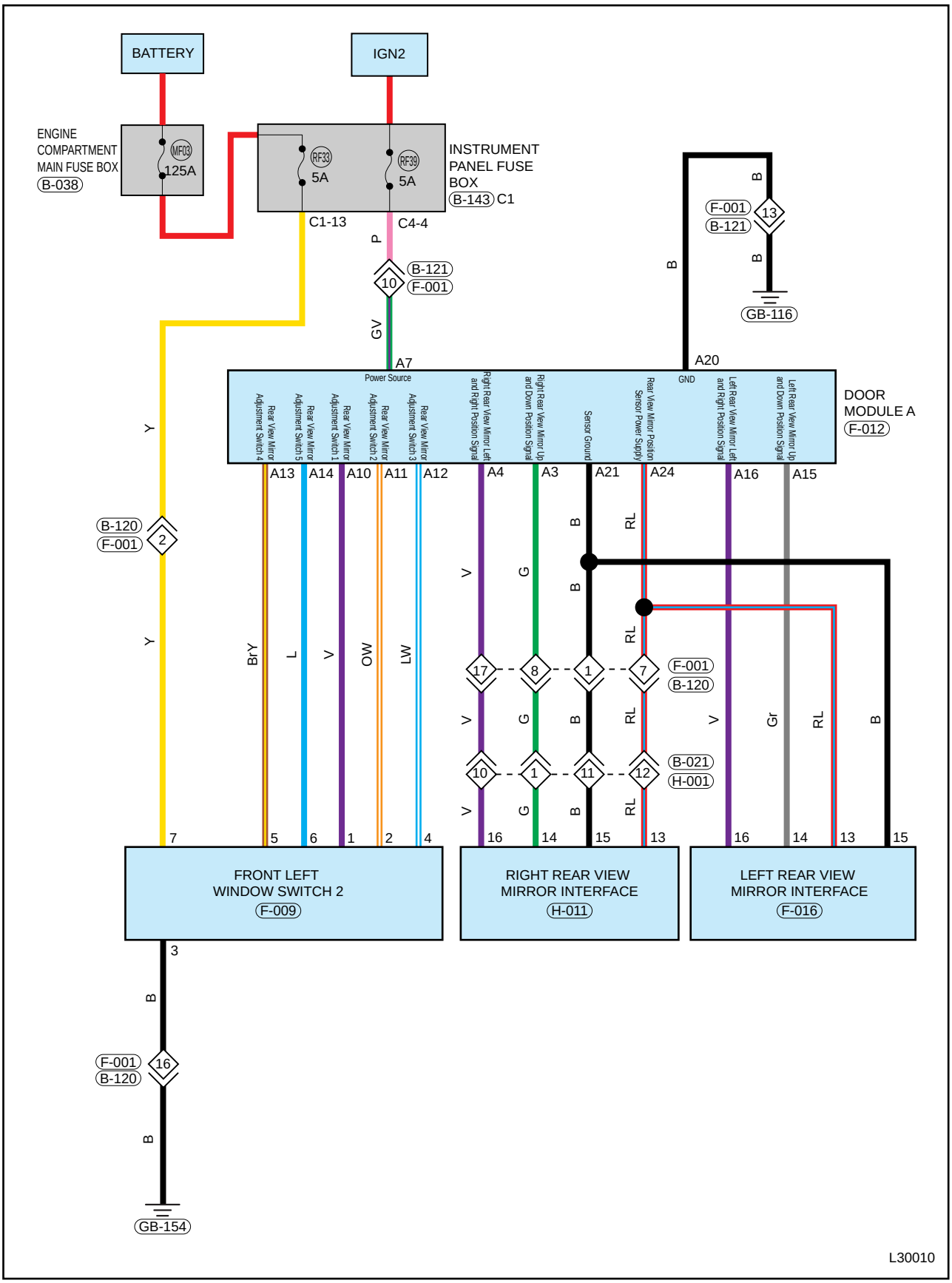
Door Control Module - B

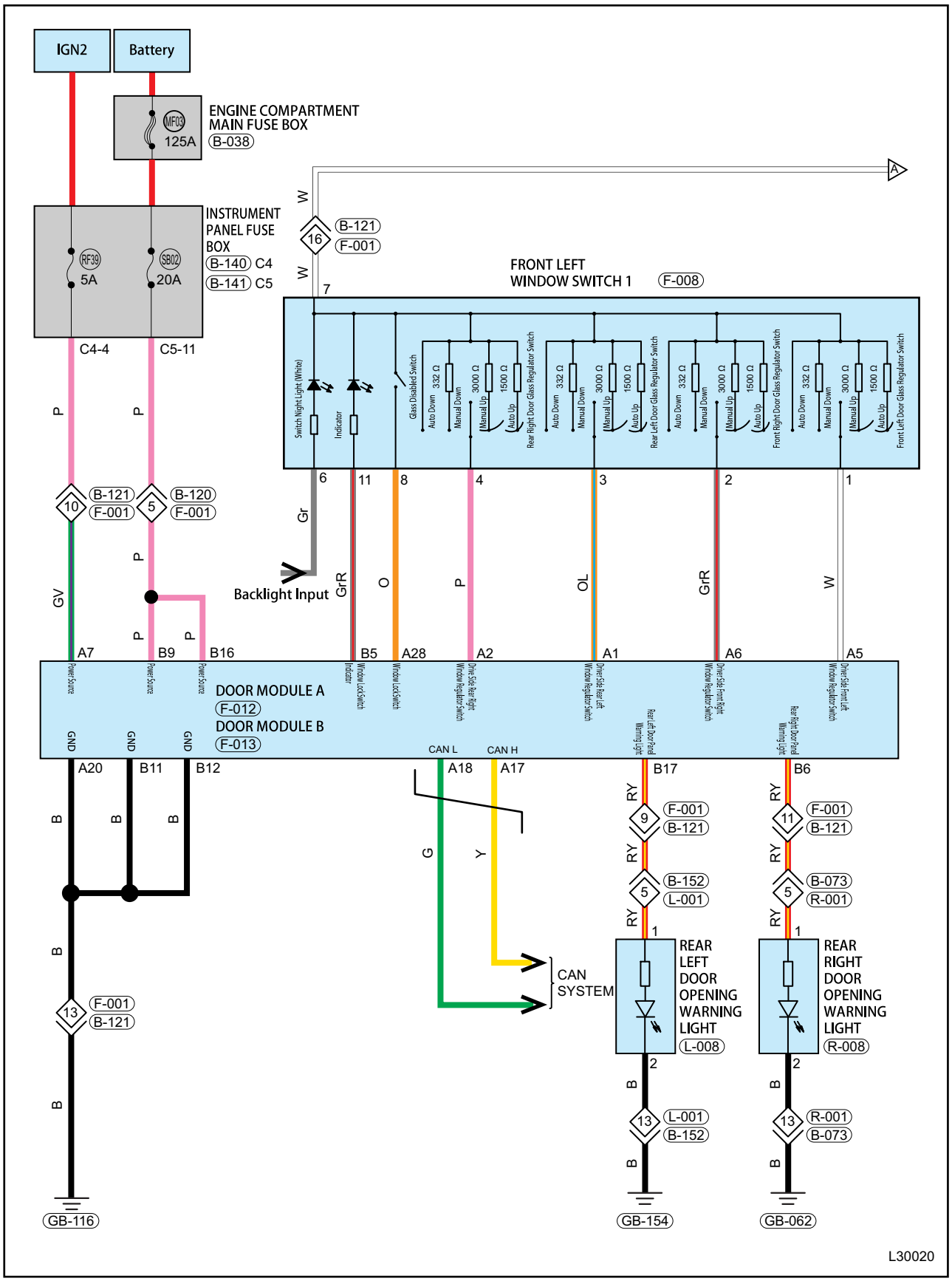


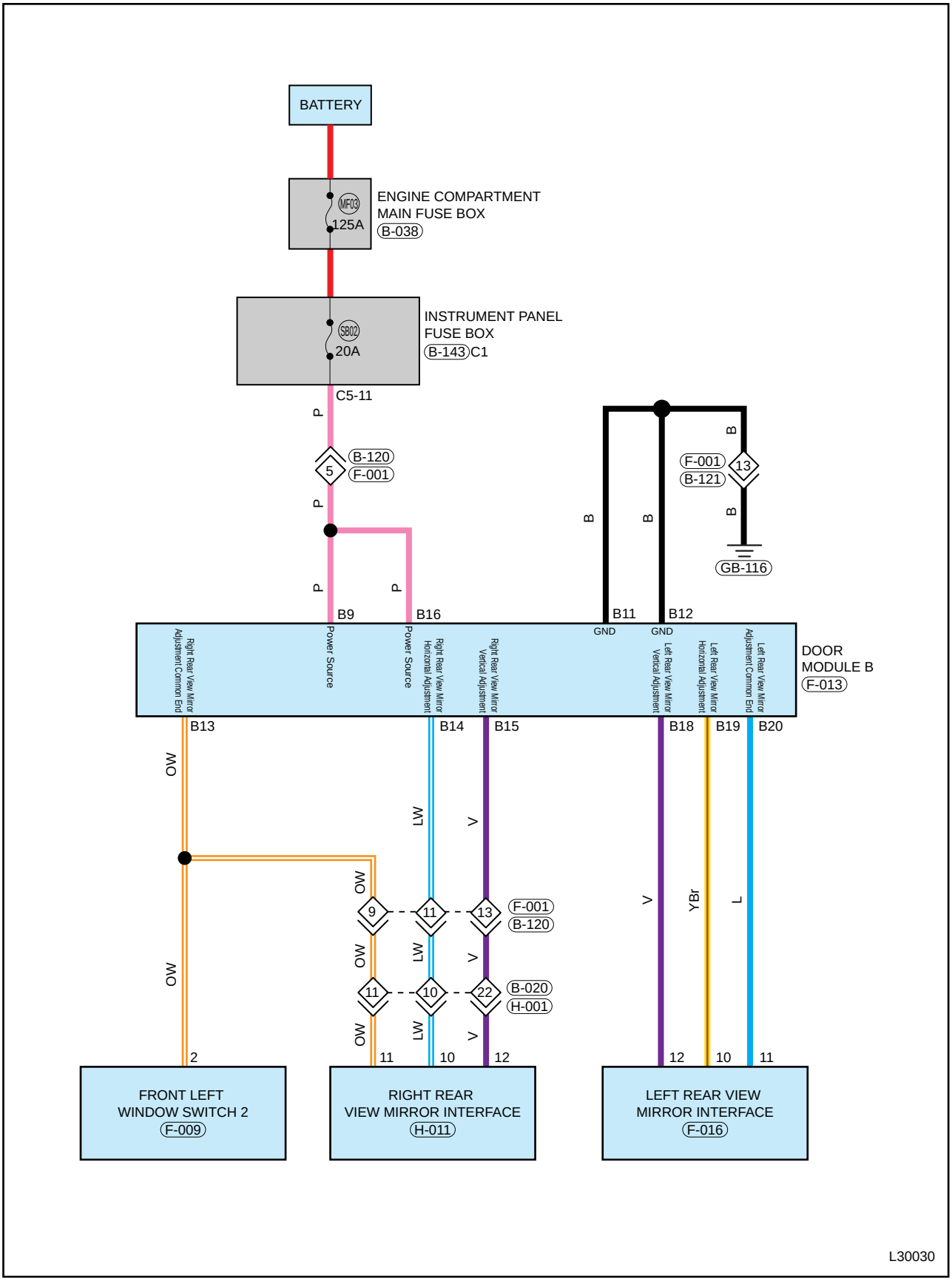
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
B1	Body ground	Rear view mirror unfolding	Power supply “ON”	-
B2	Body ground	DHL light	Power supply “ON”	-
B3	Body ground	BSD_ output signal	Power supply “ON”	12V
B4	Body ground	Courtesy light	Power supply “ON”	-
B5	Body ground	Driver glass regulator switch shield indicator	Power supply “ON”	0V
B6	Body ground	Rear right door panel warning light	Power supply “ON”	0V
B7	Body ground	/	Power supply “ON”	-
B8	Body ground	CDL status indicator	Power supply “ON”	-
B9	Body ground	KL30	Power supply “ON”	12V
B10	Body ground	Rear view mirror folding	Power supply “ON”	-
B11	Body ground	GND	Power supply “ON”	0V
B12	Body ground	GND	Power supply “ON”	0V

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
B13	Body ground	Right rear view mirror adjustment common terminal	Power supply “ON”	0 V when not adjusted; 10 V when adjusted downwards/ rightwards
B14	Body ground	Right rear view mirror horizontal adjustment	Power supply “ON”	0 V when not adjusted; 10 V when adjusted leftwards/ downwards
B15	Body ground	Right rear view mirror vertical adjustment	Power supply “ON”	0 V when not adjusted; 10 V when adjusted upwards/ rightwards
B16	Body ground	KL30	Power supply “ON”	12V
B17	Body ground	Rear left door panel warning light	Power supply “ON”	0V
B18	Body ground	Left rear view mirror vertical adjustment	Power supply “ON”	0 V when not adjusted; 10 V when adjusted upwards/ rightwards
B19	Body ground	Left rear view mirror horizontal adjustment	Power supply “ON”	0 V when not adjusted; 10 V when adjusted downwards/ leftwards
B20	Body ground	Left rear view mirror adjustment common terminal	Power supply “ON”	0 V when not adjusted; 10 V when adjusted downwards/ rightwards

3.2 Circuit Diagram




IGN2
Battery
ENGINE COMPARTMENT MAIN FUSE BOX
B-038
MF03
125A
INSTRUMENT PANEL FUSE BOX
B-140 C4
B-141 C5
RF39
5A
SB02
20A
C4-4
C5-11
FRONT LEFT WINDOW SWITCH 1
F-008
Backlight Input
DOOR MODULE A
F-012
DOOR MODULE B
F-013
CAN L
CAN H
CAN SYSTEM
REAR LEFT DOOR OPENING WARNING LIGHT
L-008
REAR RIGHT DOOR OPENING WARNING LIGHT
R-008
GB-116
GB-154
GB-062
L30020


BATTERY
MF03
125A
ENGINE COMPARTMENT
MAIN FUSE BOX
B-038
SB02
20A
INSTRUMENT PANEL
FUSE BOX
B-143 C1
C5-11
P
5
B-120
F-001
P
P
P
B
B
B
B
F-001
B-121
13
GB-116
B9
B16
B11
B12
GND
GND
Right Rear View Mirror Adjustment Common End
Power Source
Power Source
Right Rear View Mirror Horizontal Adjustment
Right Rear View Mirror Vertical Adjustment
Left Rear View Mirror Vertical Adjustment
Left Rear View Mirror Horizontal Adjustment
Left Rear View Mirror Adjustment Common End
DOOR
MODULE B
F-013
B13
B14
B15
B18
B19
B20
OW
OW
LW
V
OW
LW
V
OW
LW
V
9
11
13
F-001
B-120
11
10
22
B-020
H-001
V
YBr
L
2
11
10
12
12
10
11
FRONT LEFT
WINDOW SWITCH 2
F-009
RIGHT REAR
VIEW MIRROR INTERFACE
H-011
LEFT REAR VIEW
MIRROR INTERFACE
F-016
L30030

4 Function Overview

■ Door opening warning (use same logics for left and right DOW lights)

- Any power supply mode;
- When DCM receives CAN signal DOW_WarningLH = OFF or DOW_WarningLH = reserved, DCM controls left DOW light to turn off;
- When DCM receives CAN signal DOW_WarningLH = Level1 Warning, DCM controls left DOW light to come on;
- When DCM receives CAN signal which changes alternately between DOW_WarningLH = Level2 Warning and DOW_WarningLH = OFF, DCM controls left DOW light to flash.

■ Rear view mirror position storage

Conditions of rear view mirror position storage

- Seat memory enable signal (STAT_SeatMemoryEnable = “enable”) is received, otherwise DCM judges that position storage conditions are not met.
- DCM does not drive rear view mirror to move.
- Communication is not lost with IHU_6.
- Communication is not lost with SCU and STAT_MemorySysEnable invalid value signal is not received.

■ Rear view mirror position storage

- DCM receives memory request signal via CAN, when memory request (including ID and mode number of request) of CAN signal from IUH is received.
- DCM stores current 4 shafts positions to EEPROM. DCM is required to distribute EEPROM to store 15 groups positions: There are 5 IDs which each ID has 3 modes, corresponding to the IDs and MODE number in the REQ_SeatPosStore respectively.

■ Clear and cover storage position

- When the seat module receives the CAN bus: Set_Default=0X01, with judging the seat memory enable signal (STAT_SeatMemoryEnable= “enable”), 3 sets of memory position information under the current ID is set to the initial default position, other IDs are not memorized and remain unchanged (current ID is judged according to the ID recognized by IHU).
- When the seat module receives the CAN bus: Set_Default= 0X04, with judging the seat memory enable signal (STAT_SeatMemoryEnable= “enable”), 15 sets of memory position information under all IDs is set to the initial default position.
- When there is memory information under the stored IDs and mode gear, the memory request under this ID and mode gear is received again, and the previous memory information is covered by current position.

■ Clear and cover storage position

- After rear view mirror position is stored successfully, three frames success signals (STAT_ MirrorMemoryPosition=“Done”) are sent to CAN.
- If rear view mirror position storage fails, three frames failure signals (STAT_MirrorMemoryPosition= “Failed”) are sent to CAN.
- After sending 3 frames or when there is no storage action, feedback signal (STAT_MirrorMemoryPosition= “No action”) to CAN all the time.

■ Rear view mirror position recall

Conditions of seat memory position recall

- Seat memory enable signal (STAT_SeatMemoryEnable= “enable”).
- Engine starting.
- Communication is not lost with IHU_6.
- Communication is not lost with SCU and STAT_MemorySysEnable invalid value signal is not received.

Conditions of recalling action termination

- When single shaft reaches memory information position, single shaft action terminates (applicable to all shafts).
- Any manual adjustment input of switch will stop recall action of all shafts.
- When single shaft reaches blocking stopping position, stop recall action of all shafts.
- When single shaft detects short circuit, over-current of related drive motor, stop recall action of all shafts.
- When single shaft reaches the longest output time of 15s, stop recall action of all shafts.

Conditions of recalling action termination

- Rear view mirror always sends signal (STAT_MirrorRecallPosition = Recall Ongoing) to CAN during position recalling.
- Rear view mirror reaches recall position, and three frames completion signals (STAT_MirrorRecallPosition = Done) are sent to CAN.
- Rear view mirror does not reach recall position, and three frames failure signals (STAT_ MirrorRecallPosition = Failed) are sent to CAN.
- After sending 3 frames or when there is no recall action, feedback signal (STAT_MirrorRecallPosition = “No action”) to CAN all the time.

■ BSD power supply

(1) When power supply is in ACC/ON/Crank, DCM always keeps output to supply power to BSD.

(2) When power supply is in OFF, if one of following conditions is met, DCM keeps output for 5min to supply power to BSD:

- Power supply position status is turned from ACC/ON/Crank to OFF.
- During in OFF, the status of any door (all 4 doors) changes (from opened to closed or from closed to opened).
- DCM keeps wake-up status within 5 minutes of BSD output.

(3) When DCM is in OFF, if one of following conditions is met, the output will be off immediately:

- 5 minutes timing ends in OFF.
- ATWS status is turned from other statuses to “Secured” status.
- ATWS status is turned from other statuses to “Partly Secured” status.
- Power supply position status sent from PEPS is Invalid.
- Lost communication with PEPS.

5 Diagnostic Information and Steps

5.1 Diagnostic Help

- Connect diagnostic tester (the latest software) to diagnostic interface, and make it communicate with vehicle electronic module through data network.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If Diagnostic Trouble Code (DTC) cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all system grounds related to the latest DTCs.
- If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

5.2 DTC Confirmation Procedure

Confirm that battery voltage is not less than 12 V before performing following procedures.

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

5.3 Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate the conditions under which DTC was reset.
- Look for data that has changed or DTC to reset during wiggling test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect the mounting areas of instrument cluster, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- Remove instrument cluster from malfunctioning vehicle, then install it to a new vehicle and perform a test. If this DTC cannot be cleared, instrument cluster is malfunctioning. If DTC can be cleared, reinstall instrument cluster to original vehicle.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

5.4 Ground Inspection

Groundings are very important to entire circuit system, which are normal or not can seriously affect the entire circuit system. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) and oxidation may increase load resistance. This case will seriously affect normal operation of circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

5.5 Diagnostic Trouble Code (DTC) Chart

Description

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B1BA0-16	Low Power Supply Voltage	Power supply voltage below threshold detected.	Power supply malfunction; circuit connection malfunction.	Check if supply voltage is less than normal voltage.
B1BA0-17	High Power Supply Voltage	Power supply voltage above threshold detected.		Check if supply voltage is more than normal voltage.
B1BA1-11	Power Window Regulator Prohibited Indicator Light Short to Ground	/	1. Circuit malfunction; 2. Indicator light malfunction.	1. Check circuit and connector; 2. Check indicator light; 3. Check module assembly.
B1BA2-11	Central Control Lock Status Indicator Light Short to Ground			
B1BA3-11	Left Door Opening Warning Indicator Light Short to Ground	/	1. Circuit malfunction; 2. Indicator light malfunction.	1. Check circuit and connector; 2. Check indicator light; 3. Check module assembly.
B1BA4-11	Right Door Opening Warning			

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
	Indicator Light Short to Ground			
U2502-88	CAN Bus Off	Vehicle CAN is short to ground, this DTC will occur when disconnected; This DTC will be cleared after returning to normal	1. Control module is damaged; 2. Wire harness is damaged.	Refer to CAN network system for troubleshooting
U0142-87	Lost Communication with AVM	If the PEPS message is not received within 10 ms, this DTC will occur. If the PEPS message is received for 3 consecutive times, the DTC will be cleared.		
U0140-87	Lost Communication with BCM	If BCM message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0232-87	Lost Communication with BSDL	If BSDL message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0233-87	Lost Communication with BSDR	If BSDR message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0100-87	Lost Communication with EMS	If EMS message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0122-87	Lost Communication with ESC	If ESC message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0245-87	Lost Communication with IHU	If IHU message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0248-87	Lost Communication with PEPS	If PEPS message is not received within 10 ms, this DTC will occur, if this message is received for 3		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		consecutive times, DTC will be cleared		
U0208-87	Lost Communication with SCU	If SCU message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0101-87	Lost Communication with TCU	If TCU information is not received within 10 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0198-87	Lost Communication with TGW	If TGW message is not received within 10 ms, this DTC will occur, if this message is received for 3 consecutive times, DTC will be cleared		
U0422-81	Invalid Data Received from BCM	If incorrect data is received from BCM, this DTC will occur, the DTC will be cleared after data is normal		
U0533-81	Invalid Data Received from BSDL	If incorrect data is received from BSDL, this DTC will occur, the DTC will be cleared after data is normal		
U0534-81	Invalid Data Received from BSDR	If incorrect data is received from BSDR, this DTC will occur, the DTC will be cleared after data is normal		
U0401-81	Invalid Data Received from EMS	If incorrect data is received from EMS, this DTC will occur, the DTC will be cleared after data is normal		
U0416-81	Invalid Data Received from ESC	If incorrect data is received from ESC, this DTC will occur, the DTC will be cleared after data is normal		
U0546-81	Invalid Data Received from IHU	If incorrect data is received from IHU, this DTC will occur, the DTC will be cleared after data is normal		
U0426-81	Invalid Data Received from PEPS	If incorrect data is received from PEPS, this DTC will occur, the DTC will be cleared after data is normal		
U0509-81	Invalid Data Received from SCU	If incorrect data is received from SCU, this DTC will occur, the DTC will be cleared after data is normal		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
U0402-81	Invalid Data Received from TCU	If incorrect data is received from TCU, this DTC will occur, the DTC will be cleared after data is normal		

5.6 DTC Diagnosis Procedure

DTC	**B1BA0-16**	**Low Power Supply Voltage**
DTC	**B1BA0-17**	**High Power Supply Voltage**

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	**Check fuse**

(a) Check if fuses MF03, SB02 and RF39 are blown.

NG → **Replace fuse**

OK

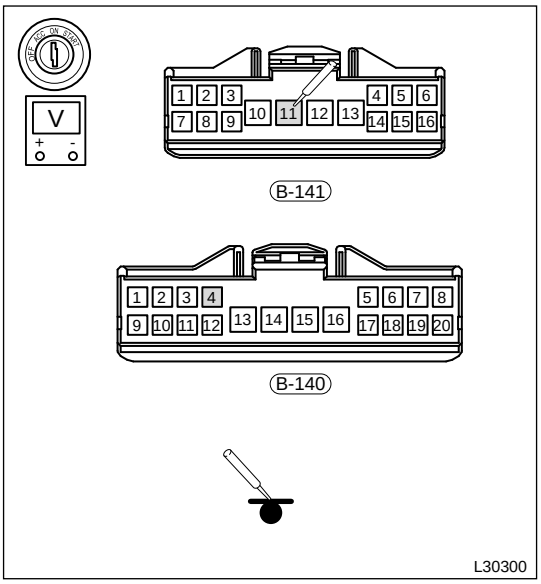
2	**Check output voltage of instrument panel fuse and relay box**

(a) Turn ENGINE START STOP switch to ON.

(b) Disconnect instrument panel fuse and relay box connectors B-140 and B-141.

(c) Using a digital multimeter, measure voltage value between connectors B-140 (4), B-141 (11) and body ground.

Multimeter Connection	Condition	Specified Condition
B-140 (4) - Body ground	ENGINE START STOP switch "ON"	⩽ 12 V
B-141 (11) - Body ground	ENGINE START STOP switch "ON"	⩽ 12 V



NG → **Replace instrument panel fuse and relay box assembly**

OK

3	Check for open in wire harness

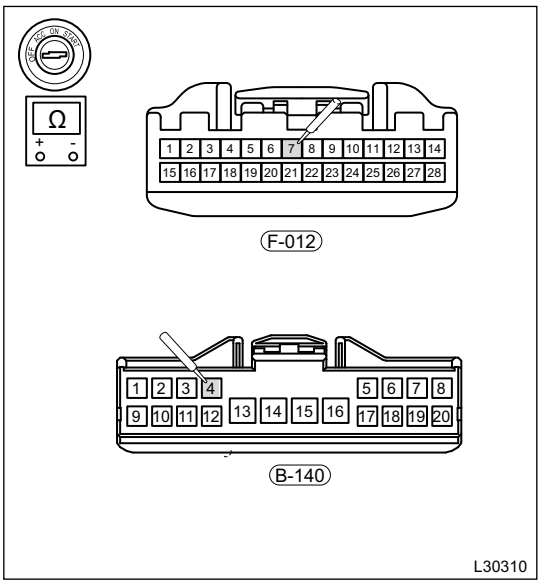
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect door control module connectors F-013 and F-012, and instrument panel fuse and relay box connectors B-140 and B-141.

(d) Using a digital multimeter, measure if resistance of connectors F-012 (7) - B-140 (4), F-013 (9) - B-141 (11) and F-013 (16) - B-141 (11) is normal to check for open in wire harness.

Multimeter Connection	Condition	Specified Condition
F-012 (7) - B-140 (4)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
F-013 (9) - B-141 (11)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
F-013 (16) - B-141 (11)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



OK → **Replace door control module assembly**

OK → **Handle and repair related wire harness**

DTC	B1BA1-11	Power Window Regulator Prohibited Indicator Light Short to Ground
DTC	B1BA2-11	Central Control Lock Status Indicator Light Short to Ground
DTC	B1BA3-11	Left Door Opening Warning Indicator Light Short to Ground
DTC	B1BA4-11	Right Door Opening Warning Indicator Light Short to Ground

Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.
For similar malfunctions of door control module, it’ s also allowable to refer to “Power Window Regulator Prohibited Indicator Light Short to Ground” for troubleshooting.

1	Check for short to ground in power window regulator prohibited indicator light

(a) Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.

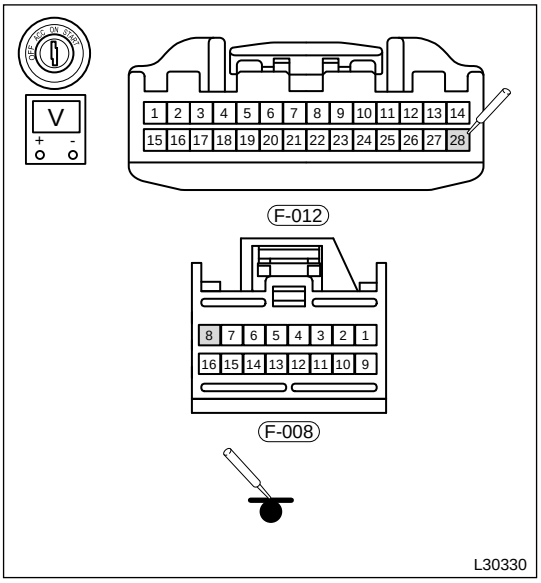
(b) Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.

(c) Turn ENGINE START STOP switch to “OFF”, disconnect the negative battery cable.

(d) Disconnect door controller connector F-012 and front left door window switch F-008.

(e) Using voltage band of multimeter, detect F-012 (28) - ground and F-008 (8) - ground separately.

Multimeter Connection	Condition	Specified Condition
F-012 (28) - Ground	ENGINE START STOP switch "ON"	⩽ 12 V
F-008 (8) - Ground	ENGINE START STOP switch "ON"	⩽ 12 V



OK → **Replace door controller or front left door window switch**

NG → **Handle and repair related wire harness**

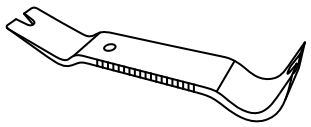
DTC	**U2502-88**	**CAN Bus Off**
DTC	**U0142-87**	**Lost Communication with AVM**
DTC	**U0140-87**	**Lost Communication with BCM**
DTC	**U0232-87**	**Lost Communication with BSDL**
DTC	**U0233-87**	**Lost Communication with BSDR**
DTC	**U0100-87**	**Lost Communication with EMS**
DTC	**U0122-87**	**Lost Communication with ESC**
DTC	**U0245-87**	**Lost Communication with IHU**
DTC	**U0248-87**	**Lost Communication with PEPS**
DTC	**U0208-87**	**Lost Communication with SCU**
DTC	**U0101-87**	**Lost Communication with TCU**
DTC	**U0198-87**	**Lost Communication with TGW**
DTC	**U0422-81**	**Invalid Data Received from BCM**
DTC	**U0533-81**	**Invalid Data Received from BSDL**
DTC	**U0534-81**	**Invalid Data Received from BSDR**
DTC	**U0401-81**	**Invalid Data Received from EMS**
DTC	**U0416-81**	**Invalid Data Received from ESC**
DTC	**U0546-81**	**Invalid Data Received from IHU**
DTC	**U0426-81**	**Invalid Data Received from PEPS**
DTC	**U0509-81**	**Invalid Data Received from SCU**
DTC	**U0402-81**	**Invalid Data Received from TCU**

1	Refer to “CAN network system” for troubleshooting.

6 On-vehicle Service

6.1 Tool

■ General Tool

Tool Name	Tool Drawing
Interior Crow Plate	 S00020

6.2 Replacement of Front Door Inner Protector Assembly

■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing front door inner protector assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Using an interior crow plate, carefully remove front door triangular block assembly.


L30011

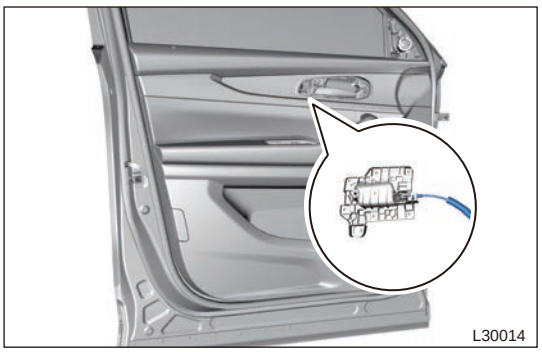
(4) Remove front left door inner protector and central control switch assembly.


L30112

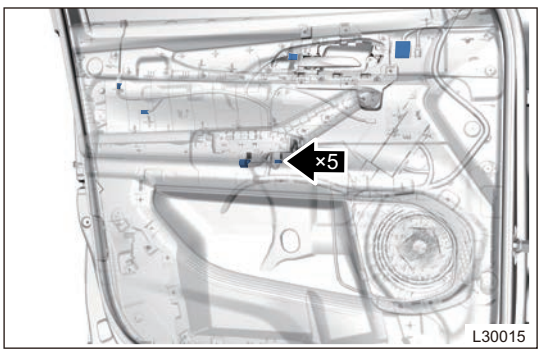
(5) Using an interior crow plate, carefully pry off door protector screw block cover.

(6) Remove fixing screw from rear side of inside handle screw block cover and fixing screw from door protector.

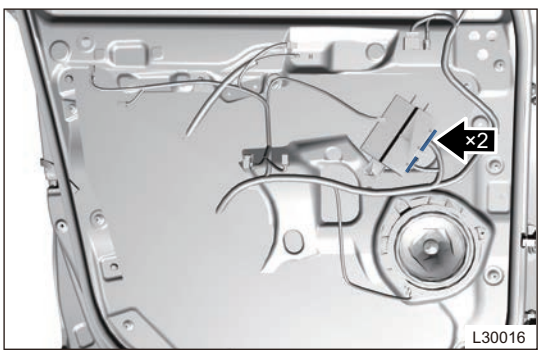
(7) Remove door protector, and disconnect inside handle cable.



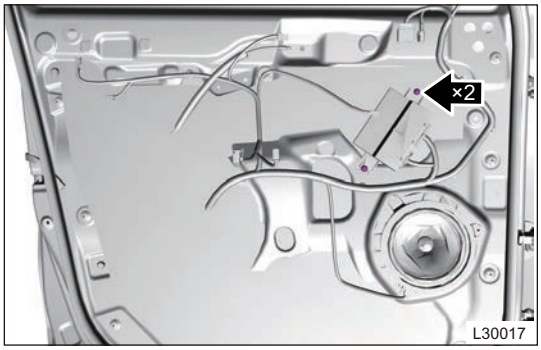
(8) Disconnect ambient light, anti-theft indicator light, glass regulator switch and rear view mirror adjustment switch connectors, and remove door protector assembly.



(9) Disconnect the door control module connectors.

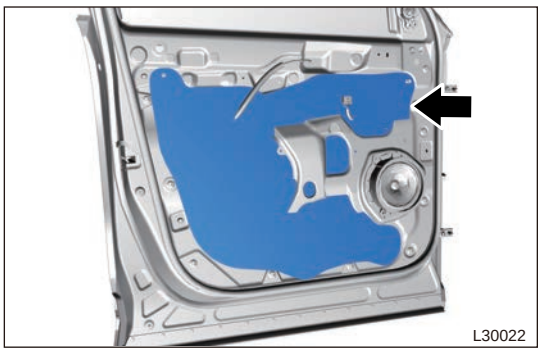


(10) Remove 2 fixing bolts and door control module assembly.



(11) Disconnect woofer and tweeter connectors.

(12) Remove the front left door protective film.



■ Installation

⚠ Caution

- **Replace damaged clips and install front door inner protector assembly in place, when installing front door inner protector assembly.**
- **Install connectors in place, when installing front door inner protector assembly.**
- **Check that each function can operate properly, after installing front door inner protector assembly.**

(1) Install the front left door protective film.
(2) Connect woofer and tweeter connectors.
(3) Install door control module assembly and tighten 2 fixing bolts.

Torque: 1.5 ± 0.5 N·m

(4) Install door control module connectors, connect ambient light, anti-theft indicator light, glass regulator switch and rear view mirror adjustment switch connectors.
(5) Install inside handle cable and door protector assembly.
(6) Install fixing screw to rear side of inside handle screw block cover and fixing screw to door protector.

Torque: 1.5 ± 0.5 N·m

(7) Install the door protector screw block cover.
(8) Install front left door inner protector and central control switch assembly.

(9) Using an interior crow plate, carefully remove front door triangular block assembly.

(10) Connect the negative battery cable.

6.3 Replacement of Front Door Assembly

■ Removal

⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing front door assembly.**
- **Try to prevent body paint surface from being scratched, when removing front door assembly.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**
- **When removing front door assembly, an assistant is needed to hold it, to prevent front door from falling down during operation, resulting in accidents.**

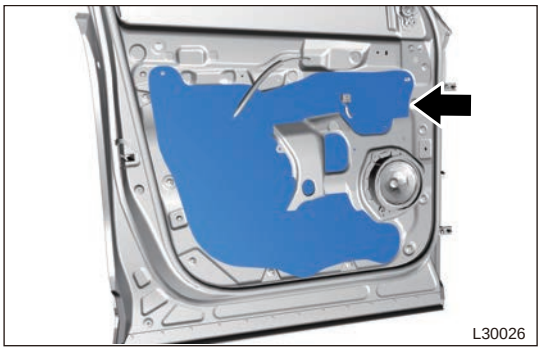
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the front left door inner protector assembly.

(4) Disconnect the woofer connector.

(5) As shown in illustration, remove front left door protective film assembly by gently peeling it along edges from one corner, and pass cable and wire harness through the opening of protective film.


L30026

⚠ Caution

- **When repairing, the removed protective film is required to be replaced (do not reuse it).**

(6) Remove the front left door woofer.

(7) Remove the left outside rear view mirror.

(8) Remove the front left door weather bar.

(9) Remove the front door glass assembly.

(10) Remove the front door glass run.

(11) Remove the front door glass guide rail assembly.

(12) Remove the front door power glass regulator.

(13) Remove the front left door lock assembly.

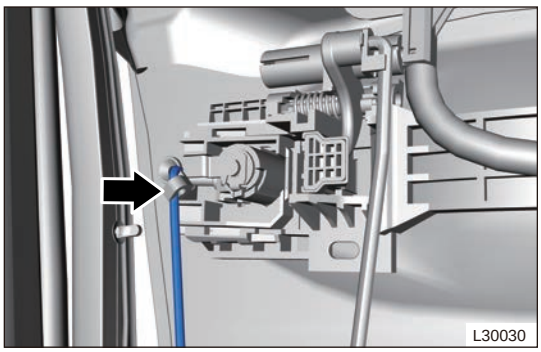
(14) Remove the front door outside handle protective cover block cover.


L30027

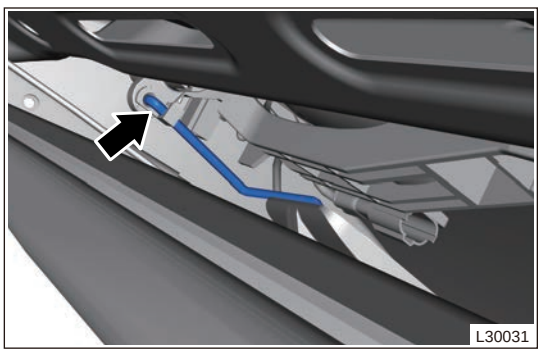
(15) Remove 1 fixing screw from front door outside handle.

(16) Slide and pull front door outside handle in direction of arrow as shown in illustration, and remove it.

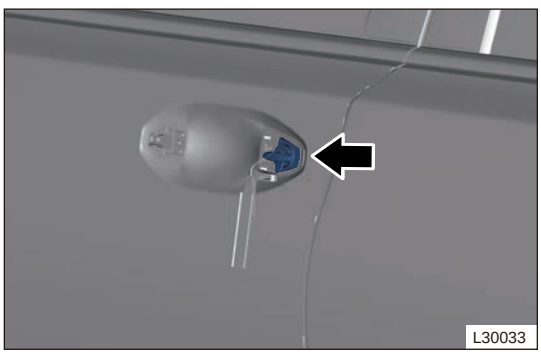
(17) Disengage the key cylinder lever.



(18) Disengage the outside handle lever.



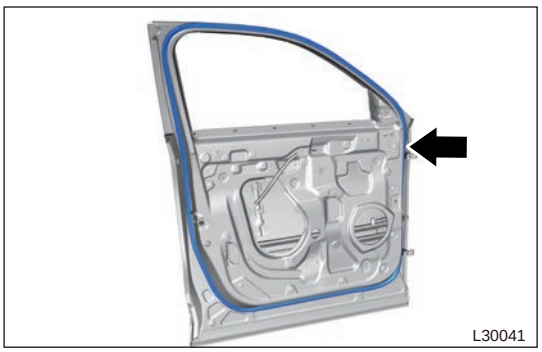
(19) Remove the key cylinder assembly.



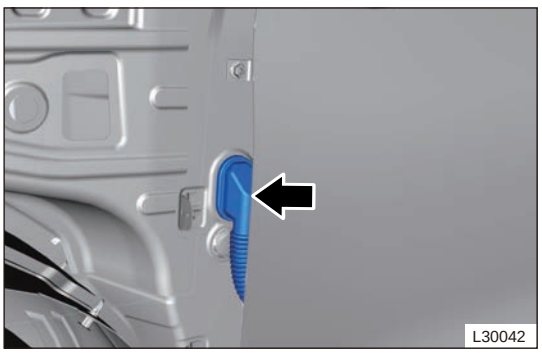
(20) Remove the front left door outside handle rear gasket.

(21) Remove fixing screw from front door outside handle seat assembly, and remove the front left outside handle seat assembly.

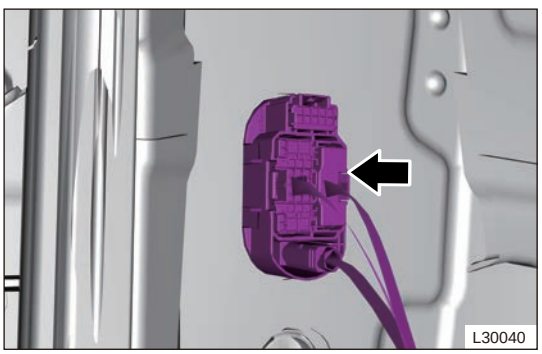
(22) Disengage clips from front door frame weatherstrip, and remove front left door frame weatherstrip (1).



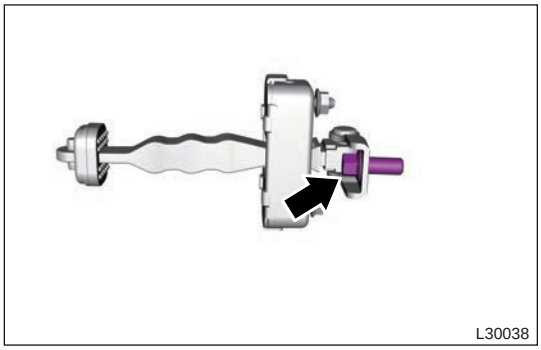
(23) Using a screwdriver wrapped with protective tape, pry off front door wire harness dust boot.



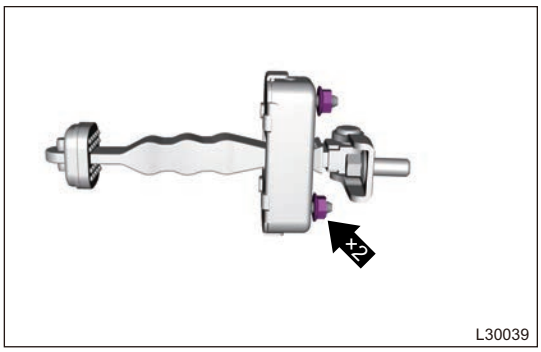
(24) Disconnect the front left door wire harness connector.



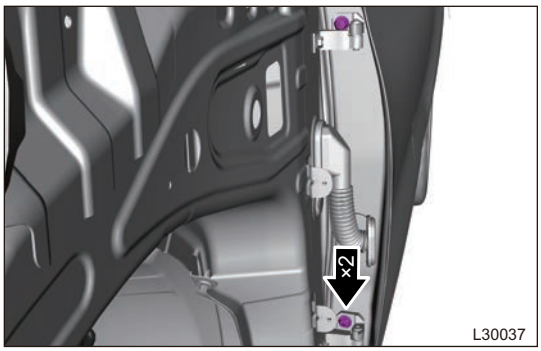
(25) Remove the coupling bolt between door check and front left door.



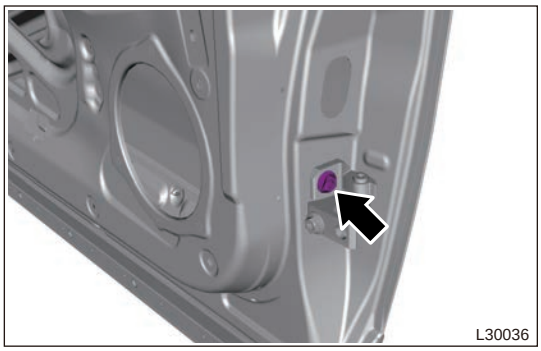
(26) Remove the coupling nuts between door check and door.



(27) Remove 1 fixing bolt between door and upper hinge.



(28) Remove 1 fixing bolt between door and lower hinge.

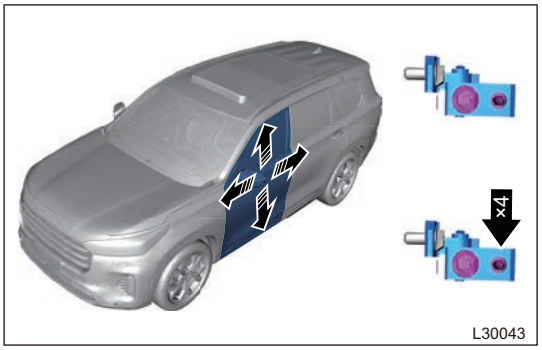


(29) Remove the front left door assembly.

■ Inspection

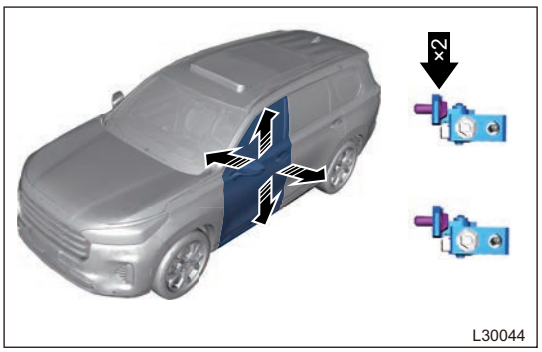
Adjust the front door assembly.

(1) Loosen 4 fixing bolts between front door hinge assembly and quarter, and adjust front door assembly position in direction of arrow as shown in illustration.



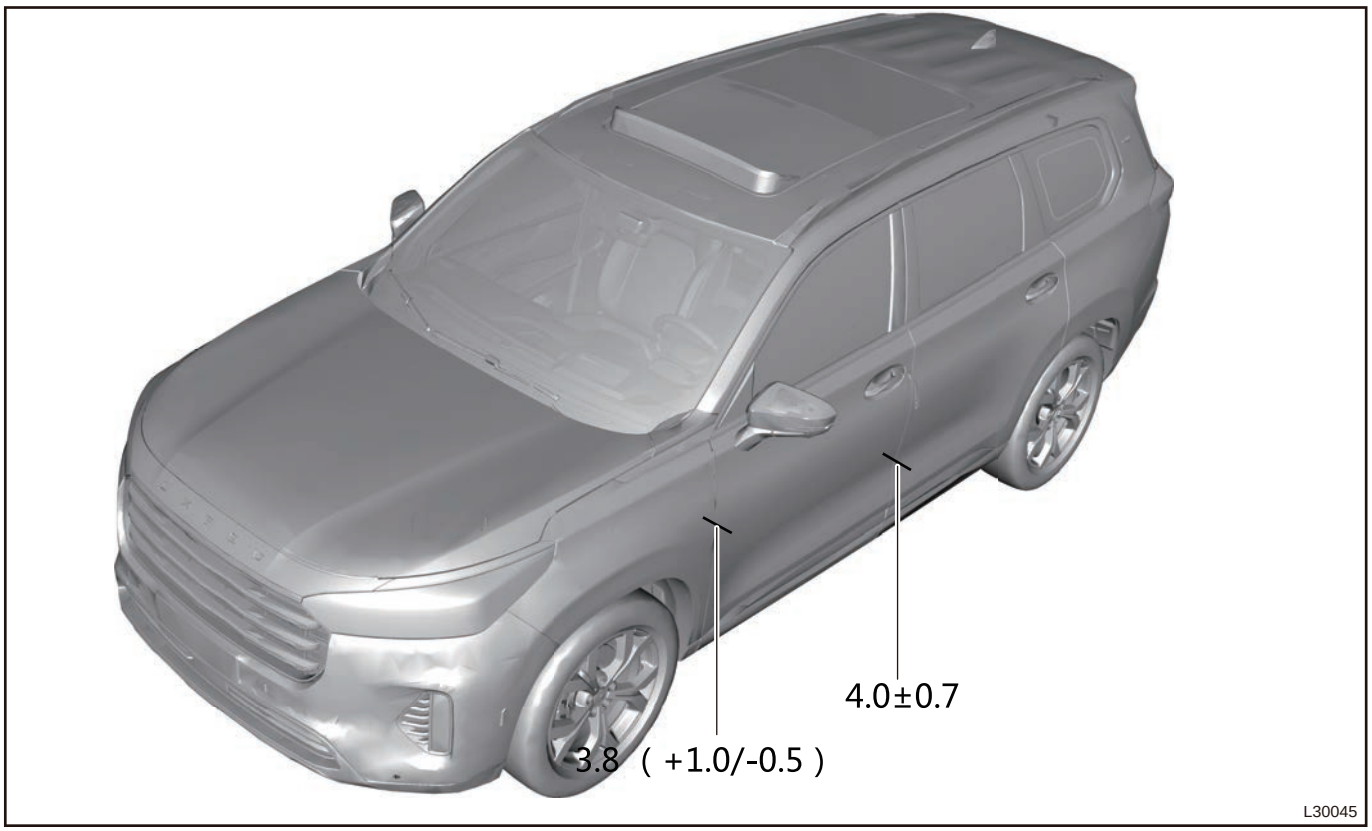
(2) After adjustment, tighten fixing bolts on front door hinge assembly to specified torque.

(3) Loosen 2 fixing bolts between front door hinge assembly and door, and adjust the front door assembly position in direction of arrow as shown in illustration.



(4) After adjustment, tighten fixing bolts on front door hinge assembly to specified torque.

(5) Standard ranges of clearance between installation positions of front door assembly and each part are as shown in illustration.

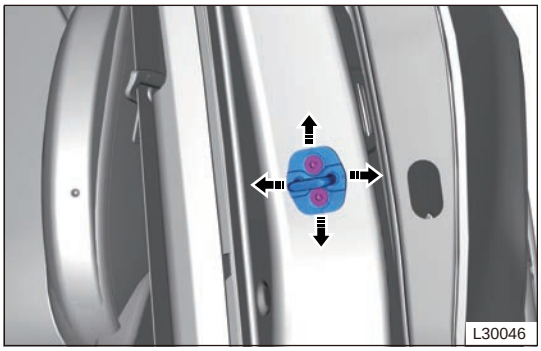


(6) After adjustment, make sure that alignment between front door assembly and rear door assembly is within standard range.

(7) After adjustment, make sure that alignment between front door assembly and wing assembly is within standard range.

Adjust the front door lock striker.

(8) Slightly loosen the fixing bolts on front door lock striker and tap it with a plastic hammer in direction of arrow to adjust the lock striker position.



⚠ Caution

- **Align the middle scale of lock striker with scale of quarter.**

(9) Tighten fixing bolts on front door lock striker to specified torque after adjustment.

■ Installation

⚠ Caution

- **Replace damaged clips and install front door inner protector in place, when installing front door inner protector.**
- **Stick protective film in specified position, not in a wrong position or an asymmetric position between left and right sides or cover the mounting holes of other installation parts.**
- **DO NOT drag protective film when sticking. It should be installed under its original condition and ensure sheet metal is clean before installation.**
- **Finished protective film should have no defects, such as wrinkles, bubbles or turnups.**
- **Finished protective film should have powerful adherence. Protective film sticking should be finished at one time. Avoid repeat sticking.**
- **When installing front door assembly, an assistant is needed to hold it, to prevent front door from falling down during operation, resulting in accidents.**
- **Be sure to wear necessary safety equipment to prevent accidents, when installing front door assembly.**

(1) Install the door to a proper position of body.

(2) Install 2 fixing bolts between door and lower hinge.

Torque: 24 ± 2 N·m

(3) Install the coupling nuts between door check and door.

Torque: 9 ± 1 N·m

(4) Install coupling bolt between door check and front left door.

Torque: 32 ± 2.5 N·m

(5) Connect the front left door wire harness connector.

(6) Install the front door wire harness dust boot.

(7) Install the front left door frame weatherstrip.

(8) Install the front left door outside handle seat assembly, and install the fixing screw on the front door outside handle seat assembly.

Torque: 5 ± 1 N·m

(9) Install the front left door outside handle rear gasket.

(10) Install the key cylinder assembly.

(11) Install the outside handle rod.

(12) Install the key cylinder lever.

(13) Install the front door outside handle.

(14) Connect the front door handle sensor connector.

(15) Install 1 fixing screw to front door outside handle.

Torque: 5 ± 1 N·m

(16) Install the front door outside handle protective cover block cover.

(17) Install the front left door lock assembly.

(18) Install the front door power glass regulator.

(19) Install the front door glass guide rail assembly.

(20) Install the front door glass run.

(21) Install the front door glass assembly.

(22) Install the front left door weather bar.

(23) Install the left outside rear view mirror.

(24) Install the front left door woofer.

(25) Install the front left door protective film assembly.

Hint:

- Wipe the door sheet metal with alcohol cloth (or fine fiber clean cloth) to ensure that the door inner sheet metal is clean and uncontaminated before assembling the protective film.
- It’ s strictly forbidden to use liquid products / or products containing surfactants (detergent type) when assembling the door connector.
- Pay attention to prevent protective film from contamination (waterproof, oil-proof, dust-proof, etc.).
- Make sure that there is sufficient pressure on the sticking place/ painted joint surface: 10N/cm2 ⩽ Rolling pressure ⩽ 30N/cm2 Using roller.
- Assembly ambient temperature requirement is 18 ˚C - 40 ˚C。
- Heating oven temperature requirement is (30+5) ˚C, 30 minutes ⩽ Heating time ⩽ 8 hours.

(26) Install 3 fixing bolts and front left door armrest bracket.

Torque: 5 ± 1 N·m

(27) Connect the woofer connector.

(28) Install the front left door inner protector assembly.

(29) Connect the negative battery cable.

6.4 Replacement of Door Inner Protector Assembly

■ Removal

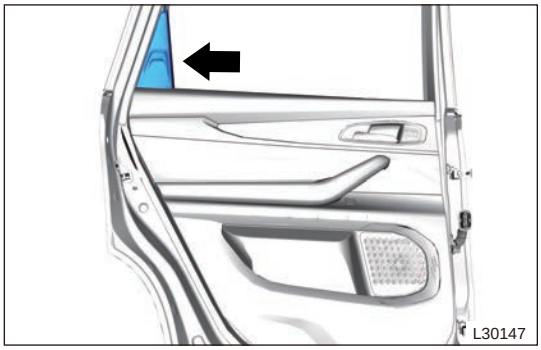
⚠ Warning

- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear door inner protector assembly.**
- **Try to prevent rear door inner protector surface from being damaged, when removing rear door inner protector assembly.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

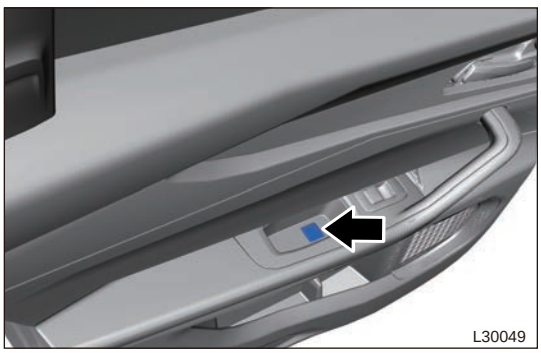
(3) Remove the rear left door inner triangular block body.



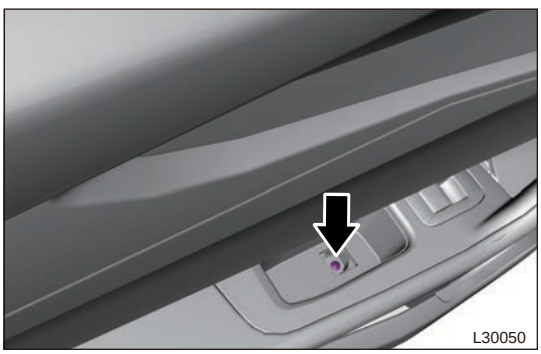
(4) Remove the rear left door front cover.

(5) Remove fixing screw from rear side of rear left door inside handle screw block cover.

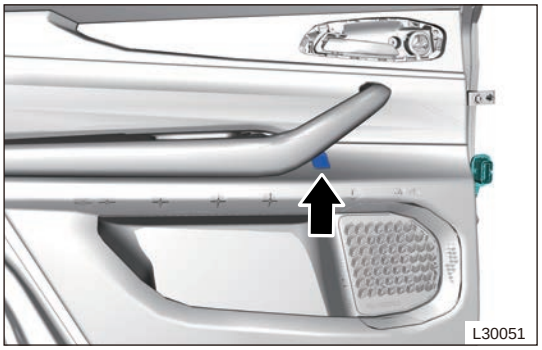
(6) Turn over rear left door handle box block cover.



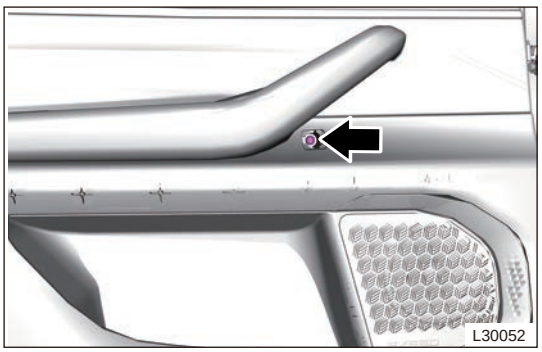
(7) Remove fixing screw from bottom part of rear left door handle box gasket.



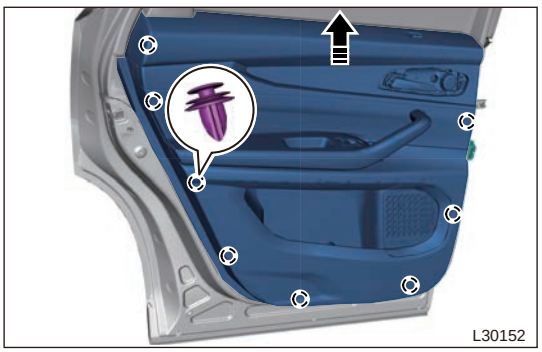
(8) Remove the rear left door inner protector block cover.



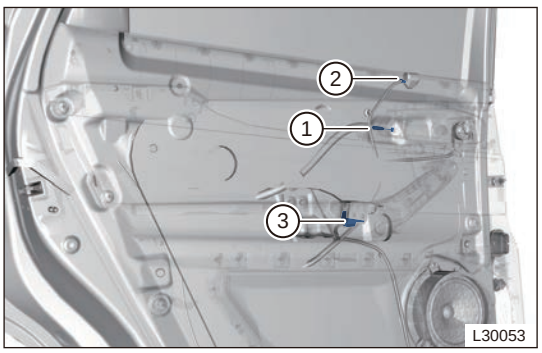
(9) Remove 1 fixing screw from rear part of rear left door inner protector block cover.



(10) Using an interior crow plate, pry up clips on rear door inside protector assembly, and remove rear door inside protector assembly in direction of arrow as shown in illustration.



(11) Detach rear door inside handle cable (1) from rear door inside handle, disconnect power glass regulator switch connector (3), and disconnect rear left door opening warning light connector (2).



(12) Remove the rear left door protector assembly.

■ Installation

⚠ Caution

- **Replace damaged clips and install rear door inner protector assembly in place, when installing rear door inner protector assembly.**
- **Install the connectors in place, when installing rear door inner protector assembly.**
- **Check that each function can operate properly, after installing rear door inner protector assembly.**

(1) Install the rear left door protector assembly to a proper position.

(2) Connect rear door power glass regulator switch connector, install rear left door cable, and connect rear left door opening warning light connector.

(3) Hang the upper end of door protector on the sheet metal, align door protector clip with the sheet metal hole, and clamp clips to the corresponding mounting hole on sheet metal in the order from up to down.

(4) Install 1 fixing screw to rear part of rear left door inner protector block cover.

Torque: 1.5 ± 0.2 N·m

(5) Install the rear left door inner protector block cover.

(6) Install fixing screw to bottom part of rear left door handle box gasket.

Torque: 1.5 ± 0.2 N·m

(7) Install the rear left door handle box block cover.

(8) Install fixing screw to rear side of rear left door inside handle screw block cover.

Torque: 1.5 ± 0.2 N·m

(9) Install the rear left door inside handle screw block cover.

(10) Install the rear left door inner triangular block body.

(11) Connect the negative battery cable.

6.5 Replacement of Rear Door Assembly

■ Removal

⚠ Warning

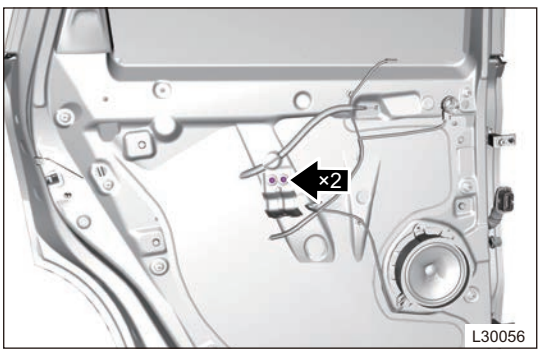
- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear door assembly.**
- **Try to prevent body paint surface from being scratched, when removing rear door assembly.**
- **When removing rear door assembly, an assistant is needed to hold it, prevent rear door from falling down during operation, resulting in accidents.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

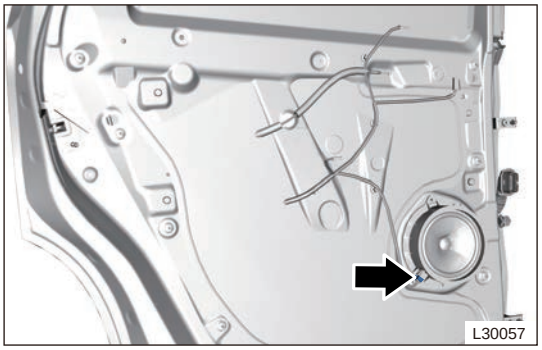
(2) Disconnect the negative battery cable.

(3) Remove the rear left door inner protector assembly.

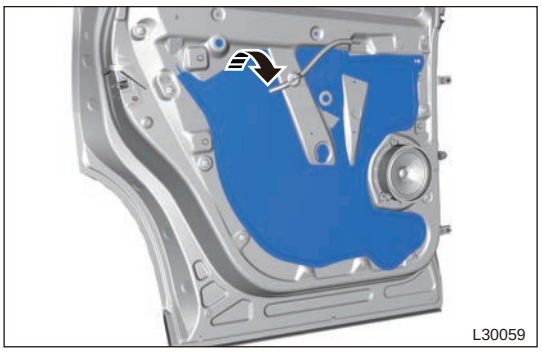
(4) Remove 2 fixing bolts from rear left door armrest bracket, and remove the rear left door armrest bracket.



(5) Disconnect woofer connector, and remove woofer assembly.



(6) As shown in illustration, remove the rear left door protective film assembly by gently peeling it along edges from one corner, and pass cable and wire harness through the opening of protective film.



(7) Remove the rear left door woofer.

(8) Remove the rear left door weather bar.

(9) Remove the rear door glass upper run.

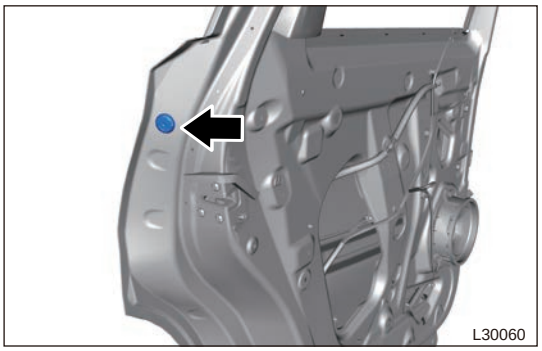
(10) Remove the rear door glass assembly.

(11) Remove the rear door glass guide rail assembly.

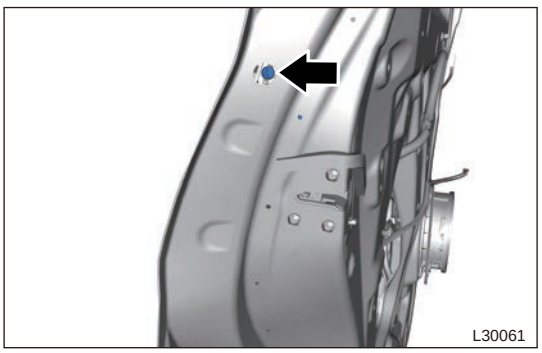
(12) Remove the rear door power glass regulator.

(13) Remove the rear left door lock assembly.

(14) Remove the rear door outside handle cover block cover.

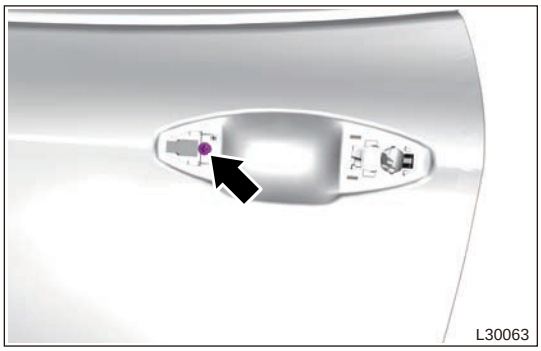


(15) Remove 1 fixing screw from rear door outside handle cover.

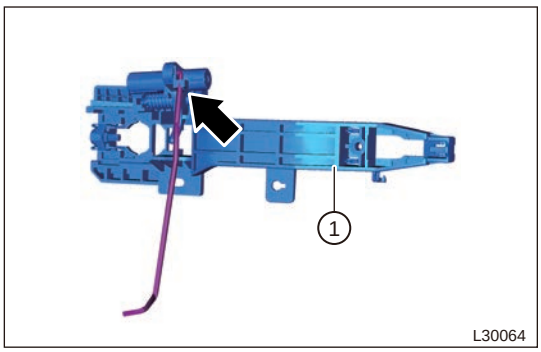


(16) As shown in illustration, slide and pull the rear door outside handle in direction of arrow, and remove it.

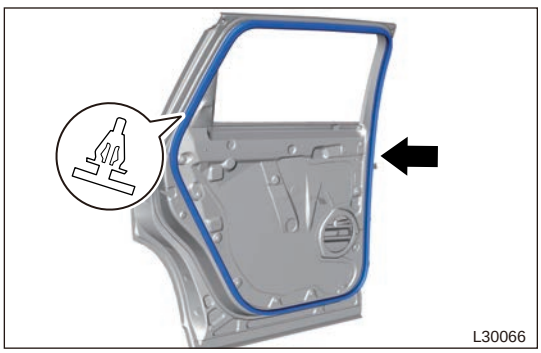
(17) Remove 1 fixing bolts from rear door outside handle seat assembly.



(18) Disengage the rear door outside handle rod, and remove rear door outside handle seat assembly (1).

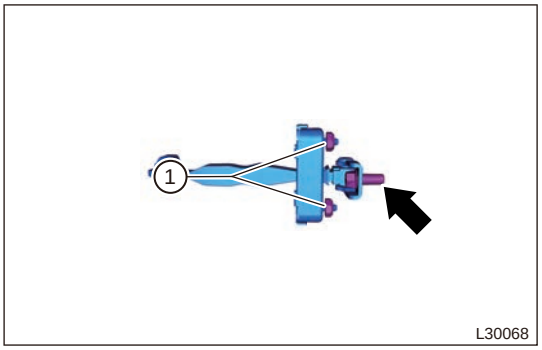


(19) Disengage clips from rear door frame weatherstrip, and remove rear left door frame weatherstrip (1).

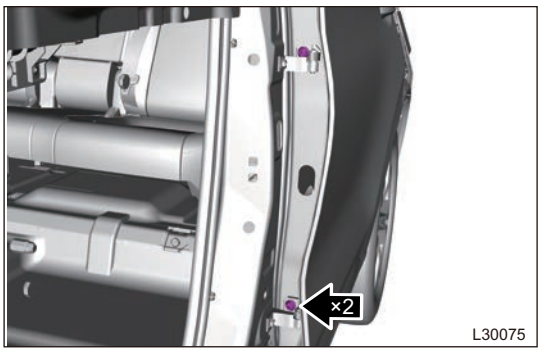


(20) Using an interior crow plate, pry up the rear door dust boot, and disconnect the rear left door wire harness connectors.

(21) Remove 2 coupling nuts (1) between door check and rear left door, and remove the coupling bolt between door check and body.



(22) Remove 2 fixing bolts between rear door upper hinge assembly and rear door assembly.

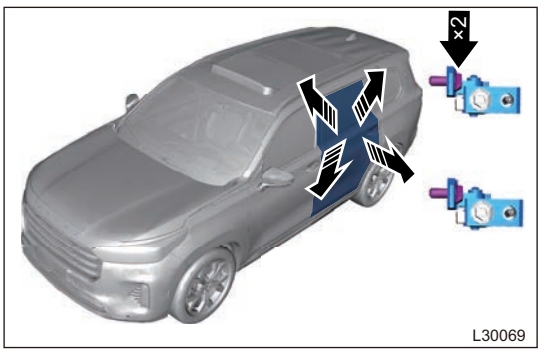


(23) Remove the rear left door assembly.

■ Inspection

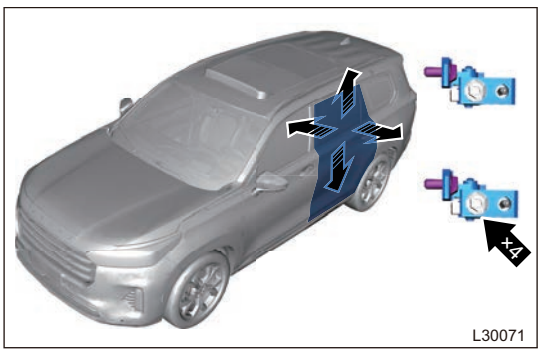
Adjust the rear door assembly.

(1) Loosen 2 fixing bolts between rear door hinge assembly and door, and adjust rear door assembly position in direction of arrow as shown in illustration.



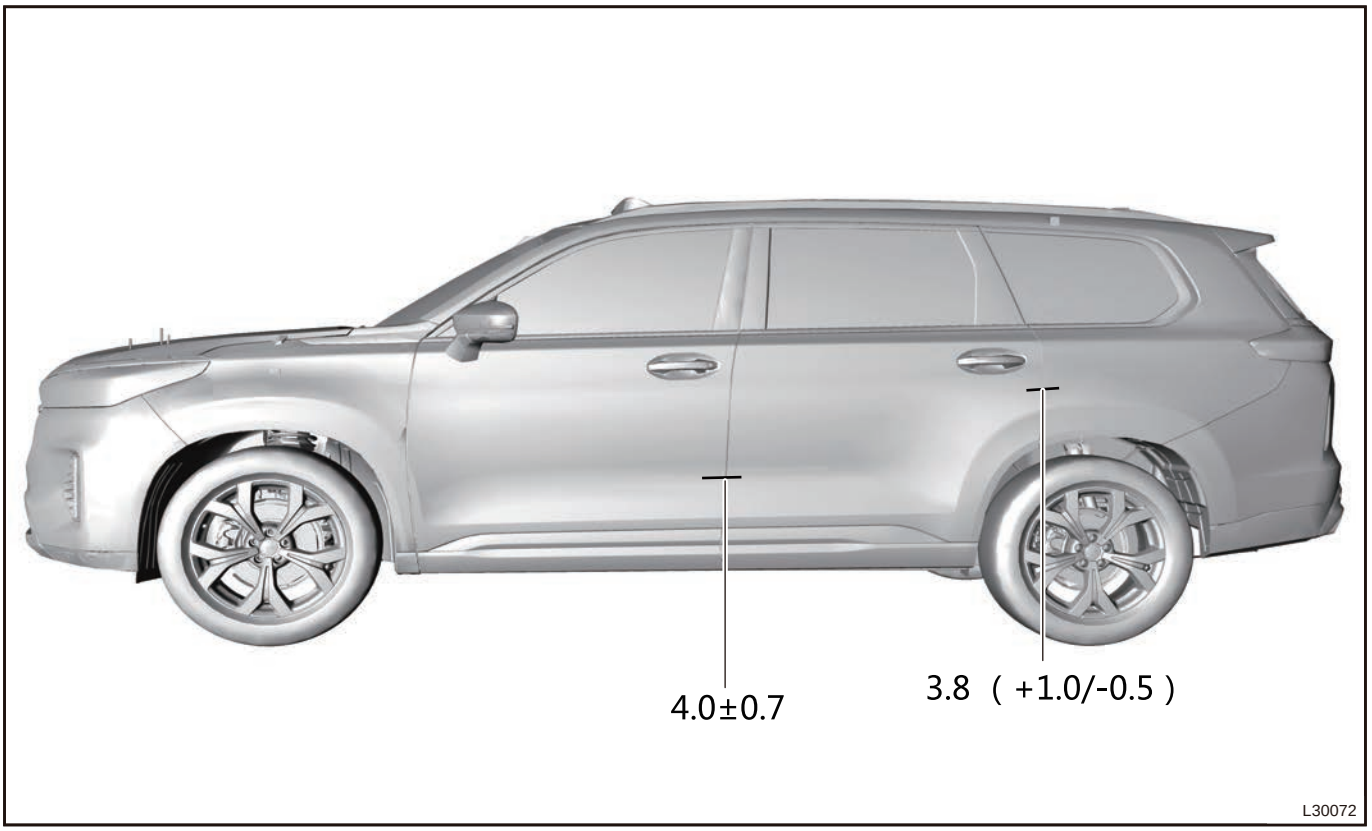
(2) After adjustment, tighten fixing bolts on rear door hinge assembly to specified torque.

(3) Loosen 4 fixing bolts between rear door hinge assembly and quarter, and adjust rear door assembly position in direction of arrow as shown in illustration.



(4) After adjustment, tighten fixing bolts on rear door hinge assembly to specified torque.

(5) Standard ranges of clearance between installation position of rear door assembly and each part are as shown in illustration.



(6) After adjustment, make sure that alignment between rear door assembly and front door assembly is within standard range.

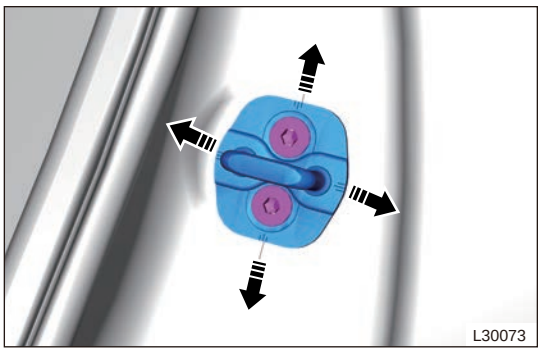
(7) After adjustment, make sure that alignment between rear door assembly and body outside panel is within standard range.

Adjust the rear door lock striker.

(8) Slightly loosen fixing bolts on rear door lock striker and tap it with a plastic hammer in direction of arrow to adjust the lock striker position.

⚠ Caution

- **Align the middle scale of lock striker with scale of quarter.**



(9) Tighten fixing bolt on rear door lock striker assembly to specified torque after adjustment.

■ **Installation**

⚠ Caution

- **Replace damaged clips and install rear door inner protector in place, when installing rear door inner protector.**
- **Stick protective film in specified position, not in a wrong position or an asymmetric position between left and right sides or cover the mounting holes of other installation parts.**
- **DO NOT drag protective film when sticking. It should be installed under its original condition and ensure sheet metal is clean before installation.**
- **Finished protective film should have no defects, such as wrinkles, bubbles or turnups.**
- **Finished protective film should have powerful adherence. Protective film sticking should be finished at one time. Avoid repeat sticking.**
- **Be sure to wear safety equipment to prevent accidents, when installing rear door assembly.**
- **When installing rear door assembly, an assistant is needed to hold it, prevent rear door from falling down during operation, resulting in accidents.**

(1) Install the rear left door assembly to a proper position of body.

(2) Install 2 fixing bolts between rear door lower hinge assembly and rear door assembly.

Torque: 24 ± 2 N·m

(3) Install 2 coupling nuts between door check and rear left door, and install coupling bolt between door check and body.

Torque: 9 ± 1 N·m

Torque: 32 ± 2.5 N·m

(4) Connect the rear left door wire harness connector, and install the rear door dust boot.

(5) Install the rear left door frame weatherstrip.

(6) Install the rear left door outside handle front shim.

(7) Install the rear door outside handle seat assembly, and connect the outside handle rod.

(8) Install 1 fixing bolt on the rear door outside handle seat assembly.

Torque: 5 ± 1 N·m

(9) Install the rear door outside handle assembly.

(10) Install 1 fixing screw on the rear door outside handle cover.

Torque: 1.5 ± 0.5 N·m

(11) Install the rear door outside handle protective cover block cover.

(12) Install the rear left door lock assembly.

(13) Install the rear door power glass regulator.

(14) Install the rear door glass guide rail assembly.

(15) Install the rear door glass assembly.

(16) Install the rear door upper glass run.

(17) Install the rear left door weather bar.

(18) Install the rear left door woofer.

(19) Install the rear left door protective film assembly.

Hint:

- Wipe the door sheet metal with alcohol cloth (or fine fiber clean cloth) to ensure that the door inner sheet metal is clean and uncontaminated before assembling the protective film.
- It’ s strictly forbidden to use liquid products / or products containing surfactants (detergent type) when assembling the door connector.
- Pay attention to prevent protective film from contamination (waterproof, oil-proof, dust-proof, etc.).
- Make sure that there is sufficient pressure on the sticking place/ painted joint surface: 10N/cm2 ≤ Rolling pressure ≤ 30N/cm2 Using roller.
- Assembly ambient temperature requirement is 18 ℃ - 40 ℃。
- Heating oven temperature requirement is (30+5) ℃, 30 minutes ≤ Heating time ≤ 8 hours.

(20) Connect the woofer connector.

(21) Install the rear left door armrest bracket and 2 fixing bolts.

Torque: 5 ± 1 N·m

(22) Install the rear left door inner protector assembly.

(23) Connect the negative battery cable.

12.8 ENGINE HOOD AND BACK DOOR

1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) When removing engine hood gas spring assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.

(2) When removing engine hood assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.

(3) When removing engine hood hinge assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.

(4) When removing back door assembly, an assistant is needed to hold the trunk lid. Try to prevent trunk lid from falling down or closing suddenly during operation, resulting in accidents.

(5) When removing back door electric support rod assembly, pay attention not to bend electric support rod by lateral force and during removal, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.

(6) When removing balance bar, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.

(7) When removing back door gas spring assembly, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.

2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Be sure to wear safety equipment to prevent accidents, when removing engine hood left gas spring assembly.

(2) Be sure to wear safety equipment to prevent accidents, when removing engine hood assembly.

(3) When removing engine hood hinge assembly, try to prevent engine hood from falling down during operation, resulting in damage to body or front windshield.

(4) Try to prevent body paint surface from being scratched, when removing back door assembly.

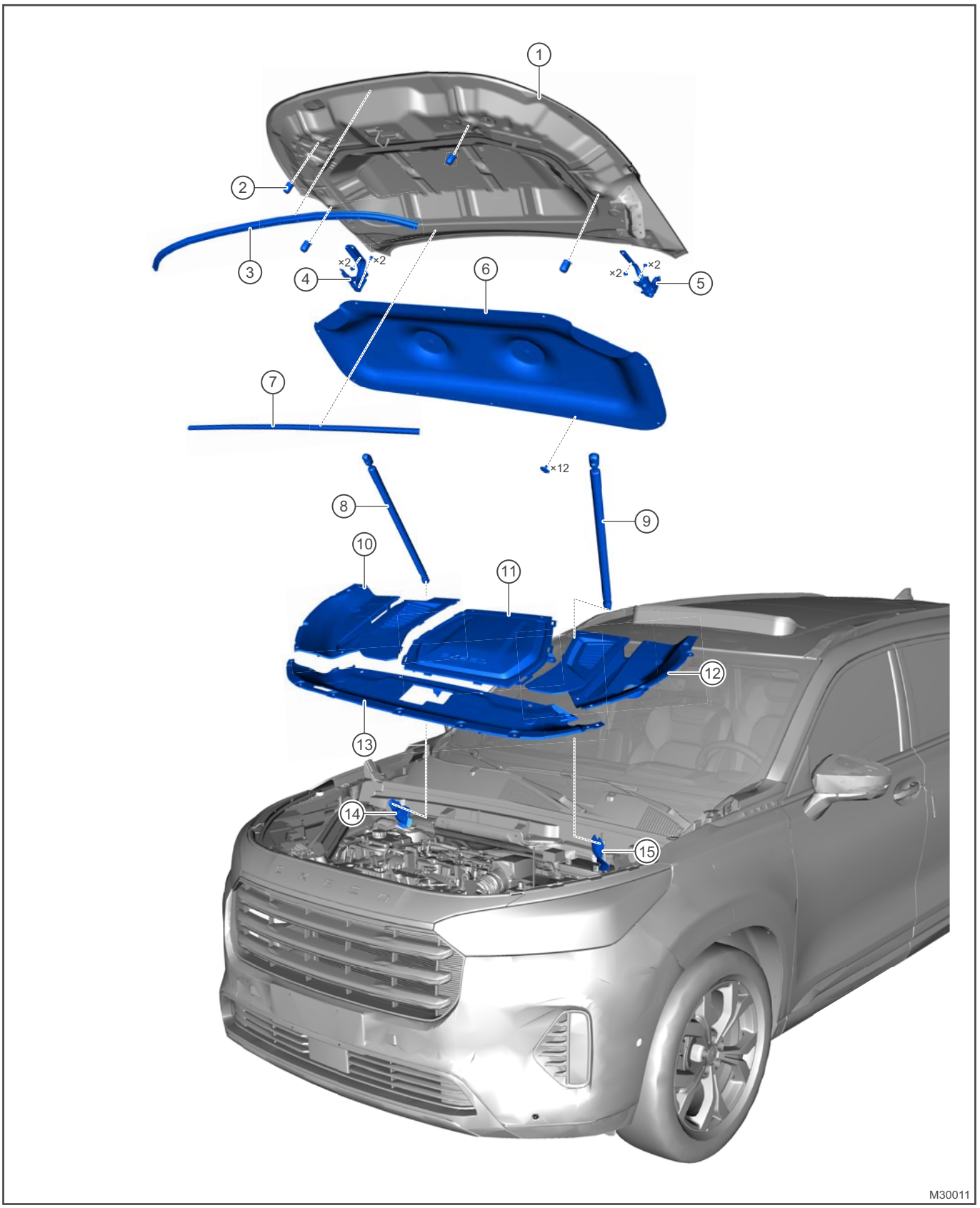
(5) Handle the removed electric support rod assembly carefully and avoid it falling down. Once it falls down, internal mechanical damage may occur, which may cause it impossible to use.

3 System Overview

3.1 System Description

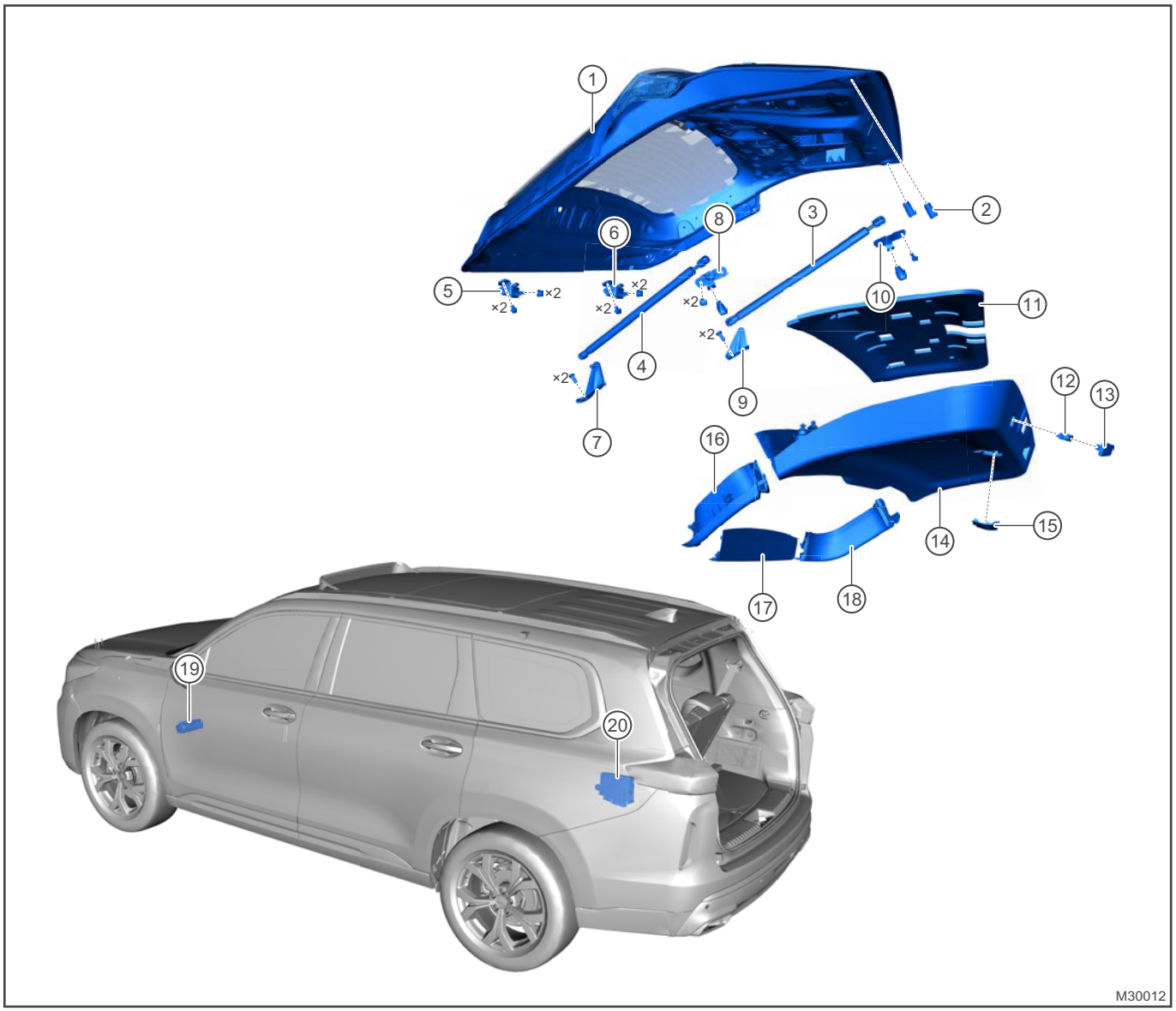
Power back door is equipped on the vehicle (for high configuration)(Power back door system consists of PLG module, electric support, anti-pinch strip, various functional switches, back door lock and self-engage mechanism, etc. Once system receives functional switch signal, it will open or close back door a motor-driven manner).

3.2 System Components Diagram



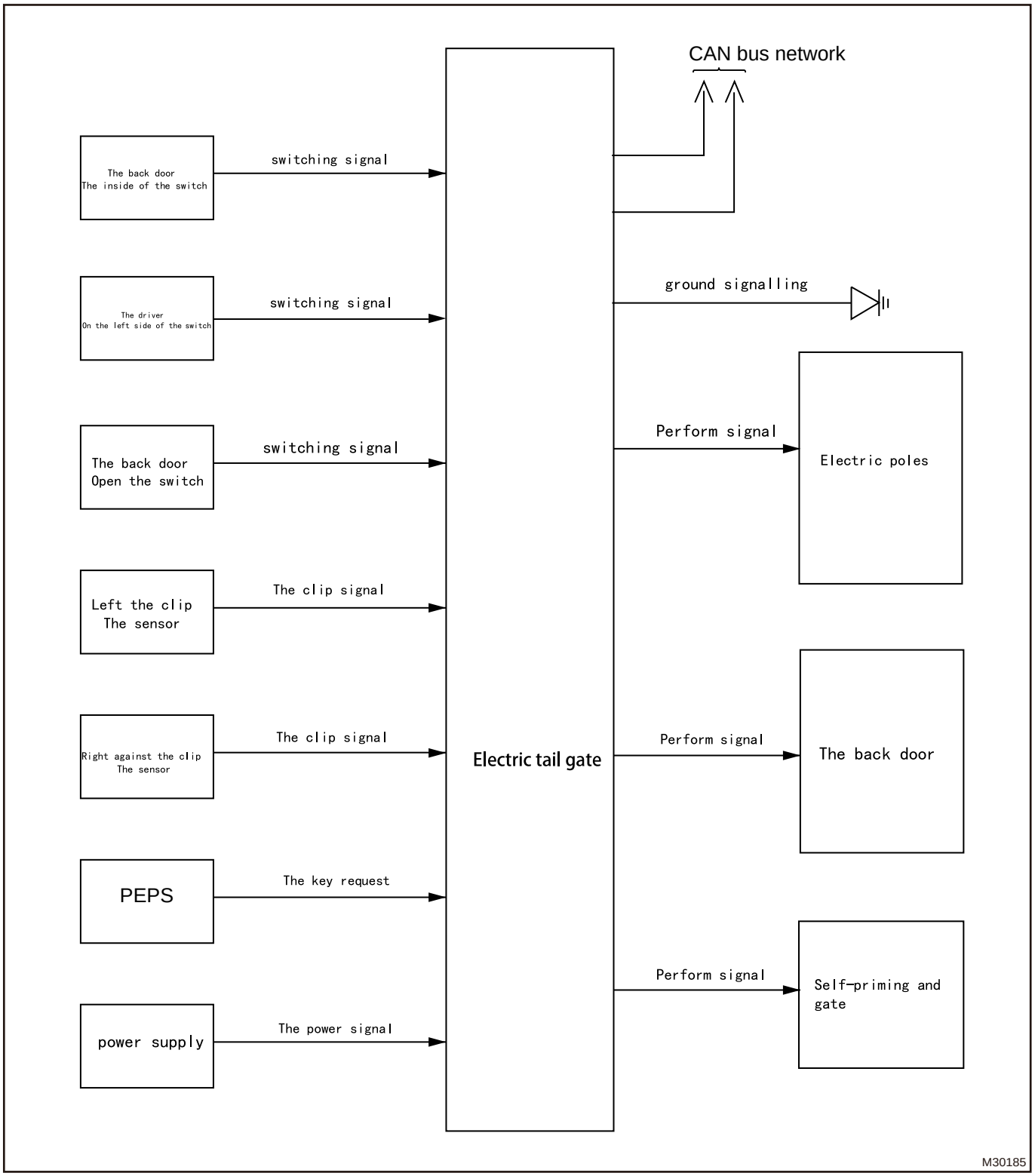
1	Engine Hood Assembly	9	Left Air Spring Assembly
2	Engine Hood Adjustable Buffer Block	10	Engine Compartment Right Protector Assembly
3	Engine Hood Front Weatherstrip	11	Engine Trim Cover
4	Engine Hood Right Hinge Assembly	12	Engine Compartment Left Protector Assembly
5	Engine Hood Left Hinge Assembly	13	Engine Compartment Front Protector Assembly
6	Engine Hood Sound Insulator Pad	14	Engine Compartment Trim Cover Right Gas Spring Removable Cover Plate
7	Engine Hood Middle Weatherstrip	15	Engine Compartment Trim Cover Left Gas Spring Removable Cover Plate
8	Right Air Spring Assembly		

Rear Door Assembly



1	Back Door Assembly	11	Back Door Lower Protector Sound Insulation Cotton
2	Back Door Adjustable Buffer Block	12	Back Door Closer Switch
3	Right Air Spring Assembly	13	Back Door Protector Block Cover
4	Left Air Spring Assembly	14	Back Door Lower Protector Assembly
5	Back Door Left Hinge Assembly	15	Emergency Cable Block Cover
6	Back Door Right Hinge Assembly	16	Back Door Left Protector Assembly
7	Air Spring Lower Left Mounting Bracket	17	Back Door Upper Protector Assembly
8	Gas Spring Upper Left Mounting Bracket	18	Back Door Right Protector Assembly
9	Air Spring Lower Right Mounting Bracket	19	Adjustment Switch Assembly
10	Gas Spring Upper Right Mounting Bracket	20	Power Back Door Module

3.3 System Schematic Diagram



Battery provides 12 V power supply to power back door module (PLG). Power back door module collects information of each sensor and switch command to perform back door action.

3.4 Function Overview

■ Back door opening function

Back door receives the external input signal (CAN signal or hard wire signal), back door unlocks and moves from closed position to opened position automatically. Back door opening function includes two basic actions, which are back door electric unlocking and back door electric opening.

■ Back door closing function

Back door receives the external input signal (CAN signal or hard wire signal), back door moves from opened position to closed position automatically and rear trunk lid lock is closed to fully locked.

■ Back door hovering function

Back door receives the external input signal (CAN signal or hard wire signal), and stops automatically at any position during movement of switch. Back door receives the external input signal (CAN signal or hard wire signal) at stop position, back door can continue to perform opening or closing action.

■ Back door opening height setting

The maximum opening angle of back door can be adjusted by related operations during back door factory configuration and user usage to meet user operation convenience.
Perform back door opening height setting as follows:

- Factory initialization configuration
- Long press back door closing switch number
- Large screen button setting ght

■ Back door jam protection function

During opening or closing of power back door, it will stop automatically and move in reverse direction after encountering obstacle resistance, prevent surrounding person of rear trunk lid being jammed and crashed.

■ Follow-up function

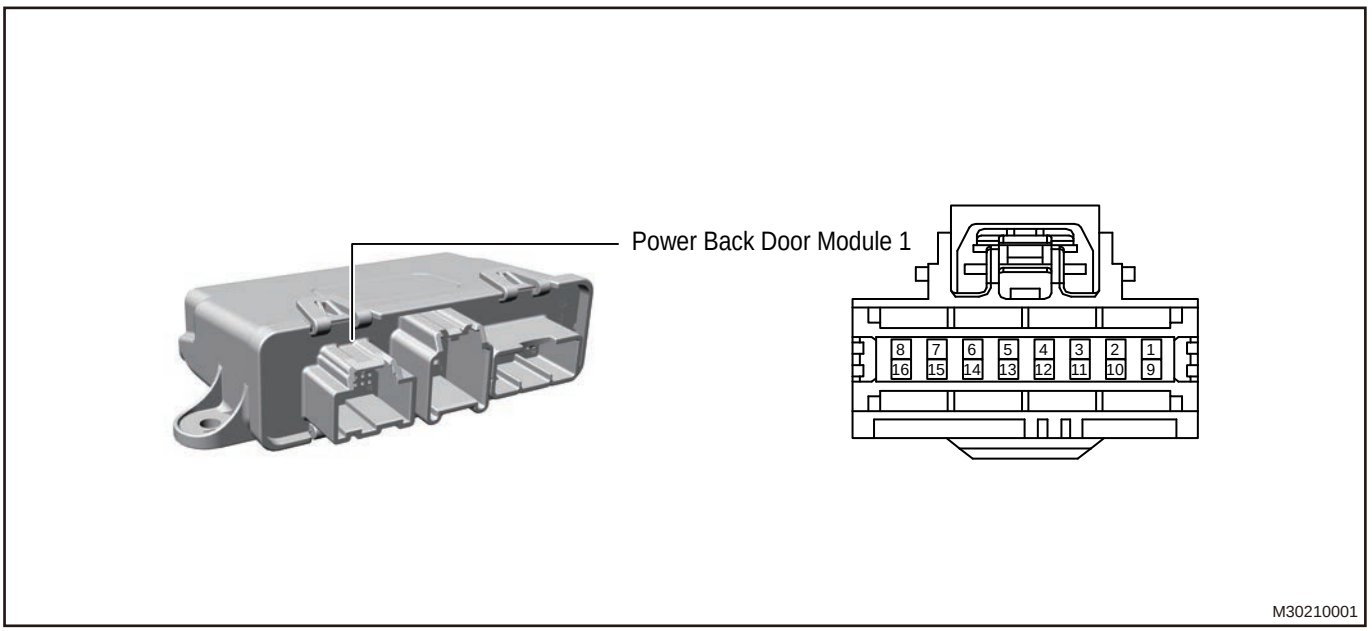
Under hovering condition of back door, back door will complete opening or closing action automatically after dragging the back door to open or close for a certain distance manually.

■ Polling function

Vehicle will poll whether it needs to open or close door, the request is sent via signal SATOReq, and PLG will respond after receiving the signal.

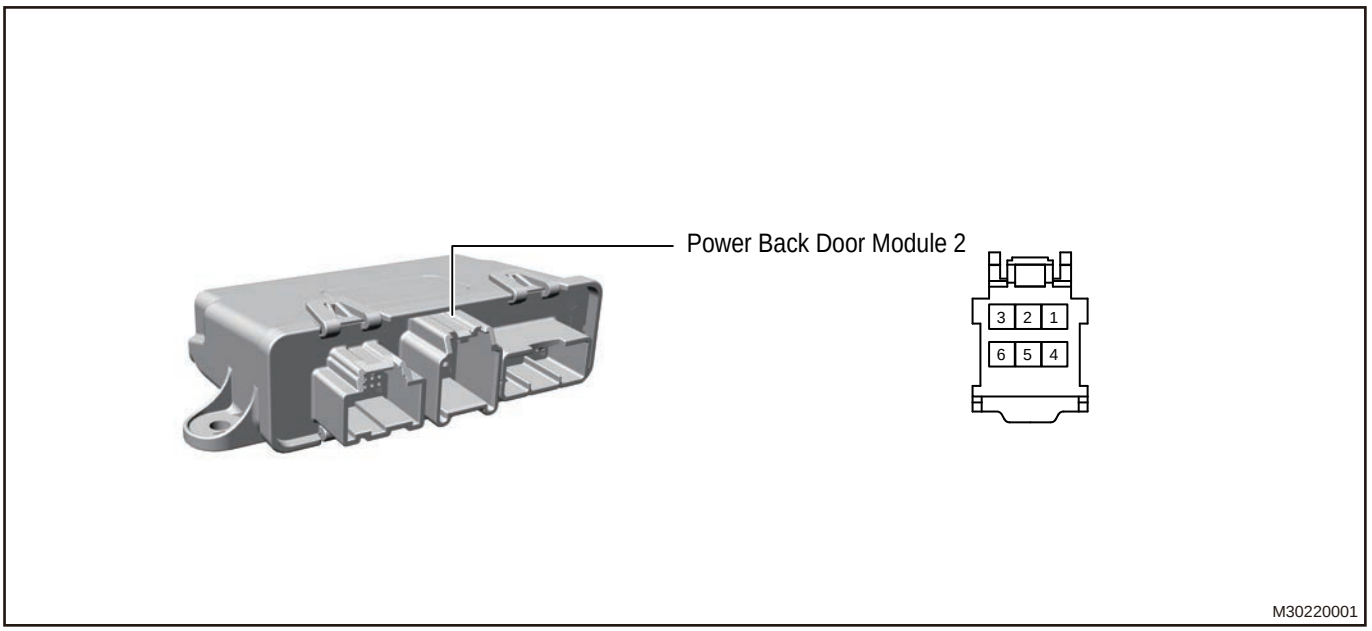
3.5 Module Terminal Definition

Power Back Door Module J1



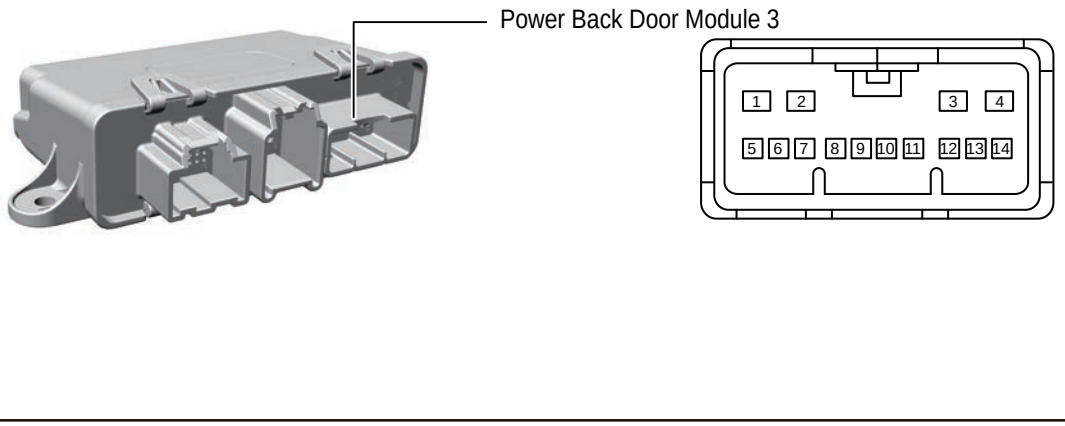
Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Left jam protection signal	Power supply “ON”	2.5V; 0 V with sensor pressed
2	Body ground	Kick sensor (reserved)	Power supply “ON”	-
3	Body ground	Back door closer switch	Power supply “ON”	13V; 0 V with pressed
4	Body ground	Reset signal	Power supply “ON”	13V without being locked; 13V-0V-13V during back door locking
5	Body ground	Half latch signal	Power supply “ON”	0 V without being locked; 13 V with locked
6	Body ground	Full latch signal	Power supply “ON”	0 V without being locked; 13 V with locked
7	Body ground	CAN-L	Power supply “ON”	2.4V
8	Body ground	Right jam protection signal	Power supply “ON”	2.5V; 0 V with sensor pressed
9	/	/	/	/
10	/	/	/	/
11	/	/	/	/
12	/	Driver side switch (reserved)	/	-
13	/	/	/	/
14	/	Outside handle switch (reserved)	/	-
15	/	CAN-H	/	2.6V
16	/	Signal ground	/	0V

Power Back Door Module J2



Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Back door lock motor 2	Power supply “ON”	3.8 V; Voltage changes during locking (3.8 V - 13 V - 3.8 V)
2	Body ground	Back door lock motor 1	Power supply “ON”	3.8 V; Voltage changes during locking (3.8 V - 13 V - 3.8 V)
3	Body ground	30A power supply	Power supply “ON”	13V
4	Body ground	10A power supply	Power supply “ON”	13V
5	Body ground	Buzzer	Power supply “ON”	0.1 V; 7.9 V when buzzer sounds
6	Body ground	Power supply ground	Power supply “ON”	0V

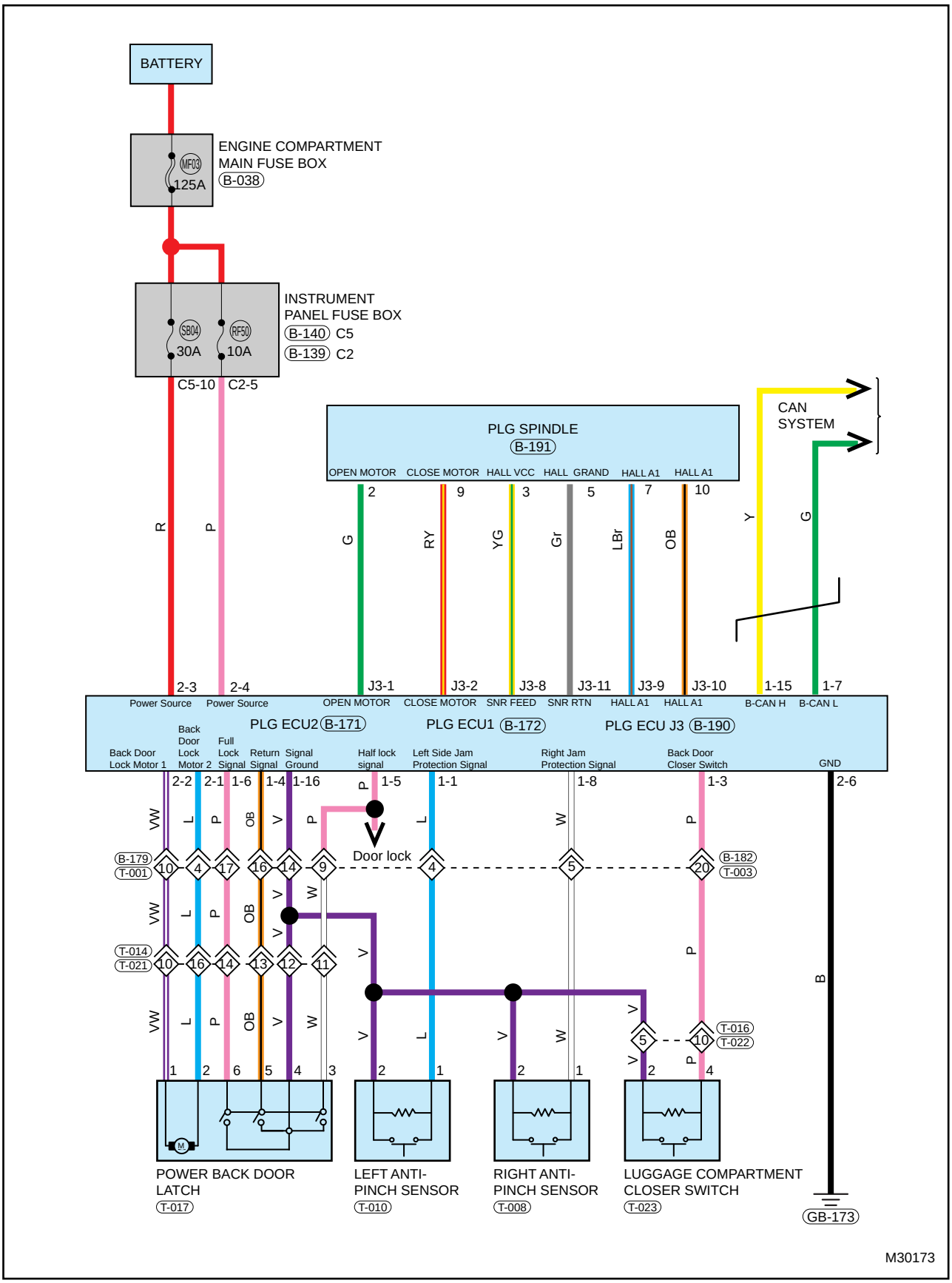
Power Back Door Module J3



Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
1	Body ground	Support rod motor ON	Power supply “ON”	9.3 V; Changes between 4-5V during back door opening; 0 V during closing;
2	Body ground	Support rod motor OFF	Power supply “ON”	9.3 V; 0 V during back door opening; Changes between 4-7V during closing;
3	/	/	/	/
4	/	/	/	/
5	/	/	/	/
6	/	/	/	/
7	/	/	/	/
8	Body ground	“Hall sensor power supply” of electric support rod	Power supply “ON”	13V
9	Body ground	“Hall signal 1” of electric support rod	Power supply “ON”	13 V (full opening) - 0 V (full closing) Varies according to position
10	Body ground	“Hall signal 2” of electric support rod	Power supply “ON”	13 V (full closing) - 0 V (full opening); Varies according to position
11	Body ground	“Hall sensor GND” of electric support rod	Power supply “ON”	0V

Terminal Inspection		Terminal Definition	Detection Condition	Measured Value
Multimeter Positive	Multimeter Negative			
12	/	/	/	/
13	/	/	/	/
14	/	/	/	/

3.6 Circuit Diagram



4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:

- Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Power door lock control system:

Symptom	Suspected Area
Back door cannot be opened	Switch failed
	Main shaft motor is damaged
	Module damaged
Back door jam protection fails	Main shaft motor stuck
	Hall sensor damaged
	Left/right anti-pinch strip damaged
Back door cannot be closed	Door lock/pillar deformed or damaged
	Door opening weatherstrip not installed correctly
	Anti-pinch strip failed

4.2 Diagnostic Help

- Connect diagnostic tester (the latest software) to diagnostic interface, and make it communicate with vehicle electronic module through data network.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If Diagnostic Trouble Code (DTC) cannot be cleared, malfunction is current.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check the related wire harness.
- Check and clean all system grounds related to the latest DTCs.
- If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

4.3 DTC Confirmation Procedure

■ **Confirm that battery voltage is not less than 12 V before performing following procedures.**

- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in the system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check DTCs in the system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

4.4 Intermittent DTC Troubleshooting

■ **If malfunction is intermittent, perform the followings:**

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.

- If possible, try to duplicate the conditions under which DTC was reset.
- Look for data that has changed or DTC to reset during wiggling test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect the mounting areas of instrument cluster, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- Remove instrument cluster from malfunctioning vehicle, then install it to a new vehicle and perform a test. If this DTC cannot be cleared, instrument cluster is malfunctioning. If DTC can be cleared, reinstall instrument cluster to original vehicle.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

4.5 Ground Inspection

Groundings are very important to entire circuit system, which are normal or not can seriously affect the entire circuit system. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) and oxidation may increase load resistance. This case will seriously affect normal operation of circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if any additional accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

5 Diagnosis Procedure

Hint:
Use following procedures to troubleshoot the PLG system.

1	**Vehicle brought to workshop**

Next

2	**Check battery voltage**

Check if battery voltage is normal.

Standard condition
Standard voltage: Not less than 12 V.

Result

NG → **Replace battery**

OK

3	**Customer problem analysis**

Result

Result	Go to
No DTC	A
DTC occurs	B

A → **Perform troubleshooting procedure without DTCs according to malfunction symptom**

B

4	**Troubleshoot according to DTCs troubleshooting procedure**

Result

Result	Go to
Problem is not resolved	A
Problem is resolved	B

A → **Return to procedure 1 and troubleshoot the process again**

B

5	**According to BSD system malfunction repair completion inspection and delivery, confirm if malfunction is resolved**

Result

Result	Go to
Delivery inspection is failed	A
Delivery inspection is qualified	B

A → **Return to procedure 1 and troubleshoot the process again**

B

6	**Finished**

6 Diagnostic Trouble Code (DTC) Chart

■ **Description**

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B14A0 – 11	Spindle Motor Shorted to Ground	ECU monitors that motor voltage is 0 V for 100 ms, when left main shaft motor is not operated.	Wire harness connector failure.	Check connecting wire (used to turn on and off motor) and main shaft motor pin voltages.
B14A0-12	Spindle Motor Shorted to Battery	ECU monitors that motor voltage is power supply voltage for 100 ms, when left main shaft motor is not operated.		
B14A0-13	Spindle Motor Open Circuit	ECU monitors that motor - 1 pin voltage is 0 V, motor - 2 pin voltage is approximately 9.6 V (value varies with power supply) for 100 ms, when left main shaft motor is not operated.		
B14A0-16	Supply Voltage Out of Range (Low)	Power supply voltage is less than 9 V for at least 9 ms.	1. Battery voltage is not stable; 2. Wire harness connector failure.	1. Check battery voltage; 2. Check wire harness connector.
B14A0-17	Supply Voltage Out of Range (High)	Power supply voltage is more than 16 V for at least 500 ms		
B14A2 – 39	Hall Sensor A1 Failed	ECU monitors A1 sensor for abnormalities within 1000 ms, when power back door is opened or closed.	1. Wire harness connector failure; 2. Main shaft motor failure.	1. Check wire and main shaft motor.
B14A3 – 39	Hall Sensor A2 Failed	ECU monitors A2 sensor for abnormalities within 1000 ms, when power back door is opened or closed.		2. Check wire and main shaft motor.
B14A2-41	Left Anti-pinch Sensor Shorted to Battery or Open	ECU detects that anti-pinch motor voltage is 5 V for 100 ms.	1. Wire harness connector failure; 2. Anti-pinch sensor failure.	1. Check connecting wire; 2. Anti-pinch sensor pin voltage.
B14A2-42	Left Anti-pinch Sensor Shorted to Ground	ECU detects that anti-pinch motor voltage is 0 V for 100 ms.		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
B14A2-43	Right Anti-pinch Sensor Shorted to Battery or Open	ECU detects that anti-pinch motor voltage is 5 V for 100 ms.		
B14A2-44	Right Anti-pinch Sensor Shorted to Ground	ECU detects that anti-pinch motor voltage is 0 V for 100 ms.		
B14A8－11	Latch Motor Shorted to Ground	ECU monitors that motor voltage is 0 V for 100 ms, when latch motor is not operated.	1. Wire harness connector failure; 2. Latch motor failure.	1. Check connecting wire; 2. Latch motor pin voltage.
B14A8-12	Latch Motor Shorted to Battery	ECU monitors that motor voltage is power supply voltage for 100 ms, when latch motor is not operated.		
B14A8-13	Latch Motor Open Circuit	ECU monitors that motor - 1 pin voltage is 0 V, motor - 2 pin voltage is approximately 9.6 V (value varies with power supply) for 100 ms, when latch motor is not operated.		
B14AA－11	Speaker Shorted to Ground	ECU monitors that speaker current is more than 5 A for 100 ms, when speaker is operated.	1. Wire harness connector failure; 2. Speaker failure.	1. Check wire connector; 2. Check speaker and speaker pin voltage.
B14AA-12	Speaker Shorted to Battery	ECU monitors that speaker voltage is power supply voltage for 100 ms, when speaker is not operated.		
B14AA-13	Speaker Open Circuit	ECU monitors that speaker voltage is approximately 5.7 V for 100 ms, when speaker is not operated.		
U0100-87	Lost Communication With EMS	If EMS information is not received within 100 ms, this DTC will occur, if this information is received for 3	1. Control module is damaged; 2. Wire harness is damaged.	Refer to CAN network system for troubleshooting

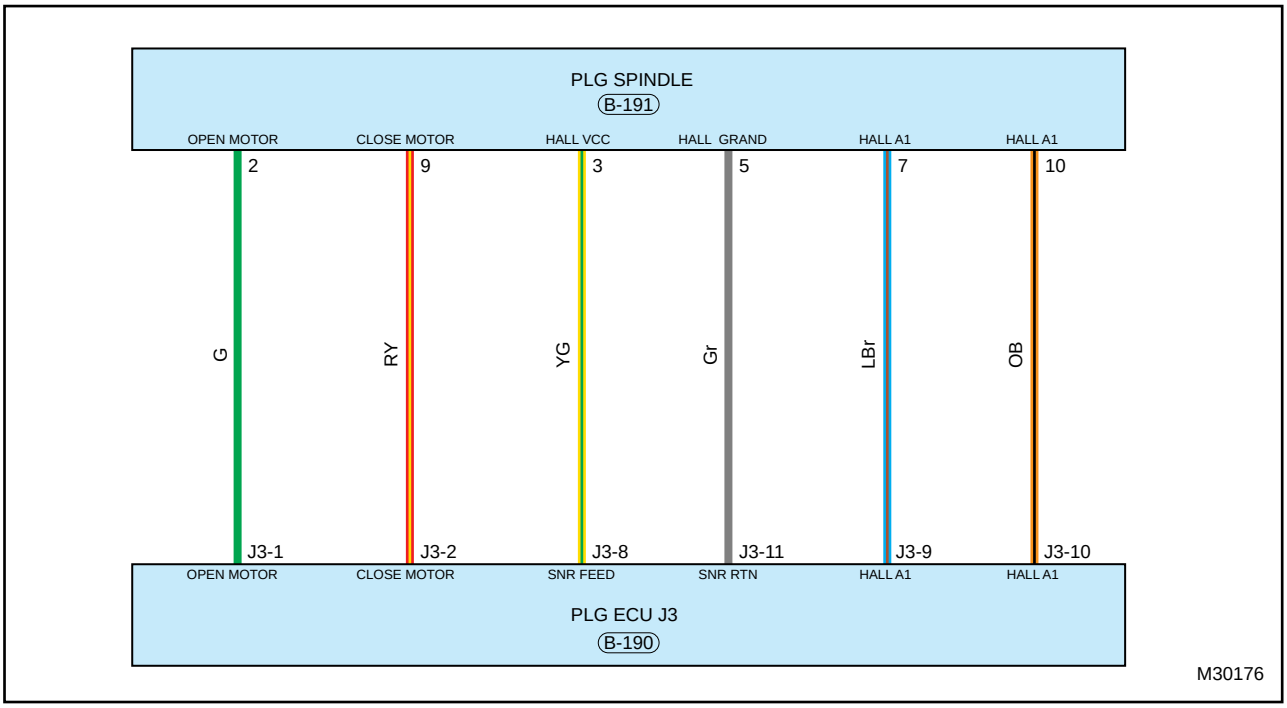
DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		consecutive times, DTC will be cleared		
U0101-87	Lost Communication with TCU	If TCU information is not received within 100 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0122-87	Lost Communication with ESC	If ESC information is not received within 100 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0140-87	Lost Communication with BCM	If BCM information is not received within 100 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0155-87	Lost Communication with IPC	If IPC information is not received within 100 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0164-87	Lost Communication with CLM	If CLM information is not received within 100 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0248-87	Lost Communication with PEPS	If PEPS information is not received within 100 ms, this DTC will occur, if this information is received for 3 consecutive times, DTC will be cleared		
U0401-81	Invalid Data Received from EMS	If incorrect data is received from EMS, this DTC will occur, the DTC will be		

DTC	DTC Definition	Detection Condition	Possible Cause	Maintenance Advice
		cleared after data is normal		
U0402-81	Invalid Data Received from TCU	If incorrect data is received from TCU, this DTC will occur, the DTC will be cleared after data is normal		
U0416-81	Invalid Data Received from ESC	If incorrect data is received from ESC, this DTC will occur, the DTC will be cleared after data is normal		
U0422-81	Invalid Data Received from BCM	If incorrect data is received from BCM, this DTC will occur, the DTC will be cleared after data is normal		
U0423-81	Invalid Data Received from IPC	If incorrect data is received from IPC, this DTC will occur, the DTC will be cleared after data is normal		
U0424-81	Invalid Data Received from CLM	If incorrect data is received from CLM, this DTC will occur, the DTC will be cleared after data is normal		

7 DTC Diagnosis Procedure

DTC	DTC Definition
B1A90-11	**Left Main Shaft Motor Shorted to Ground**
B1A90-12	**Left Main Shaft Motor Shorted to Battery**
B1A90-13	**Left Main Shaft Motor Open Circuit**

Hint:
When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.



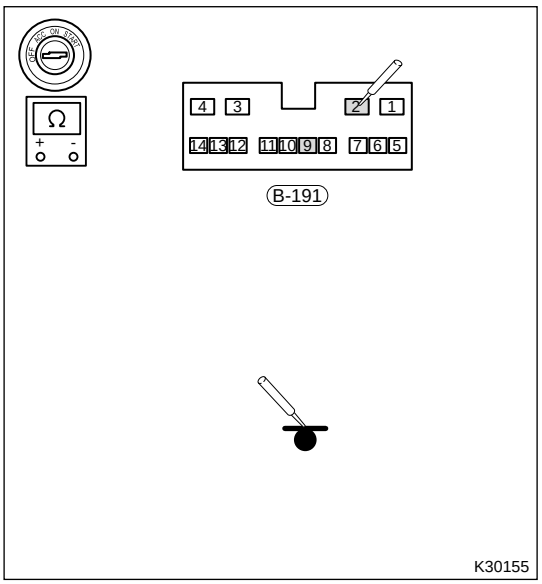
Confirm that battery voltage is not less than 12V before performing following procedures.

1	**Check if left main shaft motor circuit is shorted to ground**

(a) Turn ENGINE START STOP switch to OFF.

(b) Using a digital multimeter, measure resistance between motor support rod B-191 (2), B-191 (9) and body ground.

Multimeter Connection	Condition	Specified Condition
B-191 (2) - Body ground	ENGINE START STOP switch "OFF"	∞
B-191 (9) - Body ground	ENGINE START STOP switch "OFF"	∞



NG → **Replace or check and repair wire harness**

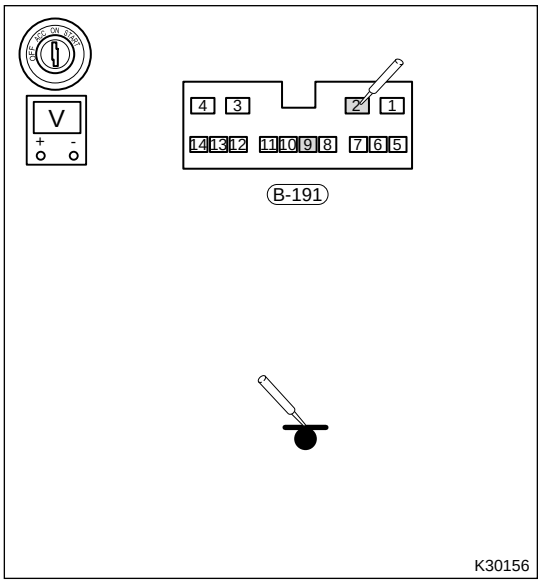
OK

2	**Check if left main shaft motor circuit is shorted to battery**

(a) Turn ENGINE START STOP switch to ON.

(b) Using a digital multimeter, measure voltage between motor support rod B-191 (2), B-191 (9) and body power supply.

Multimeter Connection	Condition	Specified Condition
B-191 (2) - Body ground	ENGINE START STOP switch "ON"	0 V
B-191 (9) - Body ground	ENGINE START STOP switch "ON"	0 V



NG → **Replace or check and repair wire harness**

OK

3	Check for open in wire harness

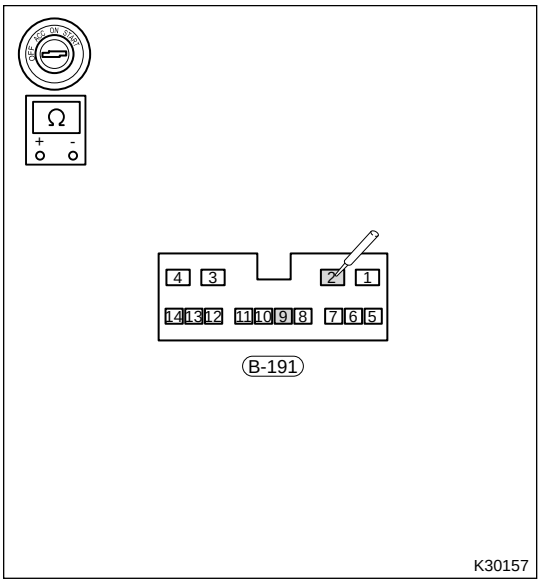
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect the electric support rod connector B-191.

(d) Using a digital multimeter, measure resistance between connectors B-191 (2) and B-191 (9) to check for open in wire harness.

Multimeter Connection	Condition	Specified Condition
B-191 (2) - B-191 (9)	ENGINE START STOP switch "OFF"	> 0 Ω

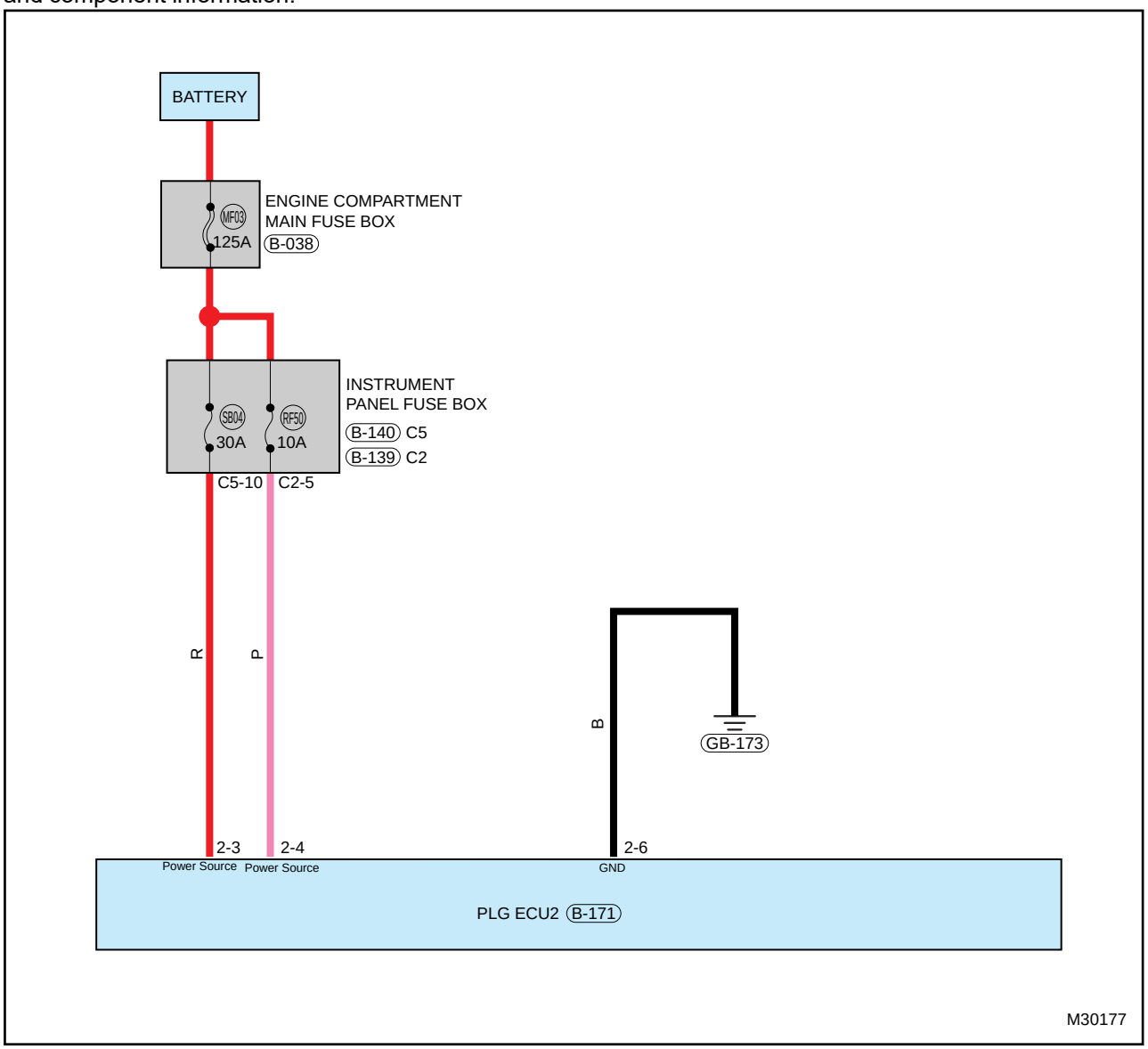


OK → **Replace power back door module assembly**

NG → **Handle and repair related wire harness**

DTC	DTC Definition
B14A0-16	Voltage Too Low
B14A0-17	Voltage Too High

Hint:
When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.



1	**Check fuse**

(a) Check if fuses MF03, SB04 and RF50 are blown out.

NG → **Replace fuse**

OK

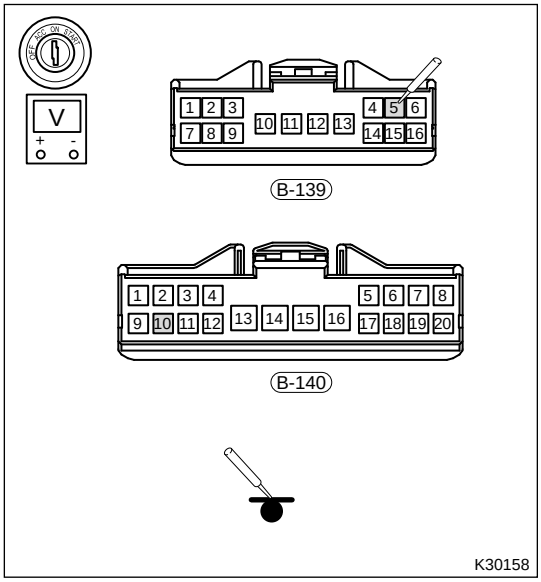
2	**Check output voltage of instrument panel fuse and relay box**

(a) Turn ENGINE START STOP switch to ON.

(b) Disconnect instrument panel fuse and relay box connectors B-140 and B-139.

(c) Using a digital multimeter, measure voltage between connectors B-139 (5) and B-140 (10) and body ground.

Multimeter Connection	Condition	Specified Condition
B-139 (5) - Body ground	ENGINE START STOP switch "ON"	⩽ 12 V
B-140 (10) - Body ground	ENGINE START STOP switch "ON"	⩽ 12 V



NG → **Replace instrument panel fuse and relay box assembly**

OK →

3	Check for open in wire harness

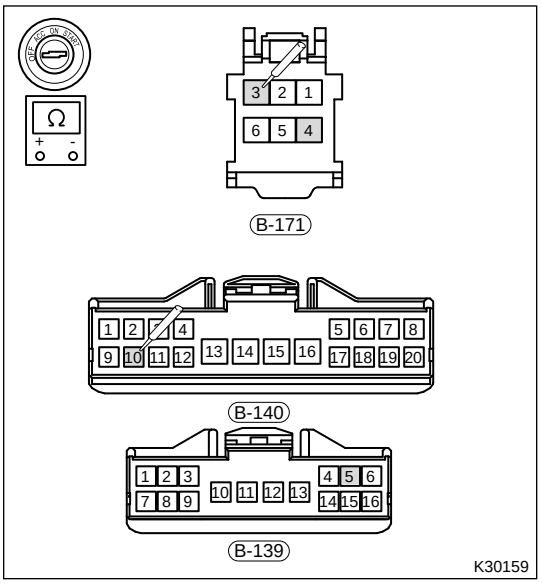
(a) Turn ENGINE START STOP switch to OFF.

(b) Disconnect the negative battery cable.

(c) Disconnect power back door module connector B-171, and instrument panel fuse and relay box connectors B-140 and B-139.

(d) Using a digital multimeter, measure resistance between connectors B-171 (3) and B-140 (10), connectors B-171 (4) and B-139 (5) to check for open in wire harness.

Multimeter Connection	Condition	Specified Condition
B-171 (3) - B-140 (10)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
B-171 (4) - B-139 (5)	ENGINE START STOP switch "OFF"	⩽ 1 Ω

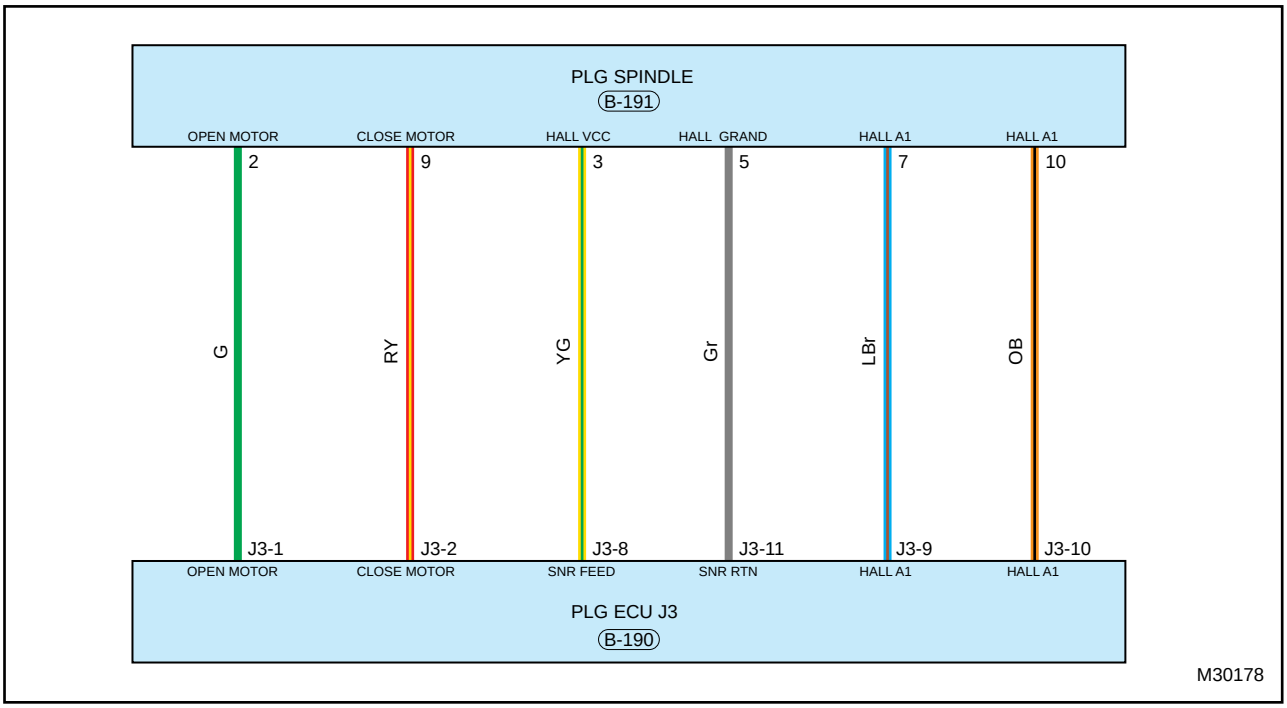


OK → **Replace PLG module assembly**

NG → **Handle and repair related wire harness**

DTC	DTC Definition
B14A2 - 39	Hall Sensor A1 Failed
B14A8 - 11	Hall Sensor A2 Failed

Hint:
When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.

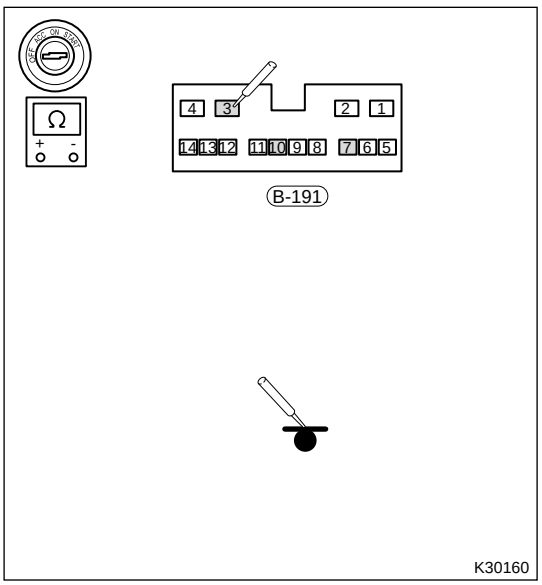


1	**Check for open in motor support rod signal circuit**

(a) Turn ENGINE START STOP switch to OFF.

(b) Using a digital multimeter, measure resistance between motor support rod B-191 (3/7/10) terminals and ground.

Multimeter Connection	Condition	Specified Condition
B-191 (3) - Body ground	ENGINE START STOP switch "OFF"	∞
B-191 (7) - Body ground	ENGINE START STOP switch "OFF"	∞
B-191 (10) - Body ground	ENGINE START STOP switch "OFF"	∞



NG → Check and repair motor support rod assembly

OK

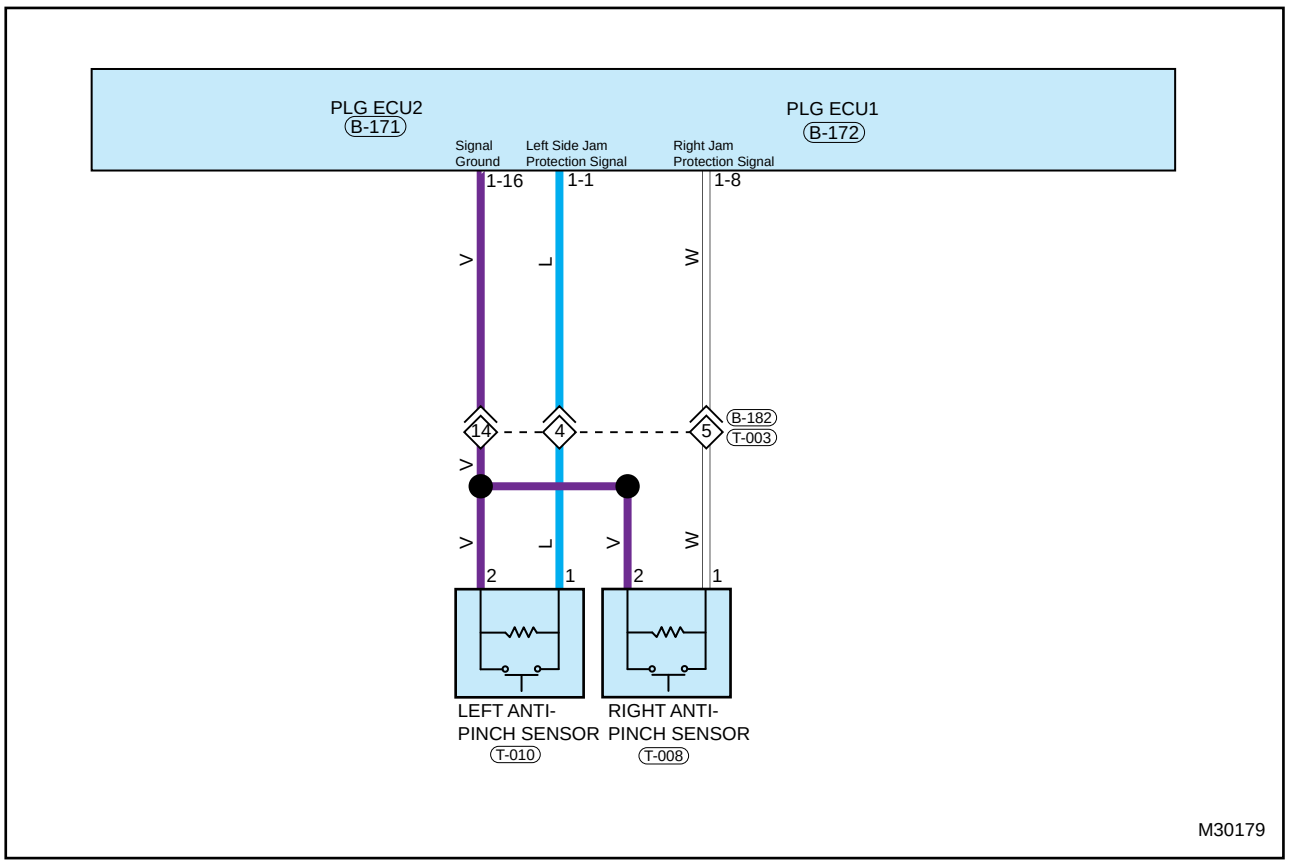
2	Check if motor support rod sensor is normal

OK → Replace PLG module assembly

NG → Replace motor support rod assembly

DTC	DTC Definition
B14A2-41	Left Anti-pinch Strip Shorted to Battery or Open
B14A2-42	Left Anti-pinch Strip Shorted to Ground
B14A2-43	Right Anti-pinch Strip Shorted to Battery or Open
B14A3 - 39	Right Anti-pinch Strip Shorted to Ground

Hint:
When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.



Take left rod anti-pinch strip as an example. For right rod anti-pinch strip, refer to LH side.

1	Check left rod anti-pinch strip connector

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the left anti-pinch strip connector T-010.
(d) Check wire harness, connector and terminal for deformation, bending or damage.

NG → **Repair or replace left anti-pinch strip wire harness**

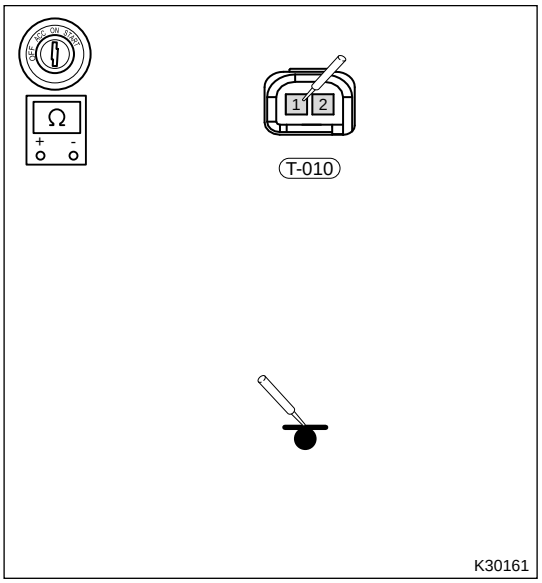
OK

2	Check for short in left rod anti-pinch strip wire harness

(a) Turn ENGINE START STOP switch to ON.

(b) Measure if left anti-pinch strip circuit is short to power supply.

Multimeter Connection	Condition	Specified Condition
T-010(1) - Body ground	ENGINE START STOP switch "ON"	5 V
T-010(2) - Body ground	ENGINE START STOP switch "ON"	≈ 0 V



NG → **Repair or replace left anti-pinch strip wire harness**

OK

3	Test left rod anti-pinch strip

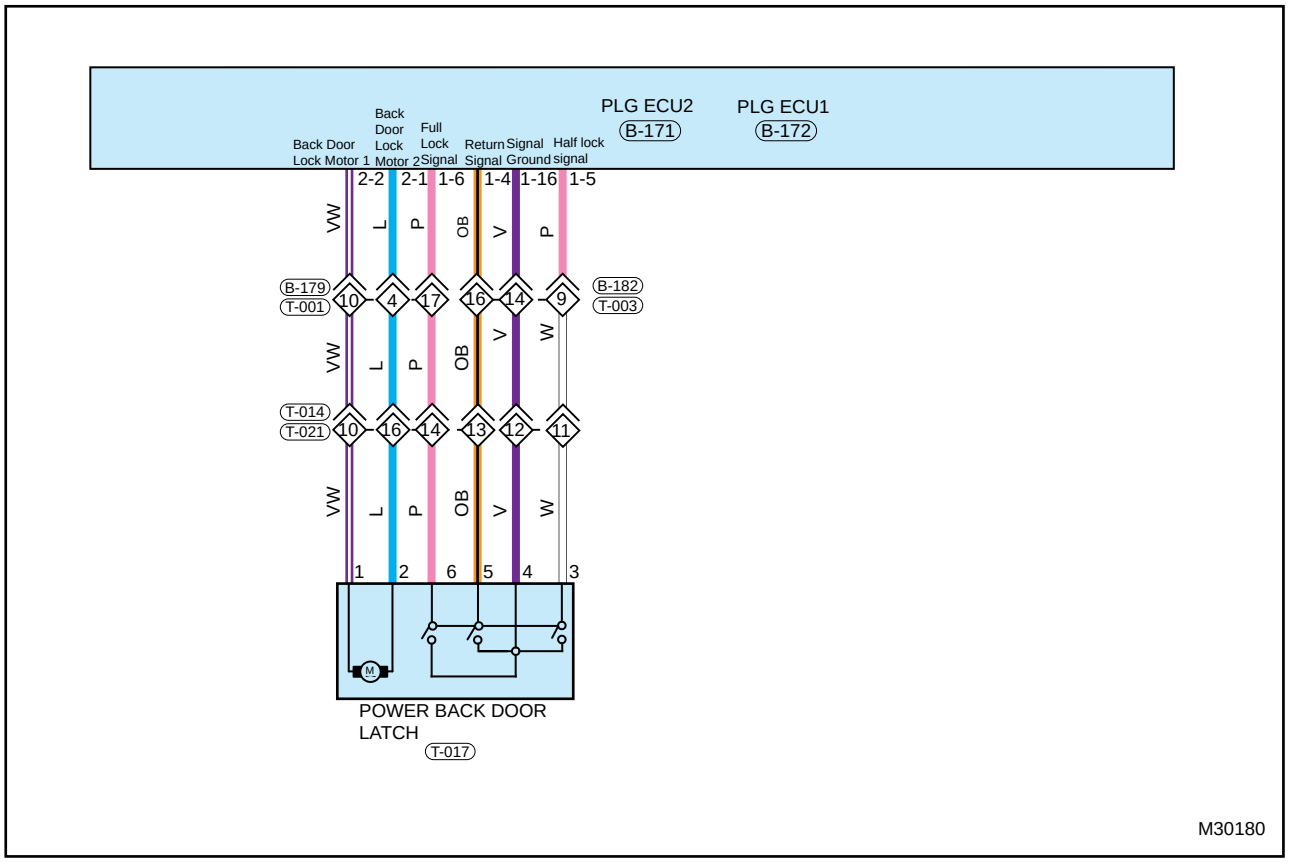
(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect left anti-pinch strip wire harness connector and use digital multimeter to measure internal resistance of left rod anti-pinch strip.

OK → **System is normal**

NG → **Replace left rod anti-pinch strip**

DTC	DTC Definition
B14A8-12	Lock Motor Shorted to Ground
B14A8-13	Lock Motor Shorted to Battery

Hint:
When performing electrical equipment diagnosis and test, always refer to circuit diagram for related circuit and component information.



1	Check lock motor connector

(a) Turn ENGINE START STOP switch to “OFF”.
(b) Disconnect the connector T-017, and check terminals.

NG → **Repair or replace motor wire harness**

OK

2	Check lock motor driver

(a) Turn ENGINE START STOP switch to “ON”.
(b) Press back door switch and measure T-017 (1), (4) with 21 W test light. The test light should be on.

NG → **Replace door lock motor assembly**

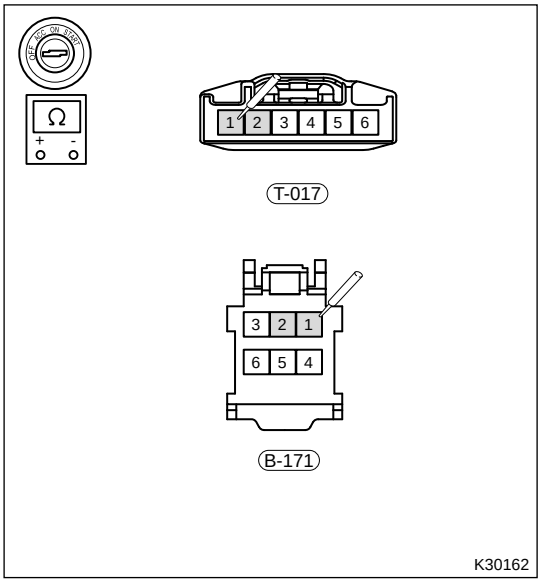
OK

3	Check lock motor wire harness

(a) Turn ENGINE START STOP switch to “OFF”.
(b) Disconnect self-engage and fastener connector T-017, and disconnect power back door connector B-171.

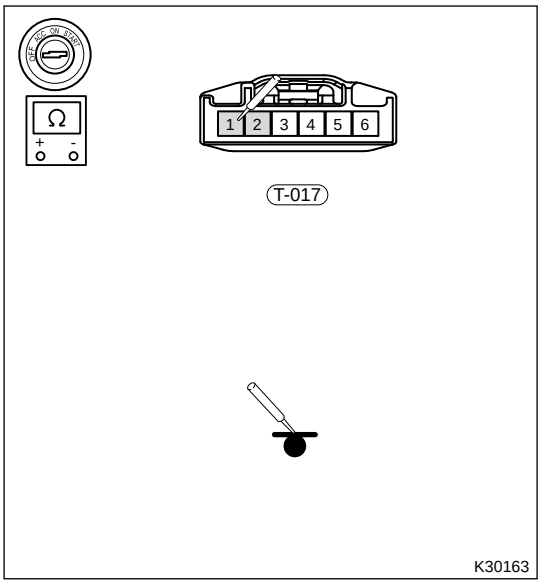
(c) Using multimeter, check for continuity between T-017 (1) - B-171 (2) and T-017 (2) - B-171 (1).

Multimeter Connection	Condition	Specified Condition
T-017 (1) - B-171(2)	ENGINE START STOP switch “OFF”	⩽ 1 Ω
T-017 (2) - B-171 (1)	ENGINE START STOP switch “OFF”	⩽ 1 Ω



(d) Using multimeter, measure resistance between T-017 (1) and T-017 (2) and ground.

Multimeter Connection	Condition	Specified Condition
T-017 (1) - Body ground	ENGINE START STOP switch “OFF”	∞
T-017 (2) - Body ground	ENGINE START STOP switch “OFF”	∞



(e) Using multimeter, measure voltage between T-017 (1) and T-017 (2) and ground.

Multimeter Connection	Condition	Specified Condition
T-017 (1) - Body ground	ENGINE START STOP switch “ON”	Other than power supply voltage
T-017 (2) - Body ground	ENGINE START STOP switch “ON”	Other than power supply voltage

NG	Repair or replace motor wire harness

OK

4	Reconfirm DTCs

(a) Connect all the connectors.
(b) Connect the negative battery cable.
(c) Turn ENGINE START STOP switch to “ON”.
(d) Use diagnostic tester (the latest software) to reread DTC in system.

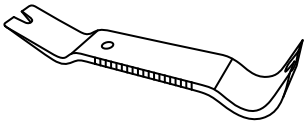
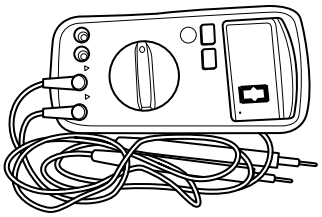
OK	System is normal
NG	Replace fastener assembly

DTC	DTC Definition
U0100-87	Lost Communication with EMS
U0101-87	Lost Communication with TCU
U0122-87	Lost Communication with ESC
U0140-87	Lost Communication with BCM
U0155-87	Lost Communication with IPC
U0164-87	Lost Communication with CLM
U0248-87	Lost Communication with PEPS
U0401-81	Invalid Data Received from EMS
U0402-81	Invalid Data Received from TCU
U0416-81	Invalid Data Received from ESC
U0422-81	Invalid Data Received from BCM
U0423-81	Invalid Data Received from IPC
U0424-81	Invalid Data Received from CLM
U0426-81	Invalid Data Received from PEPS
U0546-81	Invalid Data Received from IHU
UIBOO-88	CAN Bus Off

1	Refer to “CAN” network system for troubleshooting

8 On-vehicle Service

8.1 Tools

Tool Name	Tool Drawing
Interior Crow Plate	 S00020
Digital Multimeter	 S00002

8.2 Replacement of Engine Compartment Trim Cover Assembly

■ Removal

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing engine compartment trim cover assembly.**

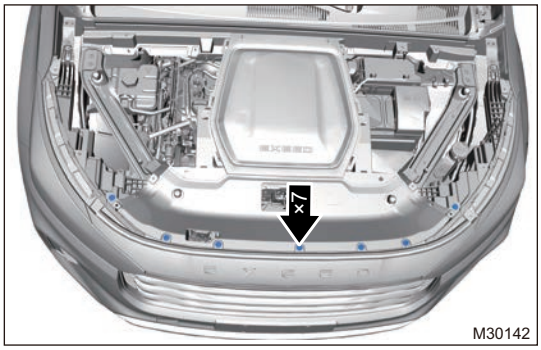
(1) Remove clips (6 on each protector) from left/right protector of engine compartment trim cover assembly.

M30040

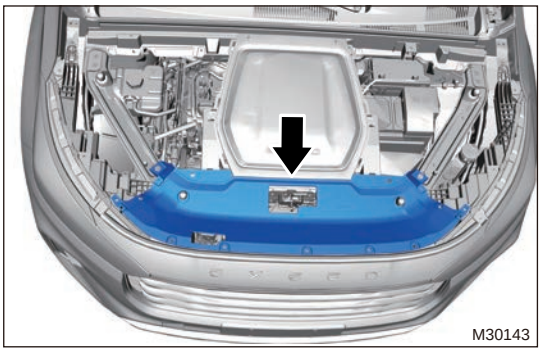
(2) Remove left/right protector assemblies from engine compartment trim cover assembly separately.


M30041

(3) Remove 7 fixing clips from front protector of engine compartment trim cover assembly.



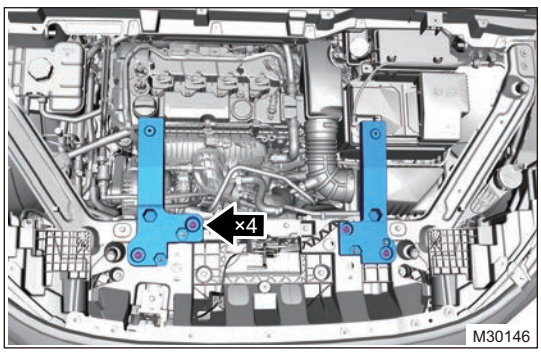
(4) Remove the front protector assembly.



(5) Remove 4 clips from engine compartment trim cover.

(6) Remove the engine compartment trim cover assembly.

(7) Remove 4 fixing bolts from left/right engine compartment trim cover bracket, and remove trim cover bracket.



■ **Installation**

⚠ Caution

- **After installation, check if it is fastened firmly without any looseness of clip.**
- **Install engine compartment trim cover to the corresponding position of engine compartment, align the holes, and center the expansion tank. Be careful not to scratch the appearance during placement, adjust in time if there is a hole deviation.**

(1) Install left/right trim cover bracket to a proper position.

(2) Install front trim cover and fix fixing clip to trim cover.

(3) Install front protector assembly, and install and tighten 7 fixing clips.

(4) Install the engine compartment trim cover left/right protector assembly.

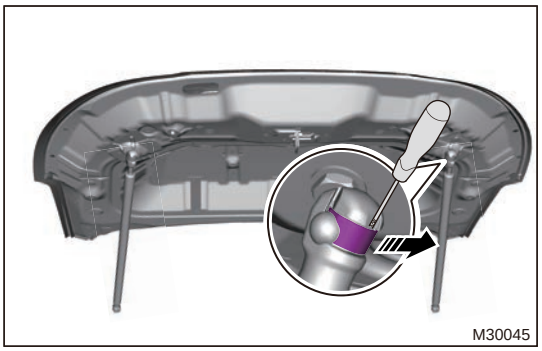
8.3 Replacement of Engine Hood Gas Spring

■ **Removal**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing engine hood gas spring assembly.**
- **When removing engine hood gas spring assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.**
- **There may be a certain starting force on gas spring when it is used firstly, although the supplier will run-in to solve this problem before leaving the factory, closing force may too strong after long term storage. For personal safety, it is necessary to close engine hood slowly at the first time, If it cannot be closed, it is necessary to replace gas spring. The gas spring is a product with internal high pressure storage. User is prohibited to approach the gas spring to the fire and heat sources; Never strike gas spring fiercely; Prevent explosion which will cause the unnecessary personal injury. It is forbidden absolutely to disassemble gas spring without site guidance of specialized person. Any small mis-operation during disassembly may lead to piston rod injection or cylinder burst, causing personal injury and accidents.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

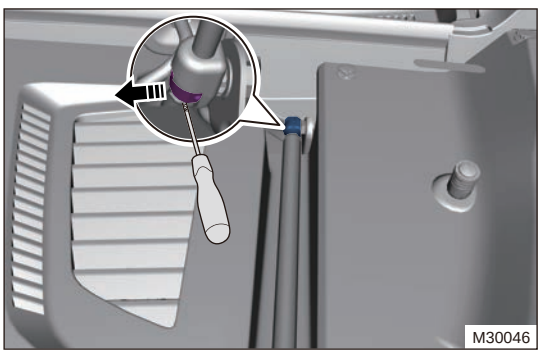
(1) Insert a flat-head screwdriver into the slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, hold the area nearest to ball socket with a hand, and pull end of gas spring lightly in the opposite direction to remove it.


M30045

⚠ Caution

- **When removing gas spring, avoid using tools to knock and removing forcibly.**
- **It is not allowed absolutely to hold center part of gas spring to remove it forcibly.**

(2) Insert a flat-head screwdriver into the slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, hold the area nearest to ball socket with a hand, and pull end of gas spring lightly in the opposite direction to remove it.


M30046

⚠ Caution

- **When removing gas spring, avoid using tools to knock and removing forcibly.**
- **It is not allowed absolutely to hold center part of gas spring to remove it forcibly.**

(3) Remove the engine hood left gas spring assembly.

■ **Installation**

⚠ Caution

- **When installing engine hood left gas spring assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.**
- **Pay attention to the installation direction and installation sequence, clamp the piston rod end to engine hood gas spring left mounting bracket, and then clamp the cylinder end to engine hood, so that ball socket cannot slide out.**
- **When installing engine hood end after gas spring ball socket of the engine hood gas spring left mounting bracket is installed, if ball pin of engine hood is not aligned with gas spring ball socket, rotate the gas spring cylinder clockwise and insert ball socket into the ball pin of engine hood when ball socket is aligned with ball pin. (This assembly method can ensure that the assembled gas spring ball socket is tightened and not loose. If it is not assembled in this order, it may cause looseness of gas spring ball socket during assembly.)**

(1) Apply grease to ball socket of gas spring body, and ensure appearance is not being affected, and then clamp the body to ball pin separately.

(2) Install the C-shaped snap spring at the lower end of engine hood left gas spring assembly.

(3) Install the C-shaped snap spring at the upper end of engine hood left gas spring assembly.

(4) Install the trim cover left gas spring removable cover plate.

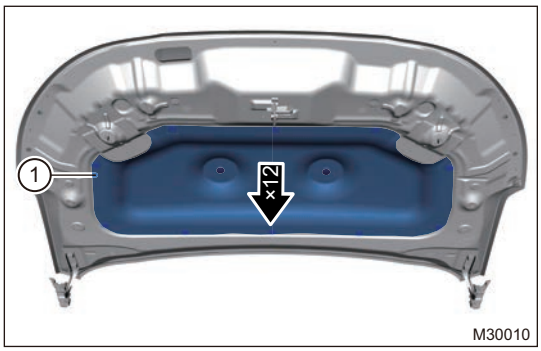
8.4 Replacement of Engine Hood Assembly

■ **Removal**

⚠ Caution

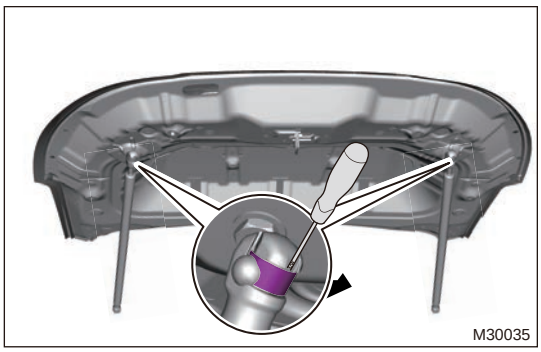
- **Be sure to wear safety equipment to prevent accidents, when removing engine hood assembly.**
- **When removing engine hood assembly, try to prevent engine hood from falling down during operation, resulting in damage to body or front windshield.**
- **When removing engine hood assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.**

(1) Remove clips from engine hood sound insulator pad, and remove the engine hood sound insulator pad (1).

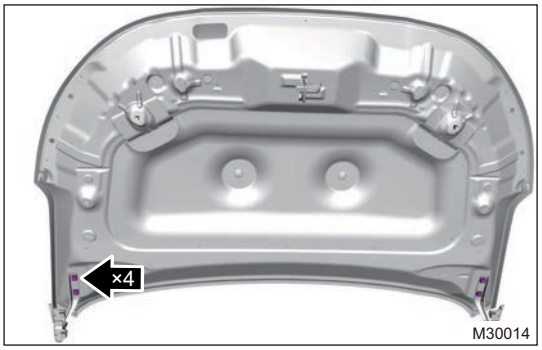


(2) Remove the front washer pipeline assembly.

(3) Using a screwdriver wrapped with protective tape, pry off fixing clip from upper end of engine hood left/right gas spring assembly.



(4) Remove 4 fixing nuts between engine hood assembly and engine hood both sides hinge assembly, and remove engine hood assembly.



■ **Installation**

(1) Install engine hood assembly, install and tighten 2 fixing bolts to engine hood.
(2) Install the engine hood left/right gas spring assembly.
(3) Install the front washer pipeline assembly.
(4) Install the engine hood adjustable buffer block.
(5) Install the engine hood sound insulator pad and fixing clip.

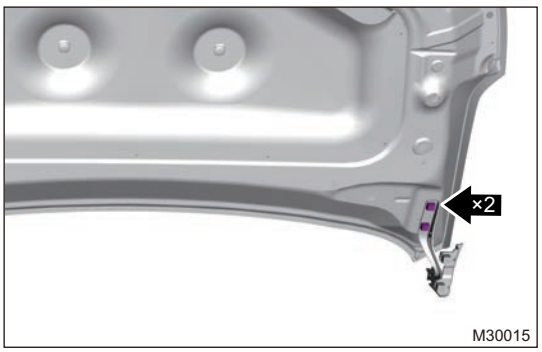
8.5 Replacement of Engine Hood Hinge Assembly

■ **Removal**

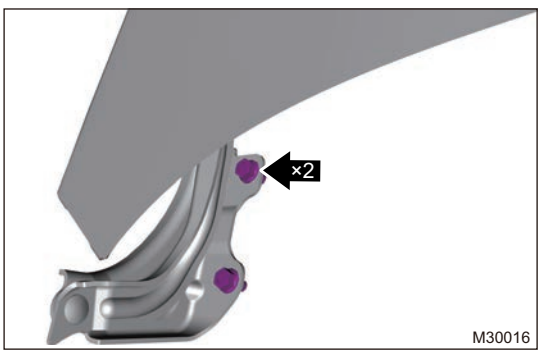
⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing engine hood hinge assembly.**
- **When removing engine hood hinge assembly, try to prevent engine hood from falling down during operation, resulting in damage to body or front windshield.**
- **When removing engine hood hinge assembly, an assistant is needed to hold engine hood. Try to prevent engine hood from falling down or closing suddenly during operation, resulting in accidents.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

(1) Remove the wing assembly.
(2) Remove 2 fixing nuts between left hinge assembly and engine hood assembly.



(3) Remove 2 fixing bolts between engine hood left hinge assembly and body.



(4) Remove the engine hood left hinge assembly.

■ **Installation**

(1) Install the engine hood left hinge assembly to a proper position of body.
(2) Install 2 fixing bolts between engine hood left hinge assembly and body.
Torque: 22 ± 1.0 N·m
(3) Install 2 fixing nuts between left hinge assembly and engine hood assembly.
Torque: 22 ± 1.0 N·m
(4) Install the wing assembly.

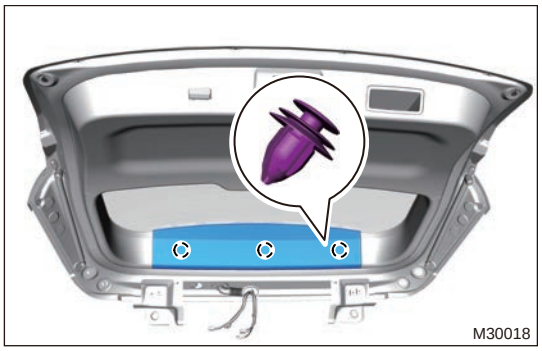
8.6 Replacement of Back Door Protector Assembly

■ **Removal**

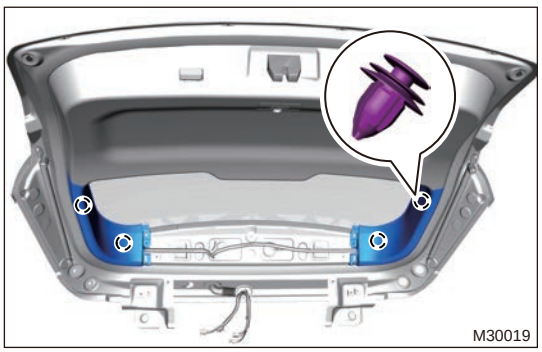
⚠ Caution

- **Be sure to wear safety equipment when removing back door protector assembly.**
- **Try to prevent body paint surface from being scratched, when removing back door protector assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Using an interior crow plate, pry off plastic clip from back door upper protector assembly carefully.


M30018

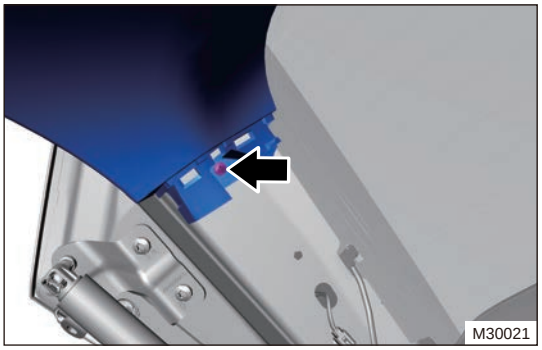
(4) Using an interior crow plate, pry off plastic clip from back door left/right protector assembly carefully.


M30019

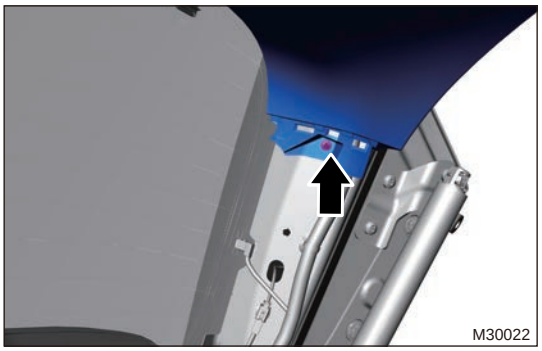
(5) Using an interior crow plate, pry off claw from emergency cable hole block cover carefully, and remove emergency cable hole block cover.


M30020

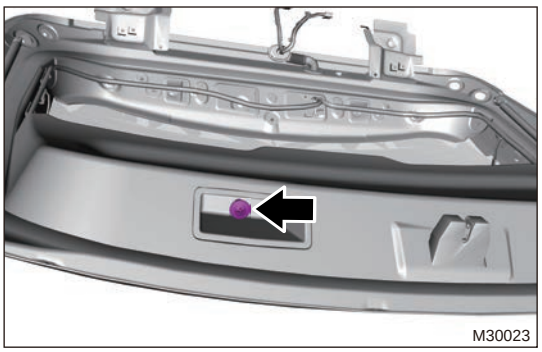
(6) Remove 1 fixing screw from back door lower protector.



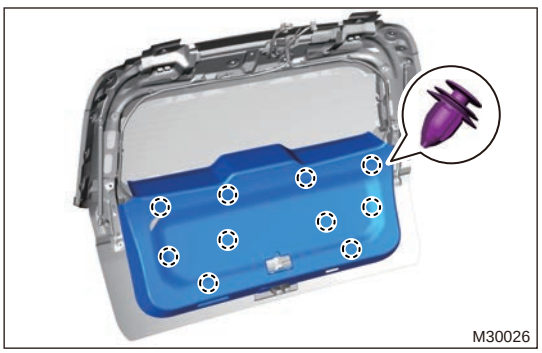
(7) Remove 1 fixing screw from back door lower protector.



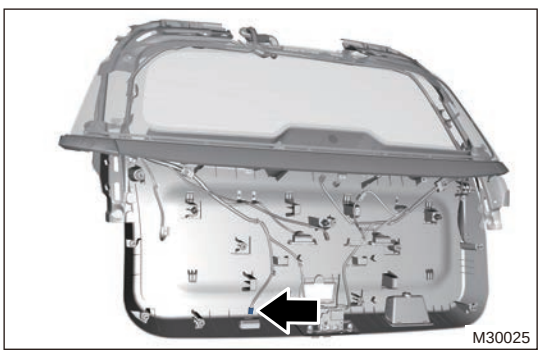
(8) Using an interior crow plate, pry off handle box screw block cover carefully, and remove fixing screw from rear side of handle box screw block cover.



(9) Using an interior crow plate, pry off plastic clip from back door lower protector assembly carefully.



(10) Disconnect the power switch assembly connector (with power back door).



(11) Remove the back door lower protector assembly.

(12) Remove back door handle box from back door lower protector assembly.

■ **Installation**

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when installing back door protector assembly.**
- **Try to prevent body paint surface from being scratched, when installing back door protector assembly.**

(1) Install handle box to a proper position of lower protector.

(2) Install back door lower protector assembly to body panel, and connect power switch assembly connector.

(3) Align back door protector clip with sheet metal hole, and clamp clips to the corresponding hole on sheet metal in the order from down to up.

(4) Install fixing screw to handle box, and install block cover.
Torque: 1.5 ± 0.5 N·m

(5) Install 2 fixing screws to back door lower protector.
Torque: 1.5 ± 0.5 N·m

(6) Install the emergency cable hole block cover.

(7) Install the back door left/right protector assembly.

(8) Install the back door upper protector assembly.

(9) Connect the negative battery cable.

8.7 Replacement of Back Door Assembly

■ **Removal**

⚠ Caution

- **Be sure to wear safety equipment when removing back door assembly.**
- **Try to prevent body paint surface from being scratched, when removing back door assembly.**
- **When removing back door assembly, an assistant is needed to hold the trunk lid. Try to prevent trunk lid from falling down or closing suddenly during operation, resulting in accidents.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the back door protector assembly.

(4) Remove the back door wiper arm.

(5) Remove the back door wiper motor assembly.

(6) Remove the back door lock assembly.

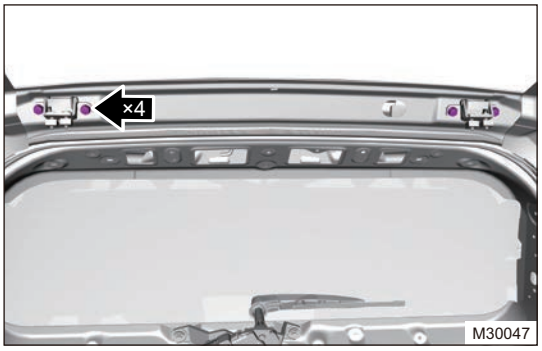
(7) Remove the rear combination light assembly (back door part).

(8) Remove the back door anti-pinch strip.

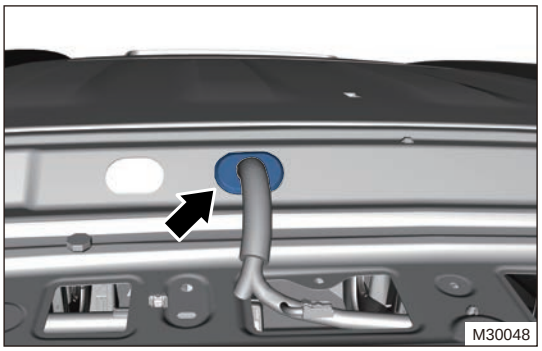
(9) Remove the rear spoiler plate.

(10) Remove the roof assembly.

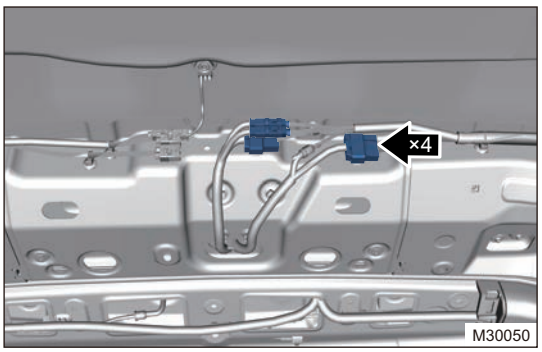
(11) Remove 4 fixing bolts from back door left and right hinges assembly.



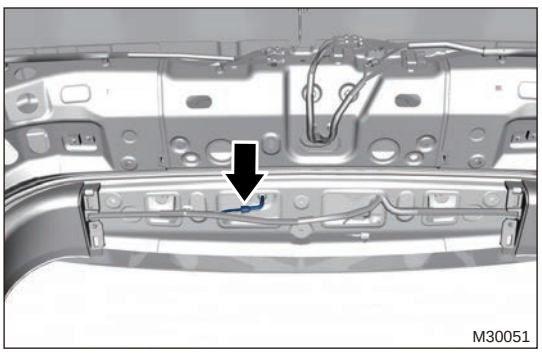
(12) Using an interior crow plate, pry off back door wire harness dust boot carefully.



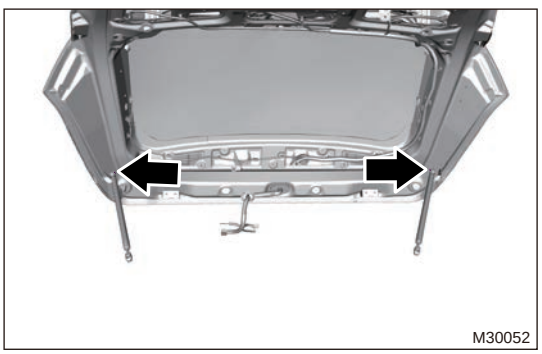
(13) Disconnect the back door wire harness assembly connector.



(14) Disconnect the back door wiper spraying pipe joint.

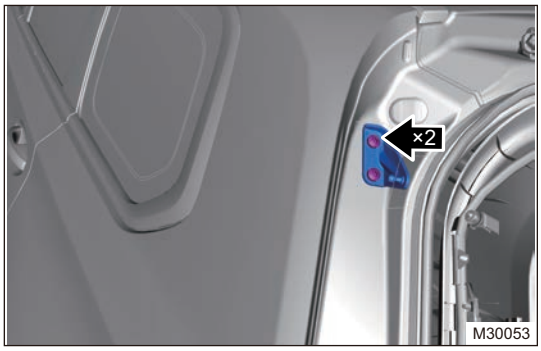


(15) Using a screwdriver wrapped with protective tape, pry off the upper fixing clips between left electric support rod and right balance bar carefully.



(16) Remove the back door assembly.

(17) Remove 4 fixing nuts from back door left and right hinges assembly.



(18) Remove the back door hinge assembly.

■ **Installation**

⚠ Caution

- **When installing back door hinge assembly, an assistant is needed to hold back door. Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.**
- **Be sure to wear safety equipment to prevent accidents, when installing back door assembly.**
- **Try to prevent body paint surface from being scratched, when installing back door assembly.**
- **After installing back door assembly, it is necessary to perform panoramic image calibration.**

(1) Install the engine hood hinge assembly to a proper position of body.

(2) Install 4 fixing bolts on the back door left and right hinges assembly.
Torque: 25 ± 2 N·m

(3) Install the engine hood assembly to a proper position of body.

(4) Install the electric support rod and right balance bar.

(5) Connect back door wiper spraying pipe joint.

(6) Connect back door wire harness assembly connector plug.

(7) Install the back door wire harness dust boot.

(8) Install 4 fixing bolts on the back door left and right hinges assembly.
Torque: 25 ± 2 N·m

(9) Install the roof assembly.

(10) Install the rear spoiler plate.

(11) Install the back door anti-pinch strip.

(12) Install the rear combination light assembly (back door part).

(13) Install the back door lock assembly.

(14) Install the back door wiper motor assembly.

(15) Install the back door wiper arm.

(16) Install the back door protector assembly.

(17) Connect the negative battery cable.

8.8 Replacement of Back Door Switch Assembly

■ **Removal**

⚠ Caution

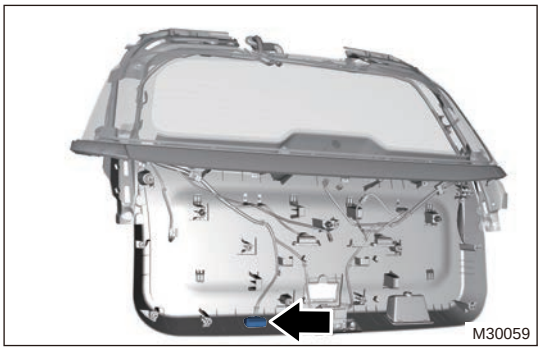
- **Be sure to wear safety equipment to prevent accidents, when removing back door switch assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the back door lower protector.

(4) Using a screwdriver wrapped with protective tape, carefully pry off the back door switch assembly.



(5) Disconnect connector on the back door switch assembly, and remove back door switch assembly.

■ **Installation**

⚠ Caution

- **After back door opener switch assembly is installed, install the connector into place.**
- **After back door opener switch assembly is installed, it is necessary to confirm that the function can operate normally.**
- **After installing back door opener switch assembly, it is necessary to perform panoramic image calibration.**

(1) Install the back door switch assembly to a proper position of back door.

(2) Connect the connector on the back door switch assembly.

(3) Press back door switch assembly tightly.

(4) Install the back door lower protector.

(5) Connect the negative battery cable.

8.9 Replacement of Back Door Left Electric Support Rod Assembly

■ **Removal**

⚠ Caution

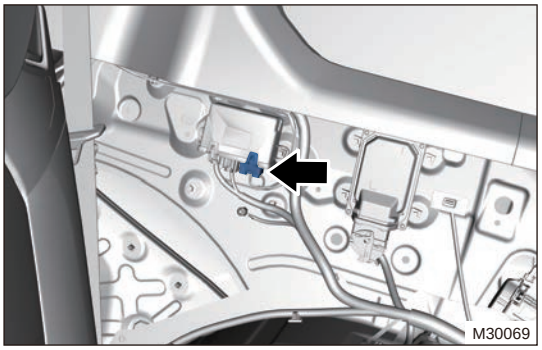
- **Left side is electric support rod with wire harness and right side is balance bar without wire harness.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing back door electric support rod assembly.**
- **When removing back door electric support rod assembly, pay attention to not bend electric support rod by lateral force during removal, one assistance is needed to hold back door; avoid back door falling down or closing suddenly during operation, resulting in accidents.**
- **Handle the removed electric support rod assembly carefully and avoid it falling down. Once it falls down, internal mechanical damage may occur, which may cause it impossible to use.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

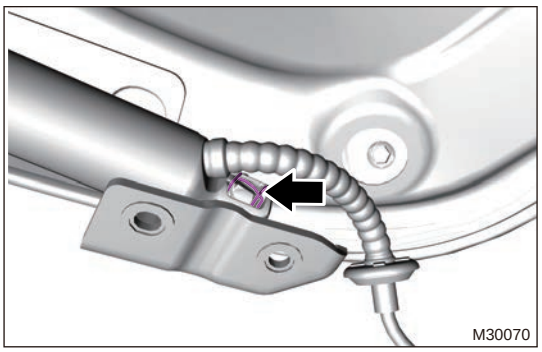
(2) Disconnect the negative battery cable.

(3) Remove the left C-pillar upper protector.

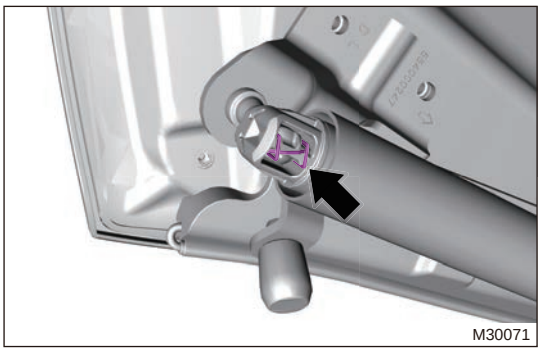
(4) Disconnect the left electric support rod assembly wire harness connector.



(5) Insert a flat-head screwdriver into the slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, and pull electric support rod lightly in the opposite direction.



(6) Insert a flat-head screwdriver into the slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, and pull electric support rod lightly in the opposite direction.



(7) Remove the back door left electric support rod assembly.

■ Installation

⚠ Caution

- **Pay attention to the installation direction and installation sequence, clamp the thick end of ball socket to gutter channel side mounting bracket, and then clamp the thin end to back door bracket. Ball socket cannot slide out, it indicates that the matching is tight.**
- **It is necessary for wire harness grommet to be installed in place. If not, water leakage may occur at this area.**
- **When installing back door end after electric support rod ball socket of the gutter channel end is installed, if ball pin of back door bracket is not aligned with electric support rod ball socket, rotate the fixing end of electric support rod clockwise and insert ball socket into the ball pin of back door bracket when ball socket is aligned with ball pin. (This assembly method can ensure that the assembled electric support rod ball socket is tightened and not loose. If assembly is not in this order, it may cause electric support rod ball socket is loose during assembly.)**

(1) Apply grease to ball socket of electric support rod body, and ensure appearance is not being affected, and then clamp the body to ball pin separately.

(2) Align the center of upper ball socket with the center of ball, and hit ball socket by hand.

(3) Align the center of lower ball socket with the center of ball, and hit ball socket by hand.

(4) Connect the left electric support rod assembly wire harness connector.

(5) Install the left C-pillar upper protector.

(6) Connect the negative battery cable.

8.10 Replacement of Back Door Right Balance Bar

■ Removal

⚠ Caution

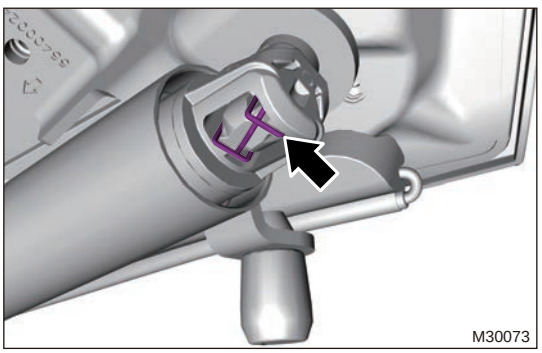
- **Left side is electric support rod with wire harness and right side is balance bar without wire harness.**
- **Be sure to wear necessary safety equipment to prevent accidents, when removing back door right balance bar assembly.**
- **When removing back door right balance bar assembly, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Insert a flat-head screwdriver into slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, and pull balance bar lightly in the opposite direction.

(4) Insert a flat-head screwdriver into slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, and pull balance bar lightly in the opposite direction.



(5) Remove the back door right balance bar.

■ Installation

⚠ Caution

- **Pay attention to the installation direction and installation sequence, clamp the thick end of ball socket to gutter channel side mounting bracket, and then clamp the thin end to back door bracket. Ball socket cannot slide out, it indicates that the matching is tight.**
- **It is necessary for wire harness grommet to be installed in place. If not, water leakage may occur at this area.**
- **After installing balance bar ball socket of the gutter channel end, when installing the back door end, if the ball pin of back door bracket is not aligned with balance bar ball socket, rotate the fixing end of balance bar clockwise and insert ball socket into the ball pin of back door bracket when ball socket is aligned with ball pin. (This assembly method can ensure that the assembled balance bar ball socket is tightened and not loose. If assembly is not in this order, it may cause balance bar ball socket is loose during assembly.)**

(1) Apply grease to ball socket of electric support rod body, and ensure appearance is not being affected, and then clamp the body to ball pin separately.

(2) Align the center of upper ball socket with the center of ball, and hit ball socket by hand.

(3) Align the center of lower ball socket with the center of ball, and hit ball socket by hand.

(4) Connect the negative battery cable.

8.11 Replacement of Back Door Gas Spring Assembly

■ Removal

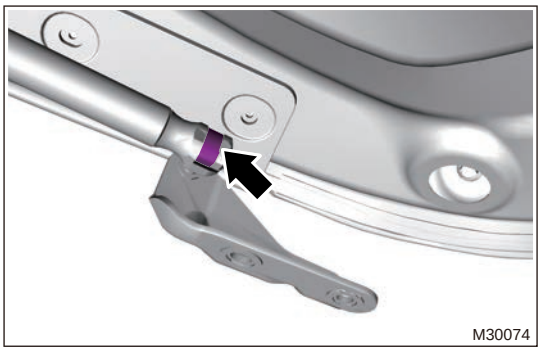
⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing back door gas spring assembly.**
- **When removing back door gas spring assembly, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.**
- **There may be a certain starting force on gas spring when it is used firstly, although the supplier will run-in to solve this problem before leaving the factory, closing force may too strong after long term storage. For personal safety, it is necessary to close trunk lid slowly at the first time, If it cannot be closed, it is necessary to replace gas spring. The gas spring is a product with internal high pressure storage. User is prohibited to approach the gas spring to the fire and heat sources; Never strike gas spring fiercely; Prevent explosion which will cause the unnecessary personal injury. It is forbidden absolutely to disassemble gas spring without site guidance of specialized person. Any small mis-operation during disassembly may lead to piston rod injection or cylinder burst, causing personal injury and accidents.**
- **Use same procedures for right and left sides, procedures listed below are for left side.**

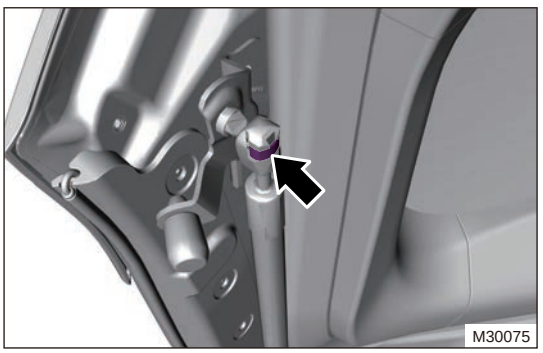
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Insert a flat-head screwdriver into slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, hold the area nearest to ball socket with a hand, and pull end of gas spring lightly in the opposite direction to remove it.


M30074

(4) Insert a flat-head screwdriver into slot between C-shaped snap spring and plastic ball socket, tilt C-shaped snap spring to a proper position, hold the area nearest to ball socket with a hand, and pull end of gas spring lightly in the opposite direction to remove it.


M30075

(5) Remove the back door left gas spring assembly.

■ **Installation**

⚠ Caution

- **When installing back door gas spring assembly, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during opening, resulting in accidents.**

(1) Apply grease to ball socket of gas spring body, and ensure appearance is not being affected, and then clamp the body to ball pin separately.

(2) Install fix snap spring at the lower end of back door gas spring assembly.

(3) Install fix snap spring at the upper end of back door gas spring assembly.

(4) Connect the negative battery cable.

8.12 Replacement of Rear Cover Upper Bracket

■ **Removal**

⚠ Caution

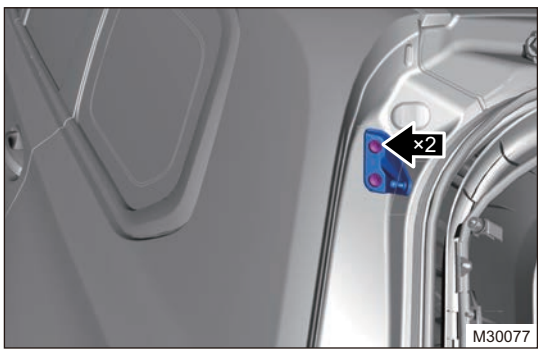
- **Be sure to wear safety equipment to prevent accidents, when removing rear cover upper bracket assembly.**
- **When removing back door gas spring assembly, one assistance is needed to hold back door; Try to prevent back door from falling down or closing suddenly during operation, resulting in accidents.**
- **Use the same procedures for rear cover upper bracket and gas spring rear cover bracket, procedures listed below are for rear cover upper left bracket.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the back door left gas spring assembly.

(4) Remove 2 fixing screws from rear cover upper bracket.



(5) Remove the rear cover upper bracket.

■ **Installation**

⚠ Caution

- **When installing gutter channel mounting bracket, pay attention to the direction of ball pin and install it in opposite inward direction; When installing the gutter channel upper bracket, pay attention to left and right parts which left part has "L" mark and right part has "R" mark.**
- **It is necessary to pre-tighten the upper mounting hole and then pre-tighten the lower mounting hole when installing bolts. When installing bracket tightening bolt, pay attention to installation sequence of the upper and lower mounting holes (pre-tighten round hole first and then waist-shaped hole).**
- **For convenience installing, after bracket is aligned with the hole, pre-tighten bolt to 2-3 threads by hand, and then install, pre-tighten and re-tighten it with tools.**

(1) After aligning rear cover upper bracket with hole on gutter channel, pre-tighten 2 fixing bolts.
Torque: 5 ± 1 N·m

(2) After pre-tightening, re-tighten them.
Torque: 25 ± 3 N·m

(3) Install the back door left gas spring assembly.

(4) Connect the negative battery cable.

8.13 Replacement of Back Door Anti-pinch Strip Assembly

■ Removal

⚠ Caution

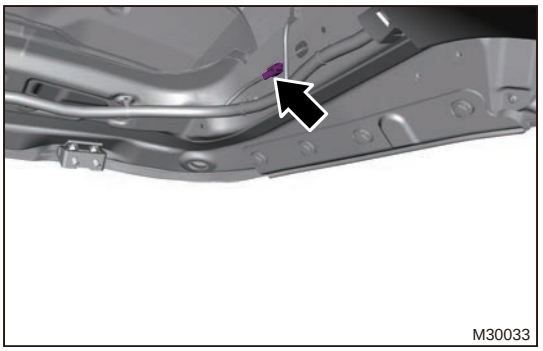
- **Be sure to wear safety equipment to prevent accidents, when removing back door anti-pinch strip assembly.**
- **Use the same procedures for left anti-pinch strip assembly and right anti-pinch strip assembly, procedures listed below are for left anti-pinch strip.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

(2) Disconnect the negative battery cable.

(3) Remove the back door left protector assembly.

(4) Disconnect the back door left anti-pinch strip connector.



(5) Remove 2 fixing clips and 2 fixing bolts from back door left anti-pinch strip.

(6) Remove the back door anti-pinch strip assembly.

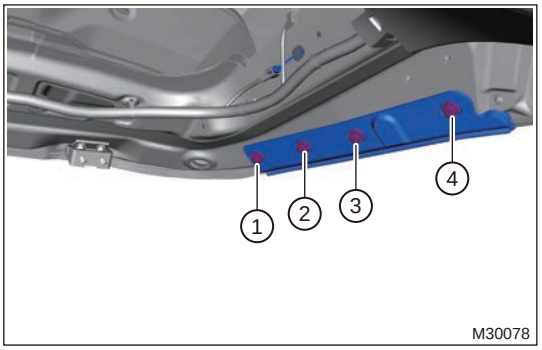
■ Installation

⚠ Caution

- **Try to prevent body paint surface from being scratched, when installing back door anti-pinch strip assembly.**

(1) Insert back door anti-pinch strip wire harness into hole, and then clamp grommet into back door sheet metal round grommet hole.

(2) Using plastic clips, install anti-pinch strip assembly to back door inner panel in order of (1), (2), (3), (4).



(3) Connect the back door left anti-pinch strip connector.

⚠ Caution

- **Make sure that other mounting holes are not covered by anti-pinch strip wire harness.**

(4) Install the back door left protector assembly.

(5) Connect the negative battery cable.

8.14 Replacement of Power Back Door Module Assembly

■ Removal

⚠ Caution

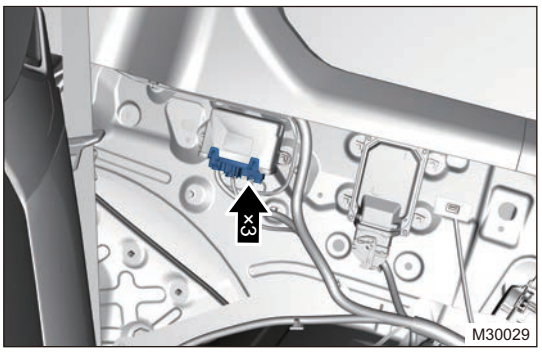
- **Be sure to wear safety equipment to prevent accidents, when removing power back door module assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.

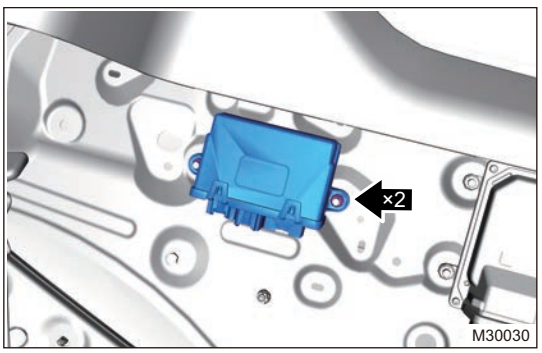
(2) Disconnect the negative battery cable.

(3) Remove the luggage compartment wheel house assembly.

(4) Disconnect the power back door module assembly wire harness connectors.



(5) Remove 2 fixing bolts from power back door module assembly.



(6) Remove the power back door module assembly.

■ **Installation**

⚠ Caution
• **After replacing power back door module, use diagnostic tester to perform self-learning operation, perform corresponding operation on each functional switch after learning is successful, so as to check each function of power back door operates normally.**

(1) Install 2 fixing bolts to power back door module assembly.
Torque: 7 ± 1 N·m

(2) Connect the power back door module assembly wire harness connectors.

(3) Install the luggage compartment wheel house assembly.

(4) Connect the negative battery cable.

(5) Connect diagnostic tester, read and clear DTCs.

8.15 Self-learning

(1) Turn ENGINE START STOP switch to OFF.

(2) Connect the diagnostic tester (the latest software).

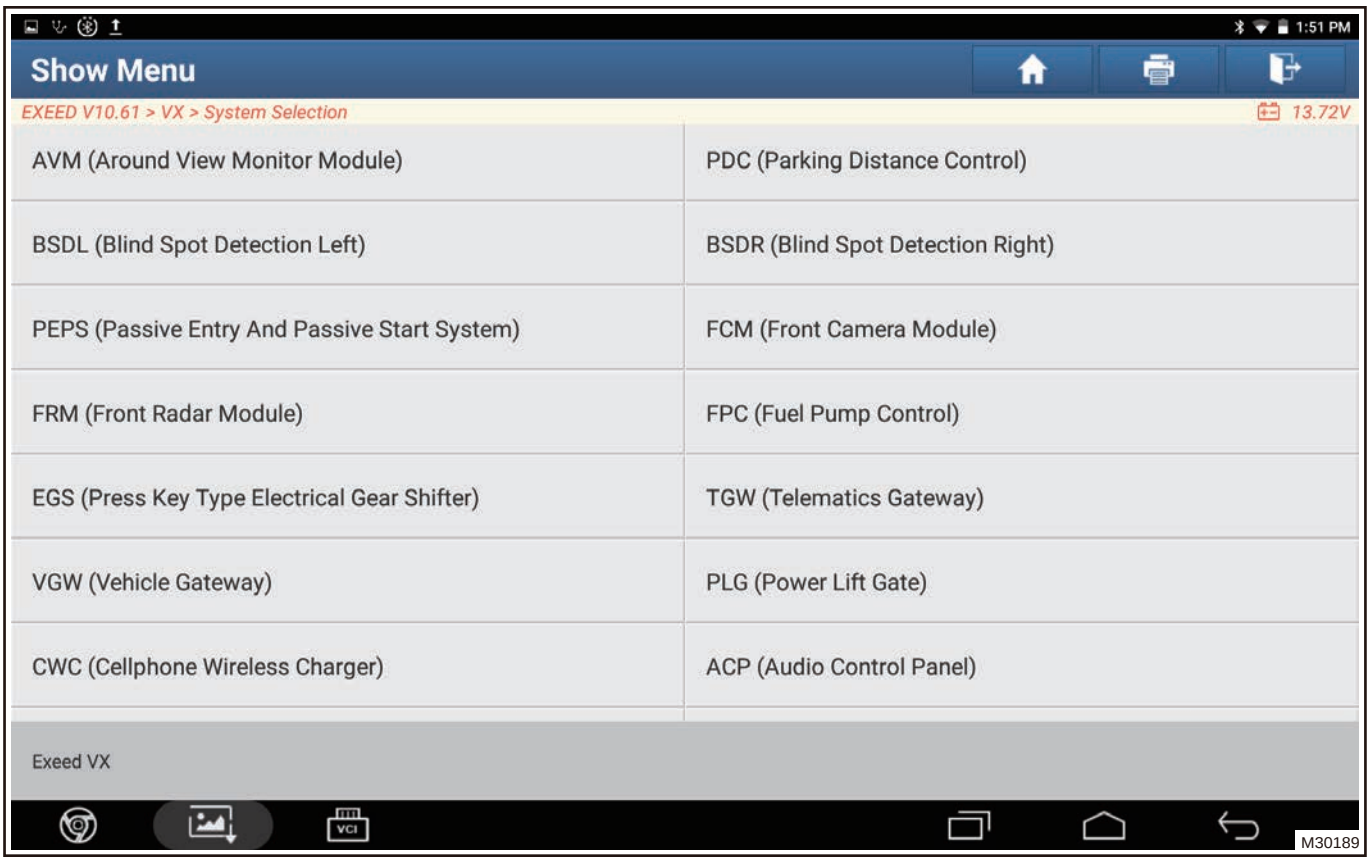
(3) Turn ENGINE START STOP switch to ON.

(4) Click “Traditional Diagnosis”.

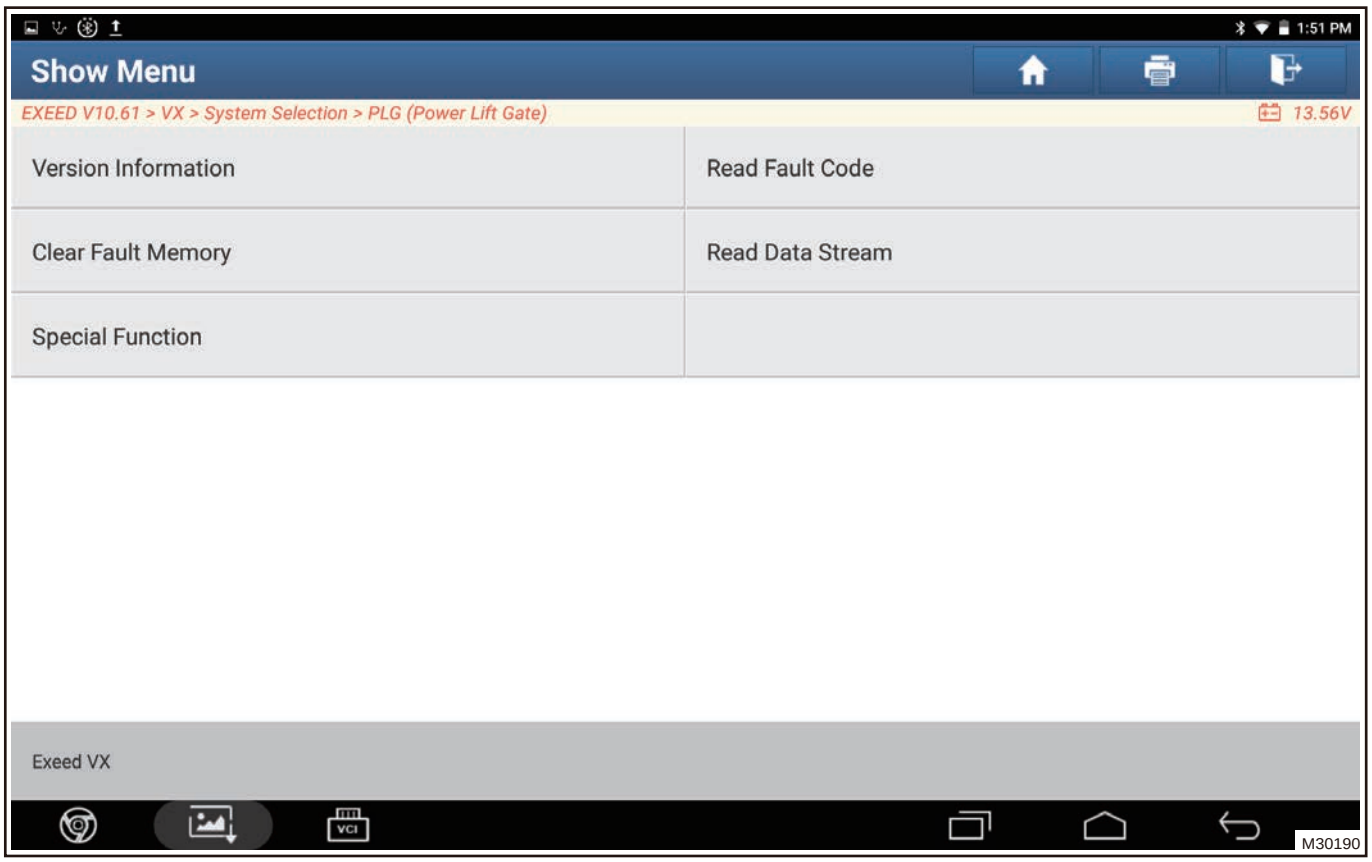
(5) Click “EXCEED”.

(6) Click “VX”.

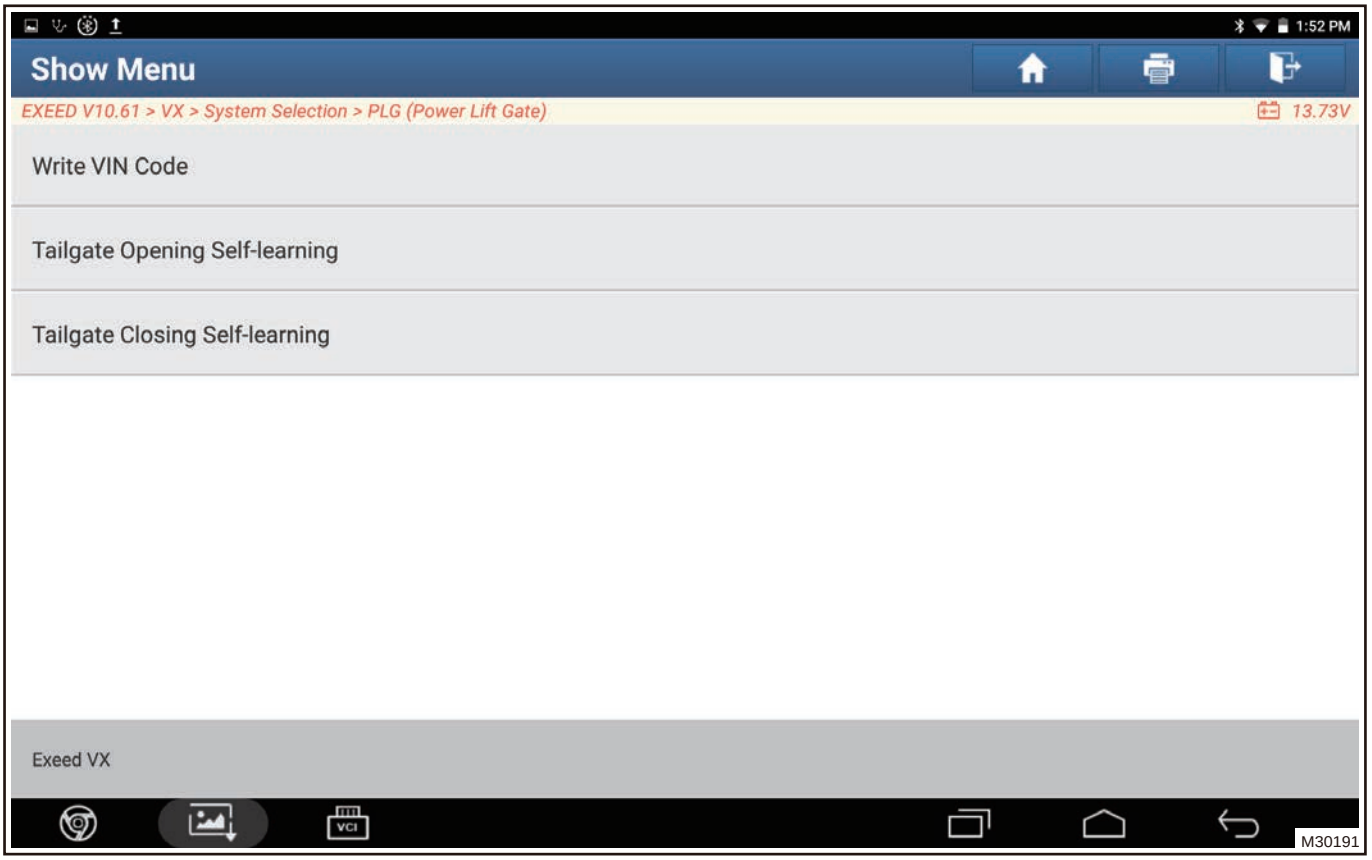
(7) Click “PLG (Power Lift Gate)”.

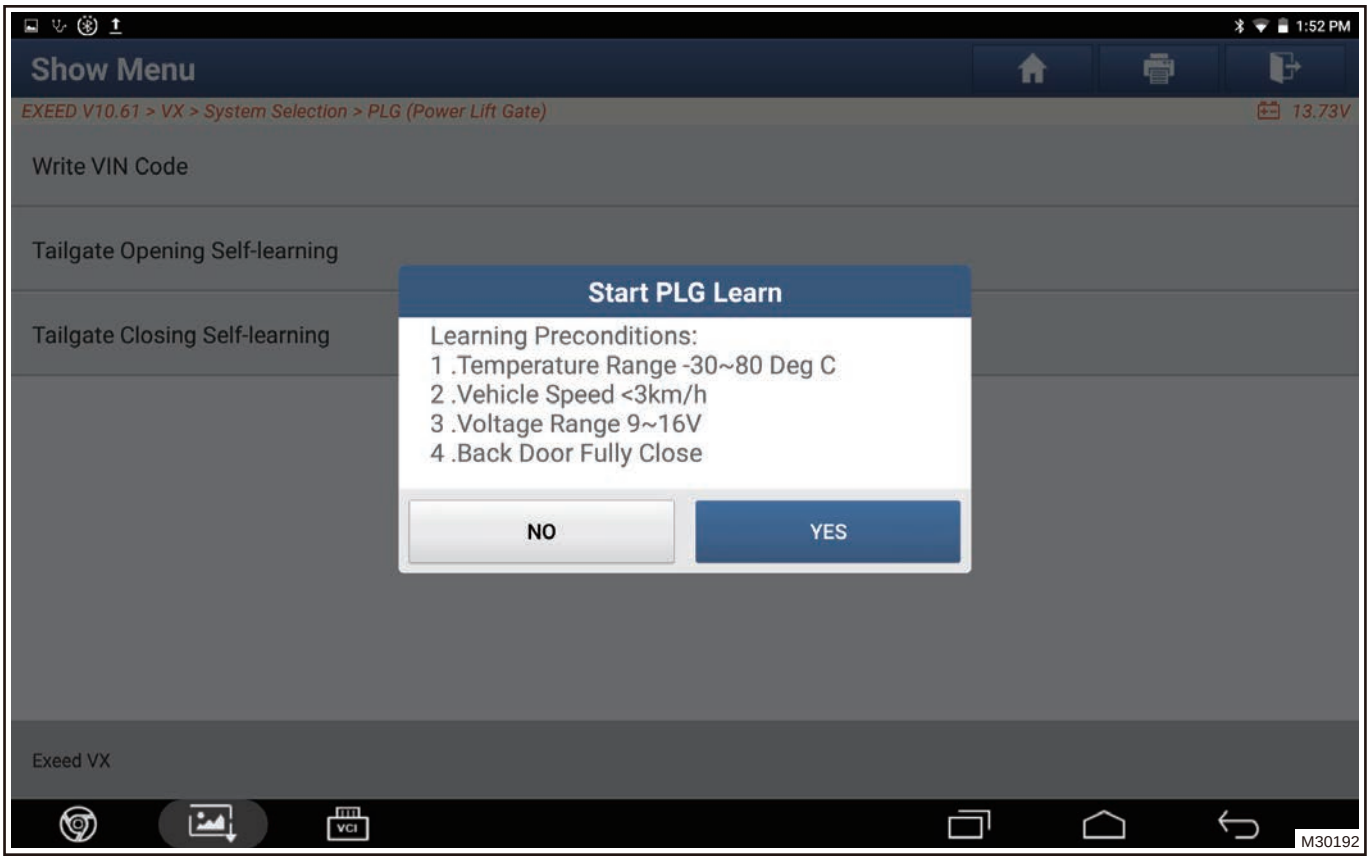


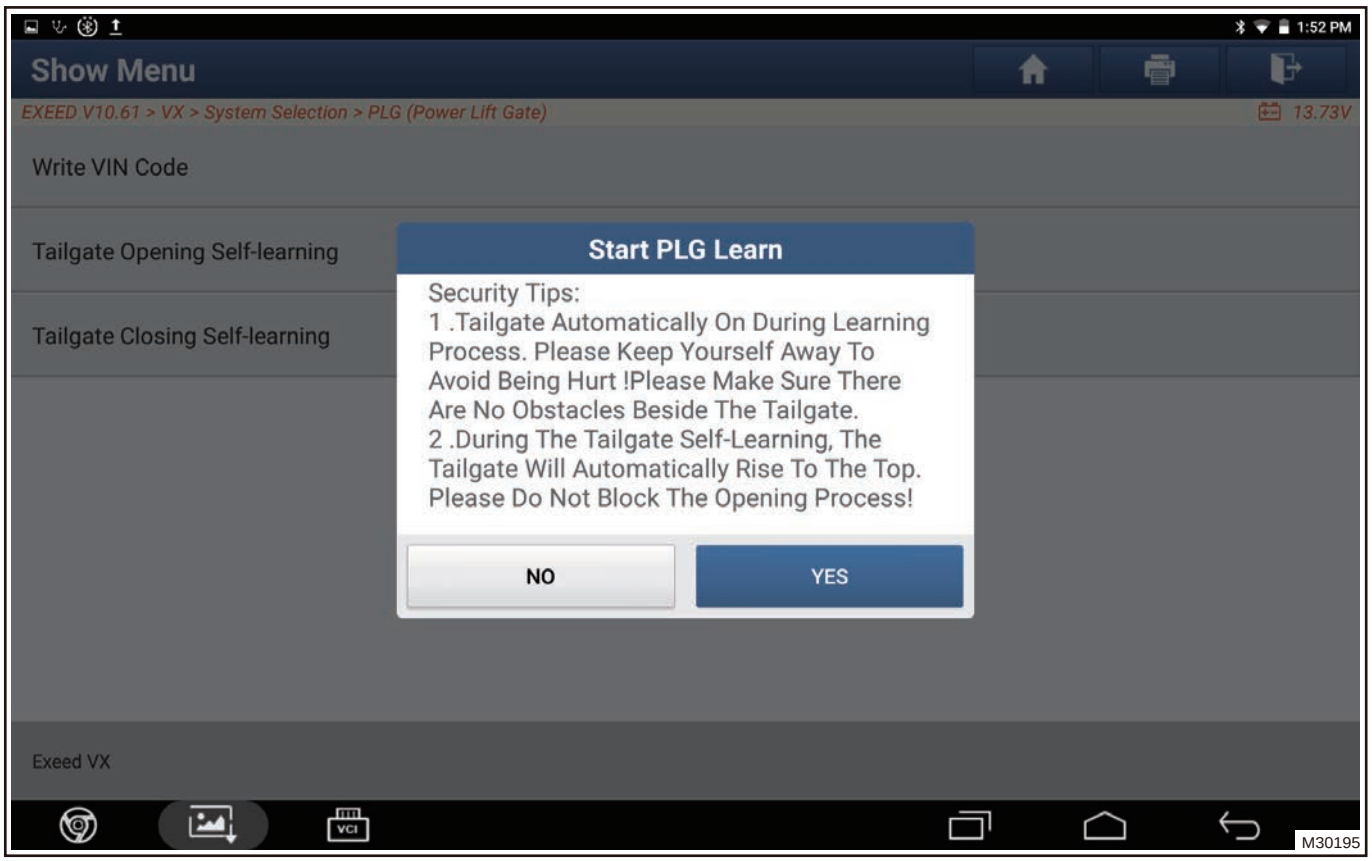
(8) Click “Special Function”.

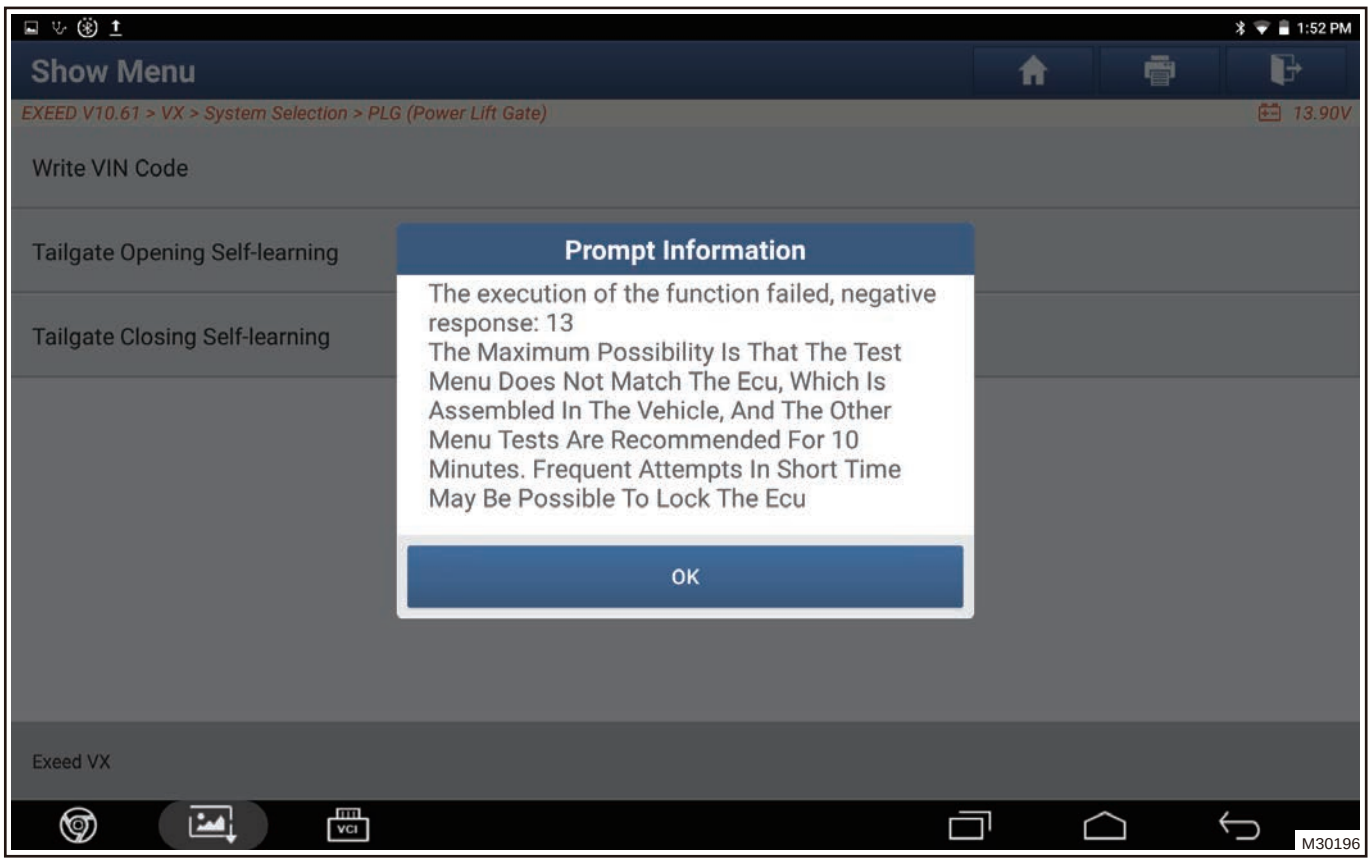


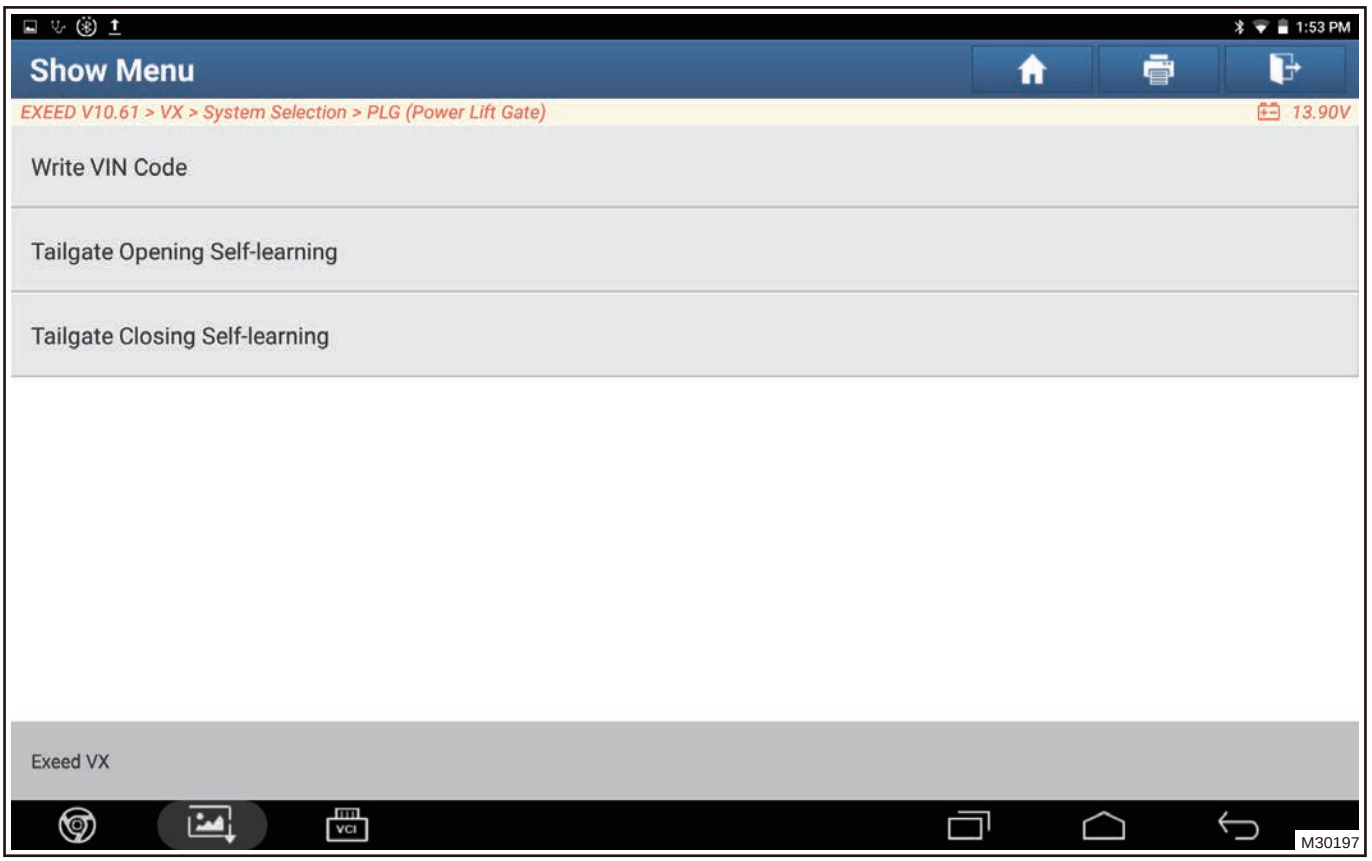
(9) Click “Tailgate Opening Self Learning”.

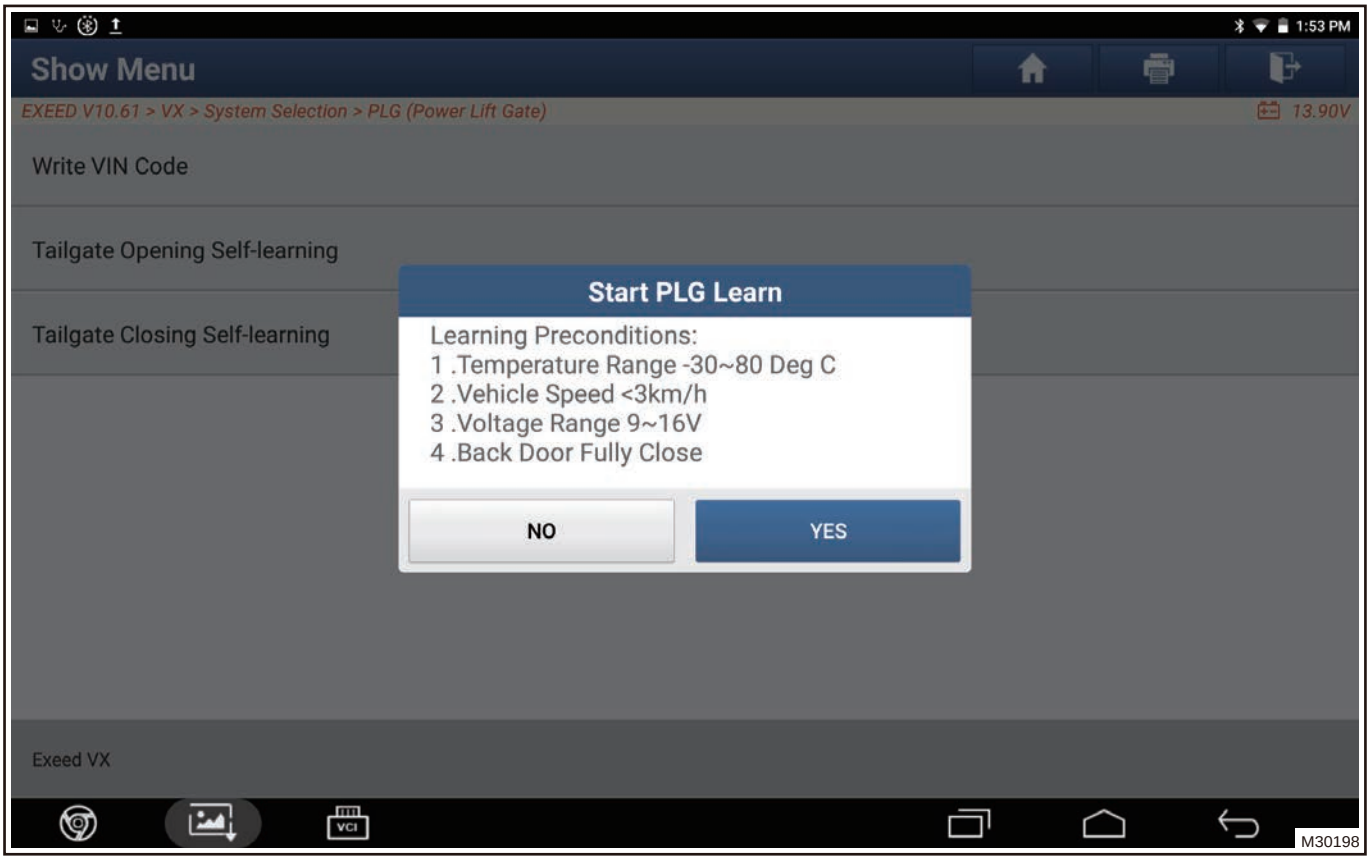


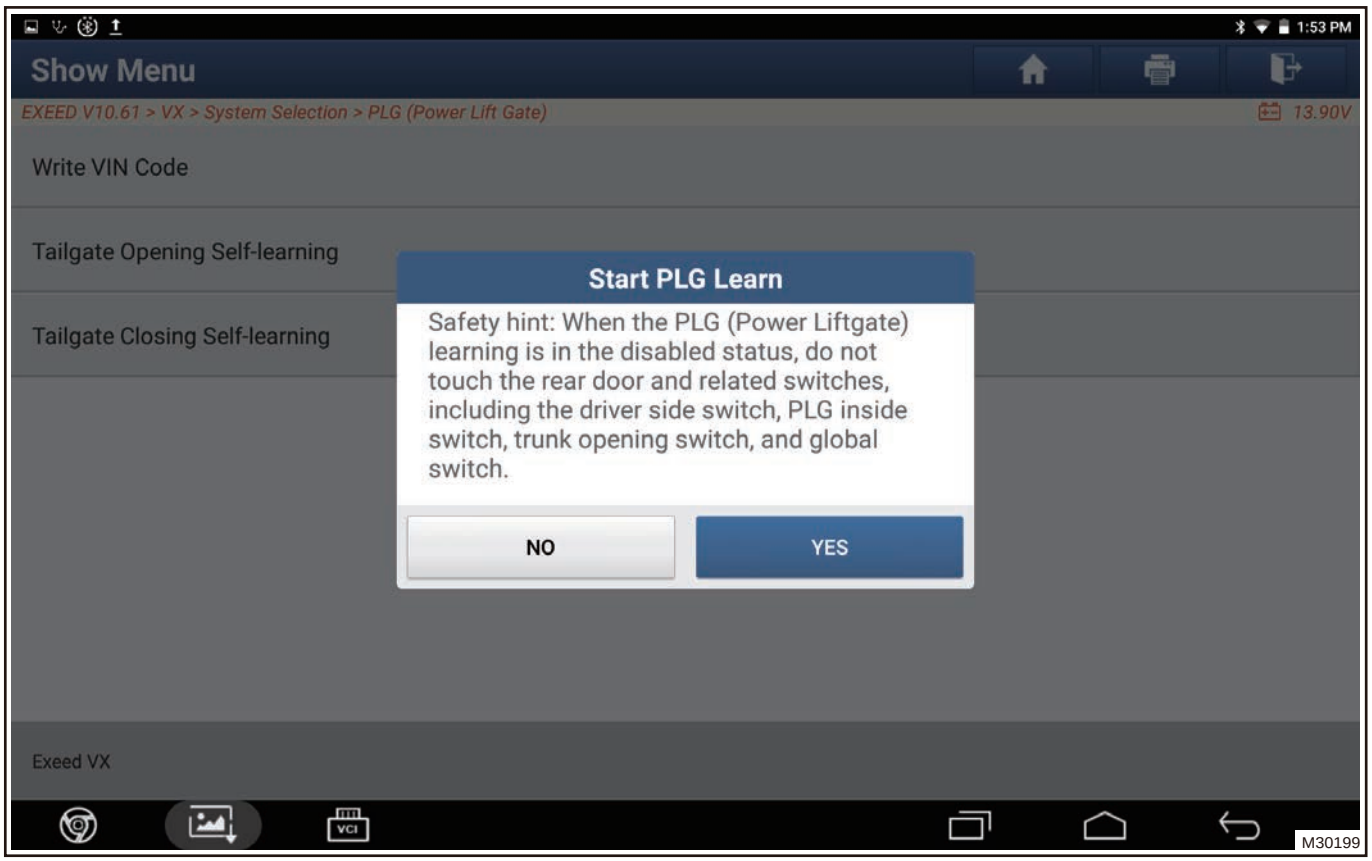


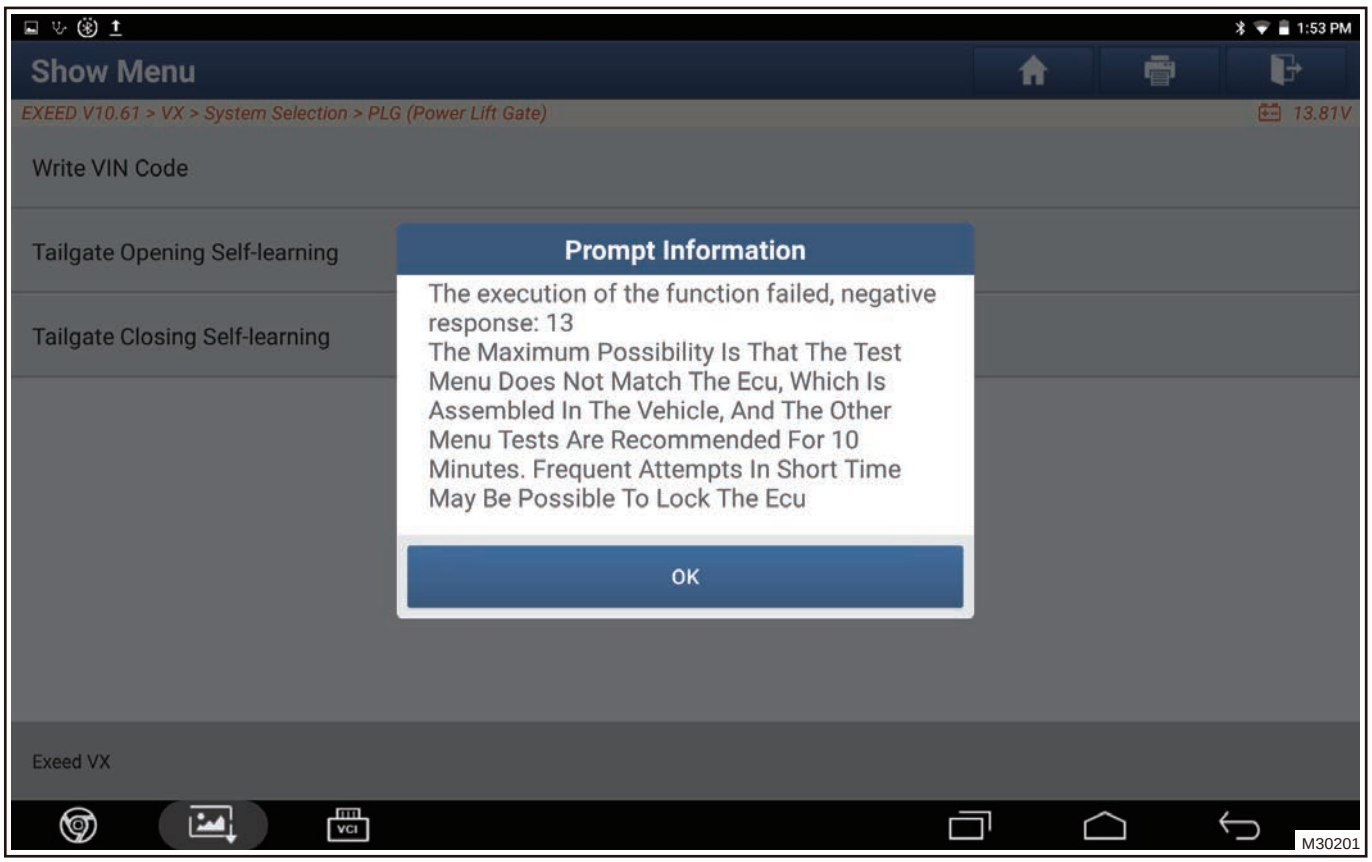

1:52 PM
Show Menu
EXEED V10.61 > VX > System Selection > PLG (Power Lift Gate)
13.73V
Write VIN Code
Tailgate Opening Self-learning
Tailgate Closing Self-learning
Start PLG Learn
Security Tips:
1 .Tailgate Automatically On During Learning Process. Please Keep Yourself Away To Avoid Being Hurt !Please Make Sure There Are No Obstacles Beside The Tailgate.
2 .During The Tailgate Self-Learning, The Tailgate Will Automatically Rise To The Top. Please Do Not Block The Opening Process!
NO
YES
Exeed VX
VCI
M30195


1:52 PM
Show Menu
EXEED V10.61 > VX > System Selection > PLG (Power Lift Gate)
13.90V
Write VIN Code
Tailgate Opening Self-learning
Tailgate Closing Self-learning
Prompt Information
The execution of the function failed, negative response: 13
The Maximum Possibility Is That The Test Menu Does Not Match The Ecu, Which Is Assembled In The Vehicle, And The Other Menu Tests Are Recommended For 10 Minutes. Frequent Attempts In Short Time May Be Possible To Lock The Ecu
OK
Exeed VX
VCI
M30196


1:53 PM
Show Menu
EXEED V10.61 > VX > System Selection > PLG (Power Lift Gate)
13.90V
Write VIN Code
Tailgate Opening Self-learning
Tailgate Closing Self-learning
Exeed VX
VCI
M30197


1:53 PM
Show Menu
EXEED V10.61 > VX > System Selection > PLG (Power Lift Gate)
13.90V
Write VIN Code
Tailgate Opening Self-learning
Tailgate Closing Self-learning
Start PLG Learn
Learning Preconditions:
1 .Temperature Range -30~80 Deg C
2 .Vehicle Speed <3km/h
3 .Voltage Range 9~16V
4 .Back Door Fully Close
NO
YES
Exeed VX
VCI
M30198


1:53 PM
Show Menu
EXEED V10.61 > VX > System Selection > PLG (Power Lift Gate)
13.90V
Write VIN Code
Tailgate Opening Self-learning
Tailgate Closing Self-learning
Start PLG Learn
Safety hint: When the PLG (Power Liftgate) learning is in the disabled status, do not touch the rear door and related switches, including the driver side switch, PLG inside switch, trunk opening switch, and global switch.
NO
YES
Exeed VX
VCI
M30199


1:53 PM
Show Menu
EXEED V10.61 > VX > System Selection > PLG (Power Lift Gate)
13.81V
Write VIN Code
Tailgate Opening Self-learning
Tailgate Closing Self-learning
Prompt Information
The execution of the function failed, negative response: 13
The Maximum Possibility Is That The Test Menu Does Not Match The Ecu, Which Is Assembled In The Vehicle, And The Other Menu Tests Are Recommended For 10 Minutes. Frequent Attempts In Short Time May Be Possible To Lock The Ecu
OK
Exeed VX
VCI
M30201

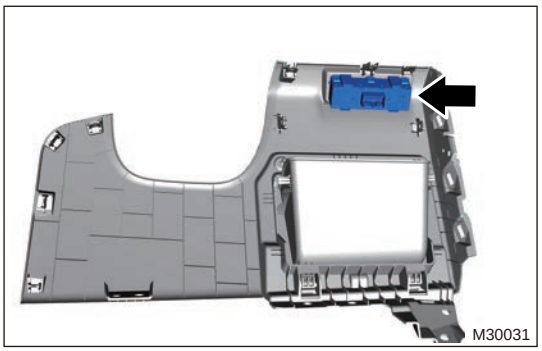
8.16 Replacement of Power Back Door Instrument Cluster Switch Assembly

■ Removal

⚠ Caution

- **Be sure to wear safety equipment to prevent accidents, when removing power back door instrument cluster switch assembly.**

(1) Turn off all electrical equipment and ENGINE START STOP switch.
(2) Disconnect the negative battery cable.
(3) Remove the instrument panel lower left protector assembly.
(4) Press the switch clip from the back, and push switch out of mounting hole of instrument panel lower left protector.



■ Removal

⚠ Caution

- **Install the power back door instrument cluster switch assembly, and install the connector in place.**
- **After power back door instrument cluster switch assembly is installed, it is necessary to confirm that the function can operate normally.**

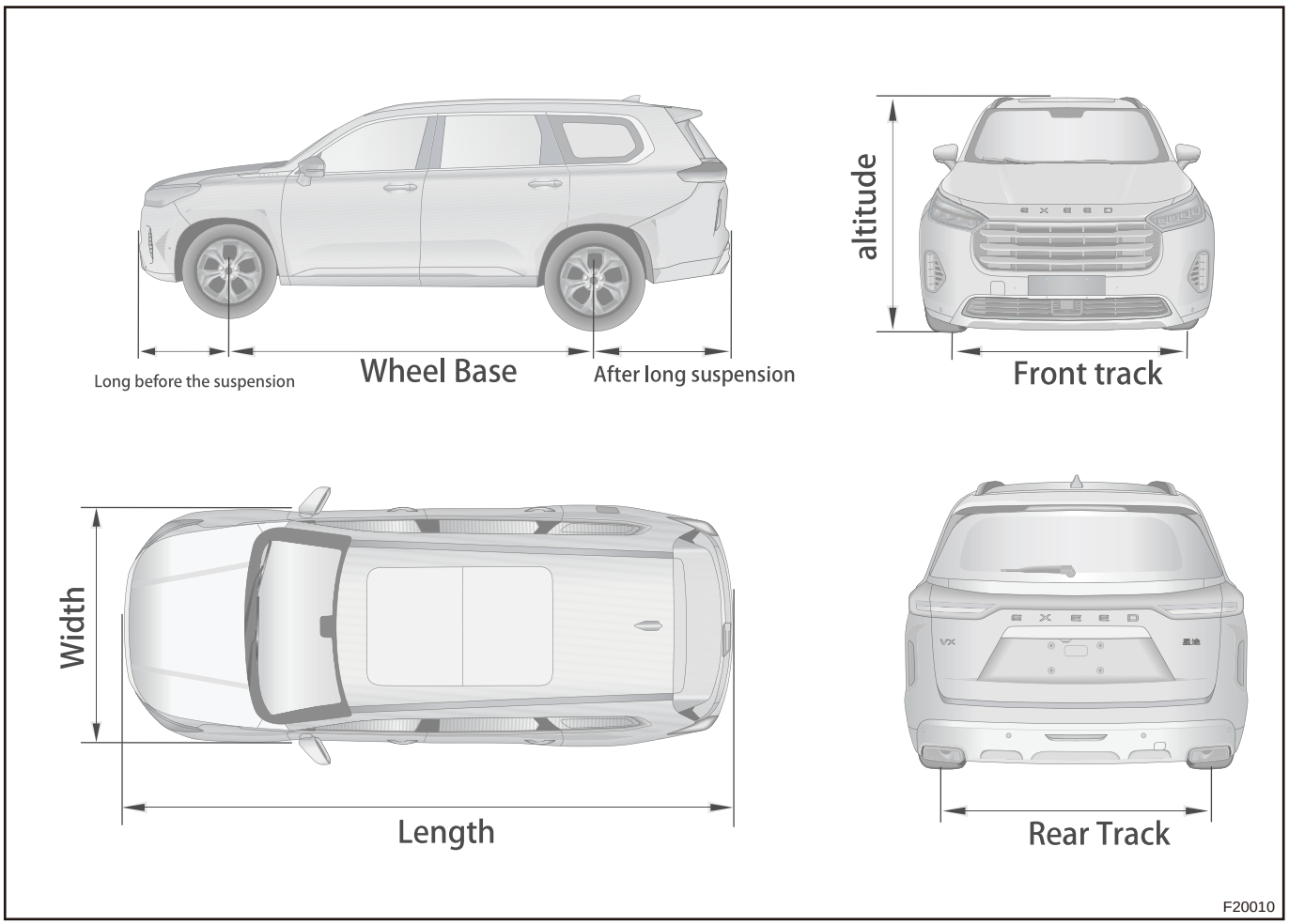
(1) Install the power back door instrument cluster switch to a proper position of instrument panel lower left protector.
(2) Install the instrument panel lower left protector assembly.
(3) Connect the negative battery cable.

12.9 BODY DIMENSIONS

1 General Information

1.1 Description

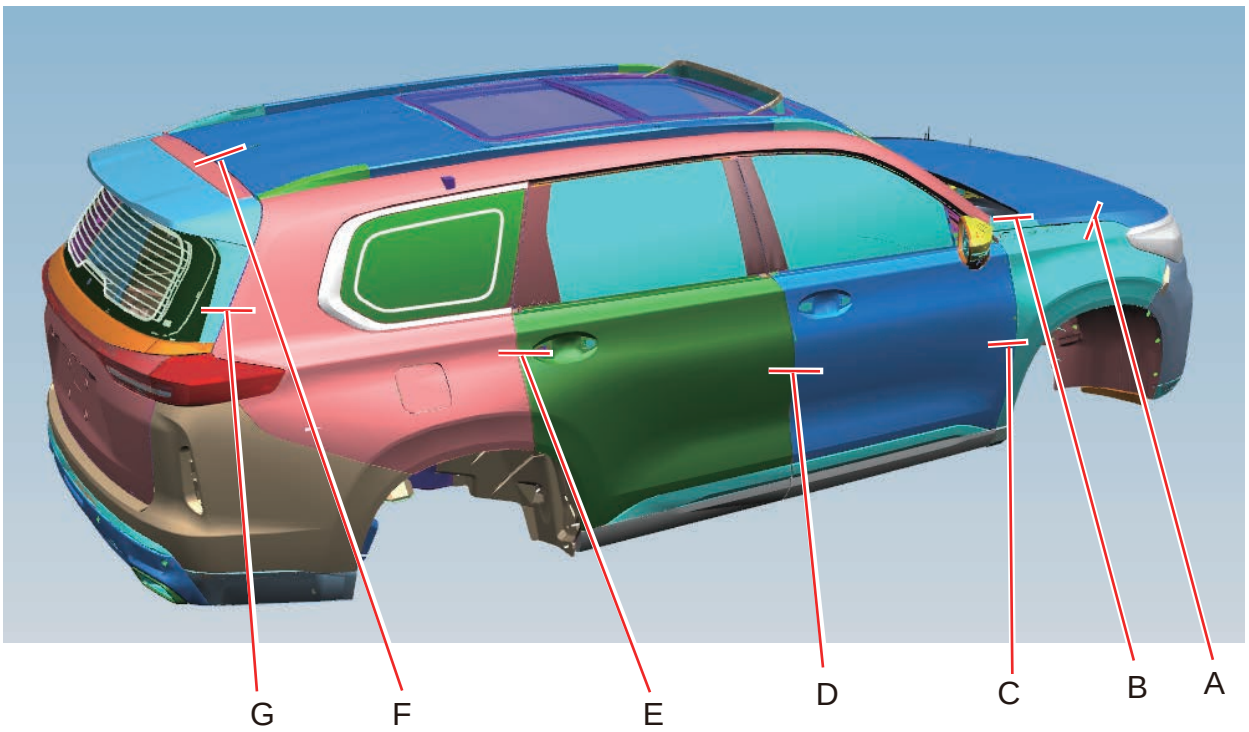
- All measurements should be made from bare metal. Remove trim and bumper covers as necessary.
- Repair seriously damaged areas before taking measurements for underbody alignment.
- Monitor upper body structure for excessive stress or movement while making any corrections to underbody structure.
- Remove all necessary glass to prevent breakage.
- All dimensions are shown in millimeters (mm).



Items		Parameters
Overall size	Length (mm)	4,970
	Width (mm)	1,940
	Height (mm)	1,795
Wheel base (mm)		2,900
Tread	Front (mm)	1,616
	Rear (mm)	1,623
Overhang	Front suspension (mm)	947

Items		Parameters
	Rear suspension (mm)	1,123

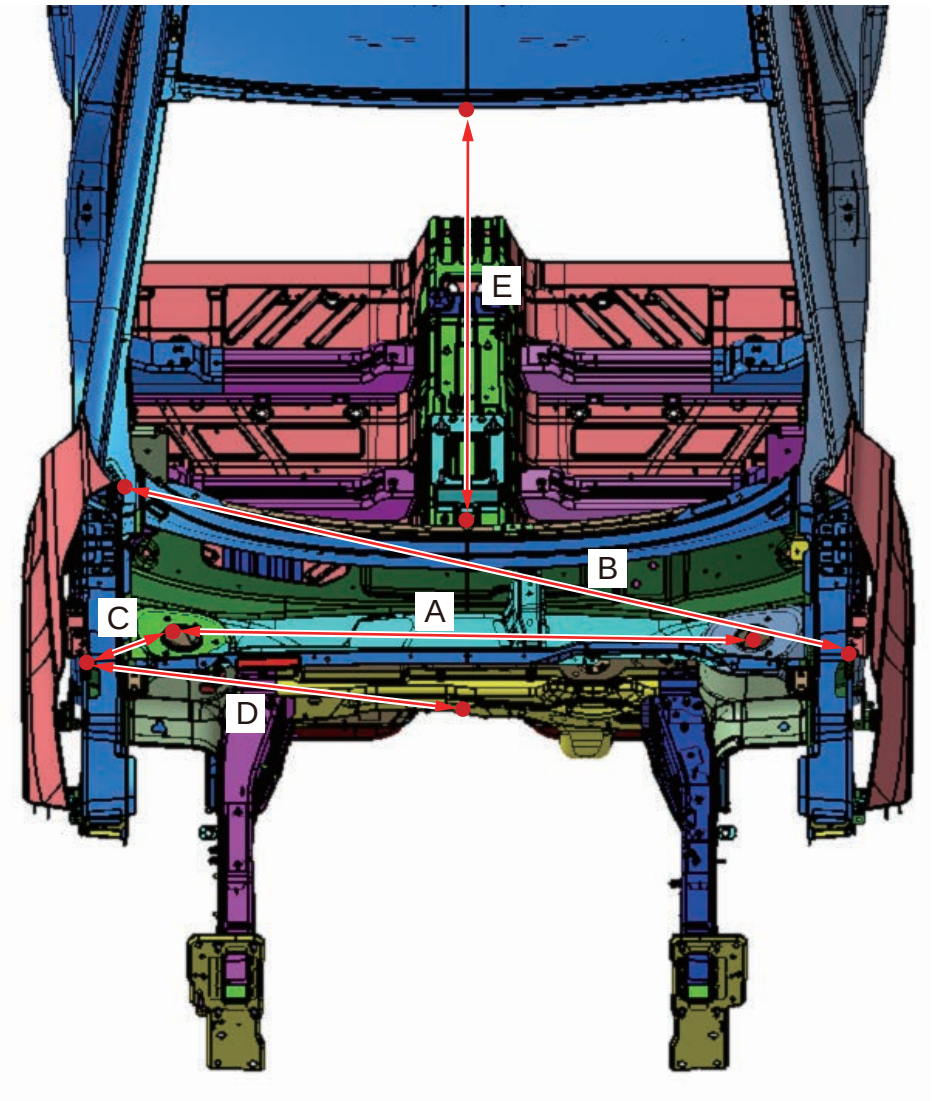
1.2 Adjust Dimension of Movable Part



N30012

Dimension Code	Standard Value (mm)	Measuring Area
A	3.8 ± 1.0	Distance between engine hood and wing
B	4.0 ± 1.0	Distance between engine hood and engine hood protector
C	3.8 (+1.0/-0.5)	Distance between front door and wing
D	4.0 ± 0.7	Distance between front door and rear door
E	3.8 (+1.0/-0.5)	Distance between rear door and rear C-pillar outer panel
F	7.0 ± 1.2	Distance between roof cover and rear spoiler
G	4.0 ± 1.0	Distance between rear C-pillar outer panel and rear glass protector

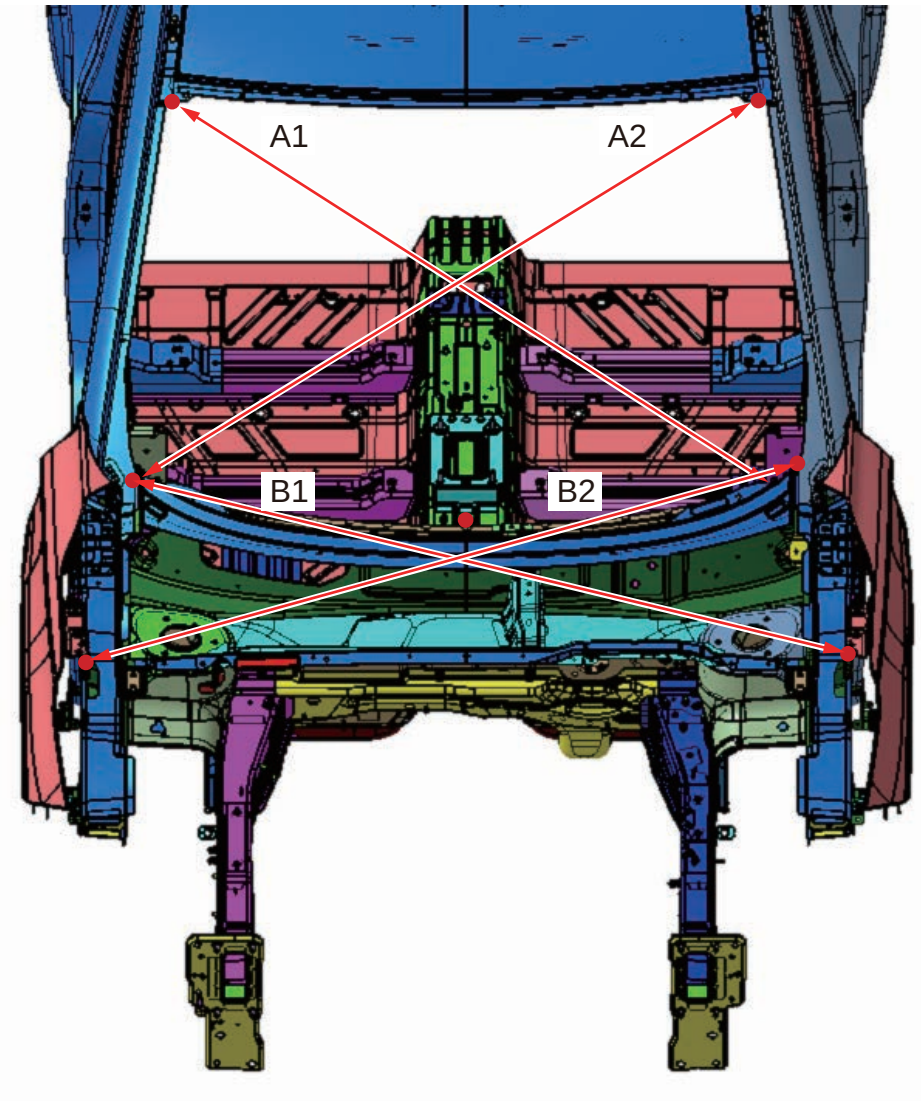
1.3 Dimensions of Engine Compartment and Windshield Frame



N30012

Dimension Code	Standard Value (mm)	Measuring Area
A	1195.6 mm	Front suspension installation center
B	1570.584 mm	Diagonal of wing fixing bolts
C	220.378 mm	Distance between front suspension installation center and wing
D	760 mm	Distance between front baffle plate center and wing fixing bolt
E	887 mm	Front windshield opening

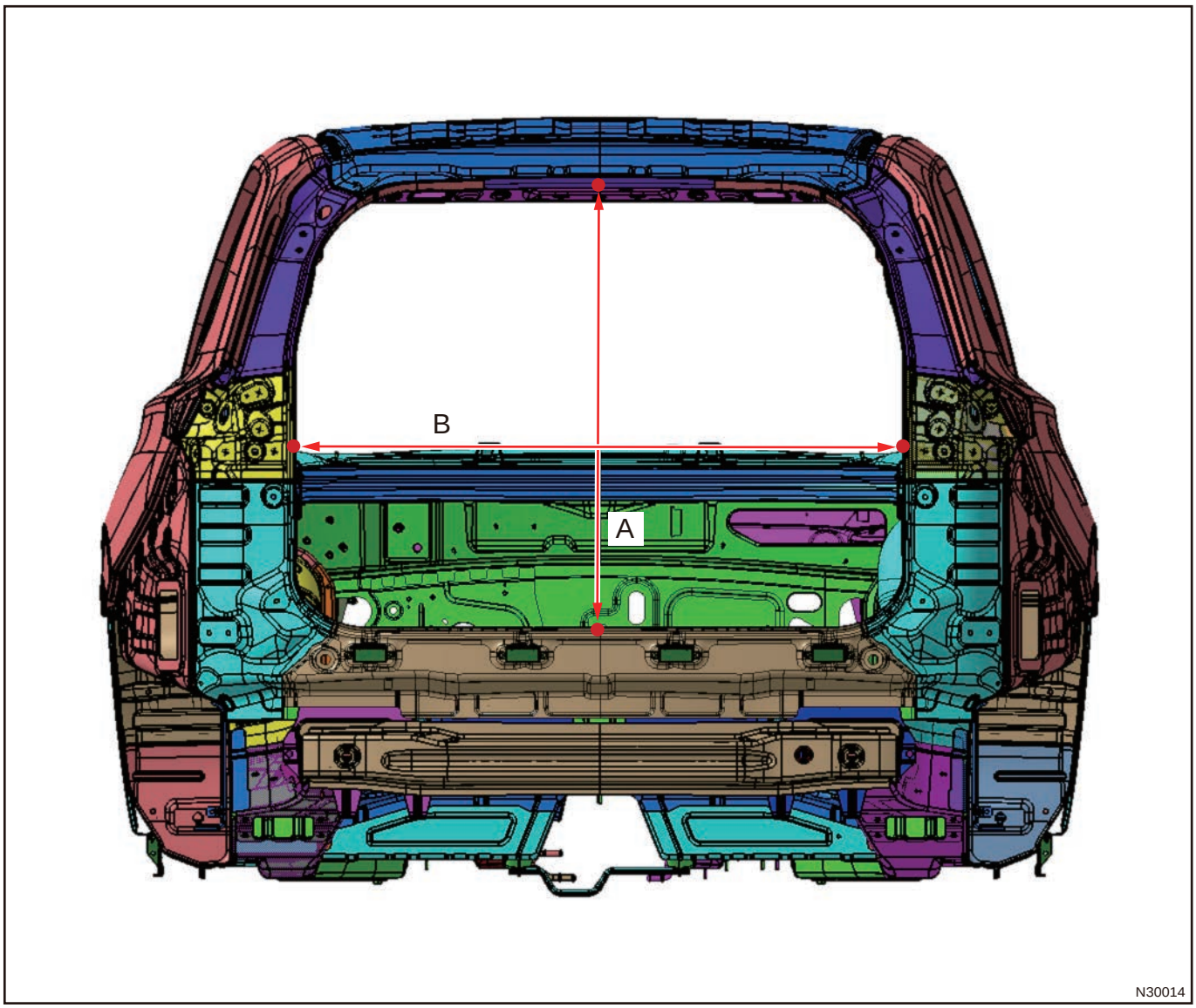
1.4 Dimensions of Engine Compartment and Windshield Frame



N30013

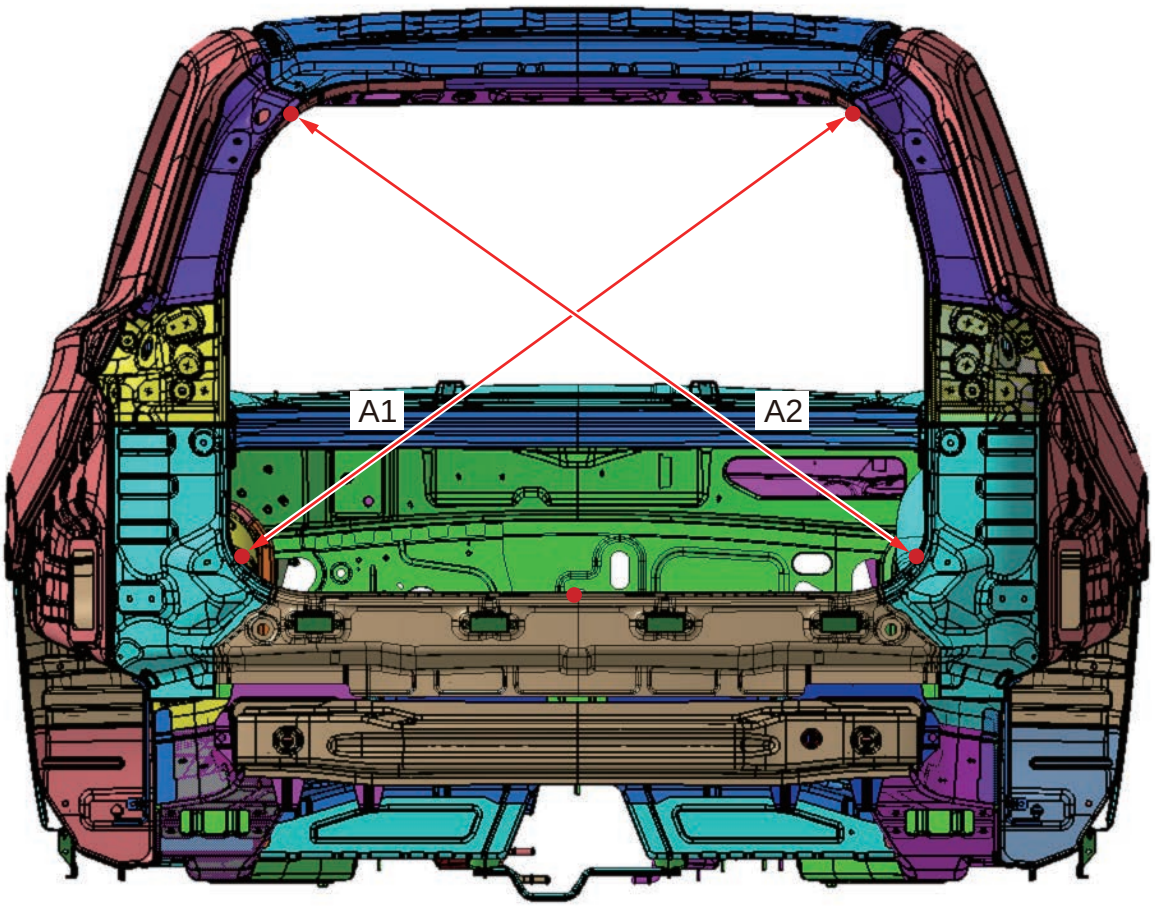
Check diagonal distance between engine compartment and windshield outer frame The values of a set of diagonals should be equal.	
A1 = A2	B1 = B2

1.5 Check Dimension of Luggage Compartment Opening



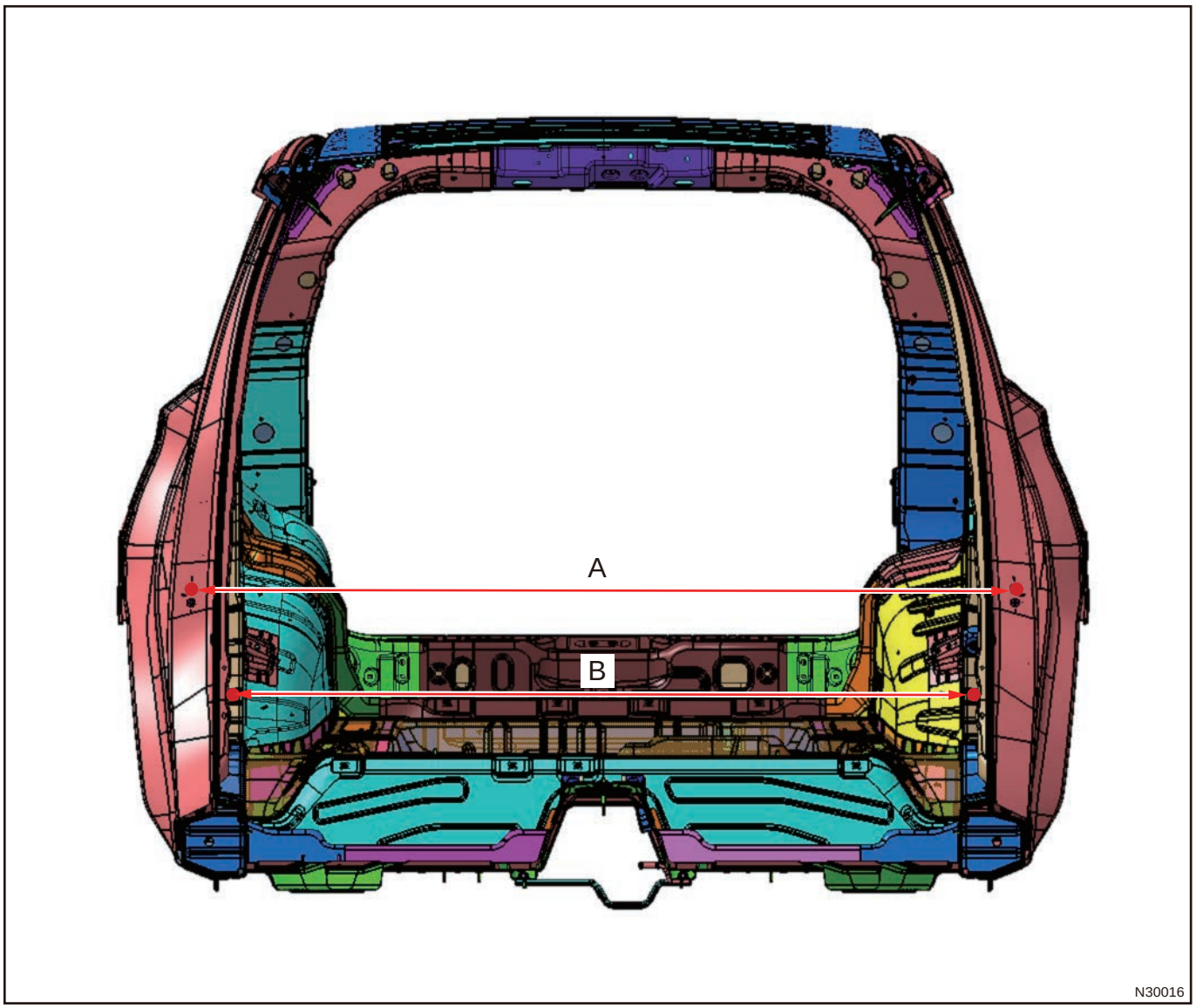
Dimension Code	Standard Value	Measuring Area
A	967.8 mm	Luggage compartment opening
B	1175 mm	Y-direction distance of luggage compartment

1.6 Check Dimension of Luggage Compartment Opening



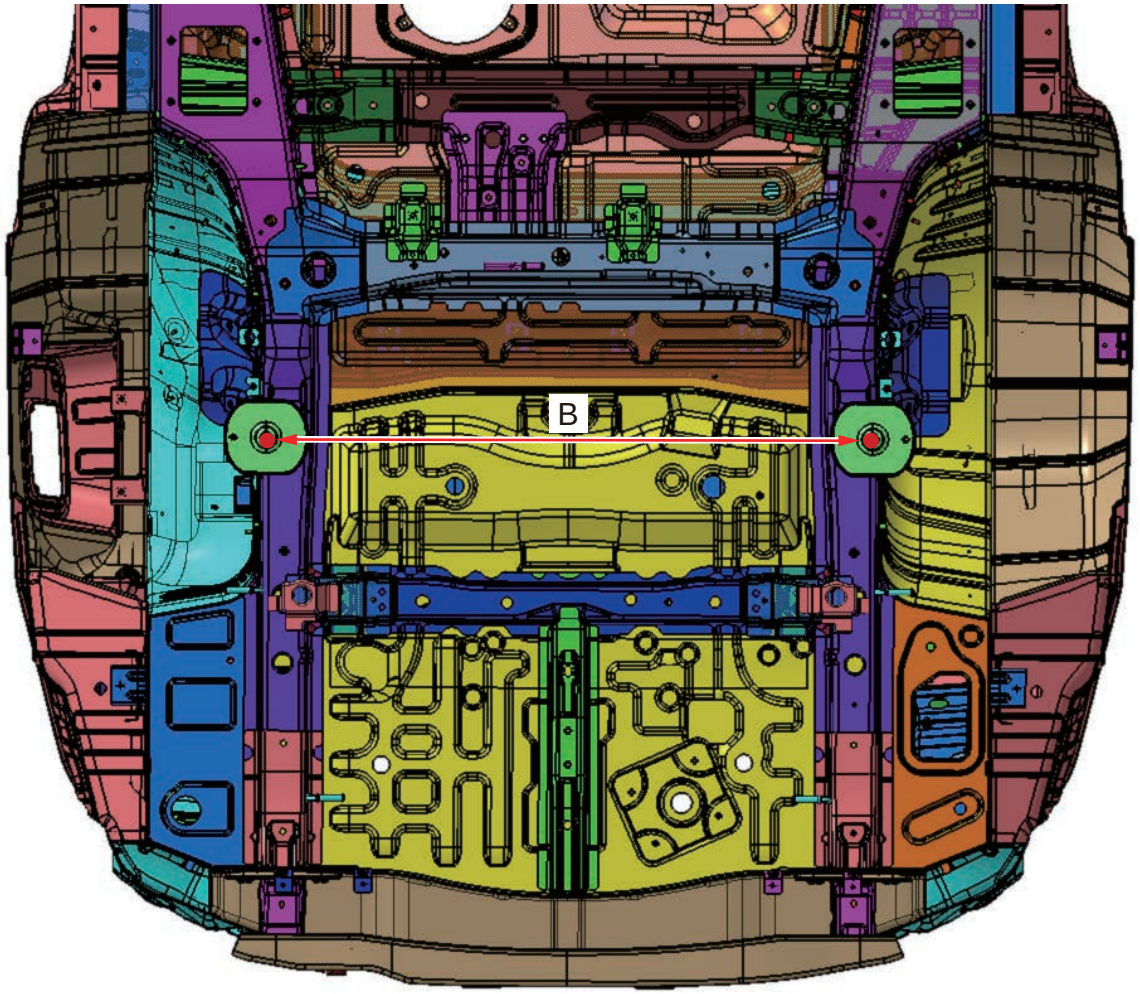
Check diagonal distance of luggage compartment outer frame The values of a set of diagonals should be equal.
A1 = A2

1.7 Check Dimension Between Body B-pillar and C-pillar



Dimension Code	Standard Value	Measuring Area
A	1634.379 mm	Y-direction distance of front door B-pillar lock pillar installation position
B	1490 mm	Y-direction distance of front seat front outer belt lower holder
C	1039.17 mm	Y-direction distance of rear suspension spring seat installation center position
D	1649 mm	Y-direction distance of rear door C-pillar lock pillar installation position

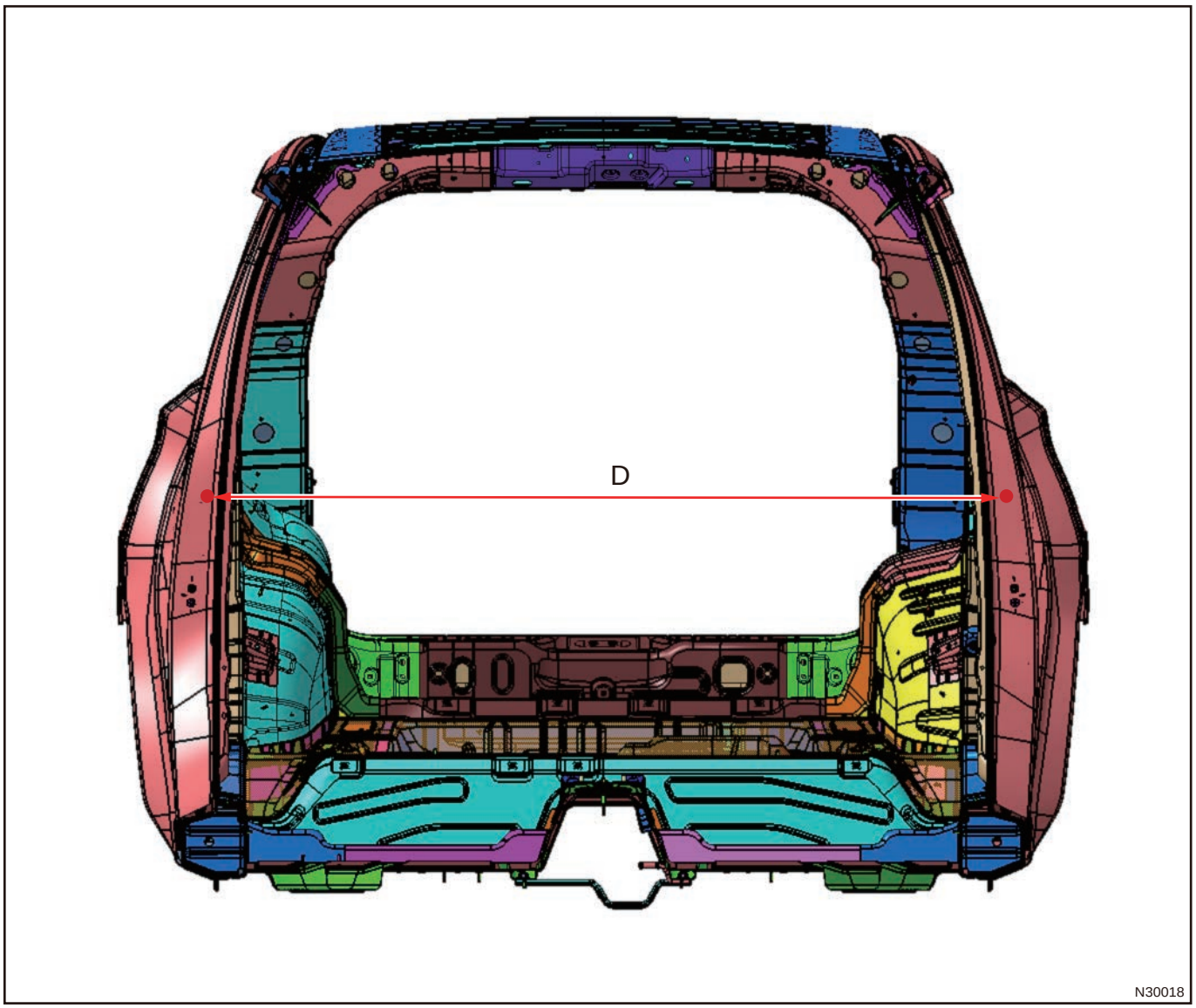
1.8 Check Dimension Between Body B-pillar and C-pillar



N30017

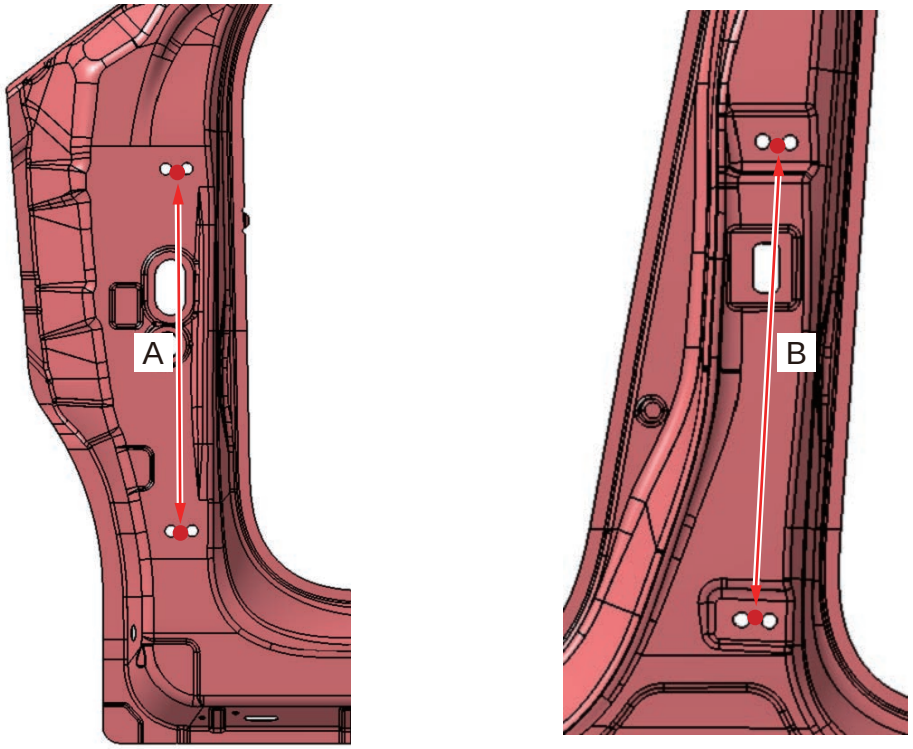
Dimension Code	Standard Value	Measuring Area
C	1039.17 mm	Y-direction distance of rear suspension installation center position

1.9 Check Dimension Between Body B-pillar and C-pillar



Dimension Code	Standard Value	Measuring Area
D	1649 mm	Y-direction distance of rear wing lock pillar installation position

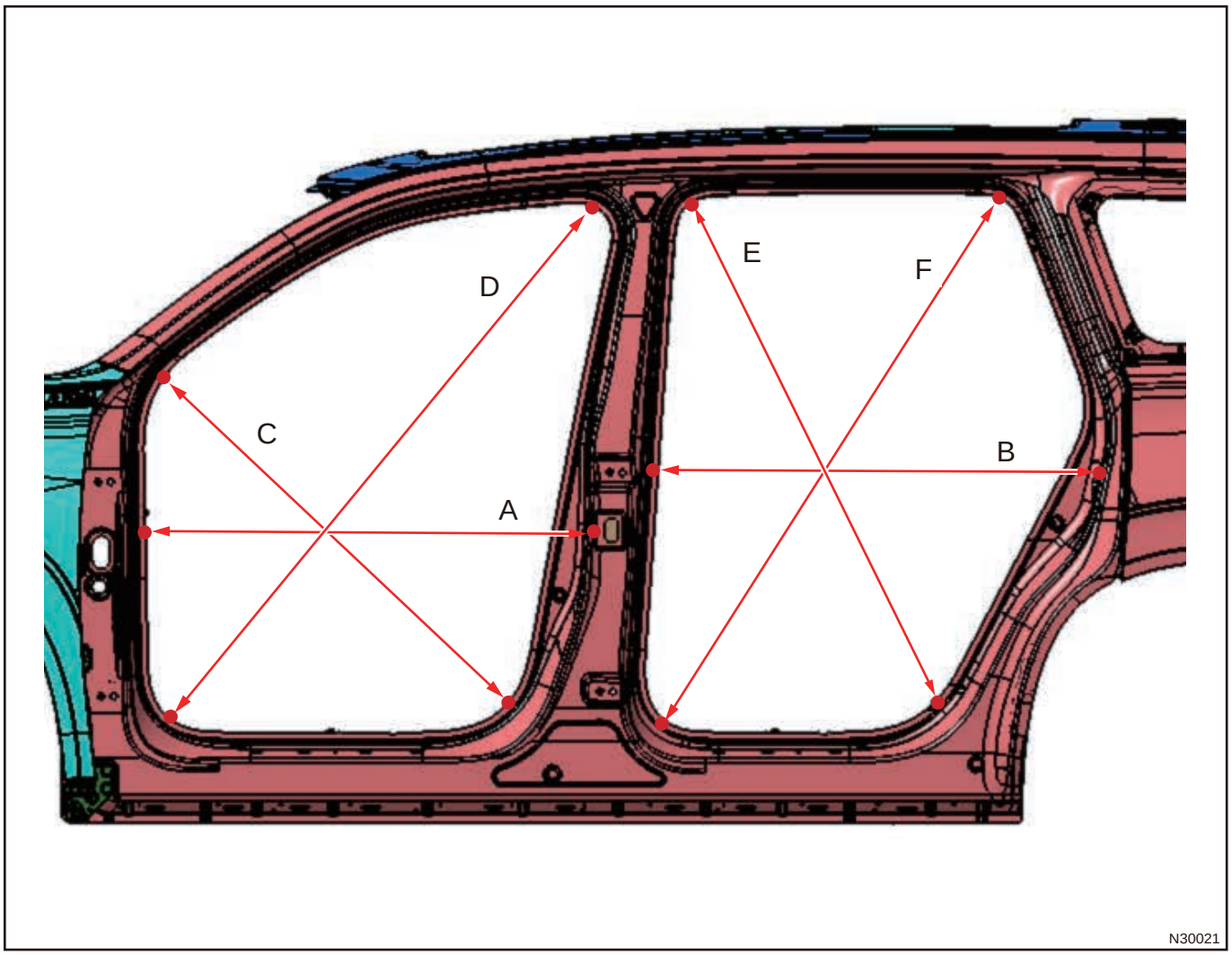
1.10 Check Distance Dimension Between Body A-pillar Hinges



Dimension Code	Standard Value	Measuring Area
A	450 mm	Z-direction distance of A-pillar hinge

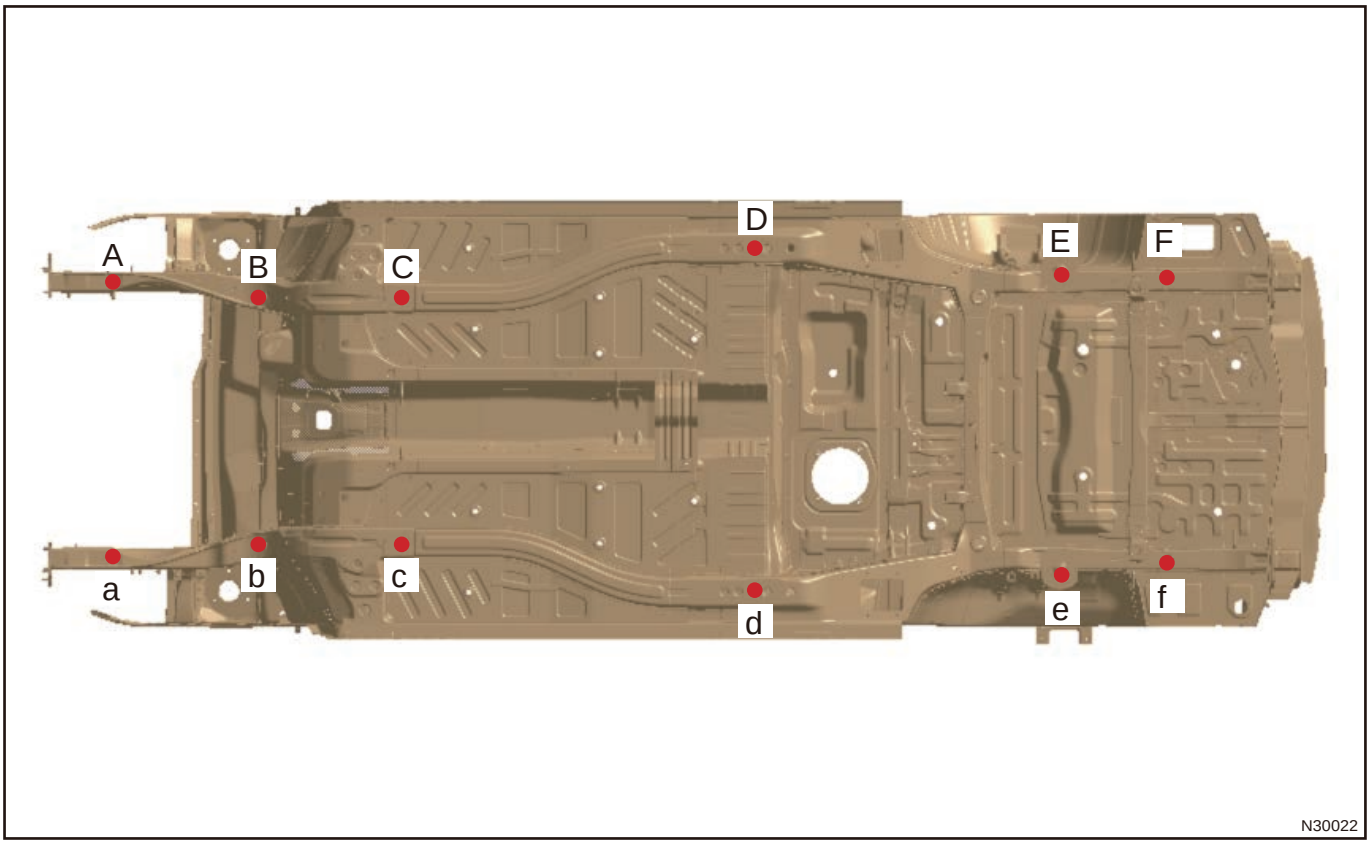
Dimension Code	Standard Value	Measuring Area
B	460 mm	Z-direction distance of A-pillar hinge

1.11 Check Dimension of Front and Rear Doors Opening



Dimension Code	Standard Value	Measuring Area
A	951.3 mm	Distance between A-pillar and B-pillar lock pillar installation position
B	958.3 mm	Distance between B-pillar and rear door lock pillar installation position
C	981.4 mm	Front door opening
D	1400.5 mm	Front door opening
E	1170.5 mm	Rear door opening
F	1307.4 mm	Rear door opening

1.12 Check Dimension of Body Deck



Point A-a: Locating holes of front side rail;
Point B-b: Mounting holes of front sub frame;
Point C-c: Locating holes of front floor;
Point D-d: Front locating holes of rear side rail;
Point E-e: Installation point of spring seat;
Point F-f: Rear locating holes of rear side rail;

Dimension Code	Standard Value	Measuring Area
1	961.4 ± 1 mm	Between A and a
2	919.2 ± 1 mm	Between B and b
3	858 ± 1 mm	Between C and c
4	1173.4 ± 1 mm	Between C and D
5	1204 ± 1 mm	Between D and d
6	1039.2 ± 1 mm	Distance between E and e
7	980 ± 1 mm	Between F and f

12.10 SERVICE OF COLLISION

1 Warning and Precaution

1.1 Warning

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repairing metal plate.

(1) It’s necessary to wear protective clothing, goggles, gloves and working shoes when performing body metal plate welding, cutting and polishing.

(2) Ensure the ventilation is well in welding area.

(3) Disconnect battery and cover the post before welding.

(4) If spark may be generated when working near the battery, it’s necessary to remove the battery.

(5) Before removing the vehicle parts, the vehicle should be fixed on the lifting frame to avoid the change of the vehicle gravity, which may affect the operation safety.

(6) Connect the ground wire of the welding device directly to the parts that need to be welded, and ensure that there is no conductive part between the ground point and the welding point when operating.

(7) Ground wire or welding electrode is forbidden to contact with electronic control unit and cable.

(8) Never park an unprotected vehicle in the body service area, because splashing sparks may cause fire, damage paint surface and glass.

(9) Special care should be taken when polishing and welding near fuel tank or other components that contain fuel, and all suspected components that may affect safety should be removed.

(10) Never weld, hard solder or soft solder any compartment of air conditioning system that contains refrigerant, or weld other parts of vehicle that may cause the temperature of air conditioning system components to rise, which may cause explosion of the air conditioning system. If it’s necessary to carry out electric welding near the refrigerant hose, the refrigerant must be recovered, because the invisible ultraviolet ray generated when performing electric welding can penetrate the refrigerant hose and cause the refrigerant to decay.

(11) It’s necessary to disconnect the battery ground wire when operating the airbag system or carrying out body calibration; the temperature around airbag components should not exceed 100 ℃.

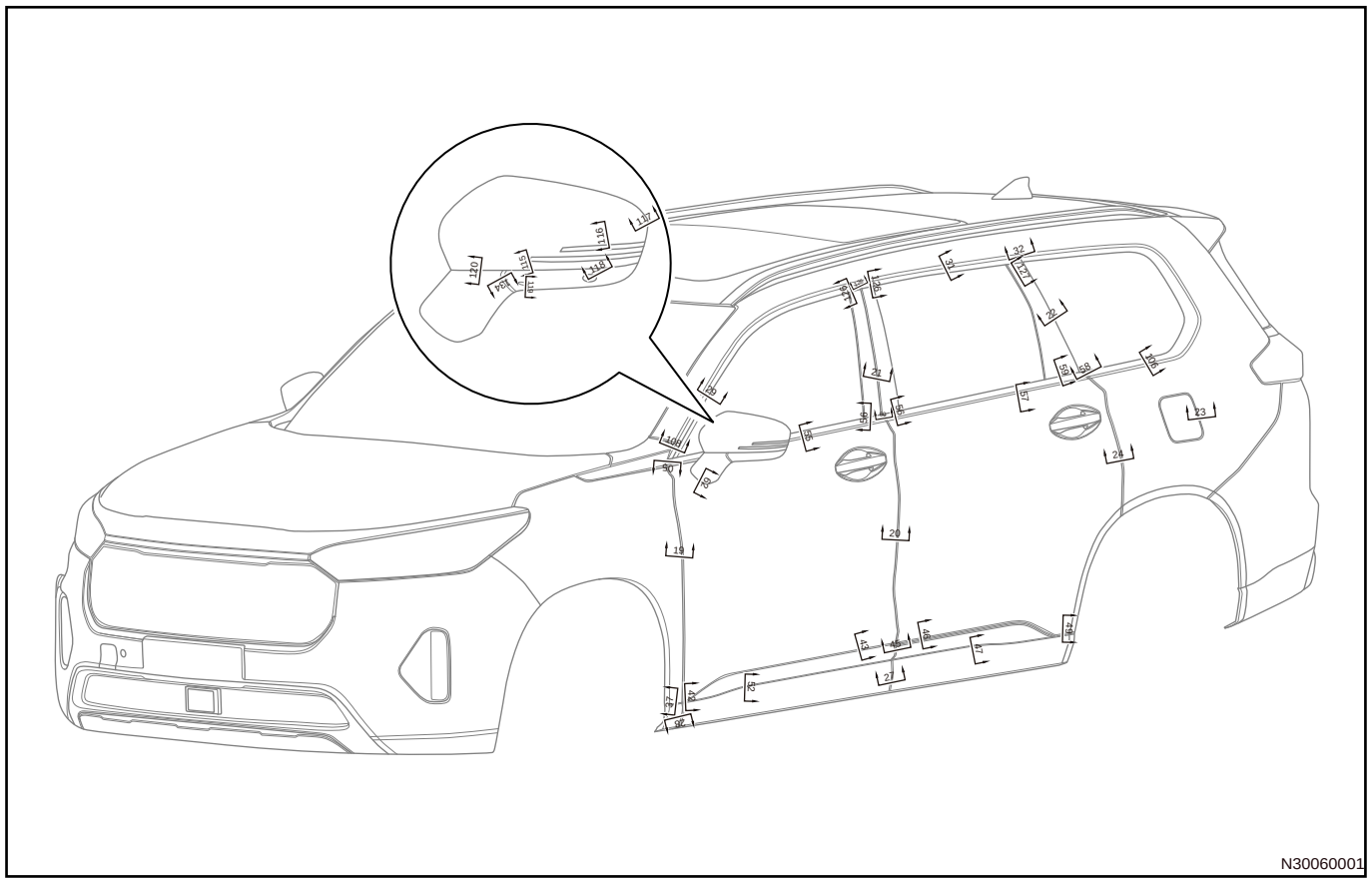
2 Body Surface Gap/Surface Difference

2.1 Description of Body Dimension Figure

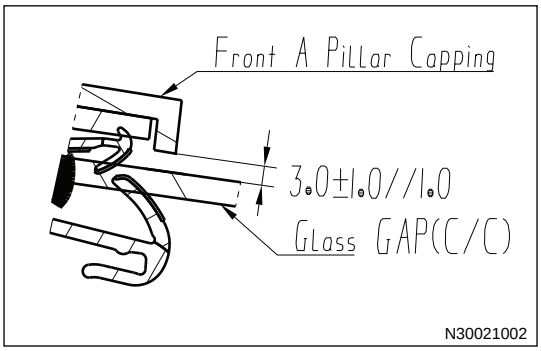
■ Description of Interpret Drawings

- Gap: Gap
- Flush: Flush
- //: Uniformity
- L/R: Range for left and right
- N/A: No size requirements, shape of gradual transition
- F/A: X direction of body is reference direction and front to rear relation
- C/C: Y direction of body is reference direction and left to right relation
- U/D: Z direction of body is the reference direction and up to down relation

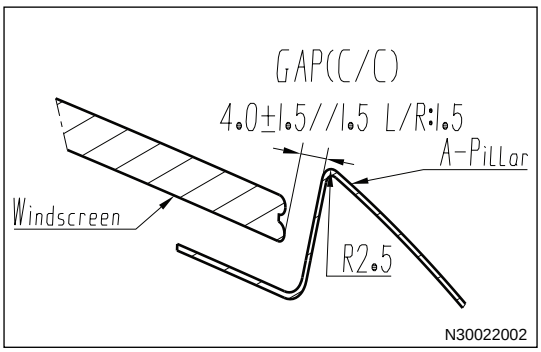
2.2 Body Surface Gap/Flush View 1



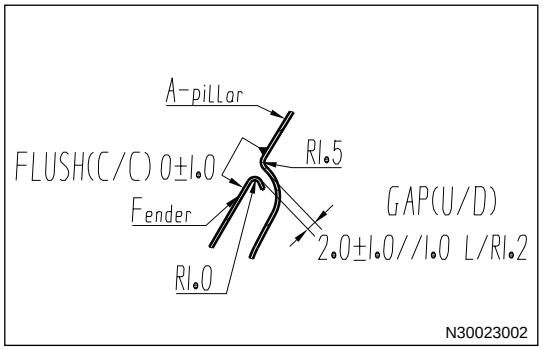
(1) Front Left Triangular Block to Glass (114)



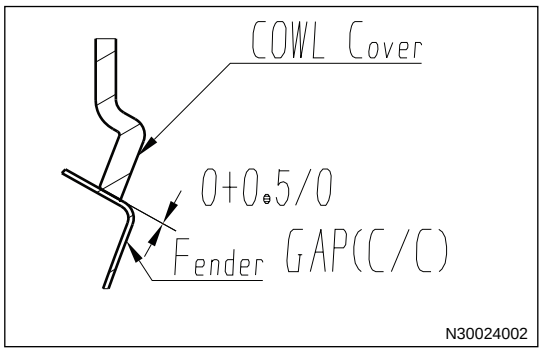
(2) Windshield to Quarter A-pillar (12)



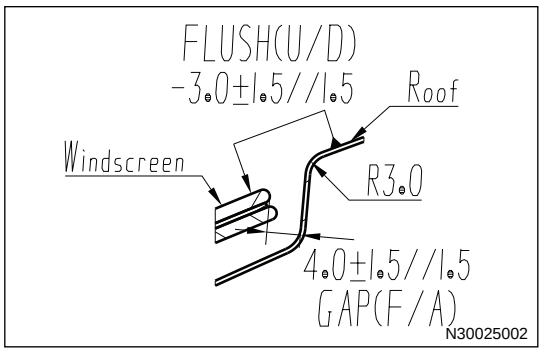
(3) Wing to A-pillar (13)



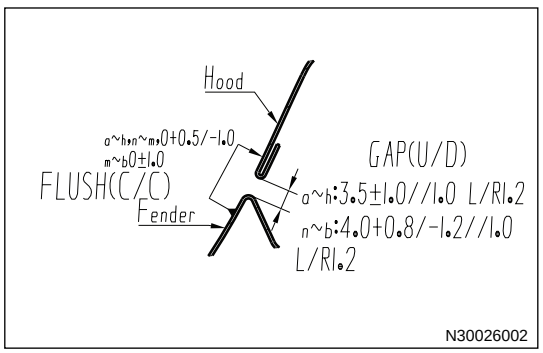
(4) Front Windshield Lower Trim Panel Cover Plate to Wing (137)



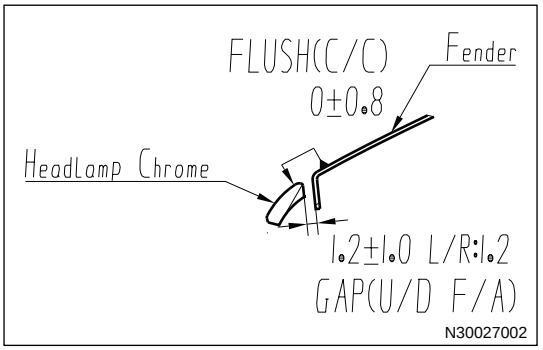
(5) Windshield to Top Panel (11)



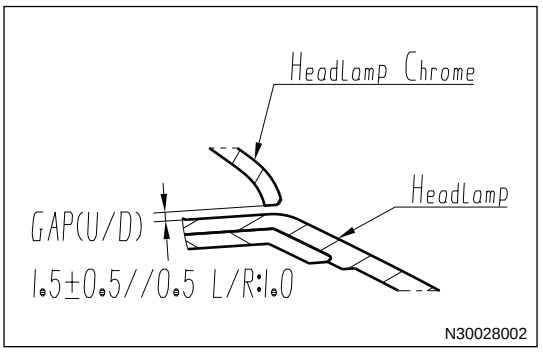
(6) Hood to Wing (06)



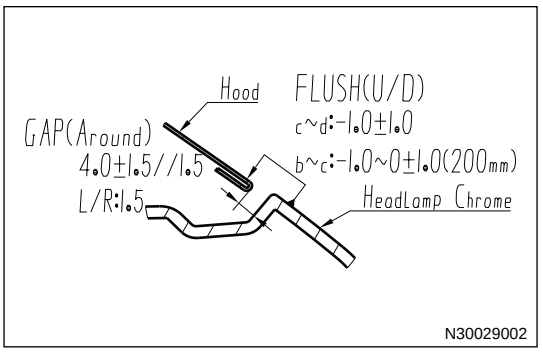
(7) Headlight Strip to Wing (07)



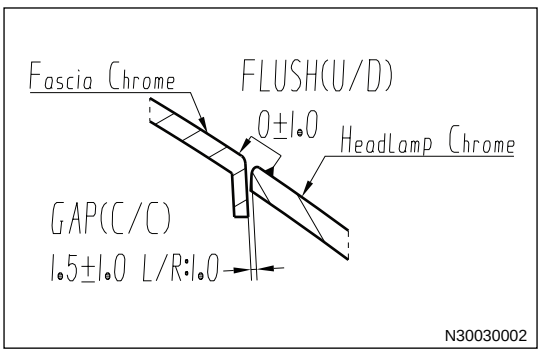
(8) Headlight Strip to Headlight (03)



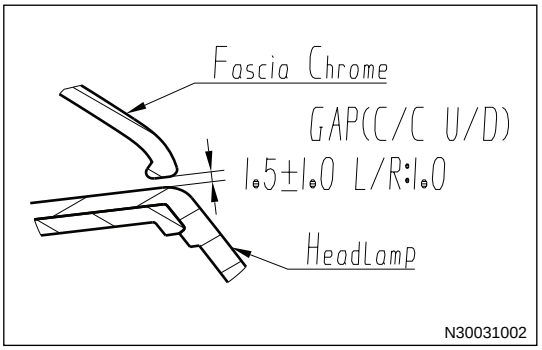
(9) Hood to Headlight Strip (02)



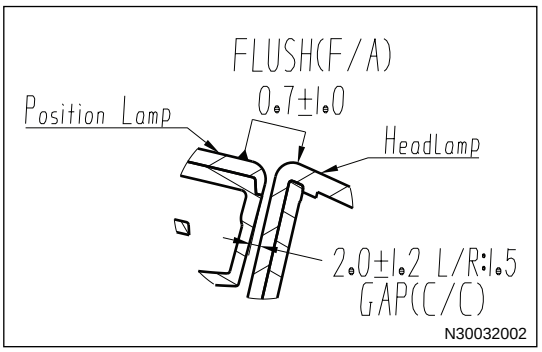
(10) Front Bumper Strip to Headlight Strip (18)



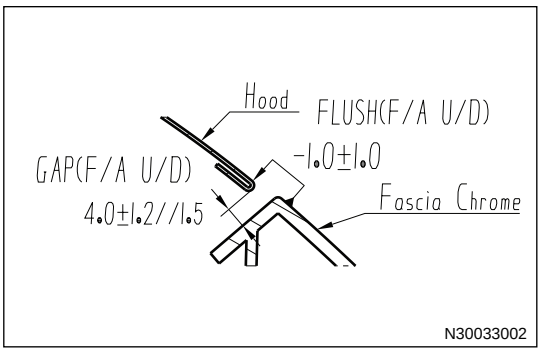
(11) Front Bumper Strip to Headlight (107)



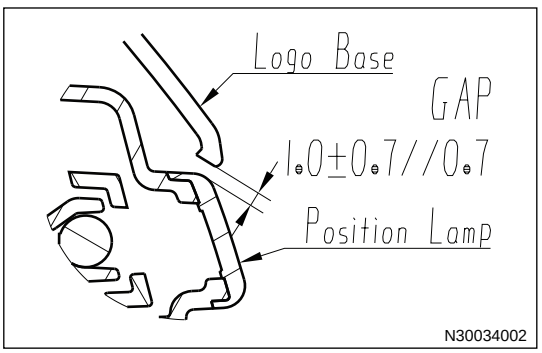
(12) Headlight to Position Light (17)



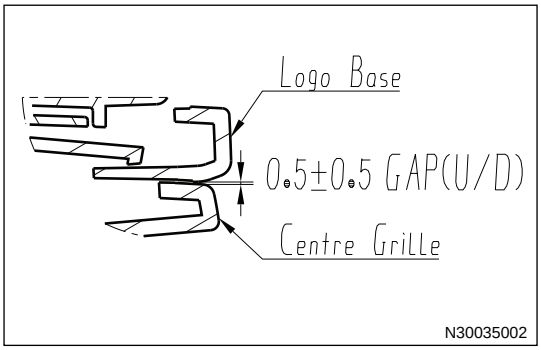
(13) Hood to Front Bumper Strip (01)



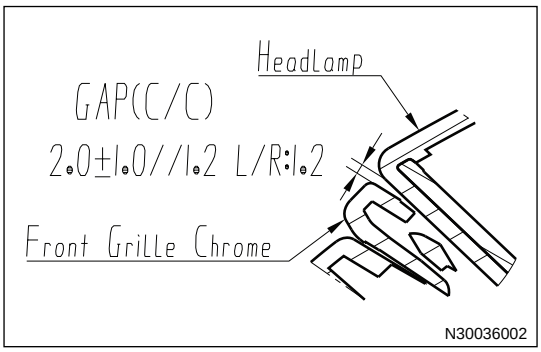
(14) Front Logo Base to Front Position Light (98)



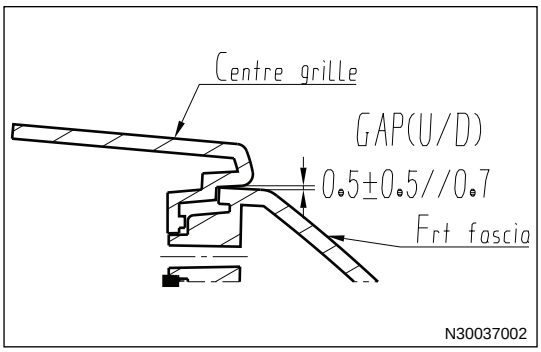
(15) Front Logo Base to Radiator Grille (88)



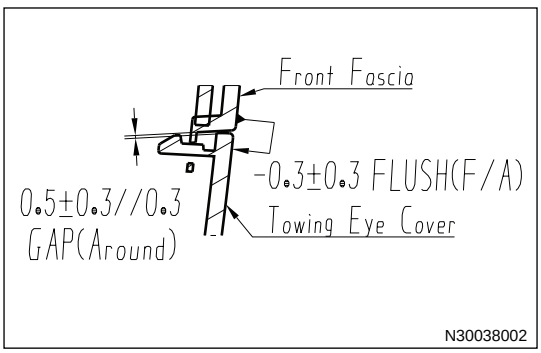
(16) Headlight to Front Grille Strip (136)



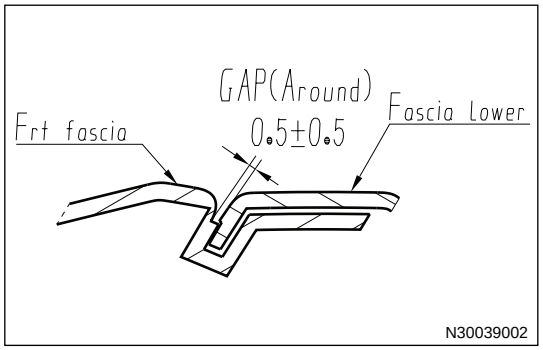
(17) Radiator Grille to Front Bumper Outer Skin (90)



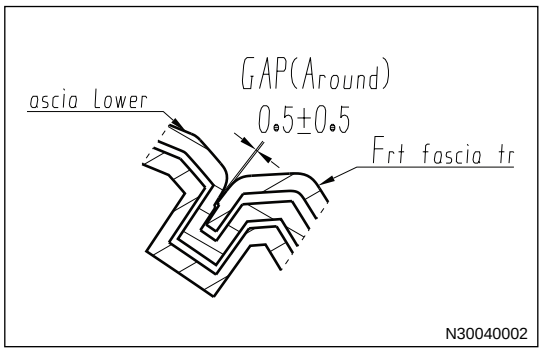
(18) Front Bumper to Front Towing Hook Cover (112)



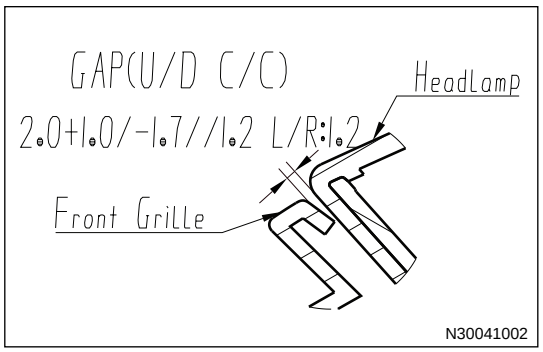
(19) Front Bumper Outer Skin to Bumper Lower Body (95)



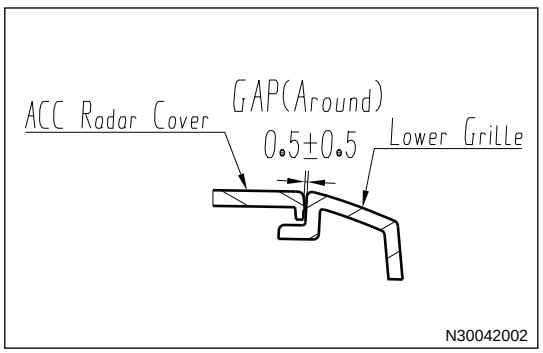
(20) Bumper Lower Body to Front Bumper Trim Panel (71)



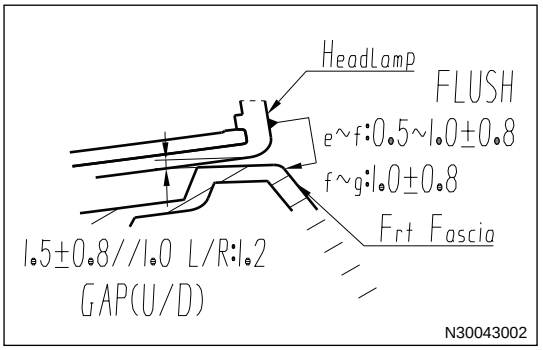
(21) Headlight to Front Grille (10)



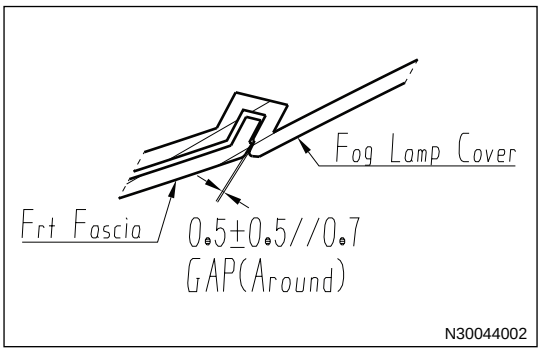
(22) ACC Radar Cover Plate to Front Bumper Lower Grille (133)



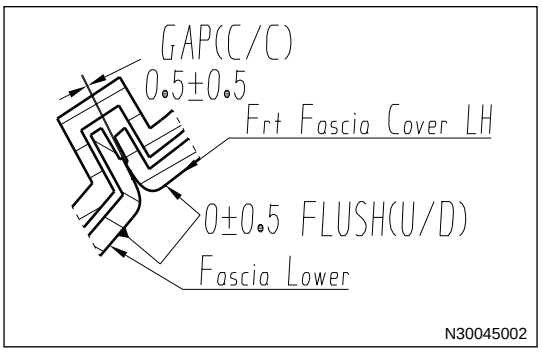
(23) Headlight to Front Bumper (09)



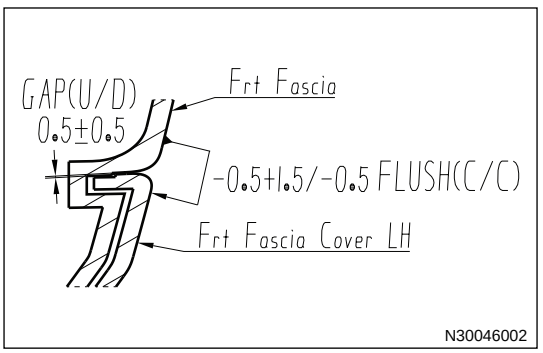
(24) Front Bumper to Fog Light Cover Plate (97)



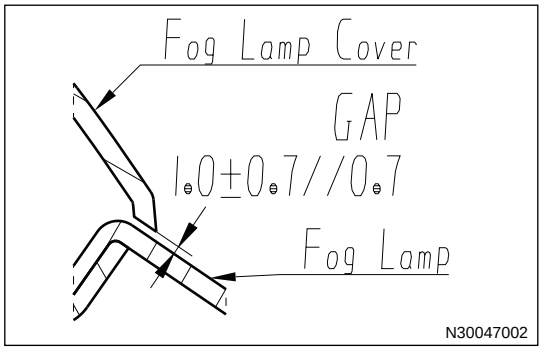
(25) Front Bumper Lower Body to Front Bumper Left Body (93)



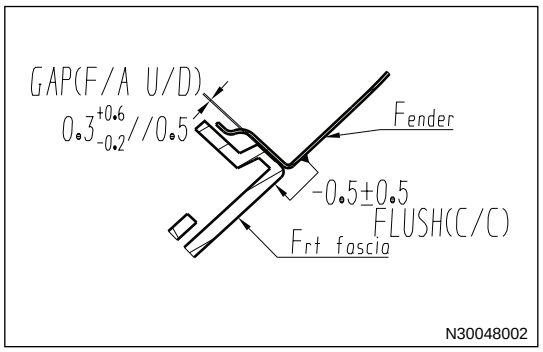
(26) Front Bumper Body to Front Bumper Left Body (94)



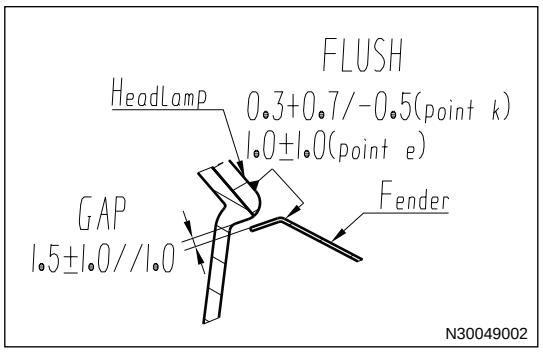
(27) Front Fog Light Cover Plate to Front Fog Light (96)



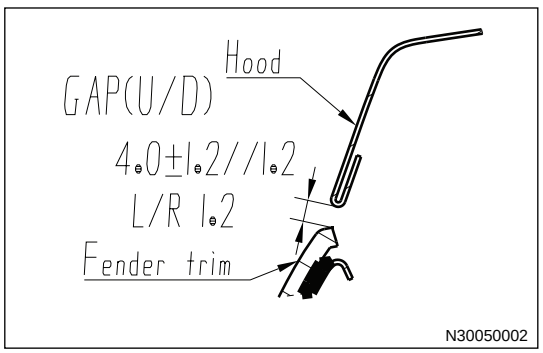
(28) Wing to Front Bumper (16)



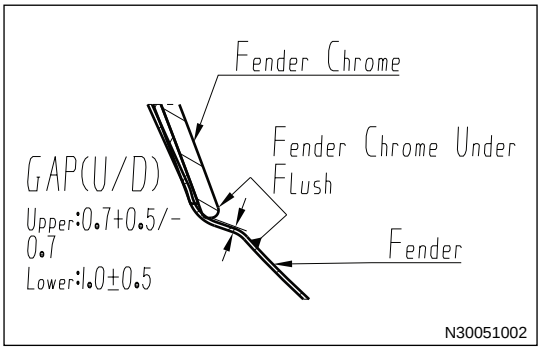
(29) Headlight to Wing (08)



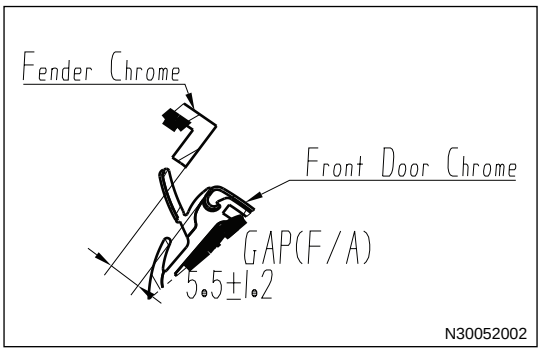
(30) Hood to Wing Trim Panel (04)



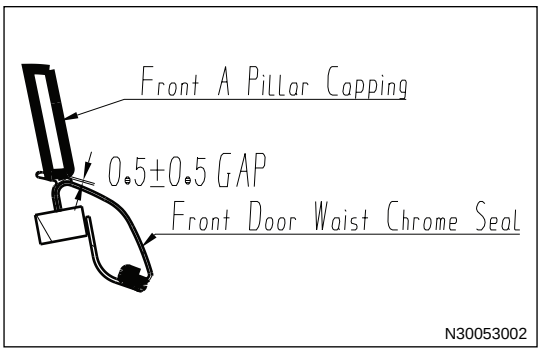
(31) Wing to Wing Trim Panel (15)



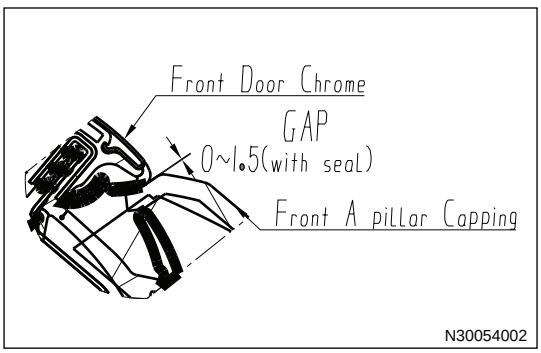
(32) Wing Strip to Front Door Strip (14)



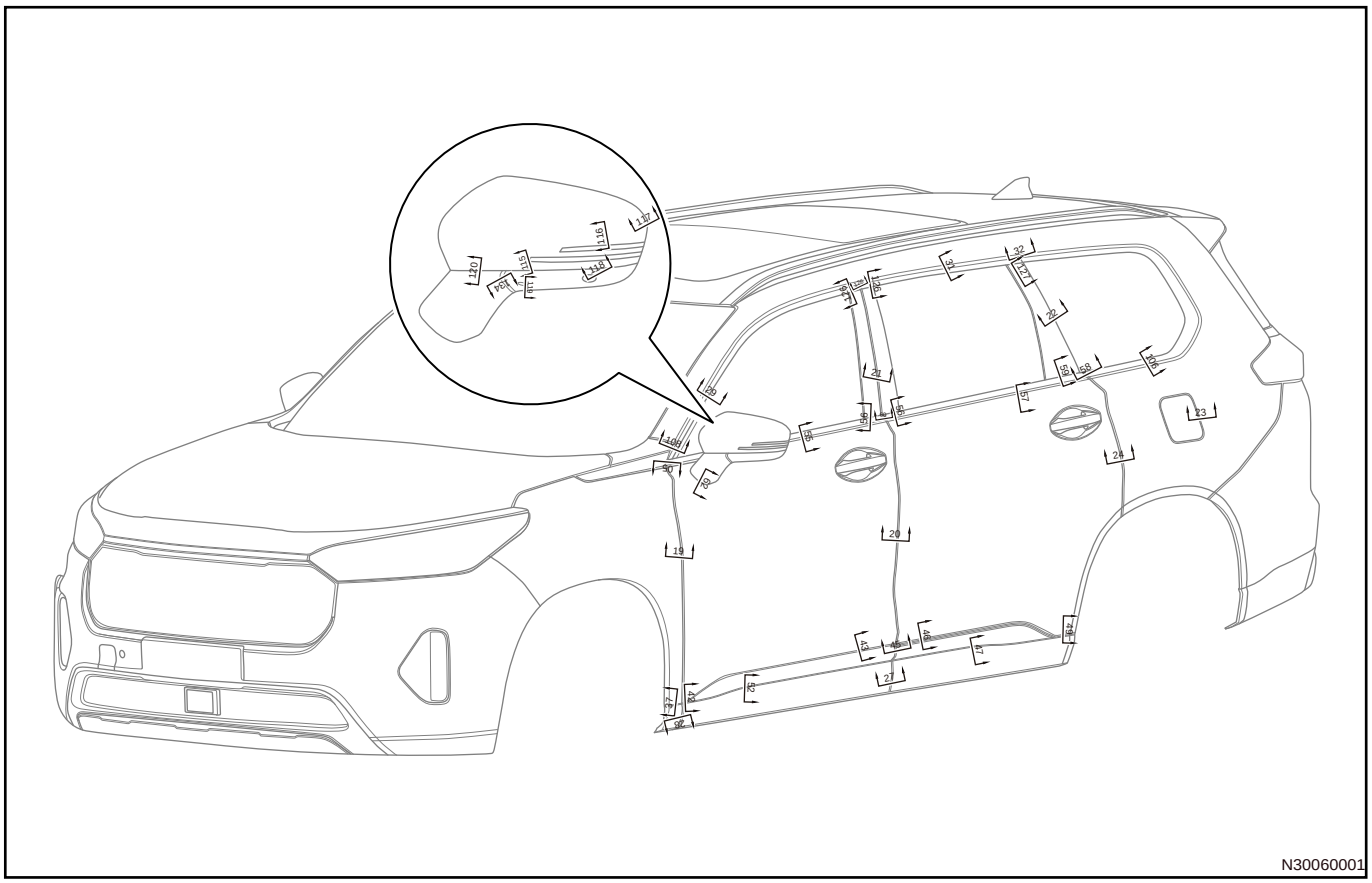
(33) Front Left Triangular Block to Front Door Weather Bar Strip Weatherstrip (131)



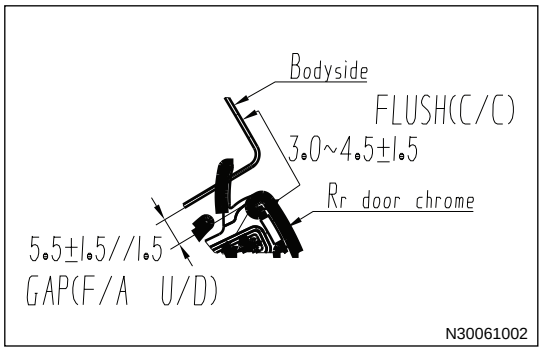
(34) Front Left Door Strip to Front Left Triangular Block (130)



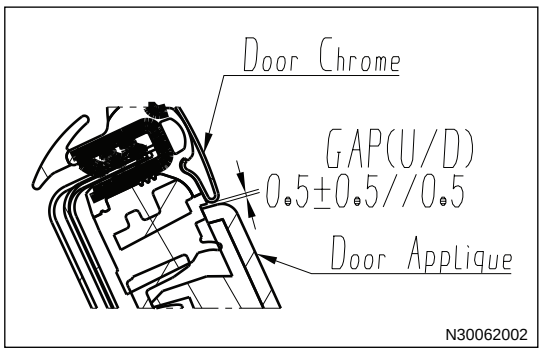
2.3 Body Surface Gap/Flush View 2



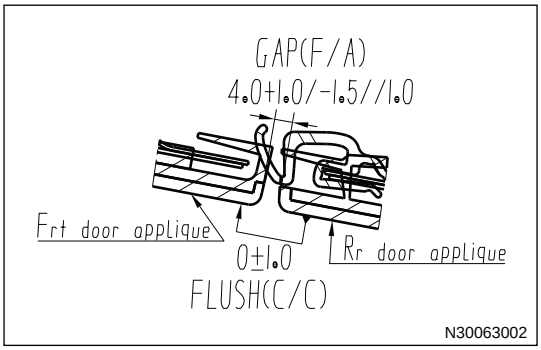
(35) Quarter Outer Panel to Rear Door Trim Strip (31)



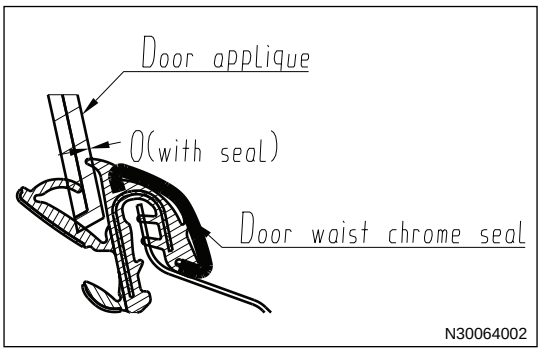
(36) Door Trim Strip to Door Trim Panel (126)



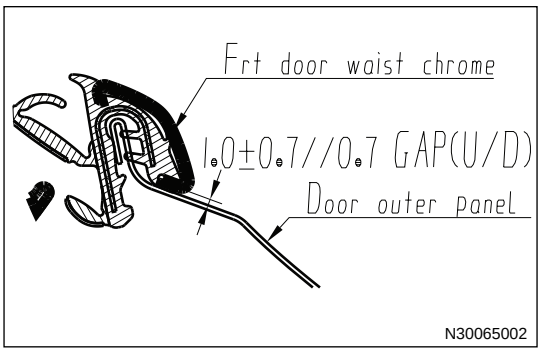
(37) Front Door Cover Plate to Rear Door Cover Plate (21)



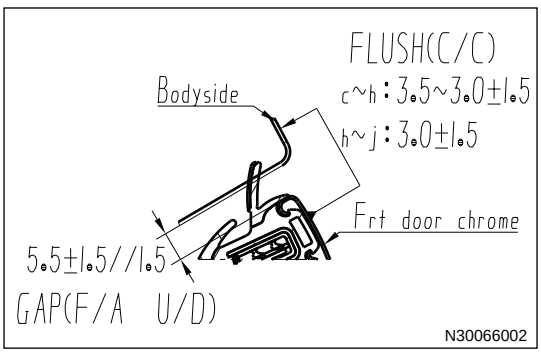
(38) Front/Rear Door B-pillar Cover Plate to Front/Rear Door Weather Bar Weatherstrip (56)



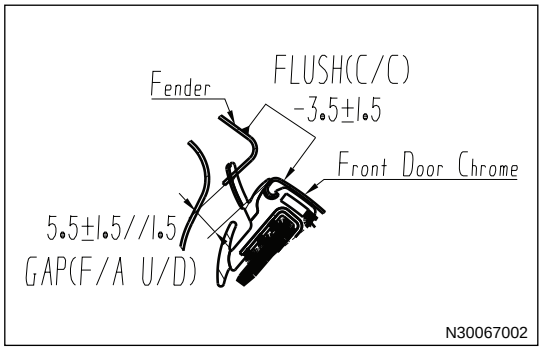
(39) Front Door Weather Bar Strip to Door Outer Panel (55)



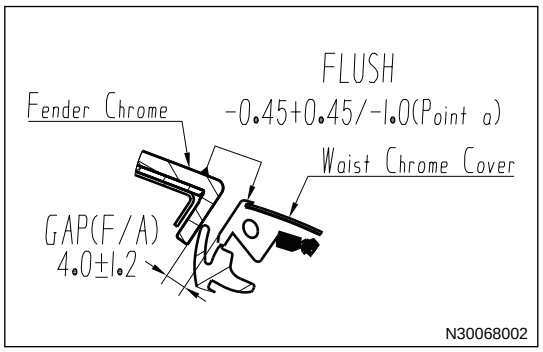
(40) Quarter Outer Panel to Front Door Trim Strip (29)



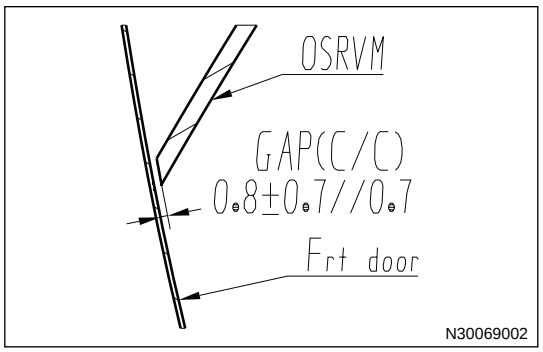
(41) Front Door Strip to Wing (108)



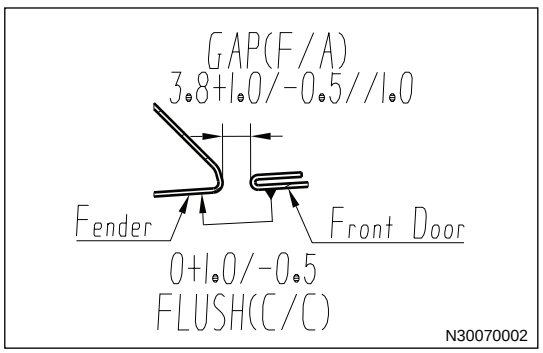
(42) Wing Strip to Front Door Weather Bar Strip (05)



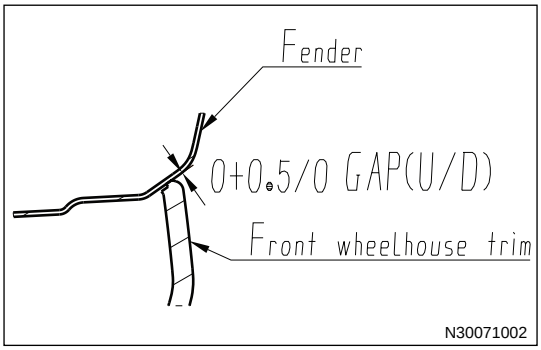
(43) Outside Rear View Mirror to Front Door Outer Panel (62)



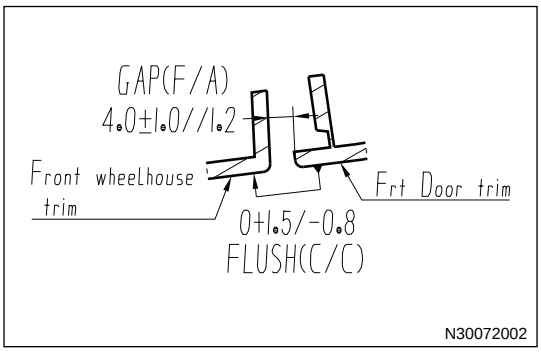
(44) Wing to Front Door (19)



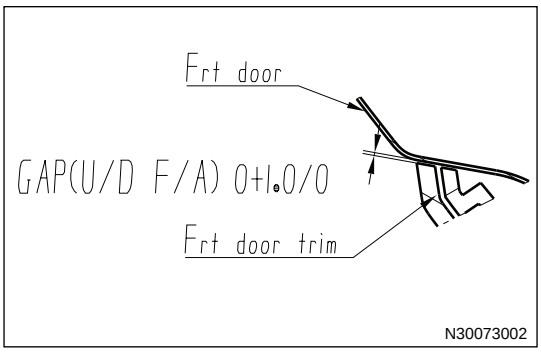
(45) Wing to Front Left Wheel Arch Ornament (37)



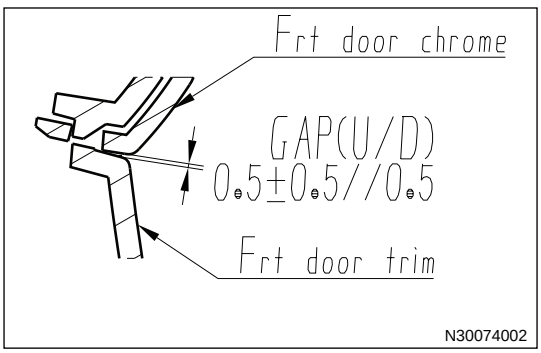
(46) Front Left Wheel Arch Ornament to Front Door Ornament (28)



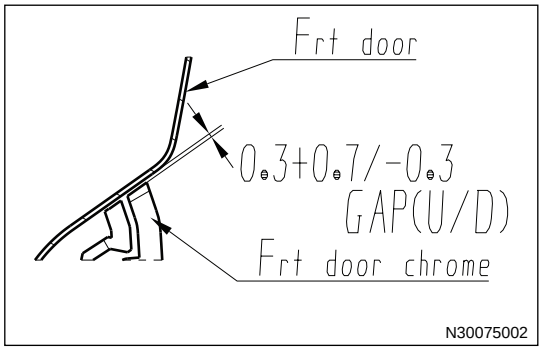
(47) Front Door Outer Panel to Front Door Trim Panel (42)



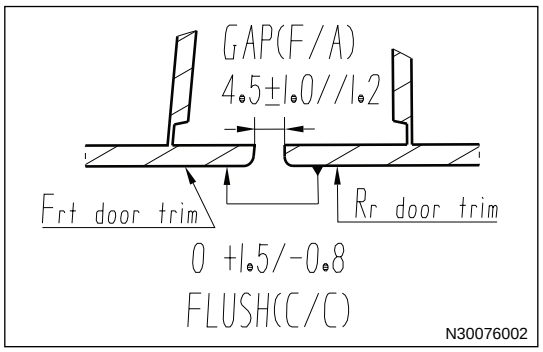
(48) Front Door Trim Strip to Front Door Trim Panel (52)



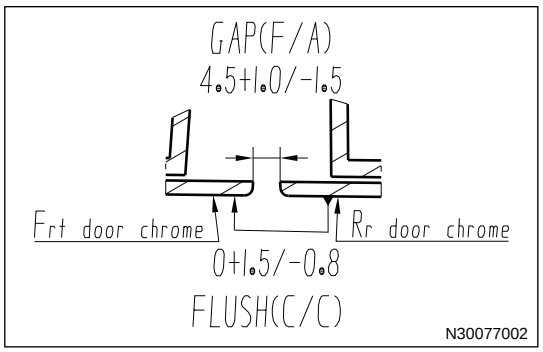
(49) Front Door Outer Panel to Front Door Trim Strip (43)



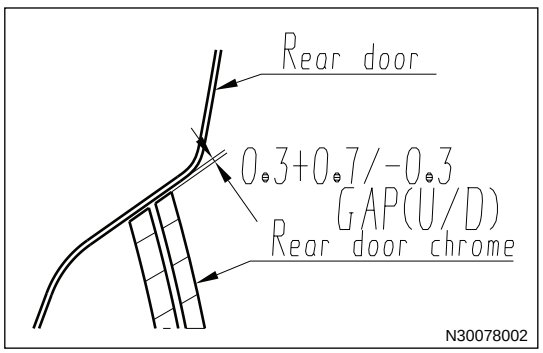
(50) Front Door Trim Panel to Rear Door Trim Panel (27)



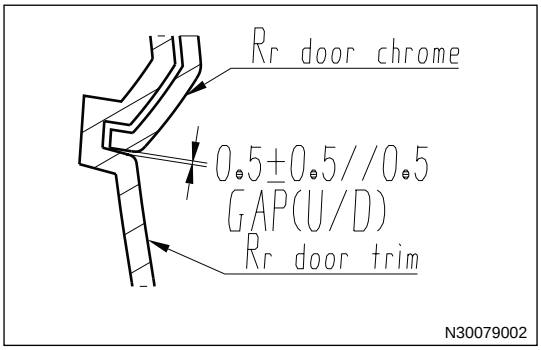
(51) Front Door Trim Strip to Rear Door Trim Strip (45)



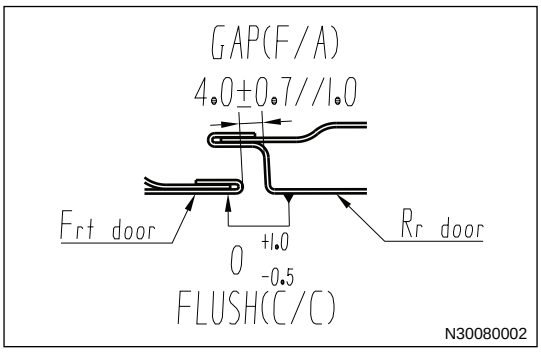
(52) Rear Door Outer Panel to Rear Door Trim Strip (46)



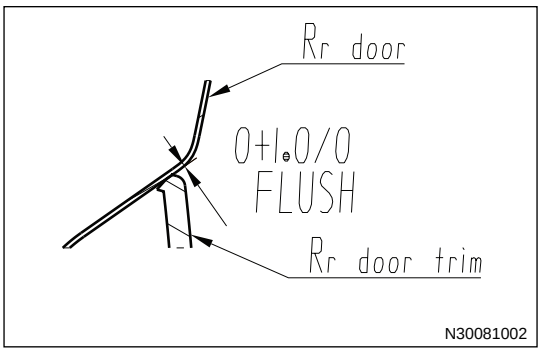
(53) Rear Door Trim Strip to Rear Door Trim Strip (47)



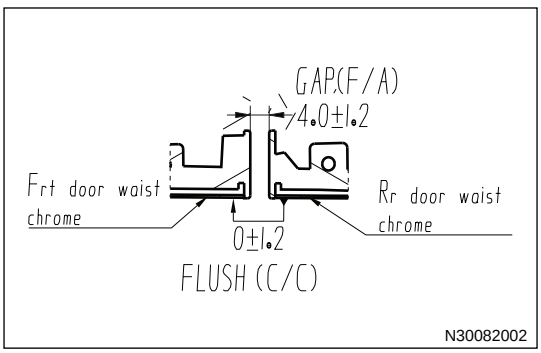
(54) Front Door Outer Panel to Rear Door Outer Panel (20)



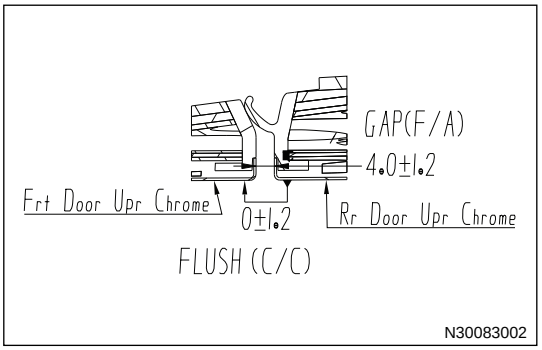
(55) Rear Door Outer Panel to Rear Door Trim Panel (49)



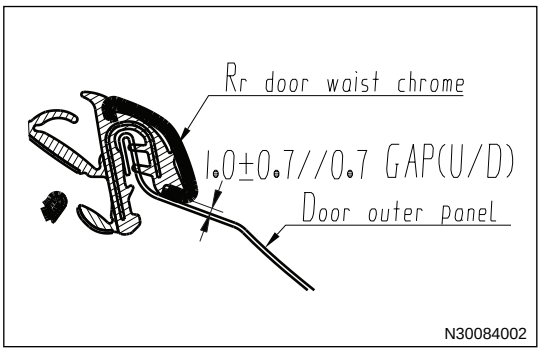
(56) Front Door Weather Bar to Rear Door Weather Bar (60)



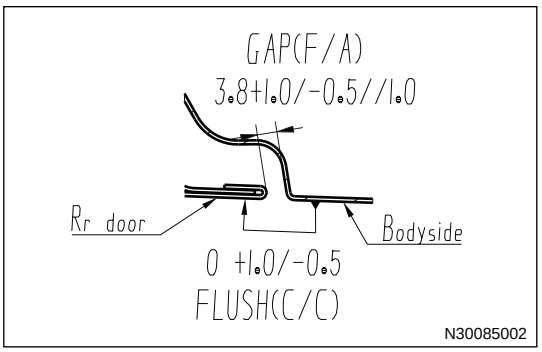
(57) Front Door Strip to Rear Door Strip (109)



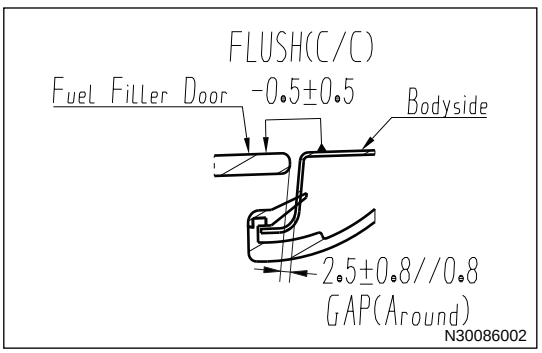
(58) Rear Door Weather Bar Strip to Door Outer Panel (57)



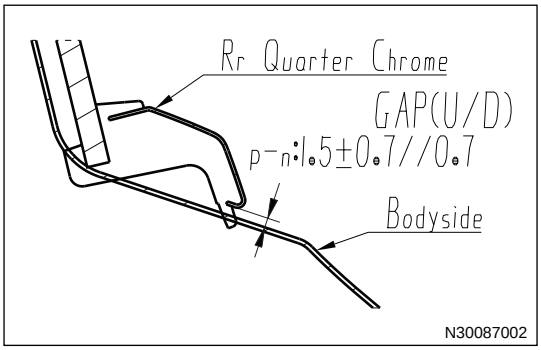
(59) Rear Door Outer Panel to Quarter Outer Panel (24)



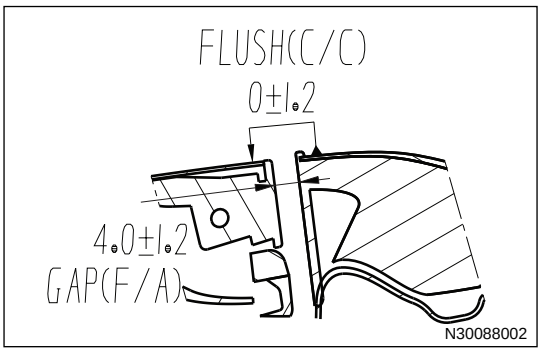
(60) Fuel Filler Cap to Quarter Outer Panel (23)



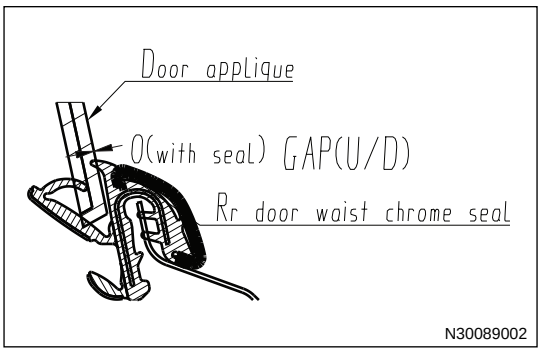
(61) Rear Round Quarter Window Strip to Quarter Outer Panel (106)



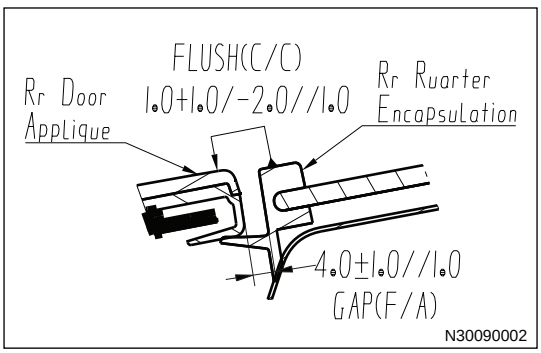
(62) Rear Left Door Waist Chromeplate to Quarter Chrome (58)



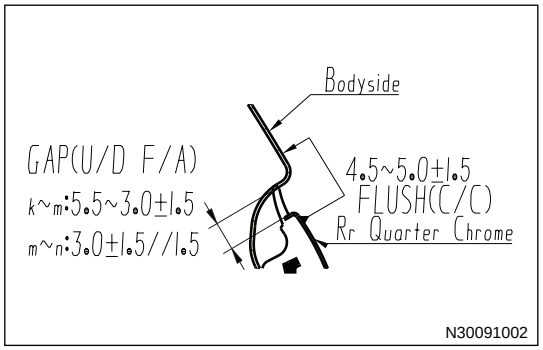
(63) Rear Door B-pillar Cover Plate to Rear Door Weather Bar Weatherstrip (59)



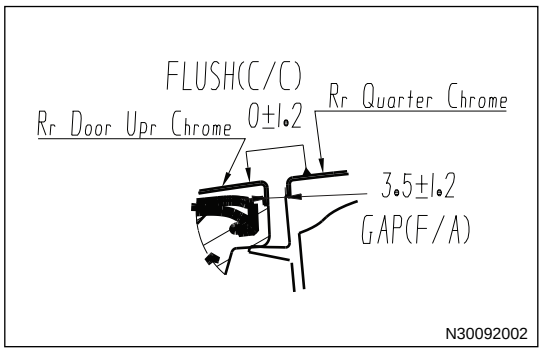
(64) Rear Door Trim Panel to Rear Quarter Window (22)



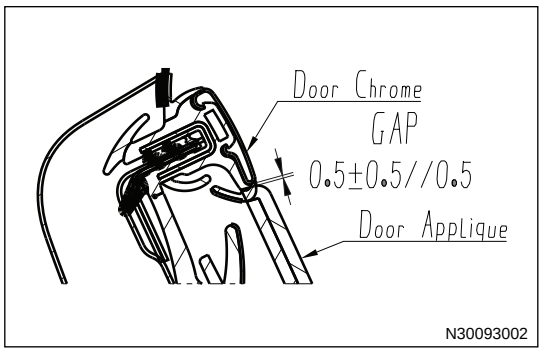
(65) Quarter Outer Panel to Rear Quarter Window Strip (33)



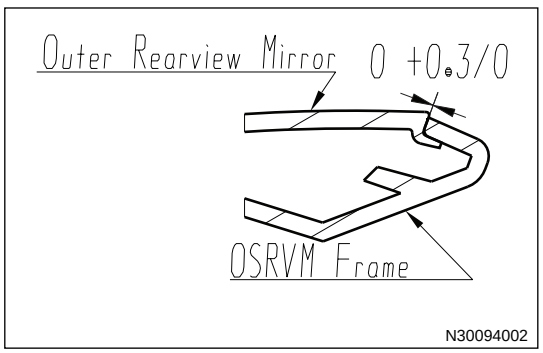
(66) Rear Quarter Window Strip to Rear Door Upper Strip (32)



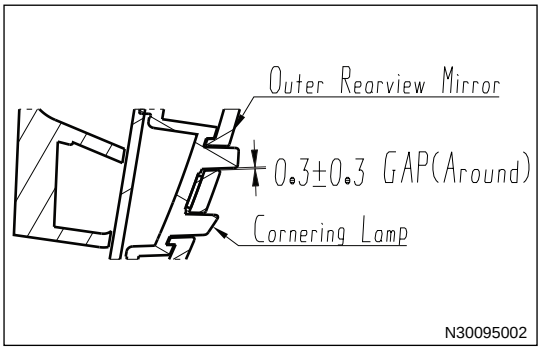
(67) Door Strip to Door Ornament (127)



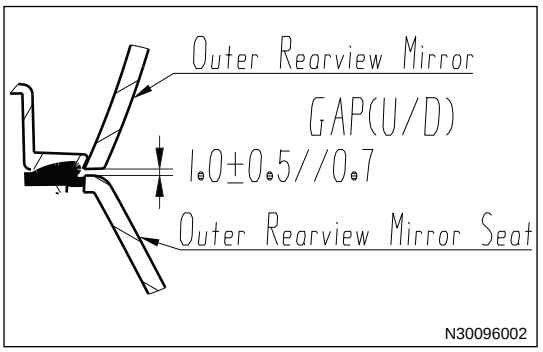
(68) Outside Rear View Mirror to Outside Rear View Mirror Frame (117)



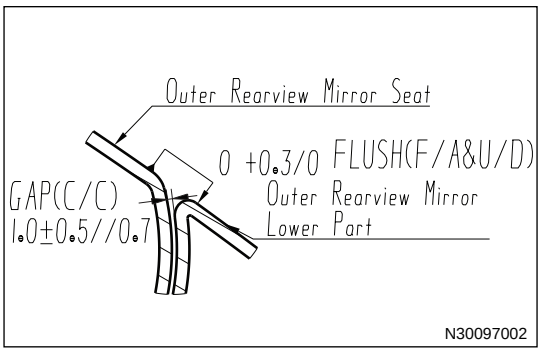
(69) Outside Rear View Mirror to Turn Signal Light (116)



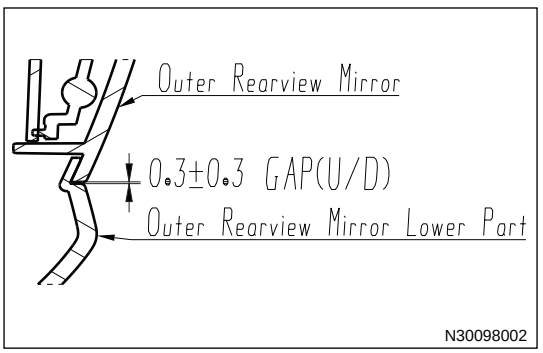
(70) Outside Rear View Mirror to Outside Rear View Mirror Base (120)



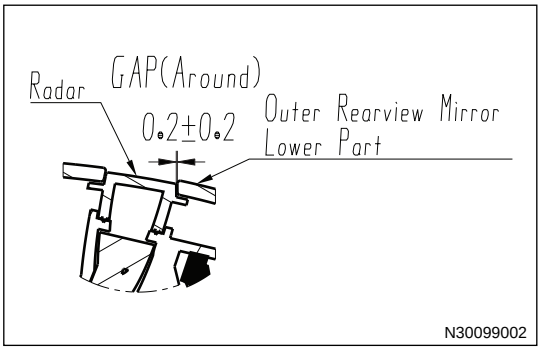
(71) Outside Rear View Mirror Base to Outside Rear View Mirror Lower Part (134)



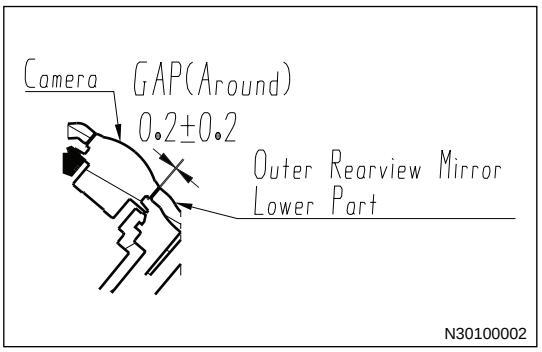
(72) Outside Rear View Mirror to Outside Rear View Mirror Lower Part (115)



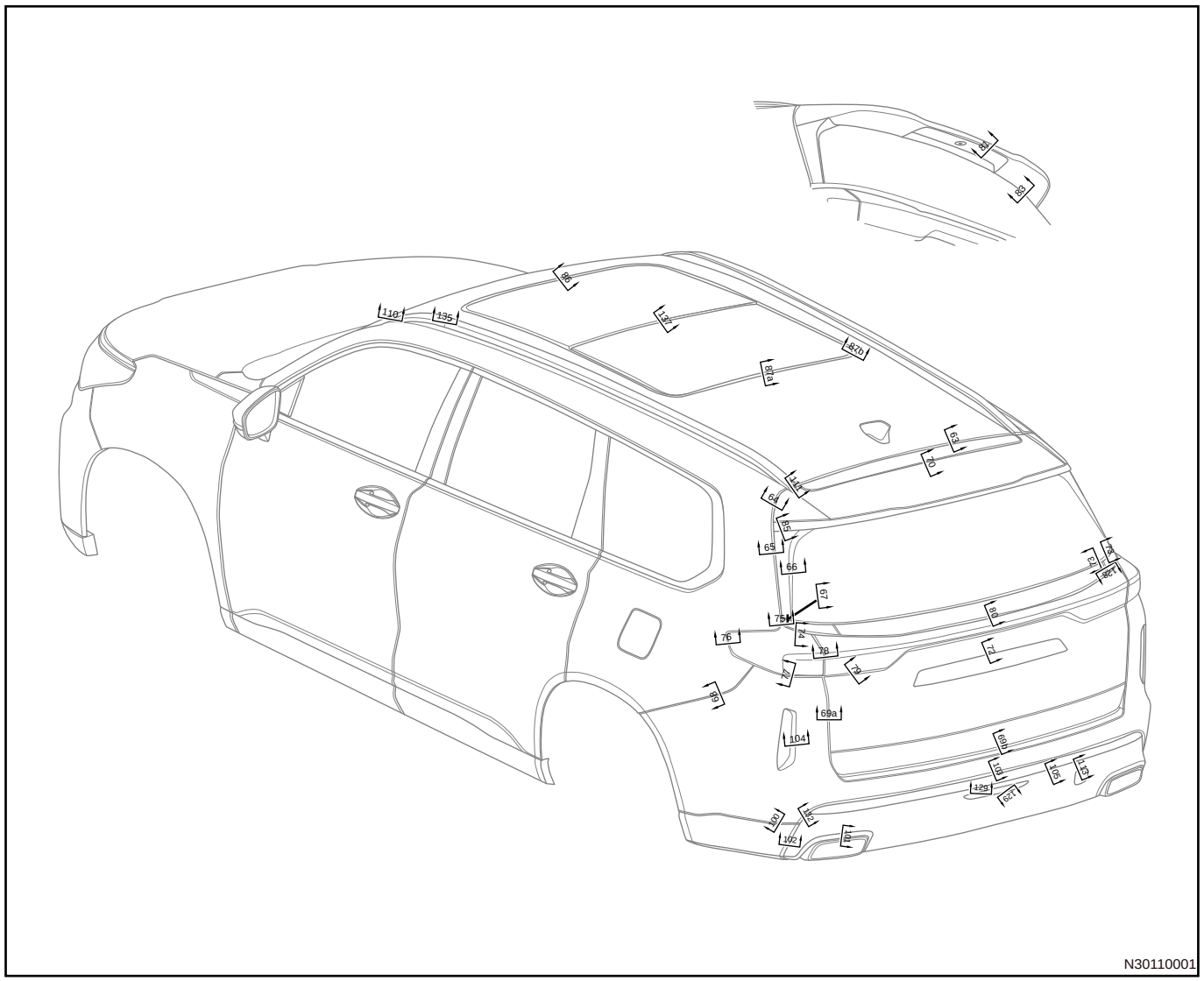
(73) Radar to Outside Rear View Mirror Lower Part Assembly (119)



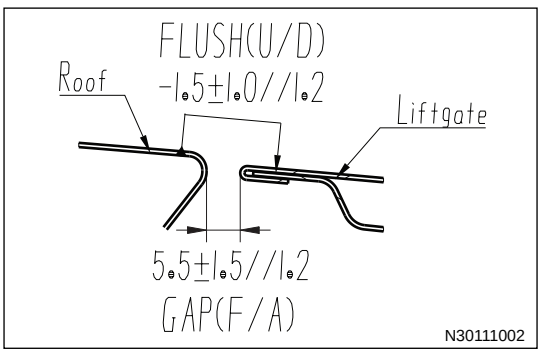
(74) Camera to Outside Rear View Mirror Lower Part Assembly (118)



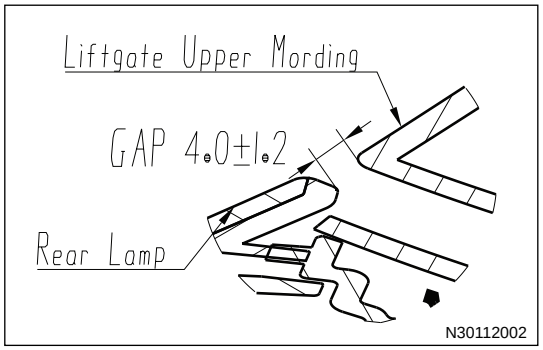
2.4 Body Surface Gap/Flush View 3



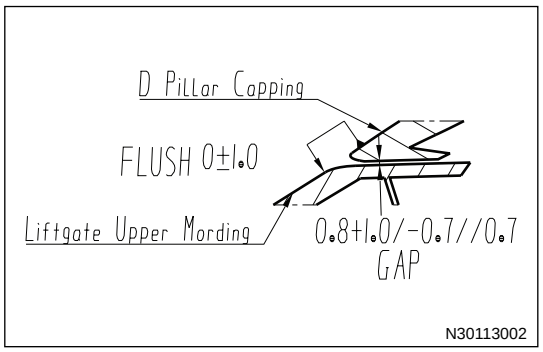
(75) Top Panel to Back Door (63)



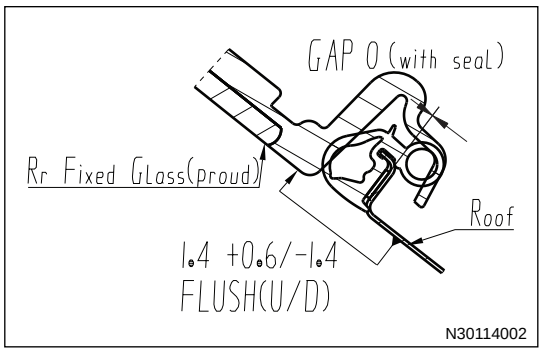
(76) Back Door Upper Trim Strip to Rear Combination Light (74)



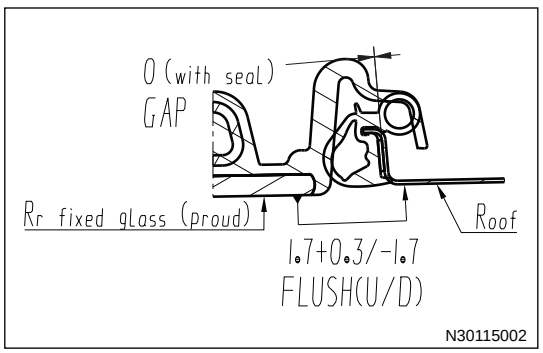
(77) D Trim Panel to Back Door Upper Left Trim Strip (67)



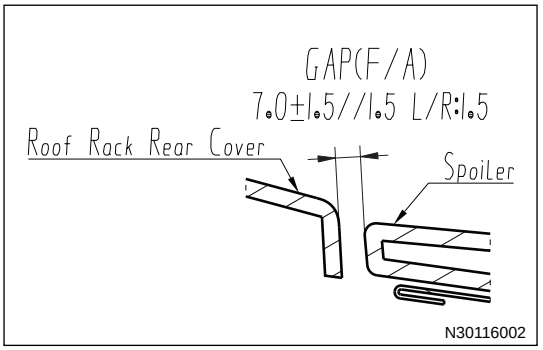
(78) Rear Fixing Roof to Roof Cover (87b)



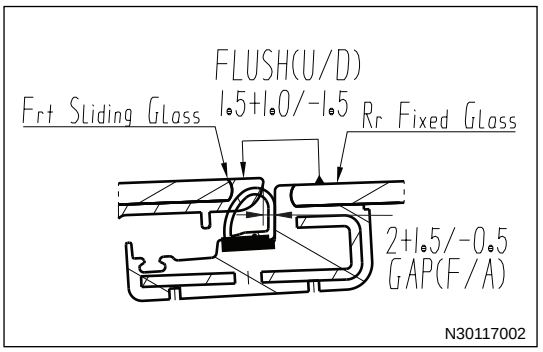
(79) Rear Fixing Roof to Roof Cover (87a)



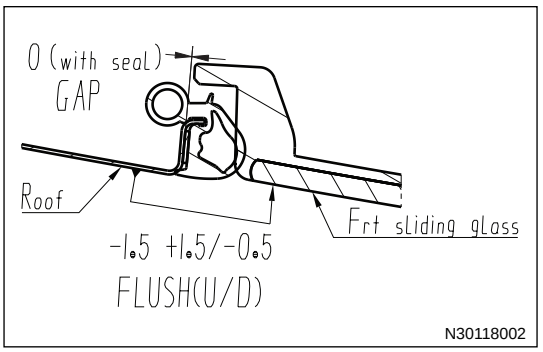
(80) Rear Left Rack End Cover to Spoiler (111)



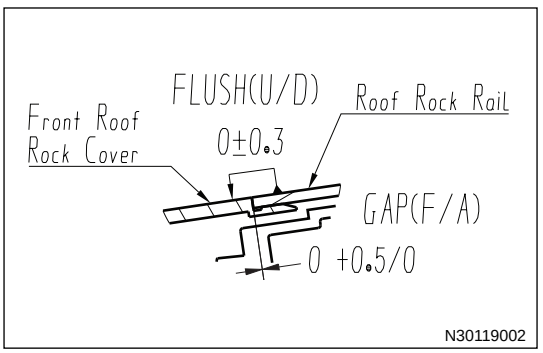
(81) Front Sliding Roof to Rear Fixing Roof (137)



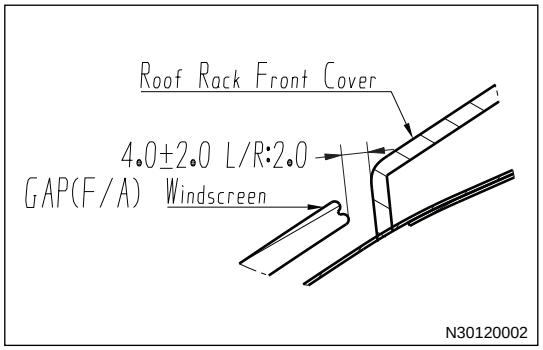
(82) Roof Cover to Front Sliding Roof Glass (86)



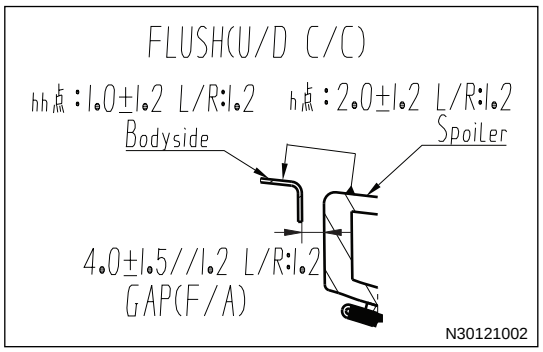
(83) Rack to Rack End Cover (135)



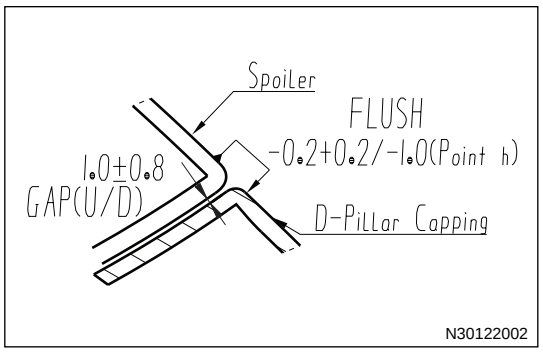
(84) Front Left Rack End Cover to Front Windshield (110)



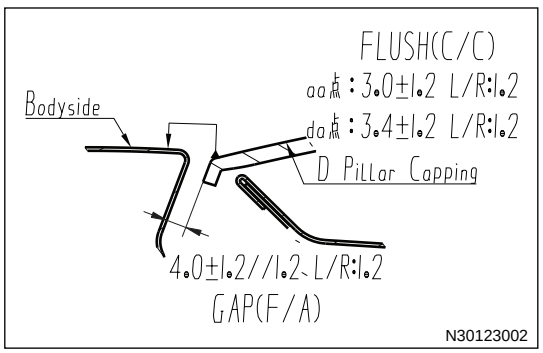
(85) Quarter to Spoiler (64)



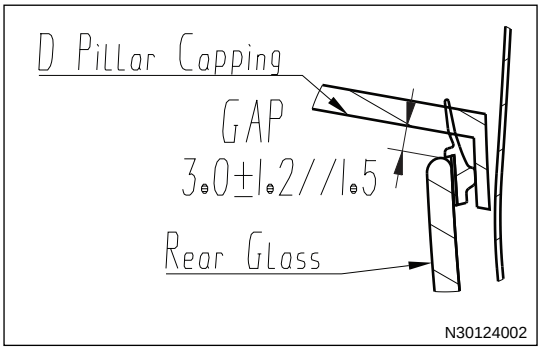
(86) Spoiler to D-pillar Trim Board (85)



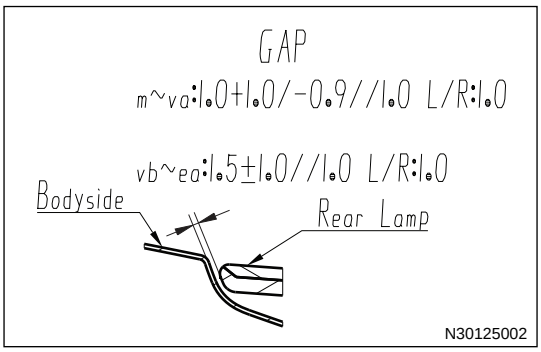
(87) Quarter to D-pillar Trim Board (65)



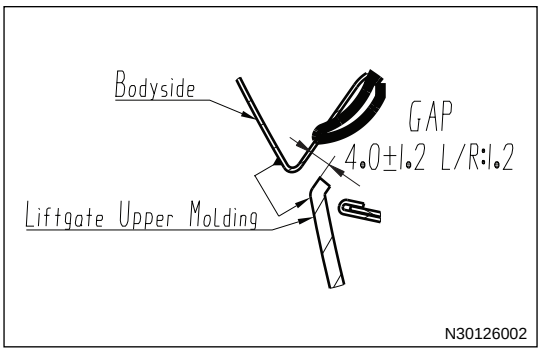
(88) D-pillar Trim Board to Rear Windshield (66)



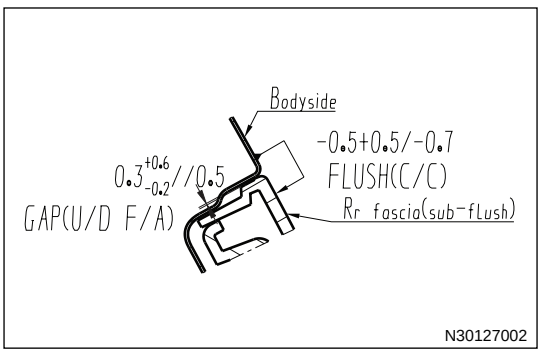
(89) Quarter Outer Panel to Rear Combination Light A Light (76)



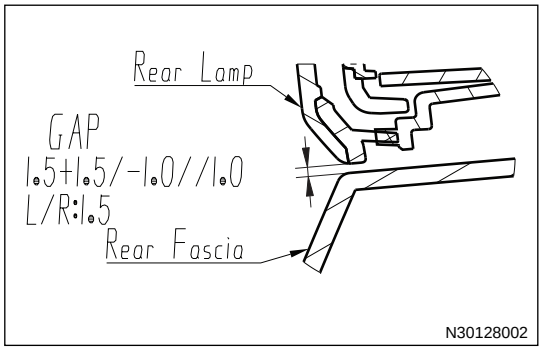
(90) Quarter to Back Door Upper Left Ornament (75)



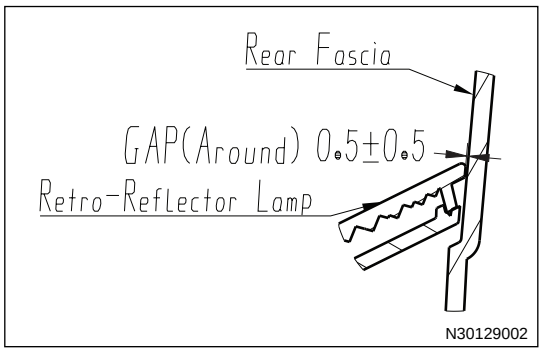
(91) Quarter Outer Panel to Rear Bumper Outer Skin (68)



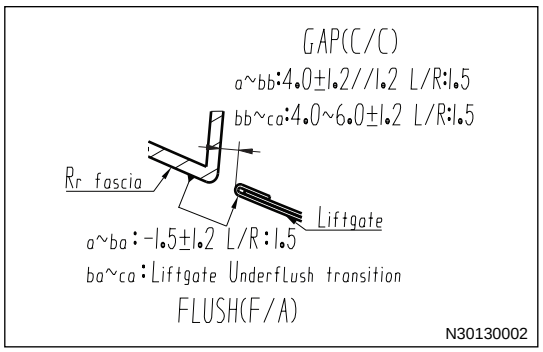
(92) Rear Combination Light A Light to Rear Bumper Outer Skin (77)



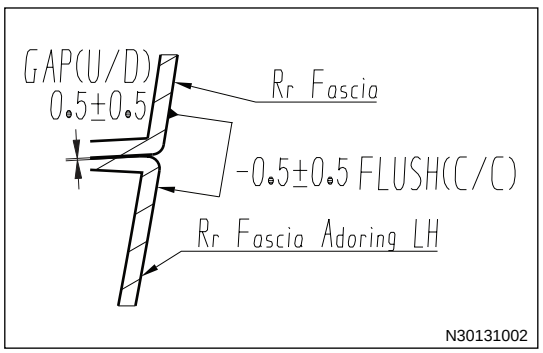
(93) Rear Bumper to Retro-reflector (104)



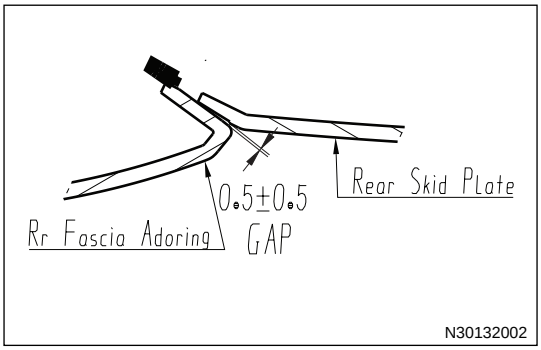
(94) Rear Bumper Outer Skin to Back Door (69a)



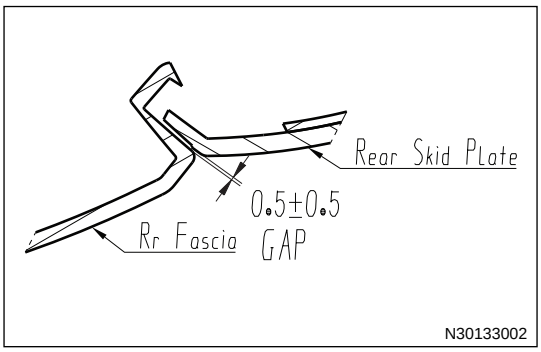
(95) Rear Bumper to Rear Bumper Left Ornament (100)



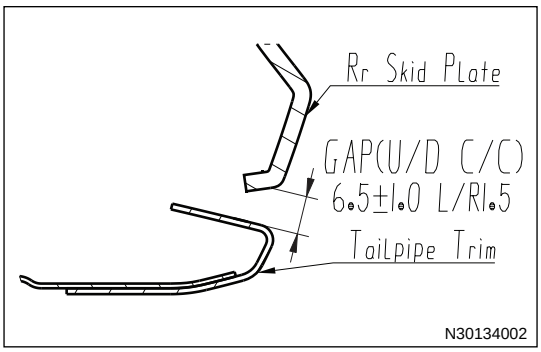
(96) Rear Bumper Left Ornament to Rear Bumper Lower Trim Board (102)



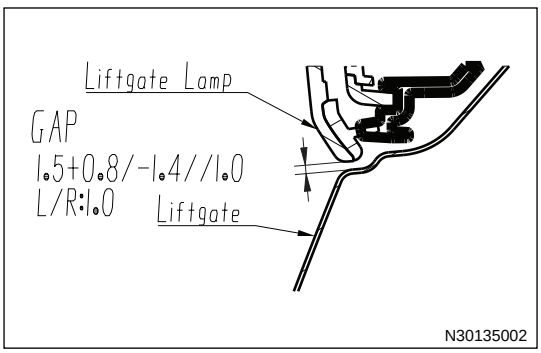
(97) Rear Bumper Lower Trim Board to Rear Bumper (132)



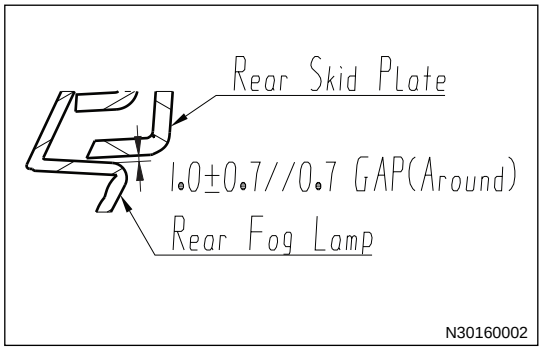
(98) Rear Bumper Lower Trim Board to Exhaust Pipe Trim Cover (101)



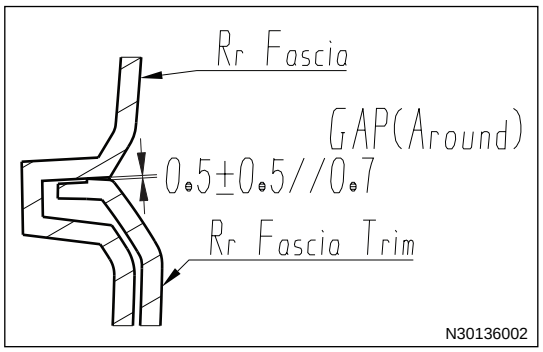
(99) Rear Combination Light B Light to Back Door (79)



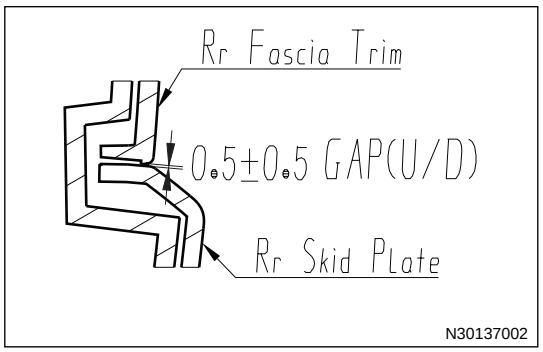
(100)Rear Bumper Ornament to Rear Rear Fog Light Assembly (129)



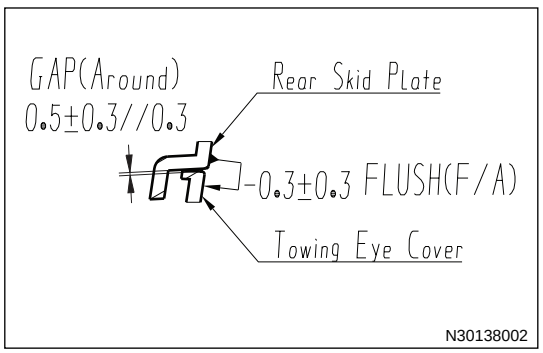
(101)Rear Bumper to Rear Bumper Center Trim Strip (103)



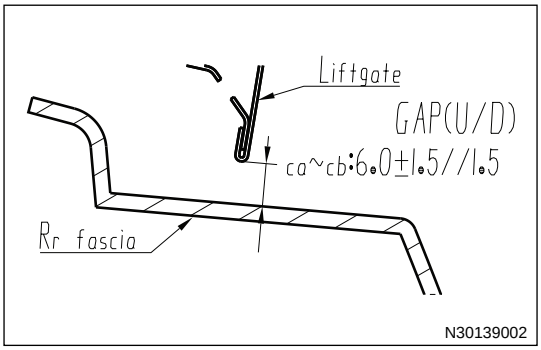
(102)Rear Bumper Center Trim Strip to Rear Bumper Ornament (105)



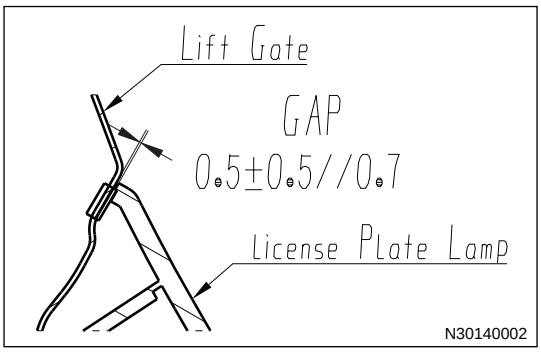
(103)Rear Bumper Lower Trim Board to Rear Towing Hook Cover (113)



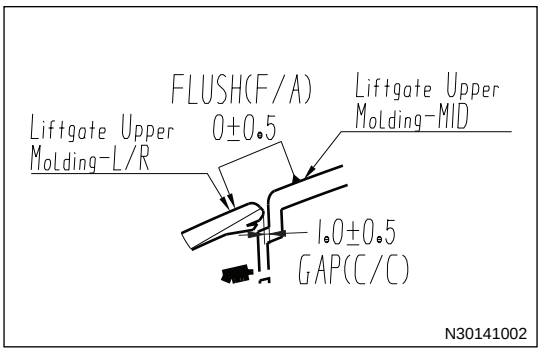
(104)Back Door to Rear Bumper Outer Skin (69b)



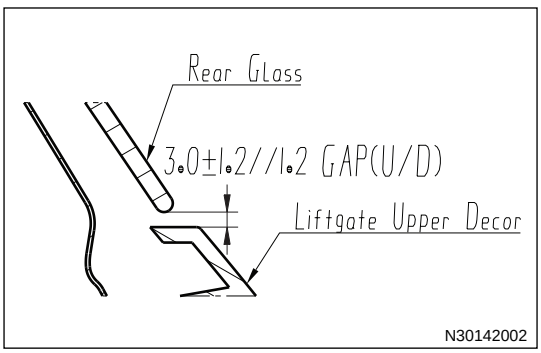
(105)Back Door to License Plate Light Protector (72)



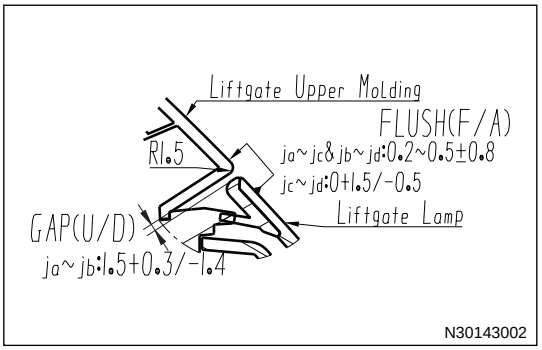
(106)Back Door Upper Left/Right Trim Strip to Back Door Upper Center Trim Strip (128)



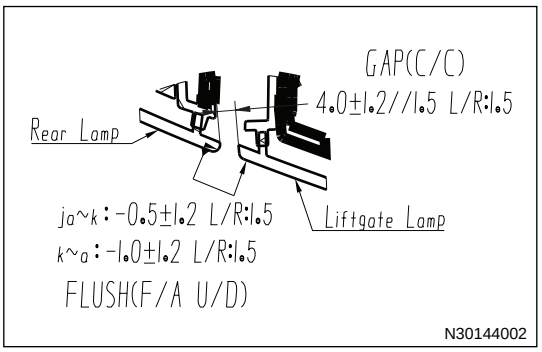
(107)Rear Windshield to Back Door Upper Ornament (73)



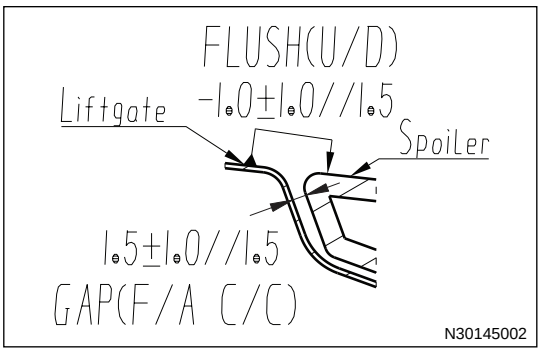
(108)Back Door Upper Trim Strip to Rear Combination Light B Light (80)



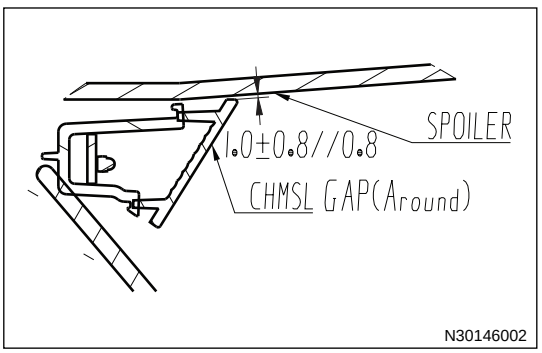
(109)Rear Combination Light A Light to Rear Combination Light B Light(78)



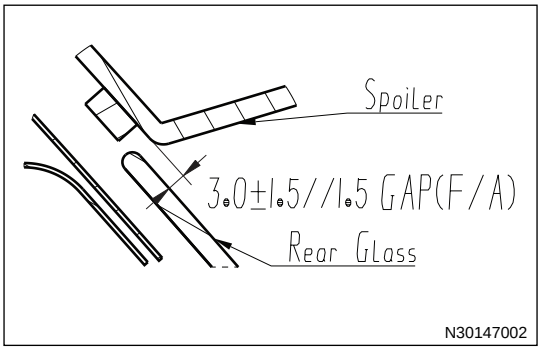
(110)Back Door to Spoiler (70)



(111)Spoiler to High Mounted Brake Light (81)



(112)Spoiler to Rear Windshield (83)



3 Description & Operation for Sheet Metal Operation

3.1 Safety Precautions

- It’s necessary to wear protective clothing, goggles, gloves and working shoes when performing body metal plate welding, cutting and polishing.
- Ensure the ventilation is well in welding area.
- Disconnect battery and cover the post before welding.
- If spark may be generated when working near the battery, it’s necessary to remove the battery.
- Before removing the vehicle parts, the vehicle should be fixed on the lifting frame to avoid the change of the vehicle gravity, which may affect the operation safety.
- Connect the ground wire of the welding device directly to the parts that need to be welded, and ensure that there is no conductive part between the ground point and the welding point when operating.
- Ground wire or welding electrode is forbidden to contact with electronic control unit and cable.
- Never park an unprotected vehicle in the body service area, because splashing sparks may cause fire, damage paint surface and glass.
- Special care should be taken when polishing and welding near fuel tank or other components that contain fuel, and all suspected components that may affect safety should be removed.
- Special care should be taken when polishing and welding near fuel tank or other components that contain fuel, and all suspected components that may affect safety should be removed.
- It’s necessary to disconnect the battery ground wire when operating the airbag system or carrying out body calibration; the temperature around airbag components should not exceed 100 ℃.

3.2 State of Components

Before the repaired car or parts are sent to the paint shop for painting, its surface must be flat, filled and polished with abrasive paper. The preparation process is completed by metal plate worker. The body and floor compartments are mainly formed by cold stamping with steel plates. Therefore, the same method should be used to restore the shape of the damaged area caused by an accident. If the damaged area cannot be restored to the original appearance, the adjacent area should be calibrated, the damaged area should be removed and replaced according to the integrity of the parts. Do not cut the parts separately. The rigidity, driving safety and service convenience of the vehicle will be affected after cutting and welding.

3.3 Description of Welding Types

Common welding types include spot welding, gas shielded welding and soldering. Never reduce the number of welding spots when performing spot welding. Generally speaking, when the spot welding device can not be carried out, plug welding can be carried out by means of gas shielded welding after drilling it. When spot welding is used, if it is the connection of three-layer plates, only the outer plate is replaced and the welding points must be placed on the original welding points. When spot welding is used, single weld, double weld and double offset weld can be generated. When gas shielded welding is used, lap weld, continuous weld and continuous weld (intermittent) can be generated. Soldering is often used to weld and repair areas with low tensile strength and relatively thinner component thickness.

3.4 Anti-corrosion Treatment

(1) It’s necessary to use approved materials to restore standard anti-corrosion layer after service.

(2) It’s necessary to apply primer to inside and outside of all welds before sealing.

(3) It’s necessary to apply sealant to metal plates with primer coating.

(4) It’s necessary to seal lap metal plates, metal edges, butt welds and welds with sealant.

(5) Apply long-term deck protection agent to the vehicle deck.

(6) It’s necessary to deal with the cavity in the service area with the protection material in the cavity after spraying the finish paint.

(7) Clean drain after the protection material in the cavity is dry.

3.5 Environment Protection Treatment Method of Car Disposal Parts

(1) It’s necessary to collect disposal materials according to the types after car maintenance or service.

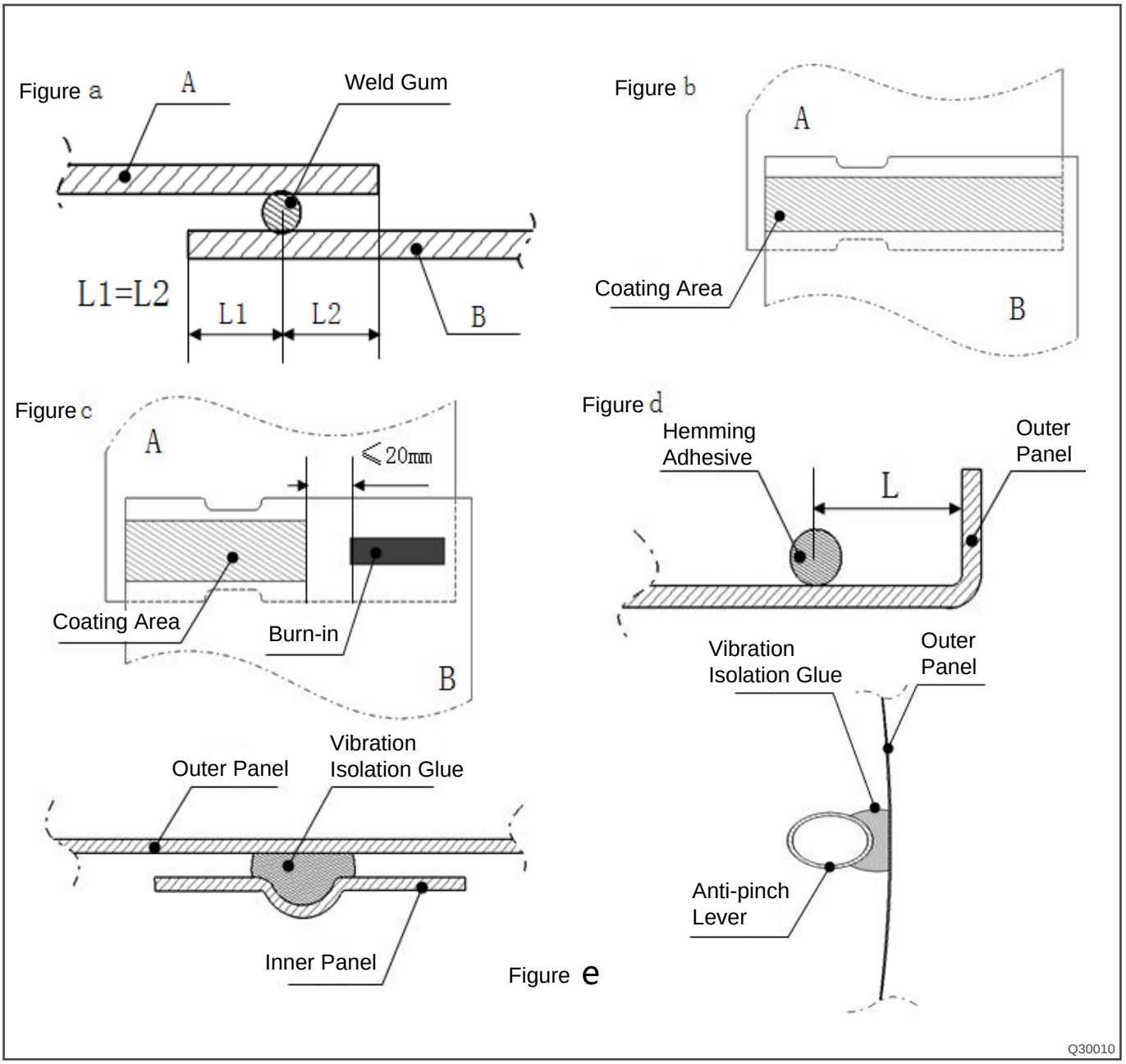
(2) Classify disposal materials and check if they can be used repeatedly.

3.6 Welding and Coating for Body in White

■ Coating Purpose

- Sealing (spot welding seal gum thumb glue).
- Bonding (hemming adhesive, structural adhesive).
- Damping (expanding damping adhesive).

■ **General Requirements 1**



(1) Weld gum

- Position: The principle is that the center line of effective lap surface for two sheet metal is the center of application line [Figure a].
- Start and end points: The principle is the start and end points of effective lap surface for two sheet metals [Figure b].
- Burn-in: The principle is that burn-in edge is 20 mm or less from application position (tentative) (Note: only for process of burn-in after coating) [Figure c].

(2) Distance between hemming adhesive and edge

- The principle is the distance between coating center line and the inner surface of outer panel [Figure d].

(3) Damping adhesive

- The principle is to fill the damping adhesive tank (table) or sol point, and meet the effective connection between inner and outer panels [Figure e].

(4) Coating size tolerance

- The principle is that the tolerance zone of coating size is defined as ±1 mm.

(5) For the requirements of coating height and diameter, when the process cannot be met at the same time, the principle is to meet the height and then meet the diameter by priority.

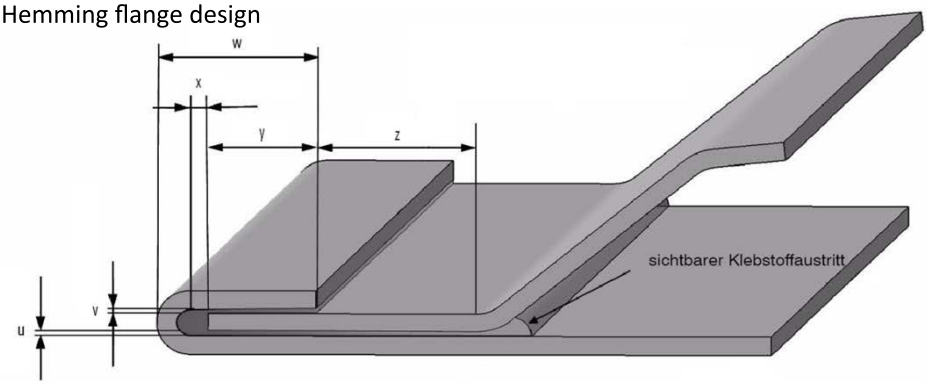
(6) Coating length tolerance

- The principle is that the tolerance zone of coating length is defined as ± 10 mm.

■ **General Requirements 2**

General Requirements 2 for Body in White Welding and Coating Drawing

1, Hemming flange design



u = 0,2 ± 0,1mm
v = 0,2 ± 0,1mm
y ≥ 6mm
x = 1 ± 0,5mm
z ≥ 5mm

Degree of filling: 50%

2, Classification

Class	Degree of corrosion protection	Describtion
A	highest	Emission of adhesive on both sides
B	high	Emission of adhesive on one side with min. 70% flange filling
C	low	Flange filling min. 70%
AF	low	Function anti flutter has be guaranteed
Hemming	High	See page 3

3, Adhesives
Henkel TEROKAL 4555B
Henkel Impermastic 1020
Henkel TEROSTAT 3206

4, Application on
Part name which the adhesive is applied

5, Length [mm]
Lenght of the application for both sides. tolerance +/- 5mm for automatic application; +/-10mm for manual application.

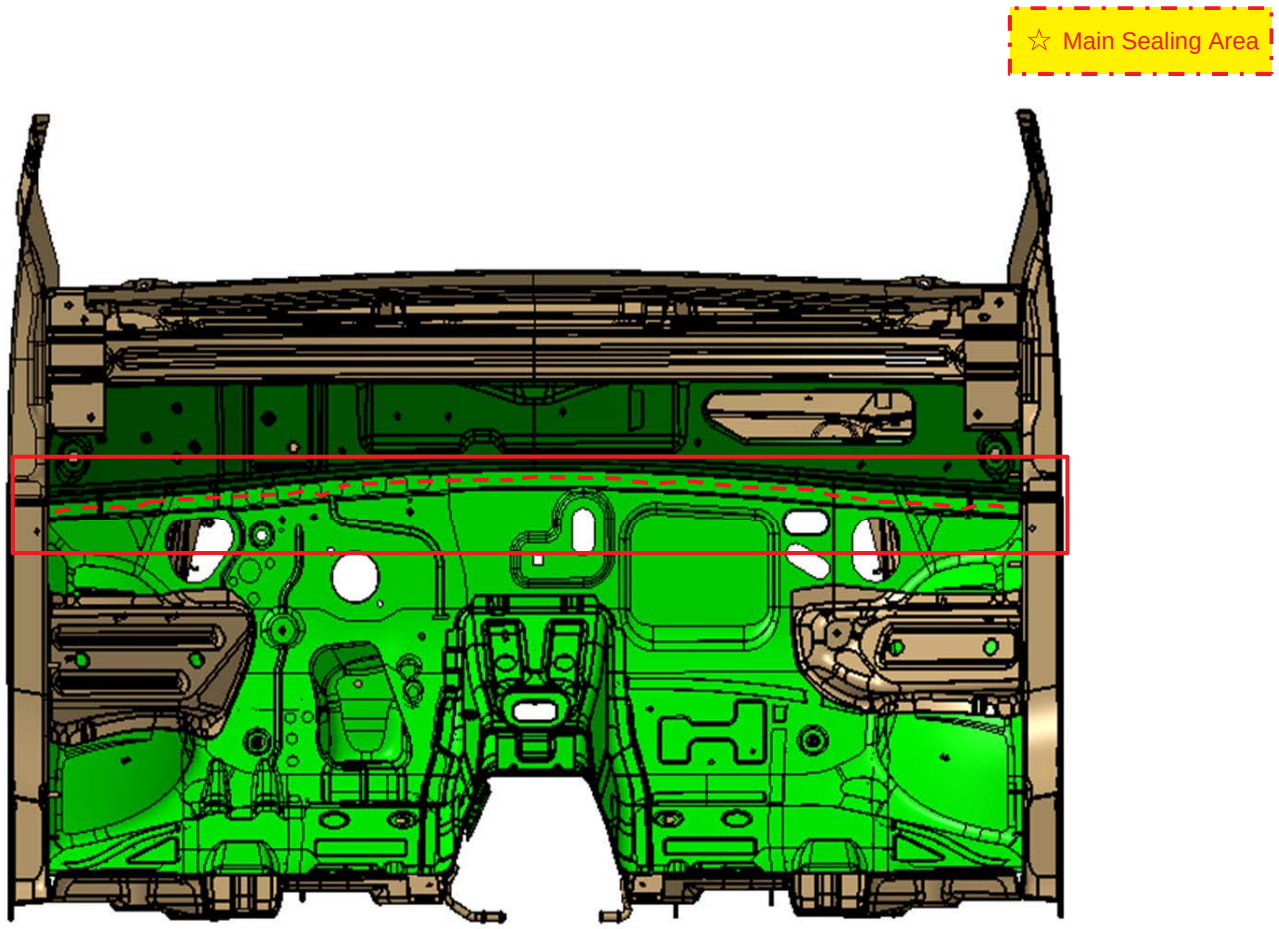
6, Emission direction
If function B this indicates the direction of the emission

Q30020

This process operation diagram indicates adhesive type and the area where the adhesive has been applied. More detailed information is included in the figure and 3D data. It is only suitable for verified oils. In bonding area, the maximum amount of oil is also partially considered. The visible area with high oil capacity is cleared. Adhesive cannot absorb more oil. As a result, adhesion is reduced, and penetration due to moisture corrosion is reduced.

■ Gutter Channel Rear Body and Front Baffle Body

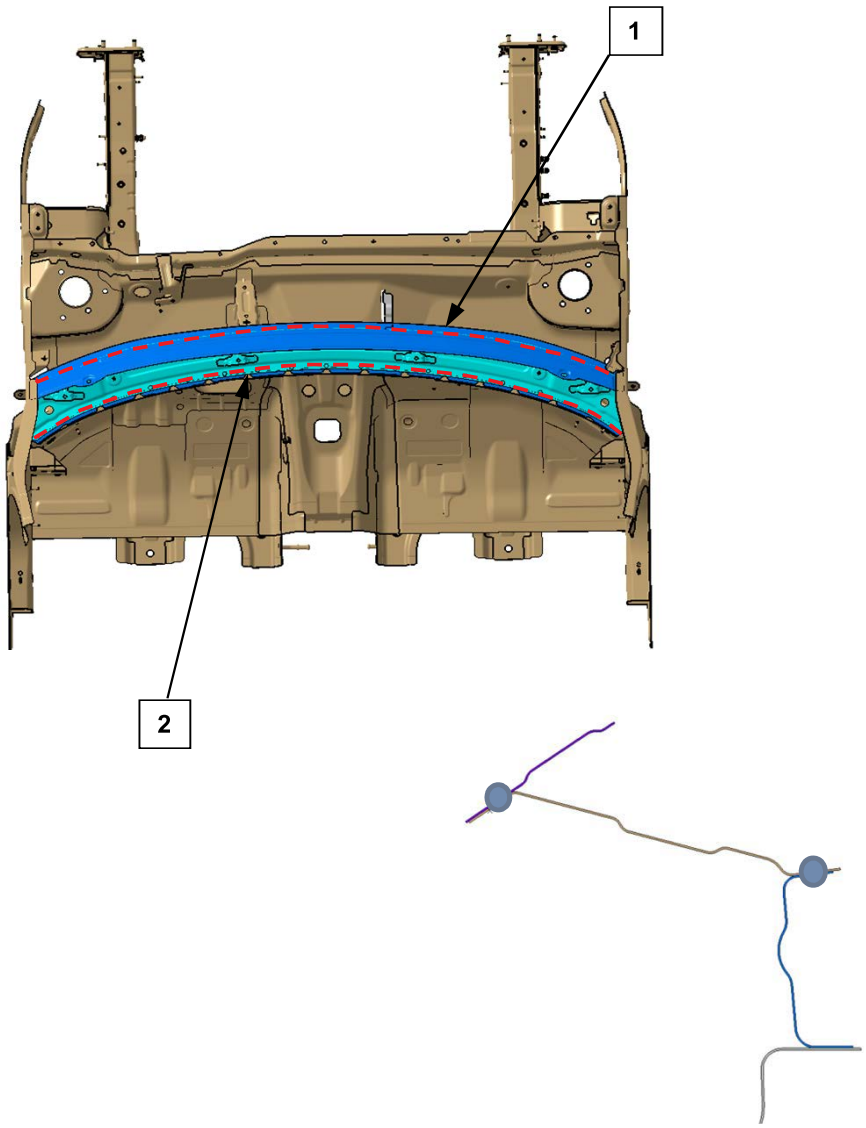
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Gutter channel rear body and front baffle body	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue)	Φ4	• Overall length 1441 mm • Sealing level: B • Sealing direction: Inner • Outsourcing

■ Front Windshield Lower Crossmember Body and Front Windshield Upper Crossmember Body

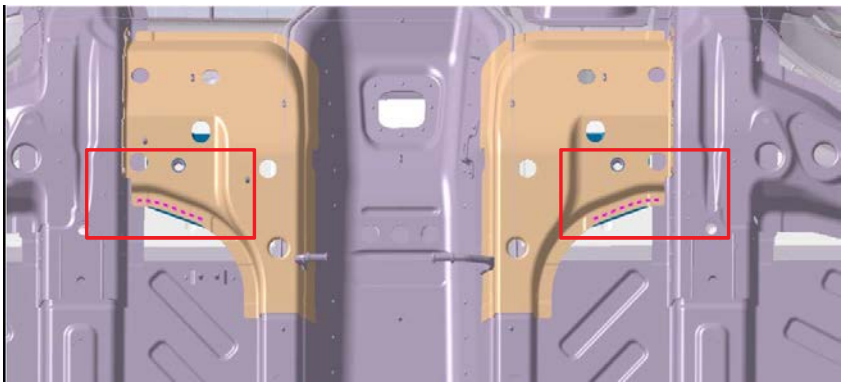
Welding and Coating Drawing for Body in White



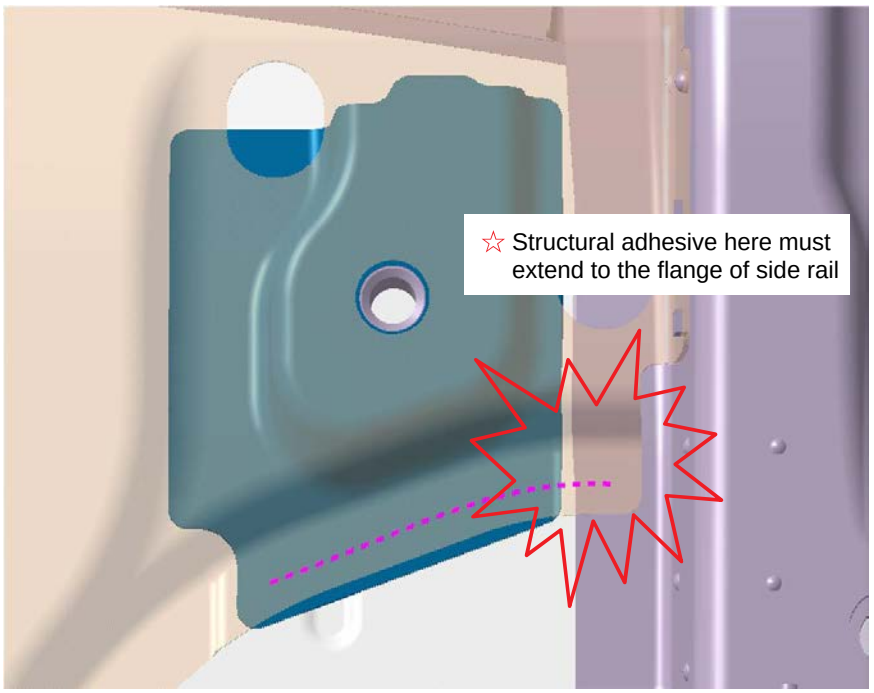
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front windshield lower crossmember body and front windshield upper crossmember body	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue)	Φ4	• Overall length 1372+1467 • Sealing level: B • Sealing direction: Outer • Outsourcing
Front windshield lower crossmember body and front windshield center crossmember body	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue)	Φ4	

■ Rear Left Mounting Seat of Front Sub Frame and Rear Left Mounting Plate of Front Sub Frame

Welding and Coating Drawing for Body in White



Symmetric



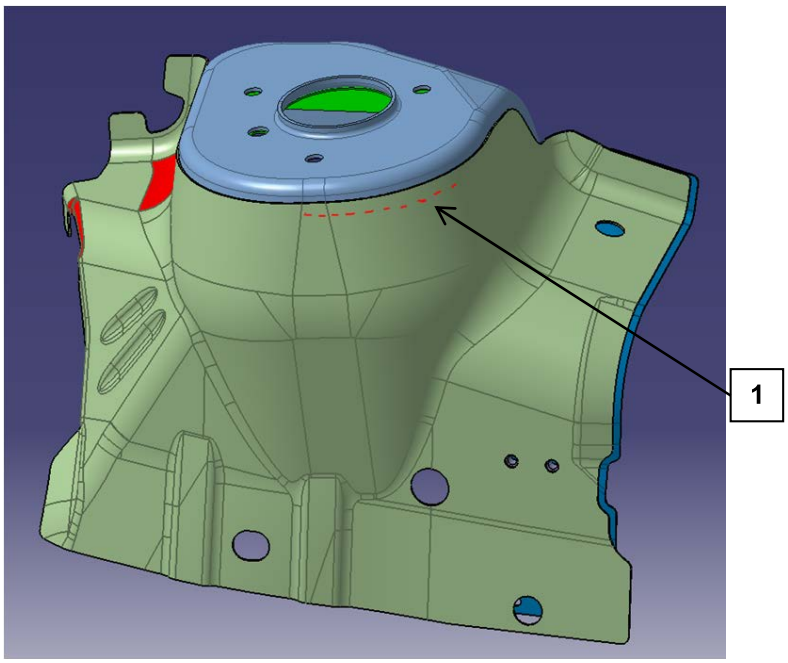
Q30050

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear left mounting seat of front sub frame and rear left mounting plate of front sub frame	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive)	Φ4	• Overall length 95 mm × 2 (symmetric) • Sealing level: C • Outsourcing
Rear right mounting seat of front sub frame and rear right mounting plate of front sub frame				

■ Left/Right Front Shock Absorber Seat and Left/Right Front Wheel House Body

Welding and Coating Drawing for Body in White

☆ Main Coating Area



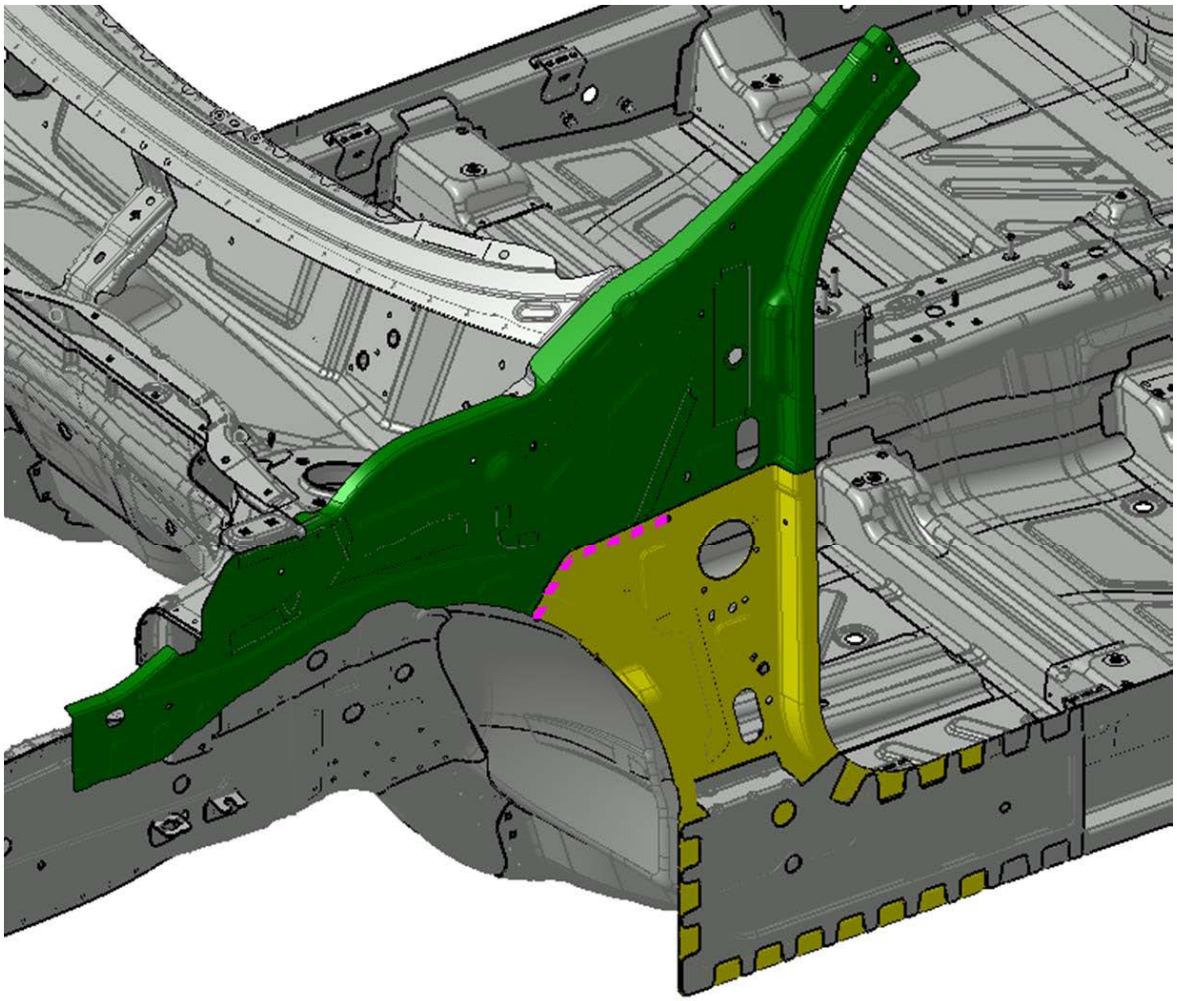
Symmetric

Q30060

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Gutter channel rear body and front baffle body	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive)	Φ3	• Overall length 125 mm× 2 + 240 mm × 2 (symmetric) • Sealing level: B • Sealing direction: Outer • Outsourcing

■ Engine Compartment Left/Right Riser Body and Front Left/Right Wheel House Side Reinforcement Beam

Welding and Coating Drawing for Body in White



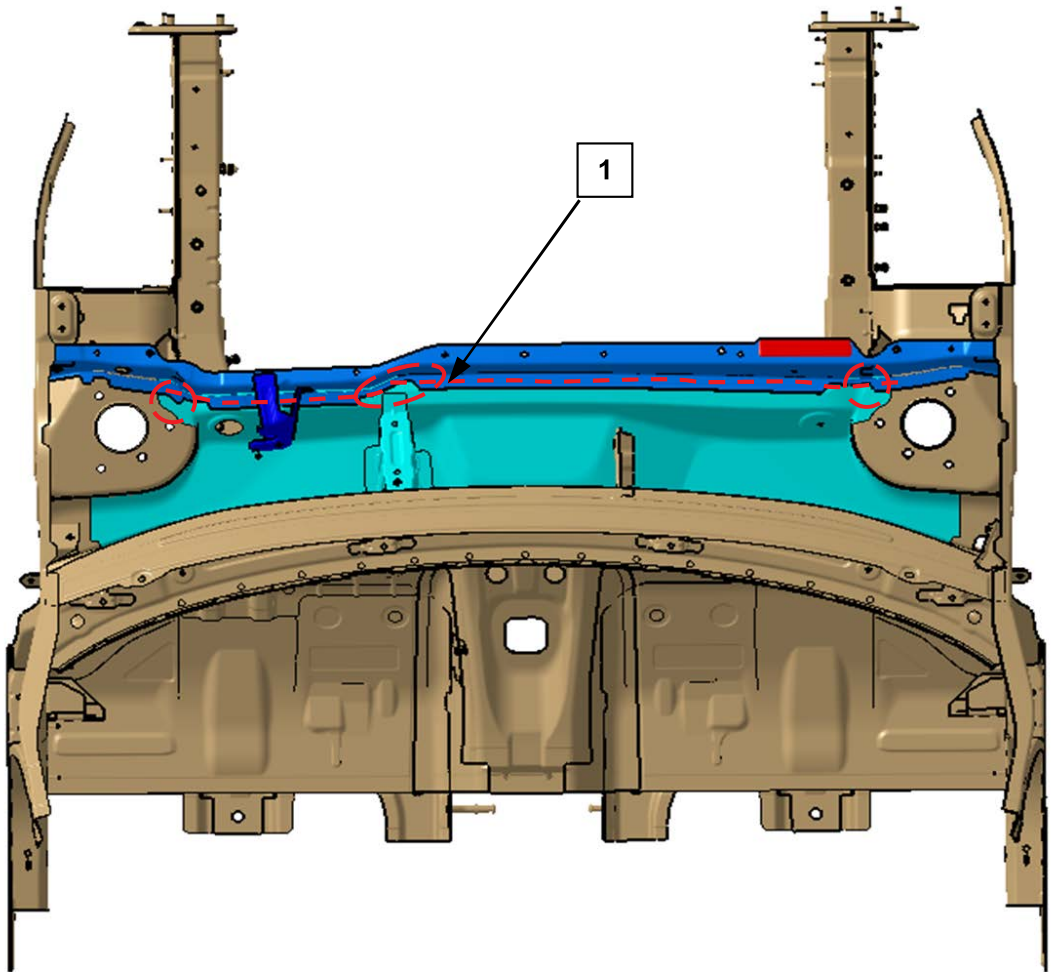
Symmetric

Q30070

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Engine compartment left/right riser body and front left/right wheel house side reinforcement beam	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 203 mm × 2 (symmetric) • Sealing level: B • Outsourcing

■ Gutter Channel Body and Gutter Channel Body Extension Panel

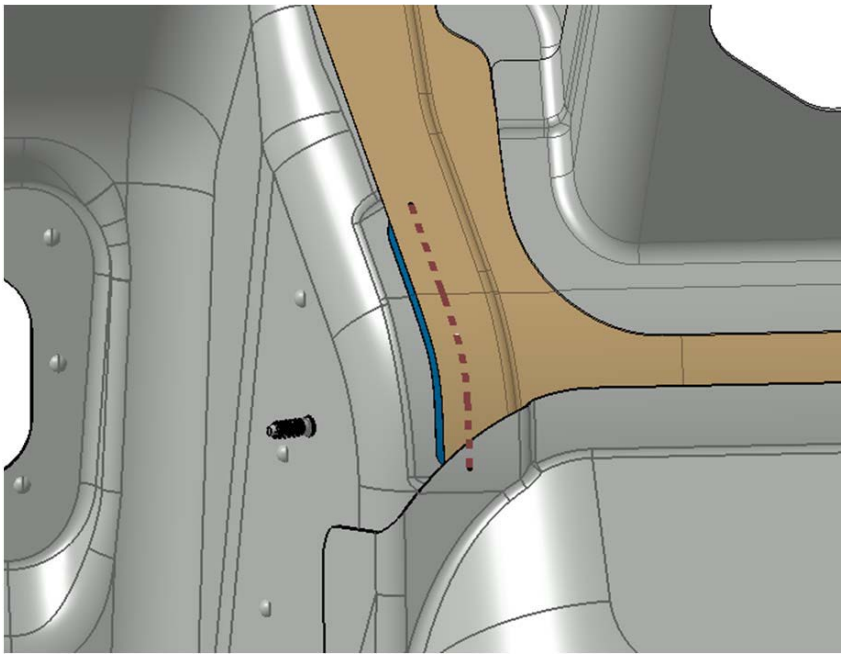
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Gutter channel body and gutter channel body extension panel	M14-4102311A spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ4	• Overall length 1096 mm • Sealing level: A • Outsourcing

■ Front Baffle Body and Vacuum Booster Mounting Plate

Welding and Coating Drawing for Body in White

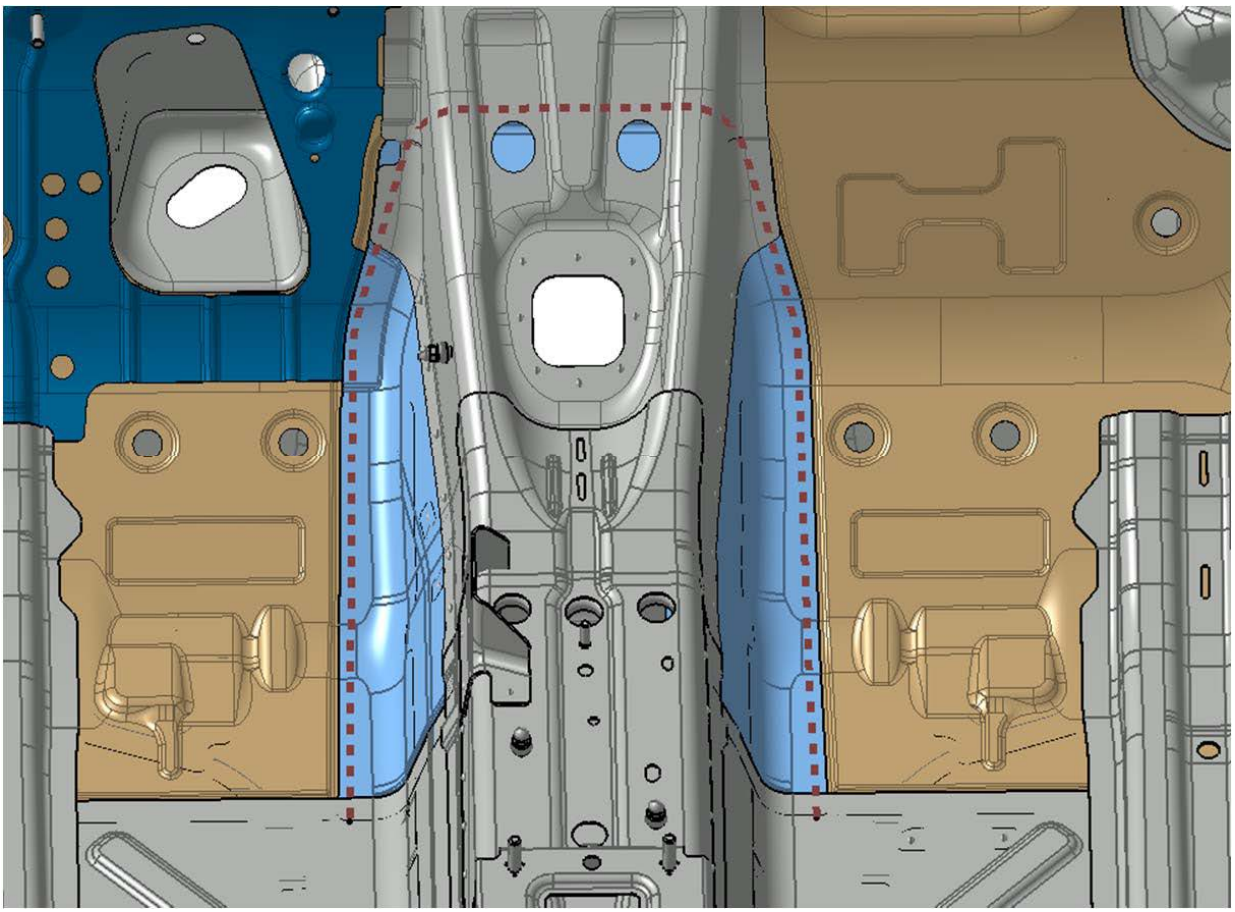


Q30090

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front baffle body and vacuum booster mounting plate	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ4	• Overall length 90 mm • Sealing level: B • Sealing direction: Outer • Outsourcing

■ Connecting Plate between Front Baffle and Center Passage and Front Baffle

Welding and Coating Drawing for Body in White

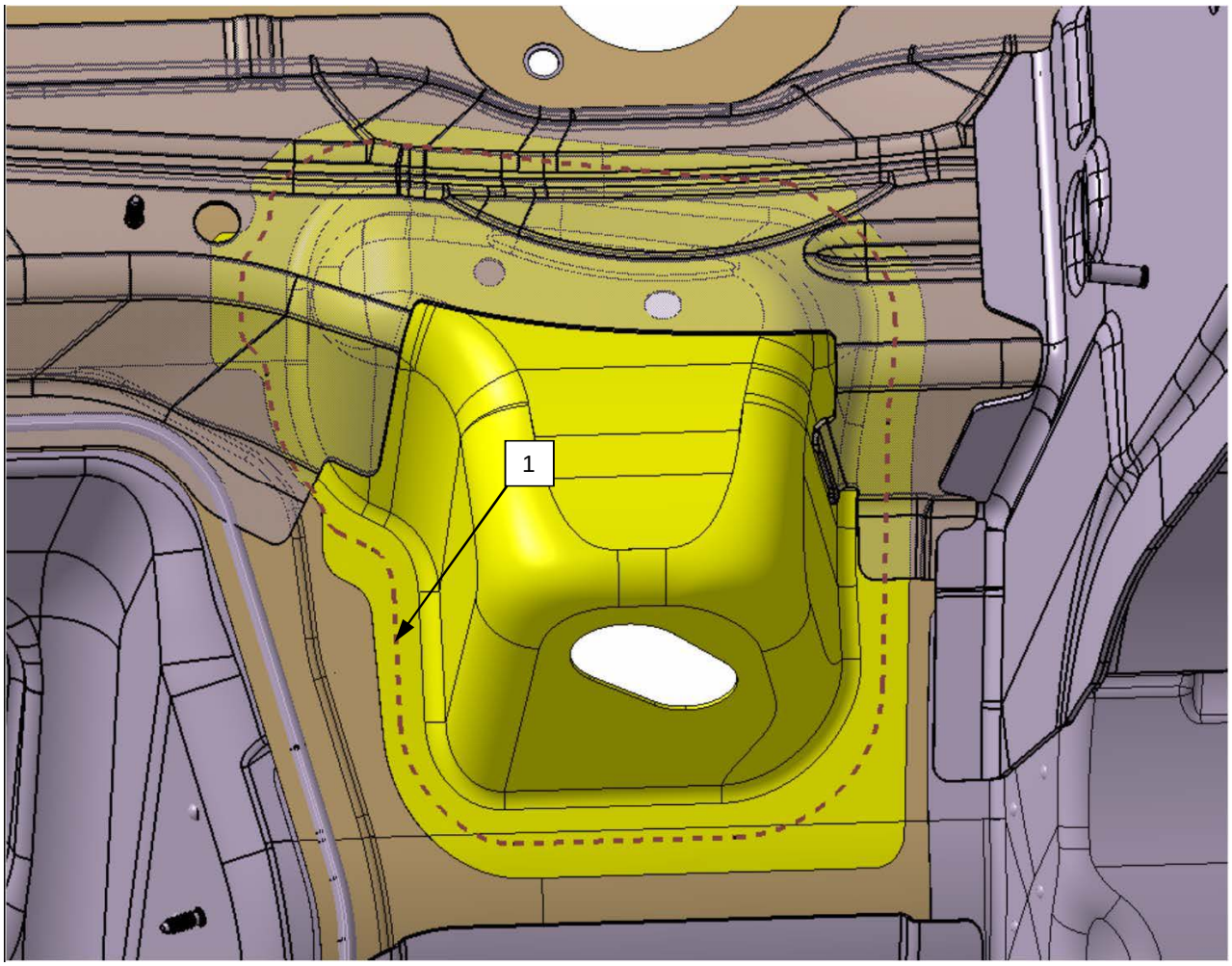


Q30100

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Connecting plate between front baffle and center passage and front baffle	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue)	Φ4	• Overall length 1266 mm • Sealing level: B • Sealing direction: Outer • Outsourcing

■ Front Baffle and Steering Gear Mounting Plate

Welding and Coating Drawing for Body in White

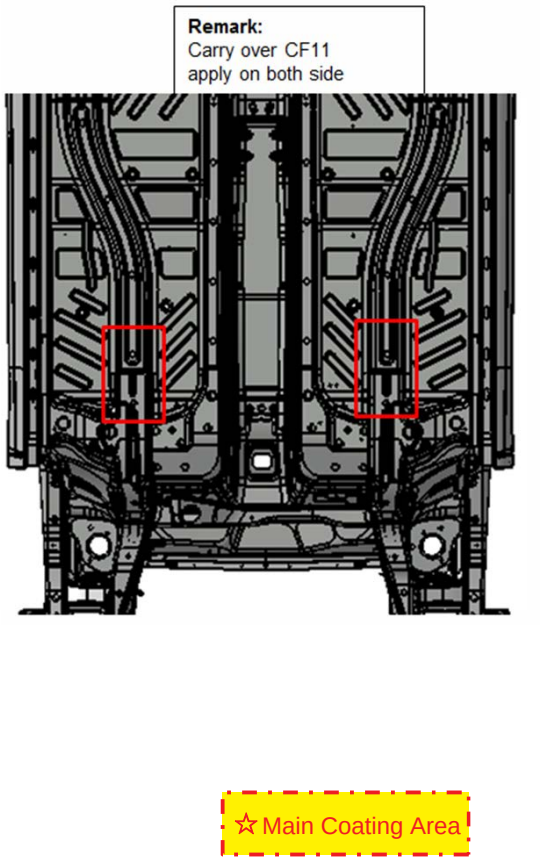


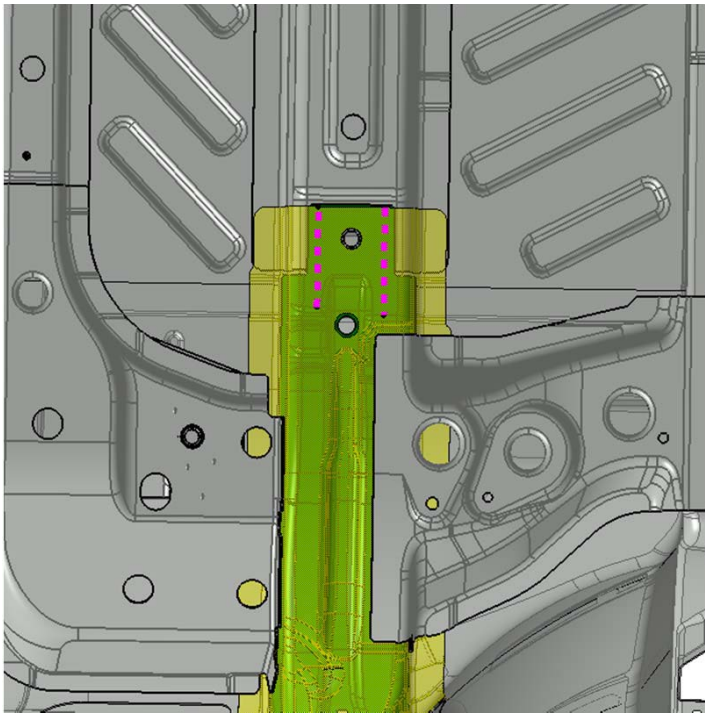
Q30110

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front baffle and steering gear mounting plate	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue)	Φ4	• Overall length 750 mm • Sealing level: B • Sealing direction: Outer • Outsourcing

■ Left/Right Front Side Rail Rear Reinforcing Plate and Left/Right Front Side Rail Rear Body

Welding and Coating Drawing for Body in White





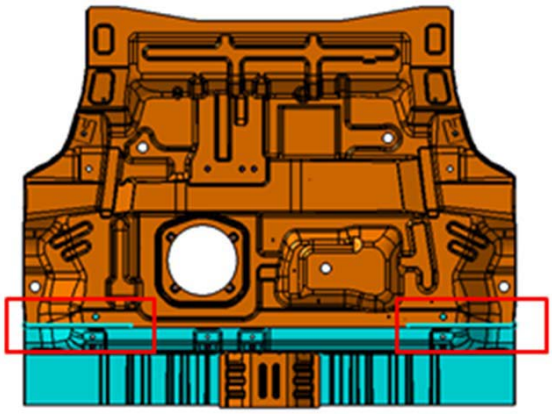
Symmetric

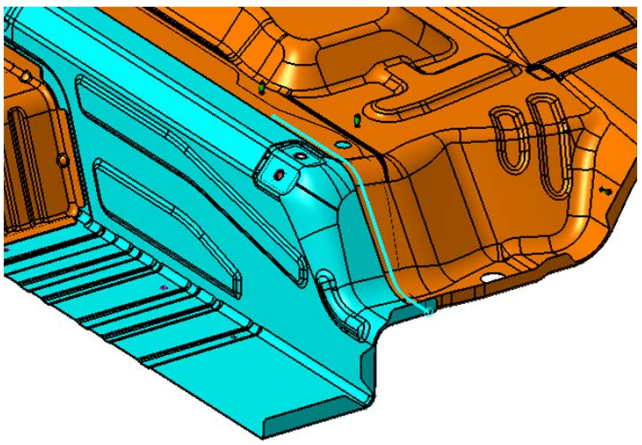
Q30120

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right front side rail rear reinforcing plate and left/right front side rail rear body	M14-4102311 structural adhesive	Sealing (spot welding seal gum thumb glue)	Φ4	• Overall length 170 mm × 2 (symmetric) • Sealing level: B • Sealing direction: Outer • Outsourcing

■ **Center Floor Body and Center Floor Connecting Plate**

Welding and Coating Drawing for Body in White





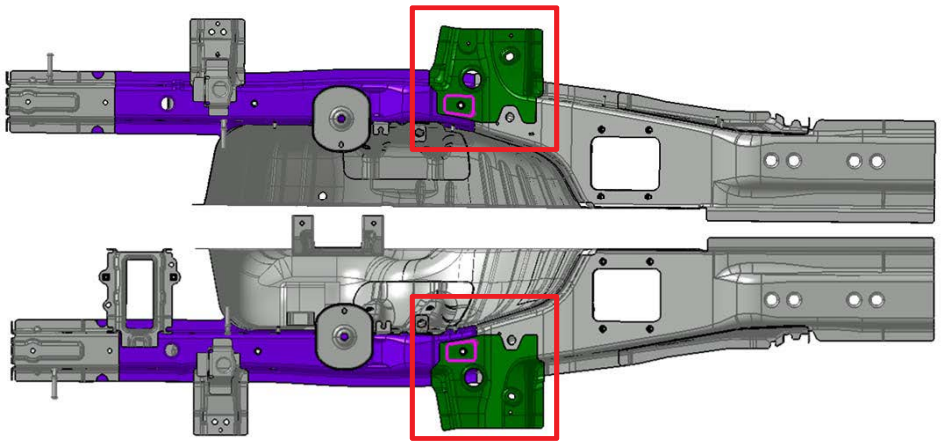
Symmetric

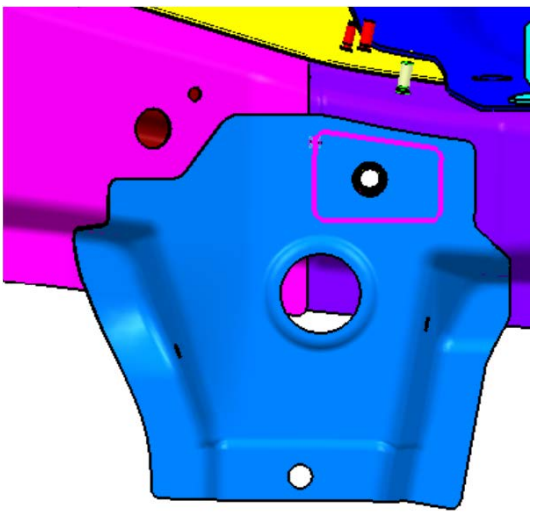
Q30130

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear left side rail rear body and rear floor crossmember I left connecting plate	M14-4102311 structural adhesive	Sealing (spot welding seal gum thumb glue): √	Φ5	• Overall length 200 mm × 2 (symmetric) • Sealing level: B • Sealing direction: Outer • Outsourcing

■ Rear Left Side Rail Rear Body And Rear Floor Crossmember I Left Connecting Plate

Welding and Coating Drawing for Body in White





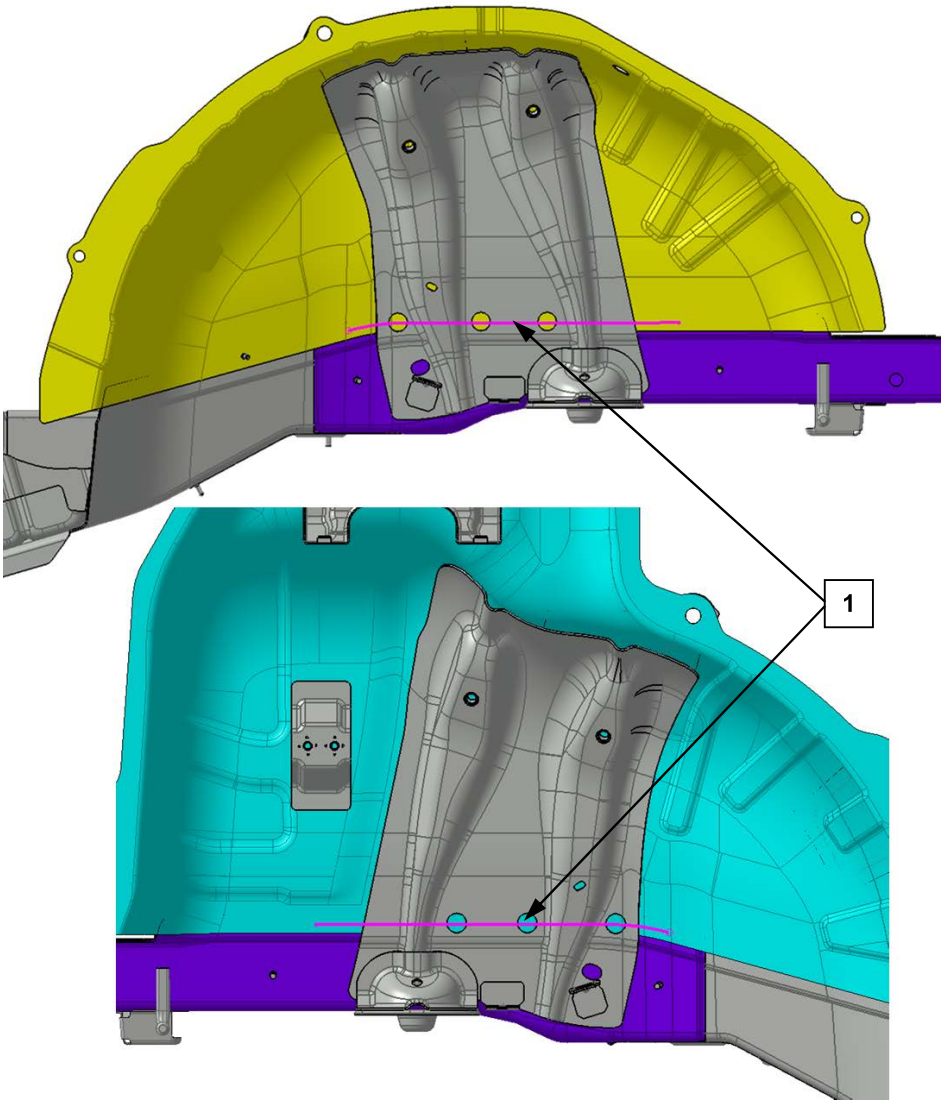
Symmetric

Q30140

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear left side rail rear body and rear floor crossmember I left connecting plate	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 200 mm × 2 (symmetric) • Sealing level: C • Outsourcing
Rear left side rail rear body and rear floor crossmember I right connecting plate				

■ **Rear Left Side Rail Rear Body and Rear Left Wheel House Inner Plate**

Welding and Coating Drawing for Body in White



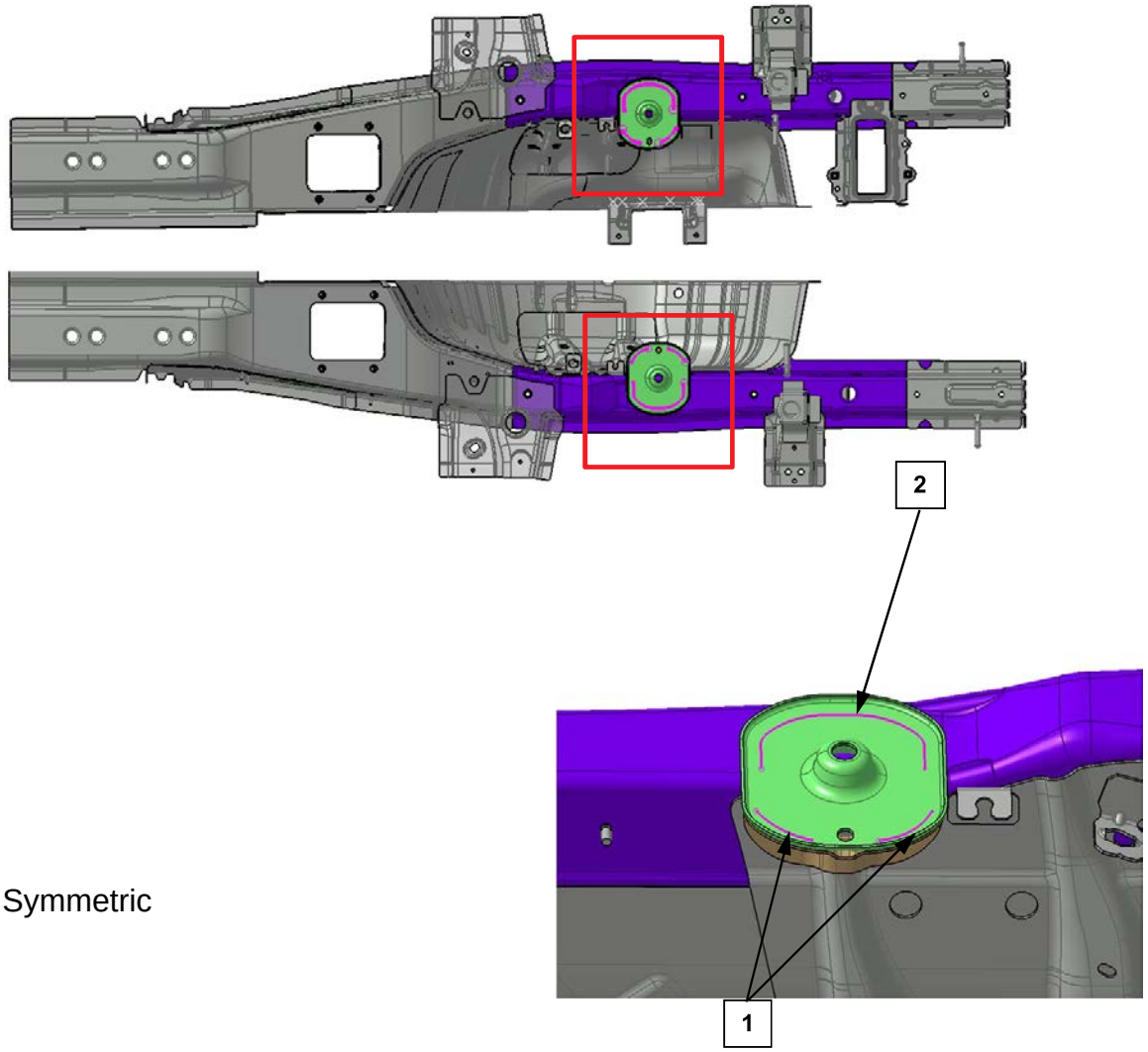
Symmetric

Q30150

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Gutter channel rear body and front baffle body	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 360 mm × 2 (symmetric) • Sealing level: A • Outsourcing
Rear right side rail rear body and rear right wheel house inner plate				

■ Rear Suspension Spring Holder Reinforcing Plate and Rear Suspension Spring Seat

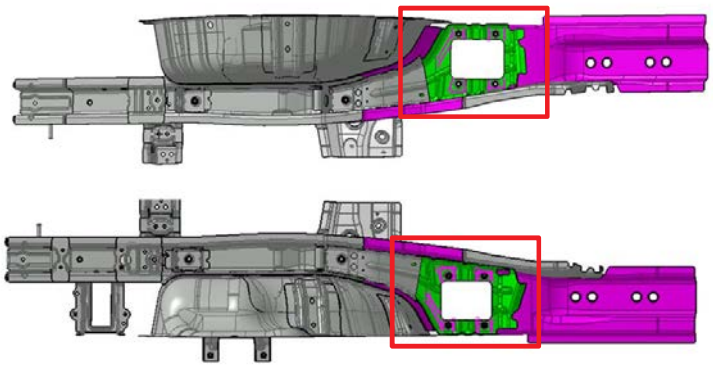
Welding and Coating Drawing for Body in White



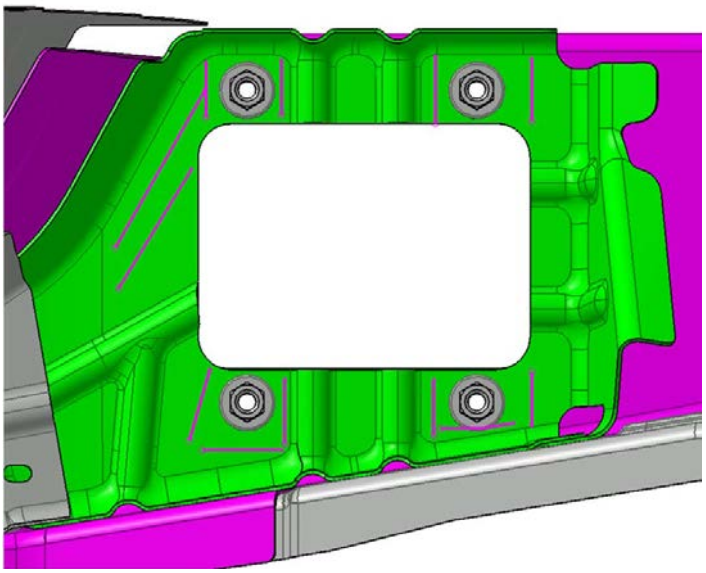
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear suspension spring holder reinforcing plate and rear suspension spring seat	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 265 mm × 2 (symmetric) • Sealing level: C • Outsourcing
Rear suspension spring seat and rear left/right side rail rear body				

■ Rear Right Side Rail Body and Rear Suspension Right Mounting Bracket Reinforcing Plate

Welding and Coating Drawing for Body in White



Symmetric

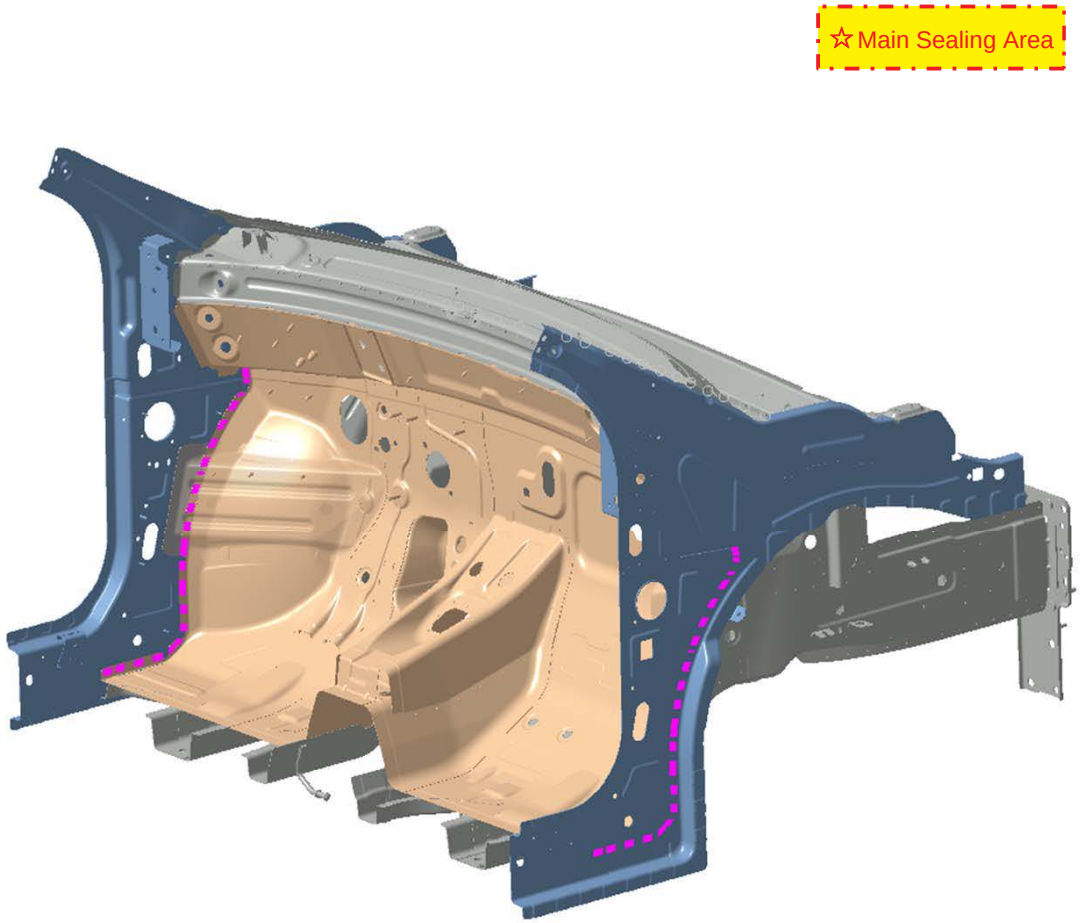


Q30170

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear right side rail body and rear suspension right mounting bracket reinforcing plate	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 453 mm × 2 (symmetric) • Sealing level: C • Outsourcing
Rear left side rail body and rear suspension left mounting bracket reinforcing plate				

■ Front Baffle Assembly and Left Riser Assembly

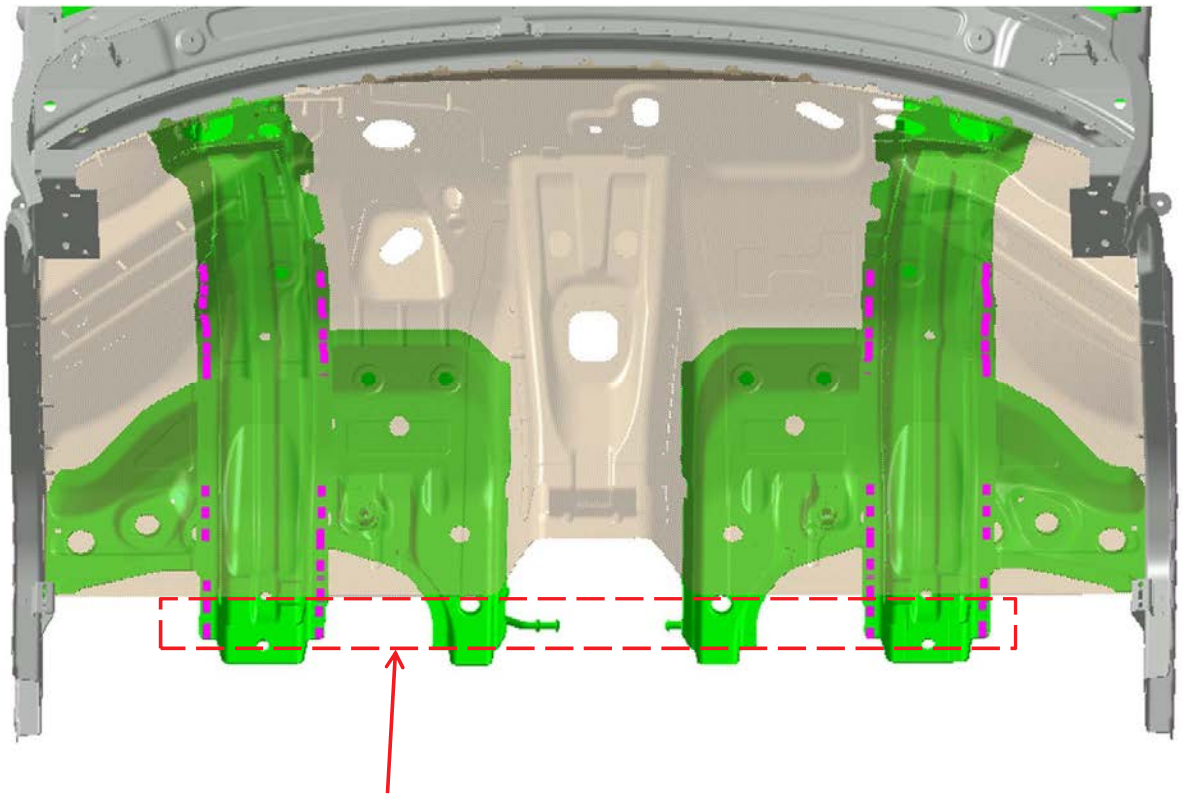
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front baffle assembly and left riser assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 650 mm × 2 (symmetric) • Sealing level: C - engine compartment sub-assembly • Manual
Front baffle assembly and right riser assembly				

■ Front Left/Right Side Rail Assembly

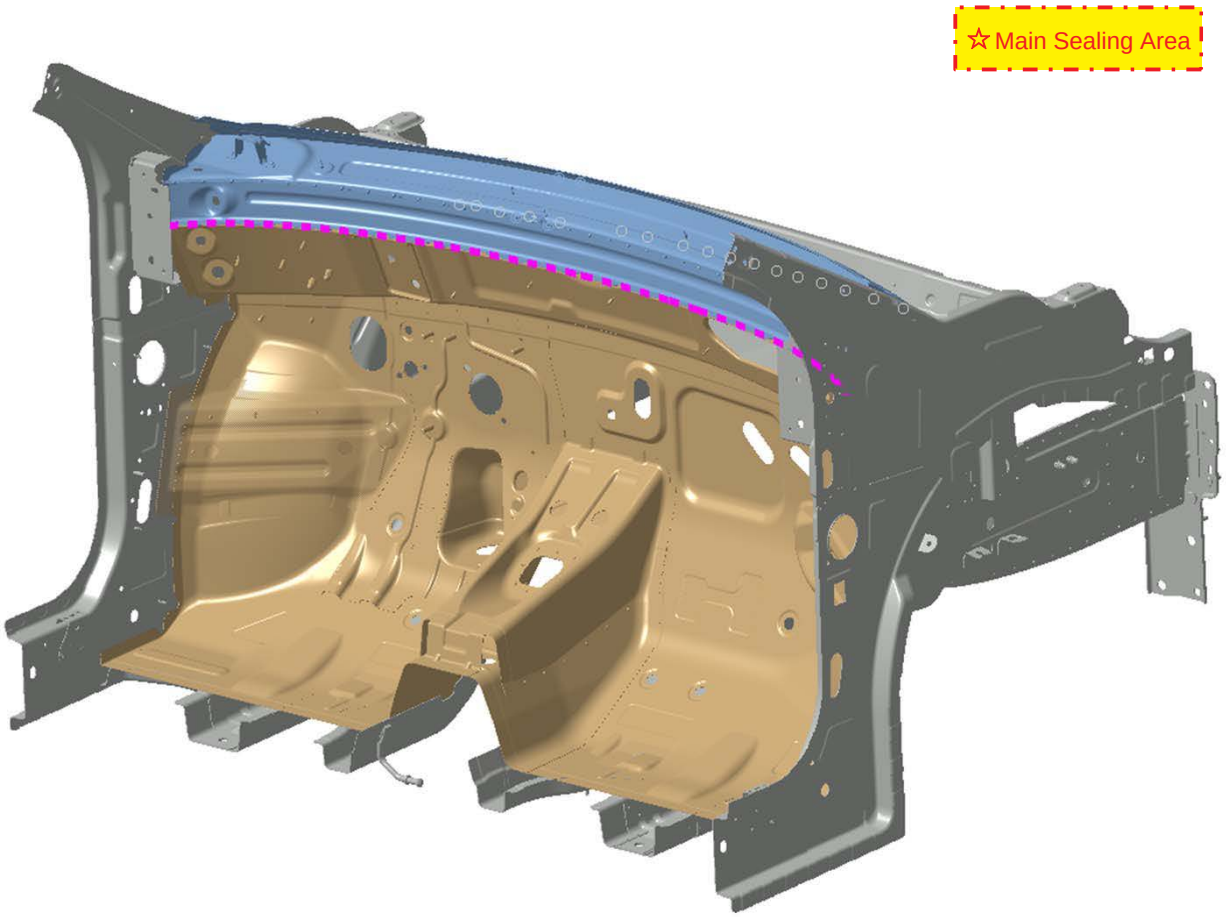
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front left/right side rail assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 710 mm × 2 (symmetric) • Sealing level: C - coating station: engine compartment sub-assembly • Manual
Front baffle assembly and front left side rail assembly				
Front baffle assembly and front right side rail assembly				

■ Front Windshield Lower Crossmember Body Assembly

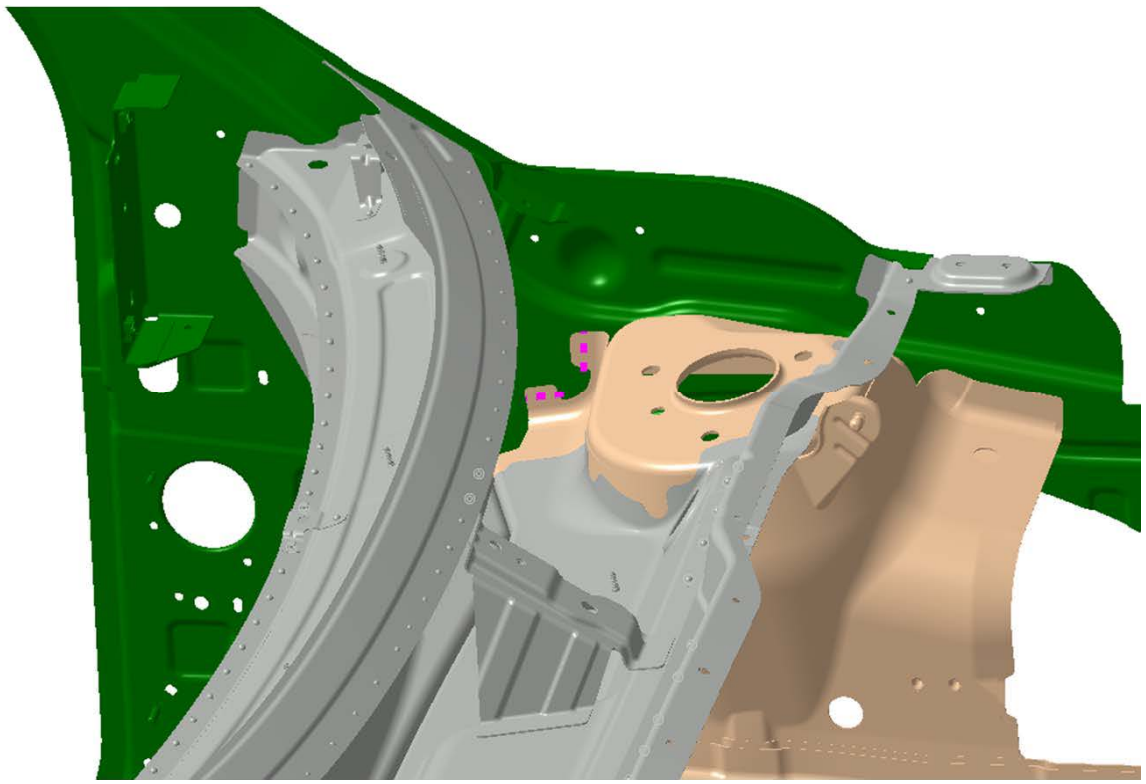
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front windshield lower crossmember body assembly	B11-4102613A spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ3	• Overall length 1462 mm • Sealing level: C - coating station: engine compartment main body assembly OP10 • Manual
Front windshield lower crossmember body assembly and front baffle assembly				

■ **Left/Right Riser Assembly**

Welding and Coating Drawing for Body in White



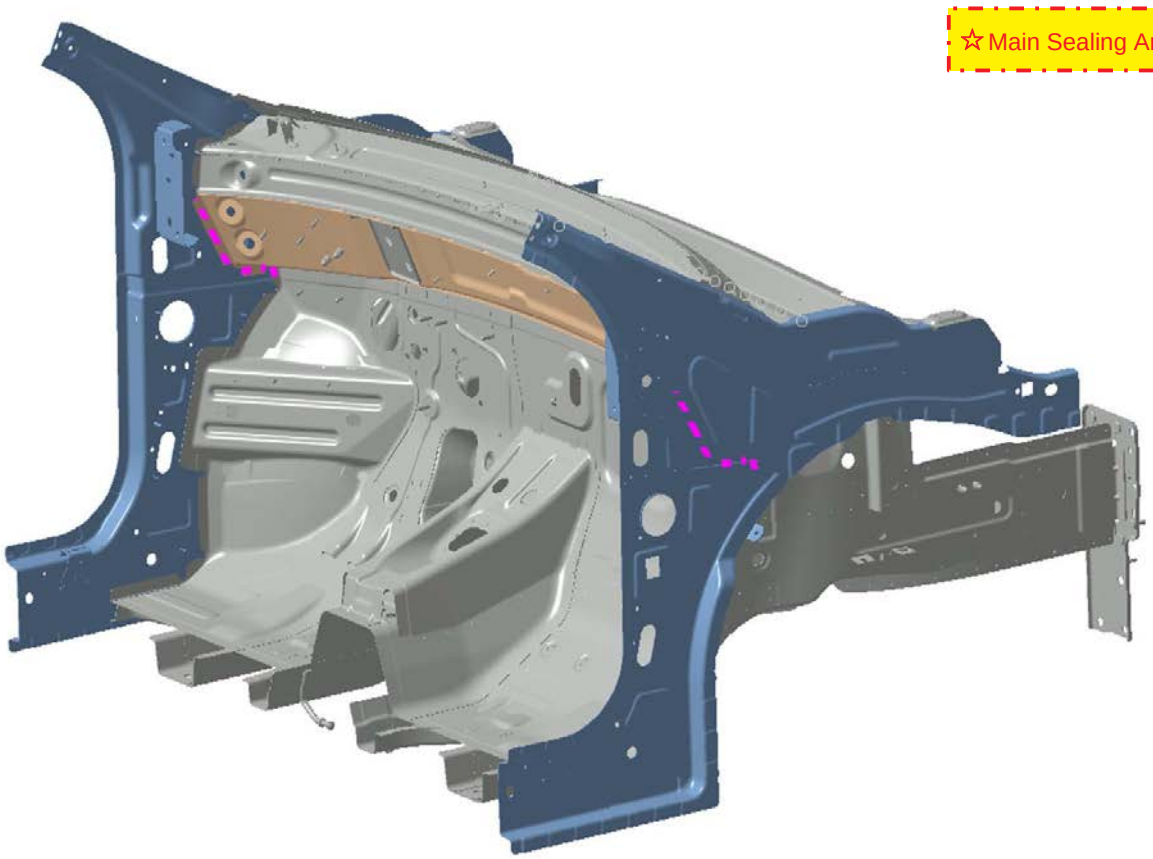
Symmetric

Q30210

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right riser assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 60 mmm × 2 (symmetric) • Sealing level: C - engine compartment sub-assembly • Manual
Front left side rail assembly and left riser assembly				
Front right side rail assembly and right riser assembly				

■ Left/Right Riser Assembly

Welding and Coating Drawing for Body in White



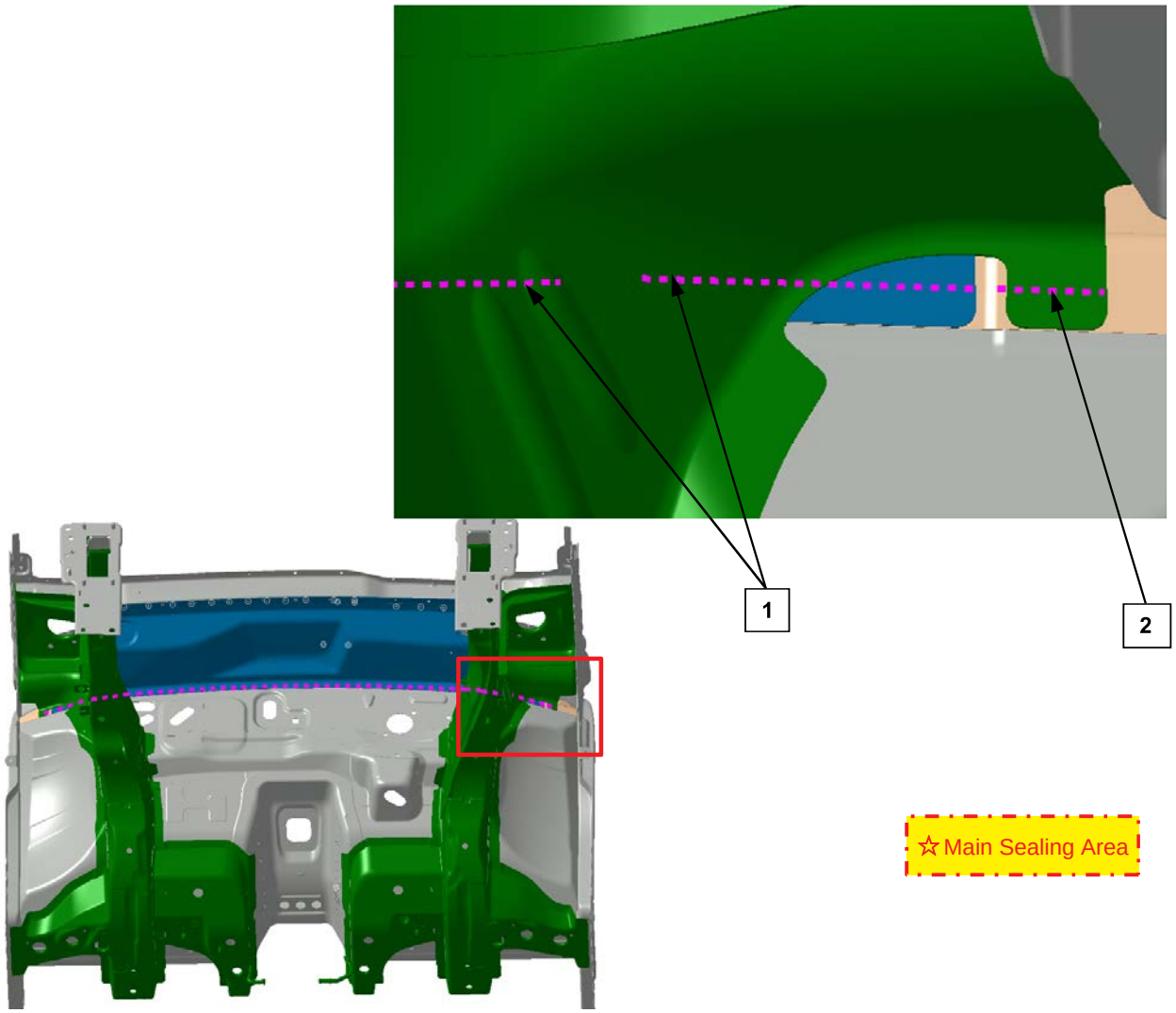
Symmetric

Q30220

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right riser assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 200 mm × 2 (symmetric) • Sealing level: C • Coating station: engine compartment sub-assembly • Manual
Front baffle assembly and left riser assembly				
Front baffle assembly and right riser assembly				

■ Front Baffle Assembly

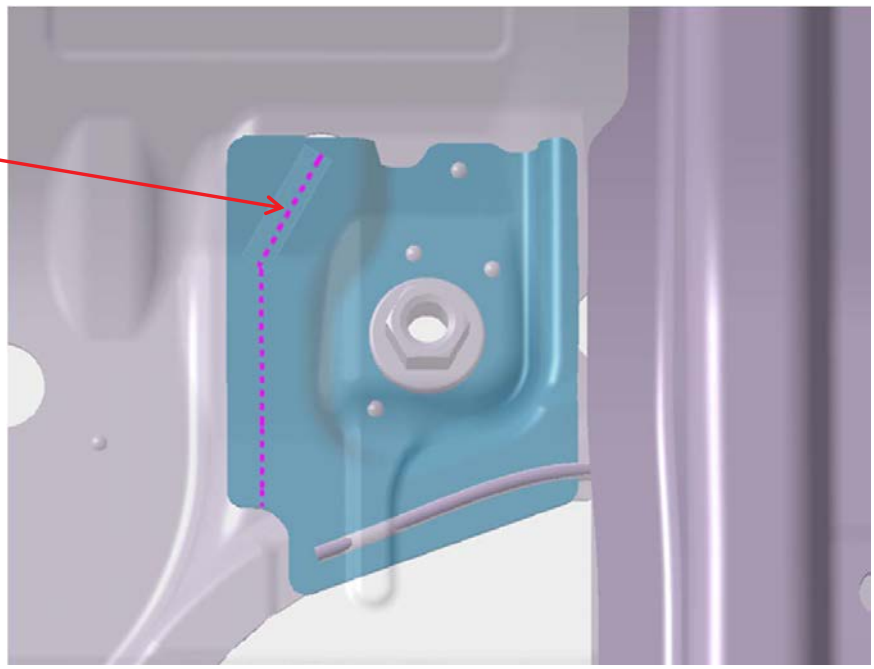
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front baffle assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 1290 mm • Sealing level: C • Coating station: engine compartment main body assembly OP10 • Manual
Front left/right side rail assembly and front baffle assembly				
Gutter channel body assembly and front baffle assembly				

■ Front Baffle Assembly

Welding and Coating Drawing for Body in White



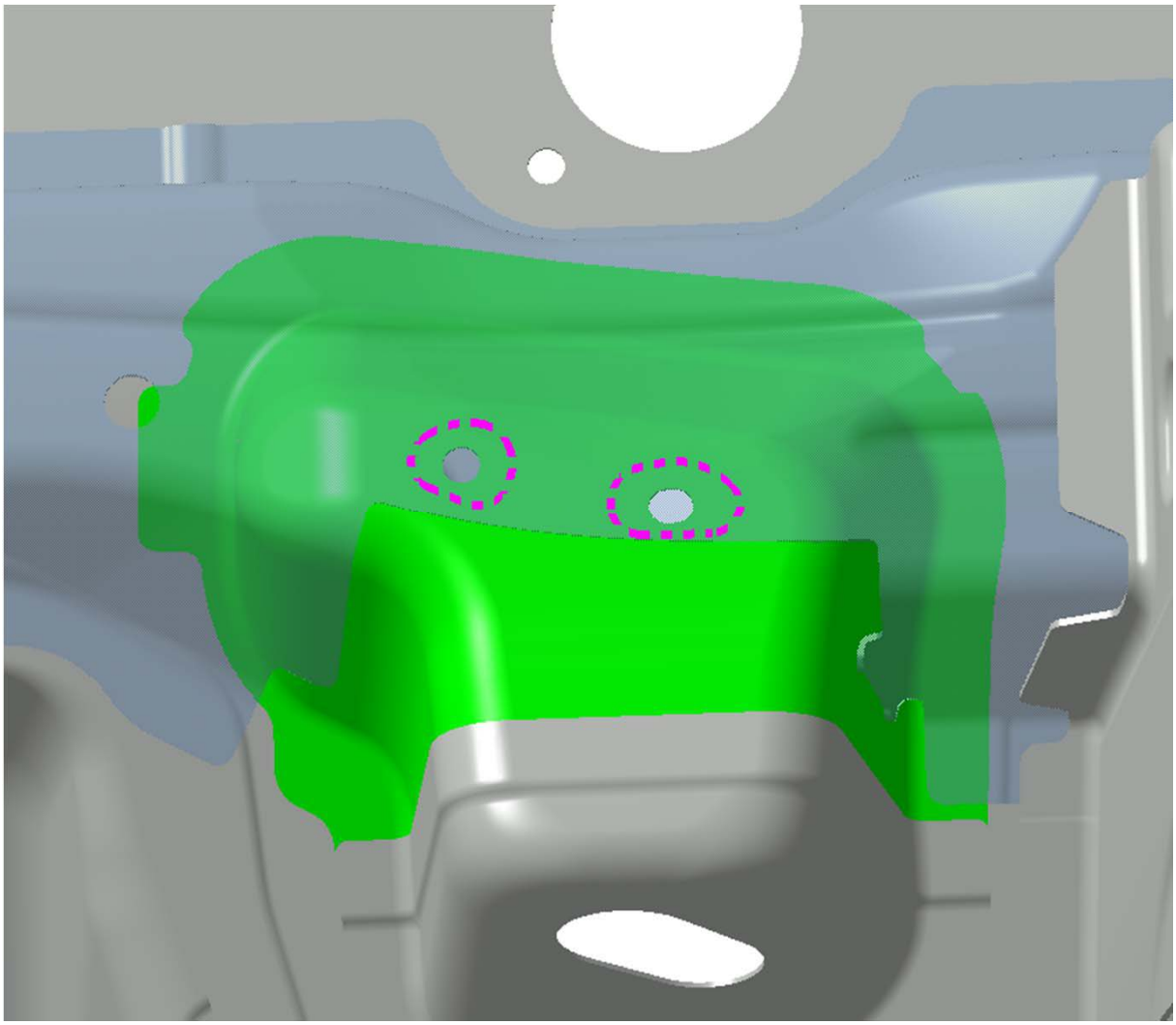
Symmetric

Q30240

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front baffle assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 106 mm × 2 (symmetric) • Sealing level: C • Coating station: engine compartment main body assembly OP10 • Manual
Front left/right side rail assembly and front baffle assembly				

■ **Front Baffle Assembly**

Welding and Coating Drawing for Body in White

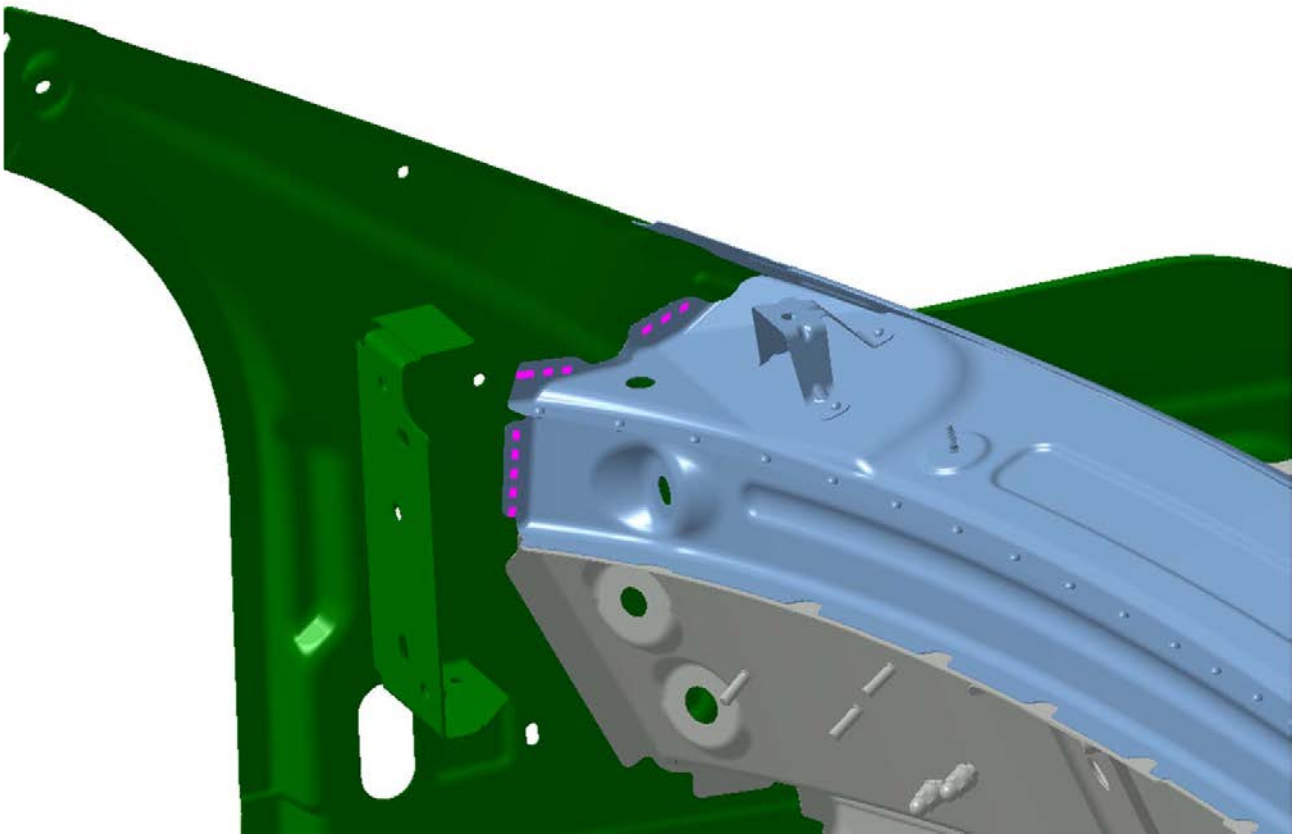


Q30250

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front baffle assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 170 mm • Sealing level: B • Coating station: engine compartment main body assembly OP10 • Manual
Front baffle assembly and front baffle crossmember assembly				

■ **Left/Right Riser Assembly**

Welding and Coating Drawing for Body in White



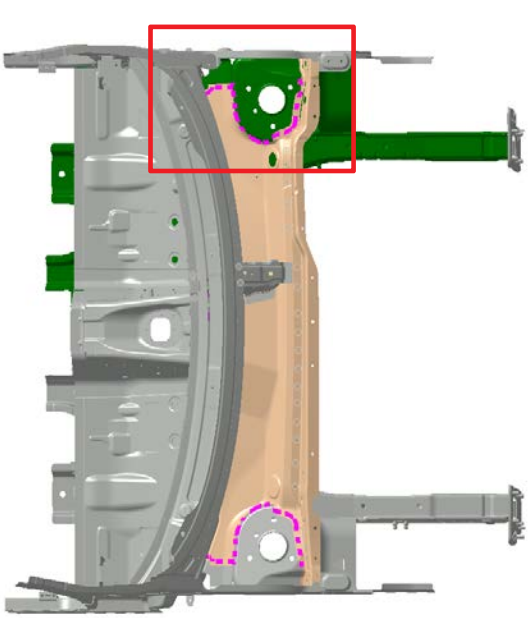
Symmetric

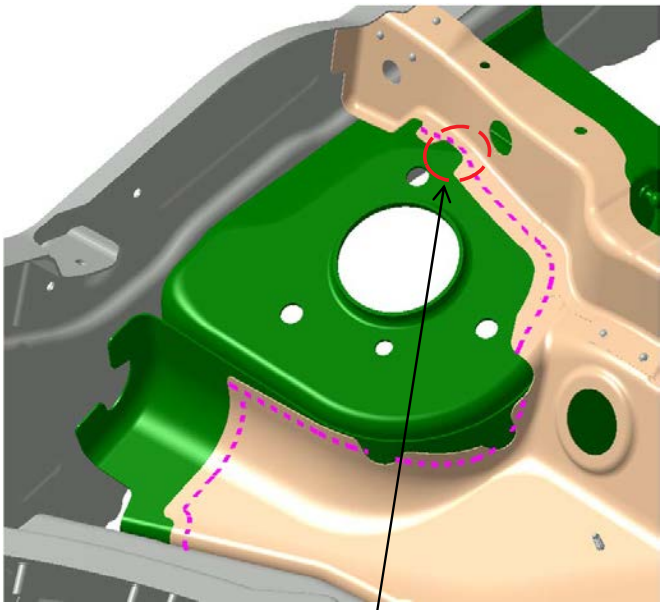
Q30260

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right riser assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 110 mm × 2 (symmetric) • Sealing level: C • Coating station: engine compartment sub-assembly • Coating method: Manual
Front windshield lower crossmember assembly and left riser assembly				
Front windshield lower crossmember assembly and right riser assembly				

■ Gutter Channel Body Assembly

Welding and Coating Drawing for Body in White





The glue is broken at the gap shown in the figure, symmetrical left and right

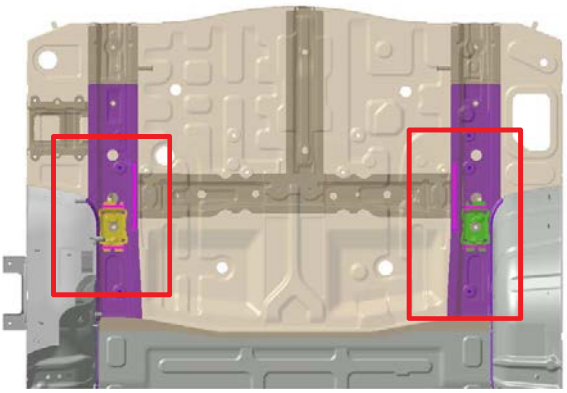
Symmetric

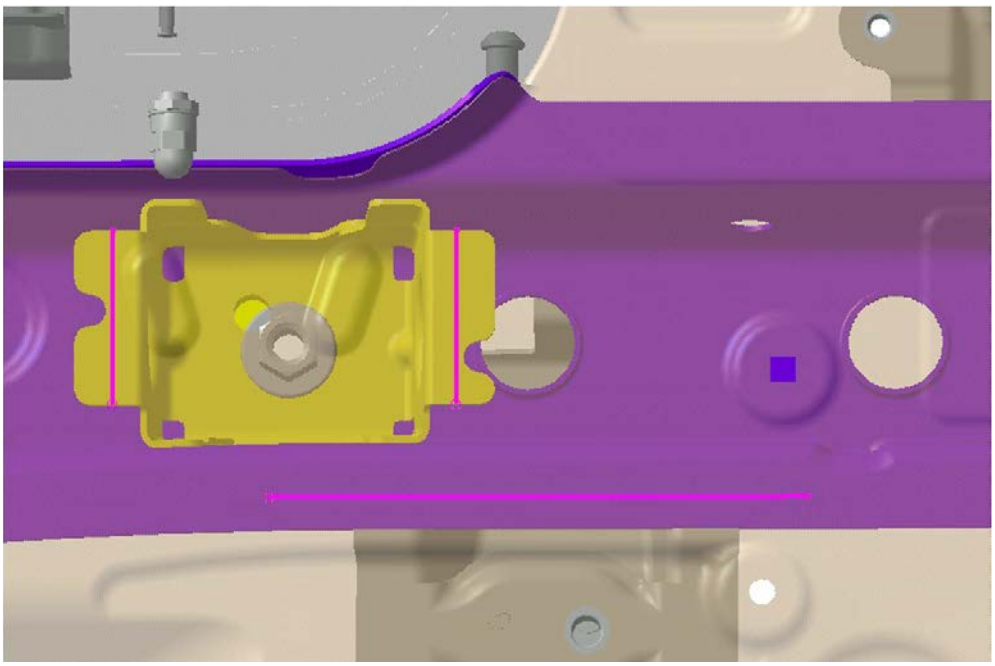
Q30270

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Gutter channel body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 515 mm × 2 (symmetric) • Sealing level: B • Coating station: engine compartment frame assembly OP10 • Coating method: Manual
Gutter channel body assembly and front left side rail assembly				
Gutter channel body assembly and front right side rail assembly				

■ Rear Floor Body Assembly

Welding and Coating Drawing for Body in White





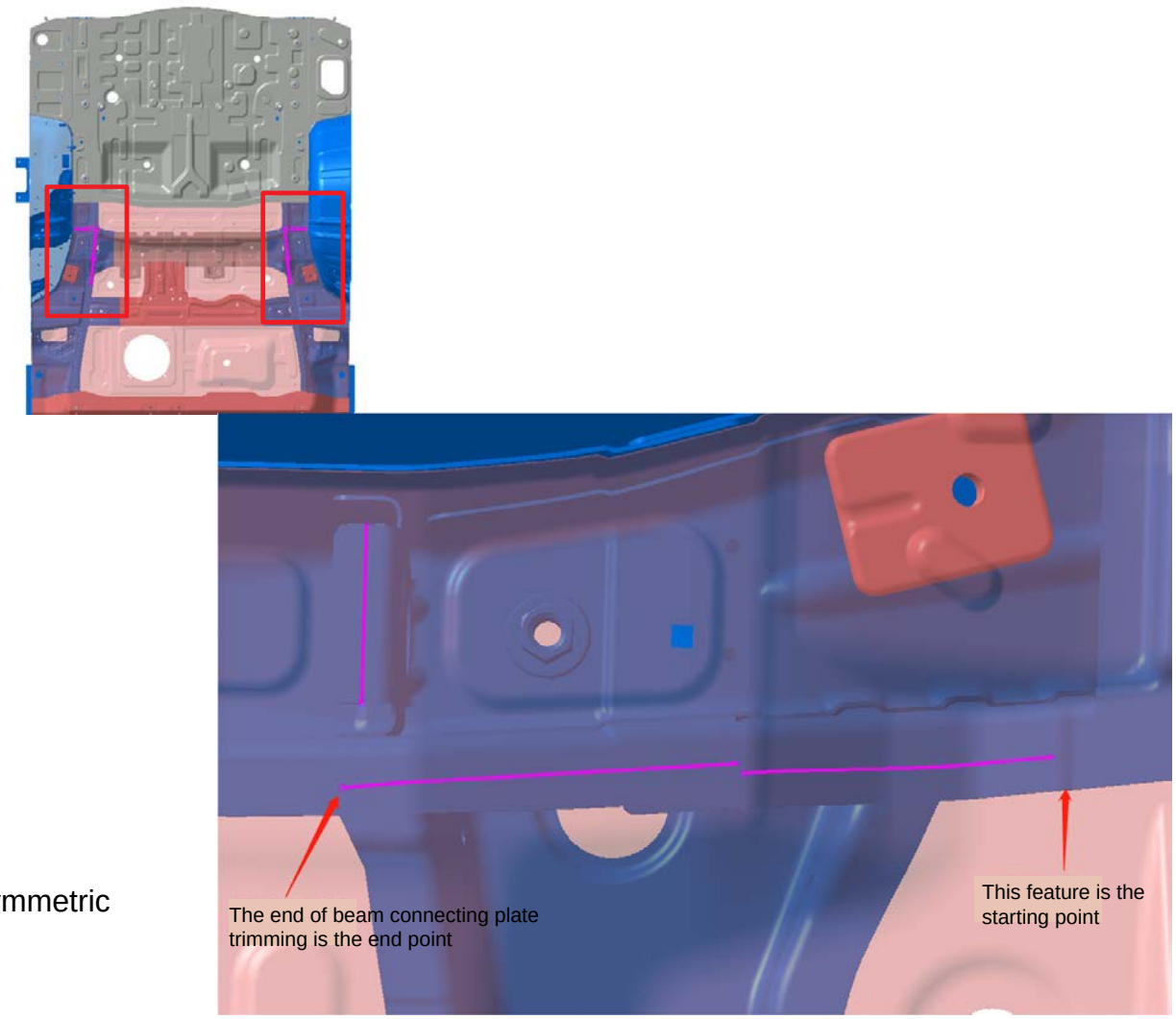
Symmetric

Q30280

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear floor body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 280 mm × 2 (symmetric) • Sealing level: C • Complete rear floor frame assembly OP10 • Manual
Rear left side rail sub-assembly and rear floor body assembly				
Rear right side rail assembly and rear floor body assembly				

■ Center Floor Body Assembly

Welding and Coating Drawing for Body in White

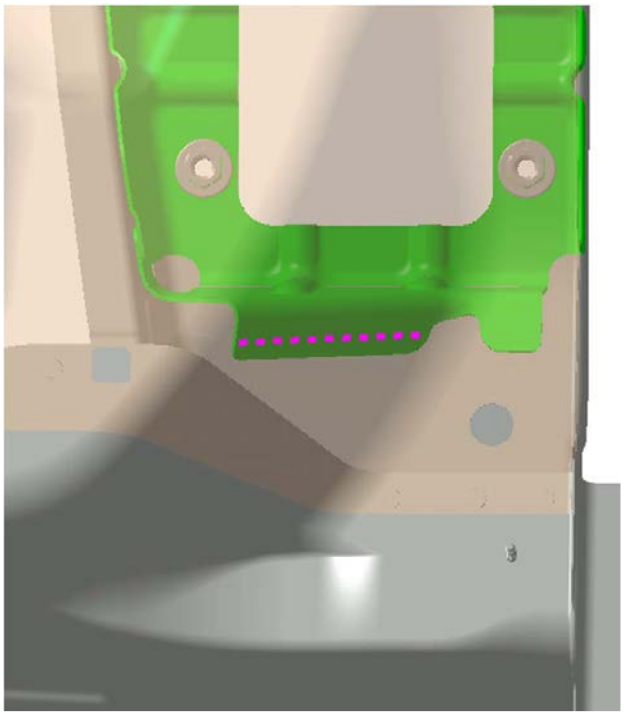


Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Center floor body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 320 mm × 2 (symmetric) • Sealing level: C • Coating station: Rear floor frame assembly OP60 • Coating method: Manual
Rear left side rail sub-assembly and center floor body assembly				
Rear right side rail sub-assembly and center floor body assembly				

■ Center Floor Body Assembly

Welding and Coating Drawing for Body in White

Symmetric

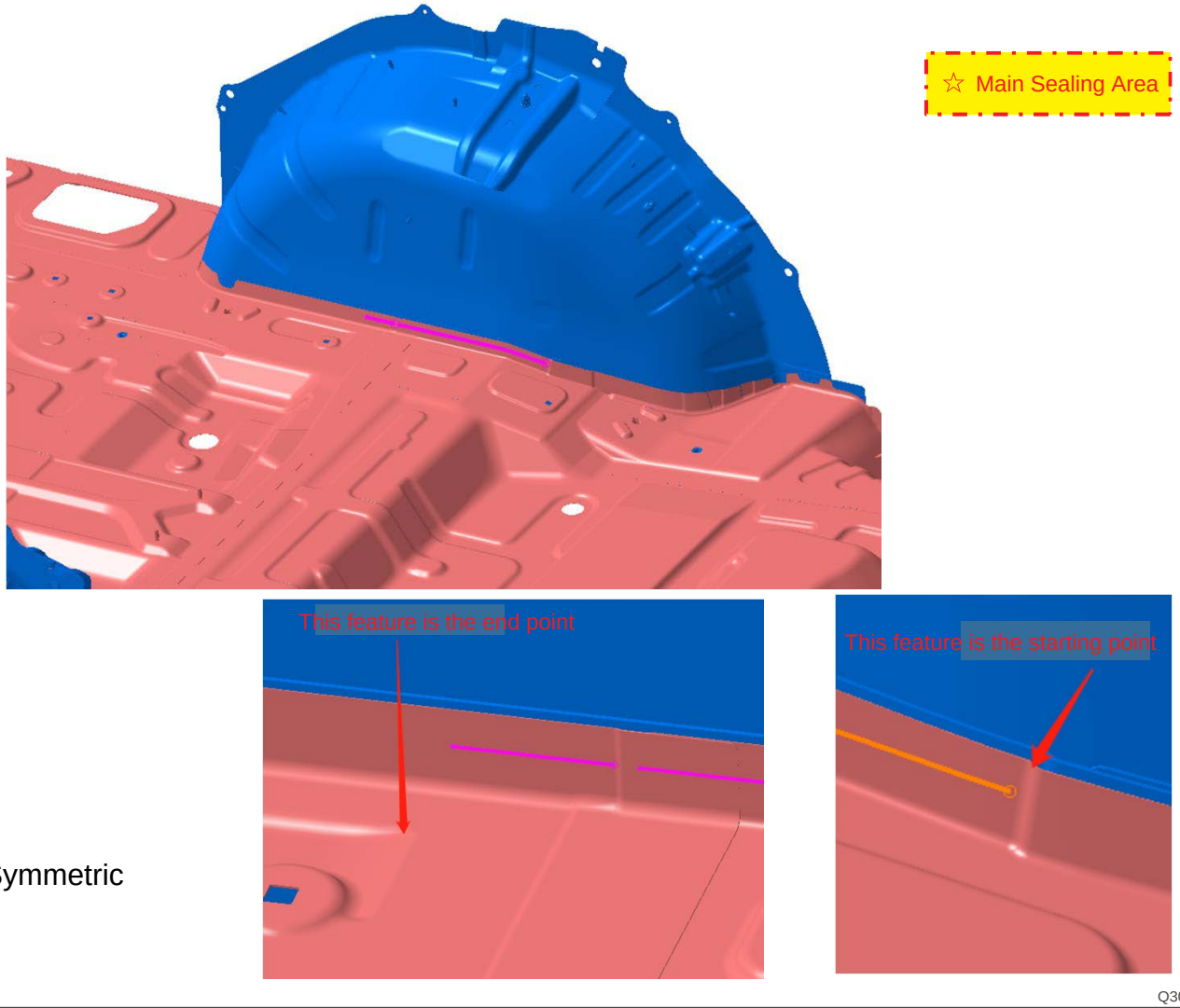


Q30300

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Center floor body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 125 mm × 2 (symmetric) • Sealing level: C • Coating station: Rear floor frame assembly OP60 • Manual
Rear left side rail assembly and center floor body assembly				
Rear right side rail assembly and center floor body assembly				

■ **Rear Left Side Rail Assembly and Center/Rear Floor Body Assembly**

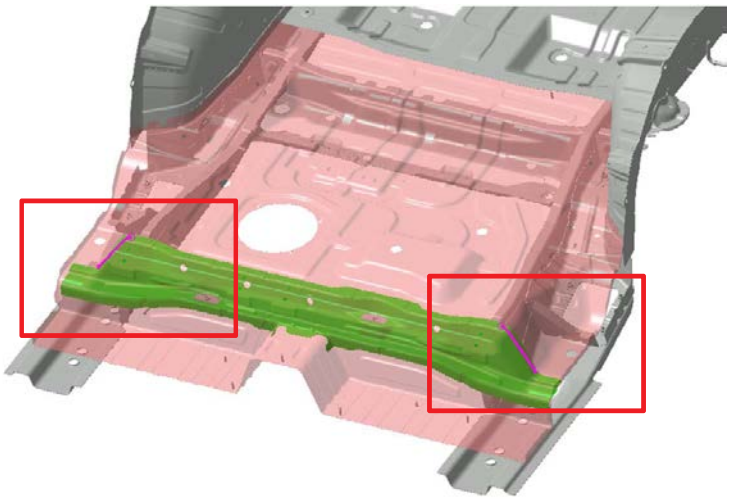
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear left side rail assembly and center/rear floor body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 265 mm × 2 (symmetric) • Sealing level: C • Coating station: Rear floor frame assembly OP60 • Manual
Rear right side rail assembly and center/rear floor body assembly				

■ Center Floor Body Assembly and Rear Seat Front Crossmember Assembly

Welding and Coating Drawing for Body in White



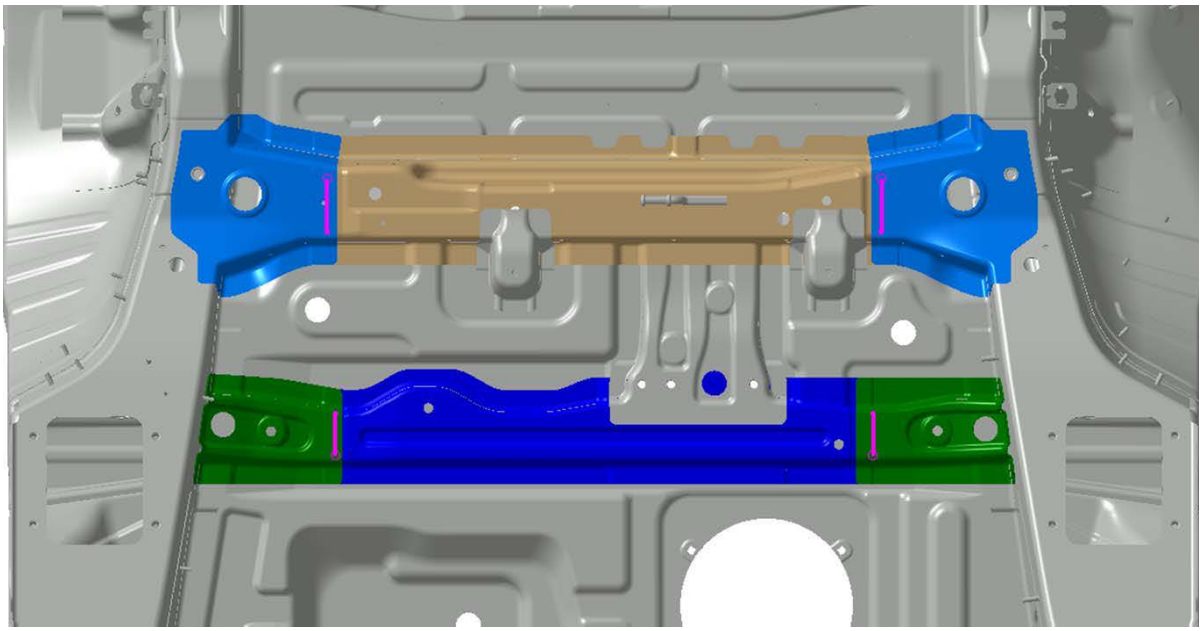
Symmetric

Q30320

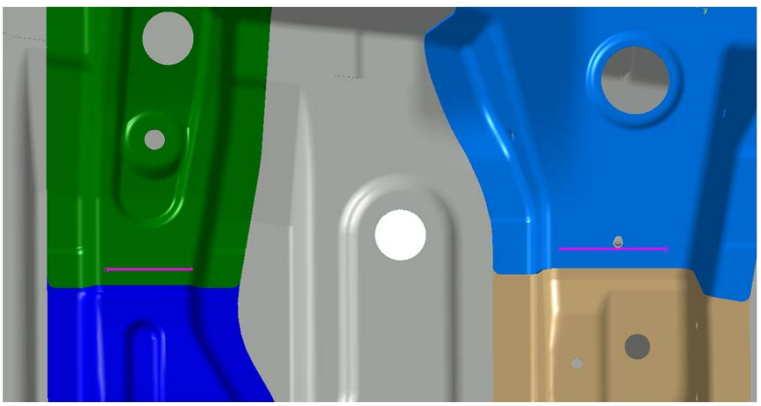
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Center floor body assembly and rear seat front crossmember assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 150mm × 2 (symmetric) • Sealing level: C • Coating station: Rear floor frame assembly OP60 • Manual

■ Rear Left Side Rail Assembly and Rear Floor Crossmember Ⅰ Assembly

Welding and Coating Drawing for Body in White



Symmetric

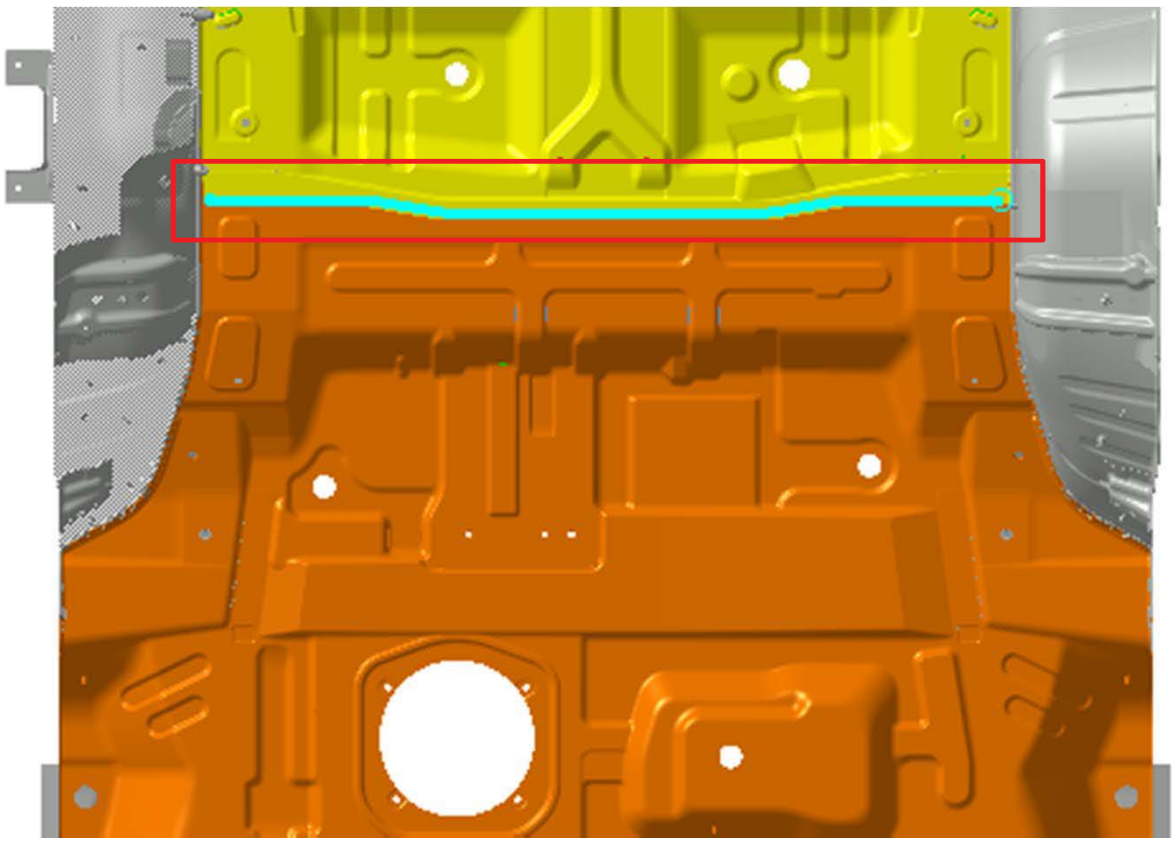


Q30330

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear left side rail assembly and rear floor crossmember Ⅰ assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 112 mm × 2 (symmetric) • Sealing level: C • Manual
Rear right side rail assembly and rear floor crossmember Ⅰ assembly				

■ Rear Floor Body Assembly

Welding and Coating Drawing for Body in White

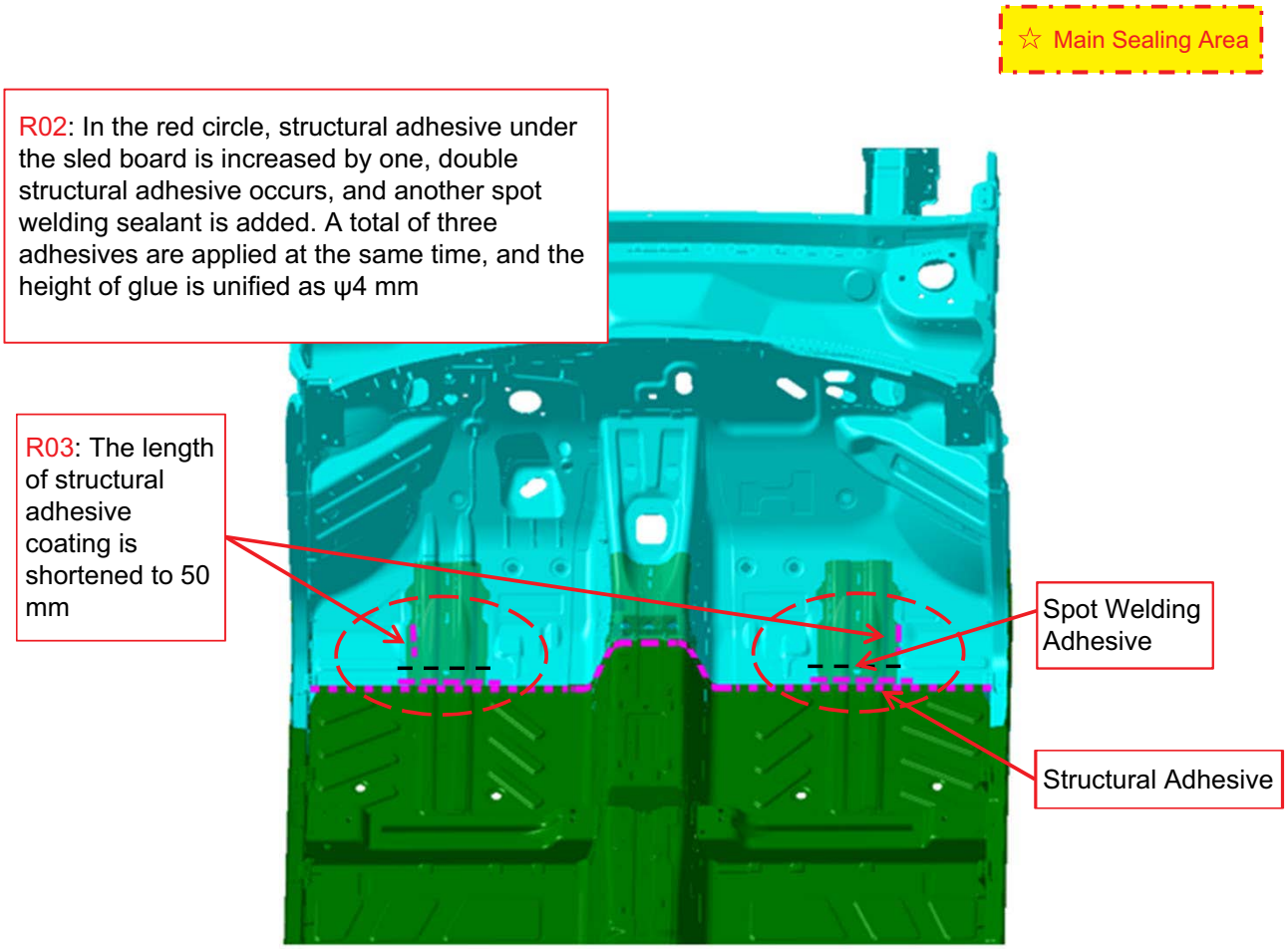


Q30340

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear floor body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 1037 mm (symmetric) • Sealing level: A • Coating station: Complete rear floor frame assembly OP10 • Manual
Rear floor body assembly and center floor body assembly				

■ Front Floor Assembly

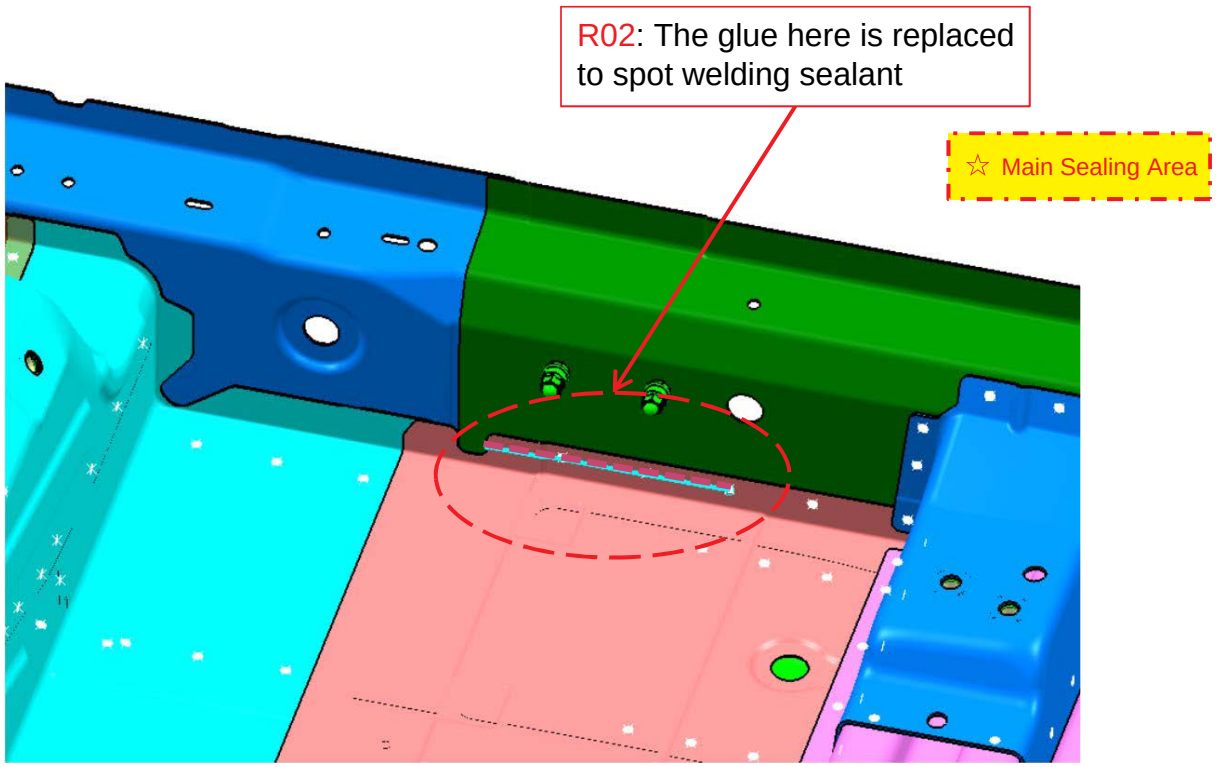
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front floor assembly	505000012AA structural adhesive B11-4102613 spot welding seal gum	Bonding (hemming adhesive, structural adhesive): √	Φ5	• 135 mm × 2 (symmetric) • Sealing level: B • Complete coating station: UB110
Front floor assembly and front baffle assembly				

■ Left/Right Doorsill Assembly

Welding and Coating Drawing for Body in White



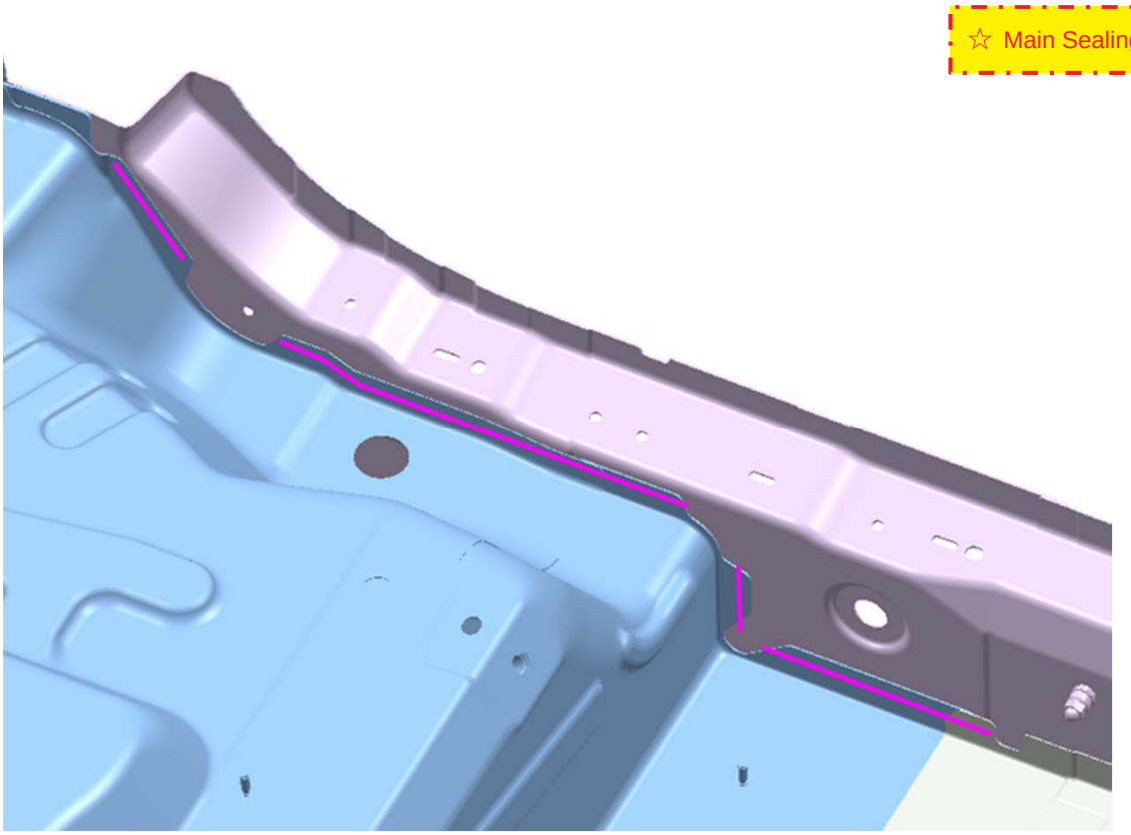
Symmetric

Q30360

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right doorsill assembly	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ3	• Overall length 135mm × 2 (symmetric) • Sealing level: B • Complete coating station: UB110
Front floor assembly and left doorsill assembly				
Front floor assembly and right doorsill assembly				

■ **Center Floor Body Assembly and Left Doorsill Assembly**

Welding and Coating Drawing for Body in White



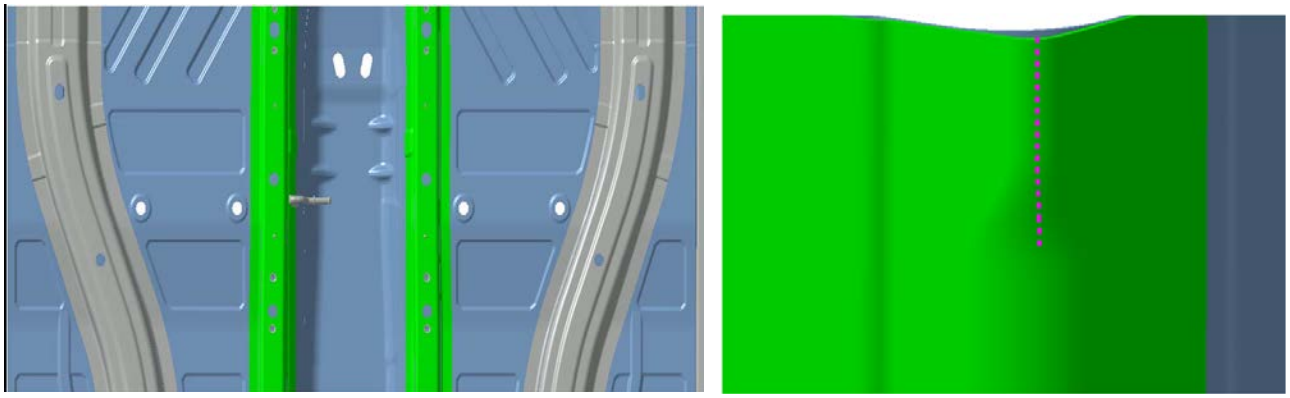
Symmetric

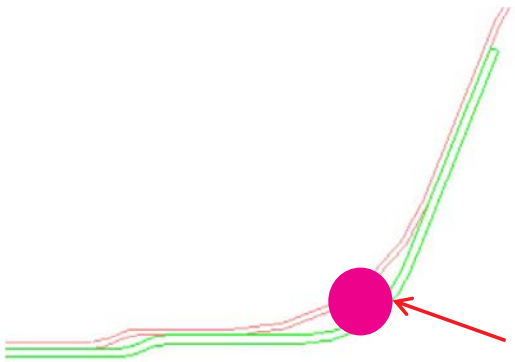
Q30370

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Center floor body assembly and left doorsill assembly	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ3	• Overall length 512 mm × 2 (symmetric) • Sealing level: C • Coating station: UB110 • Manual
Center floor body assembly and right doorsill assembly				

■ Front Floor Assembly

Welding and Coating Drawing for Body in White





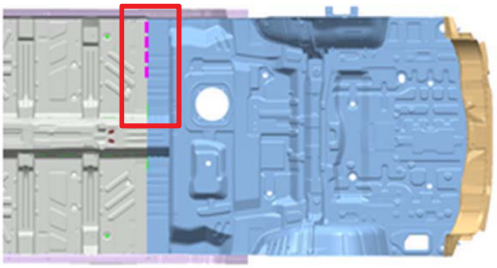
Symmetric

Q30380

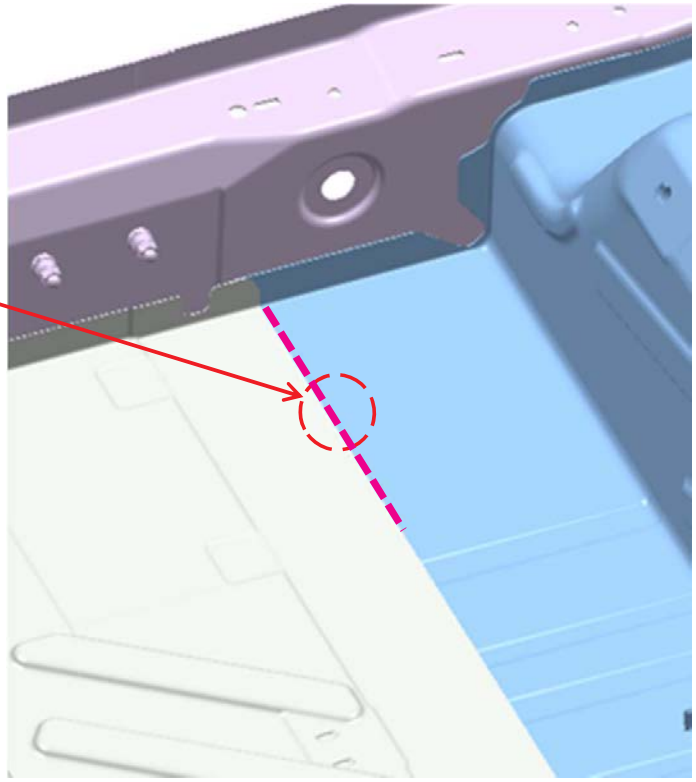
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front floor assembly	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	• Overall length 35 mm × 2 (symmetric) • Sealing level: A • Coating station: UB80 • Manual
Front floor assembly and center passage left side rail assembly				
Front floor assembly and center passage right side rail assembly				

■ Front Floor Assembly

Welding and Coating Drawing for Body in White



☆ Main Sealing Area



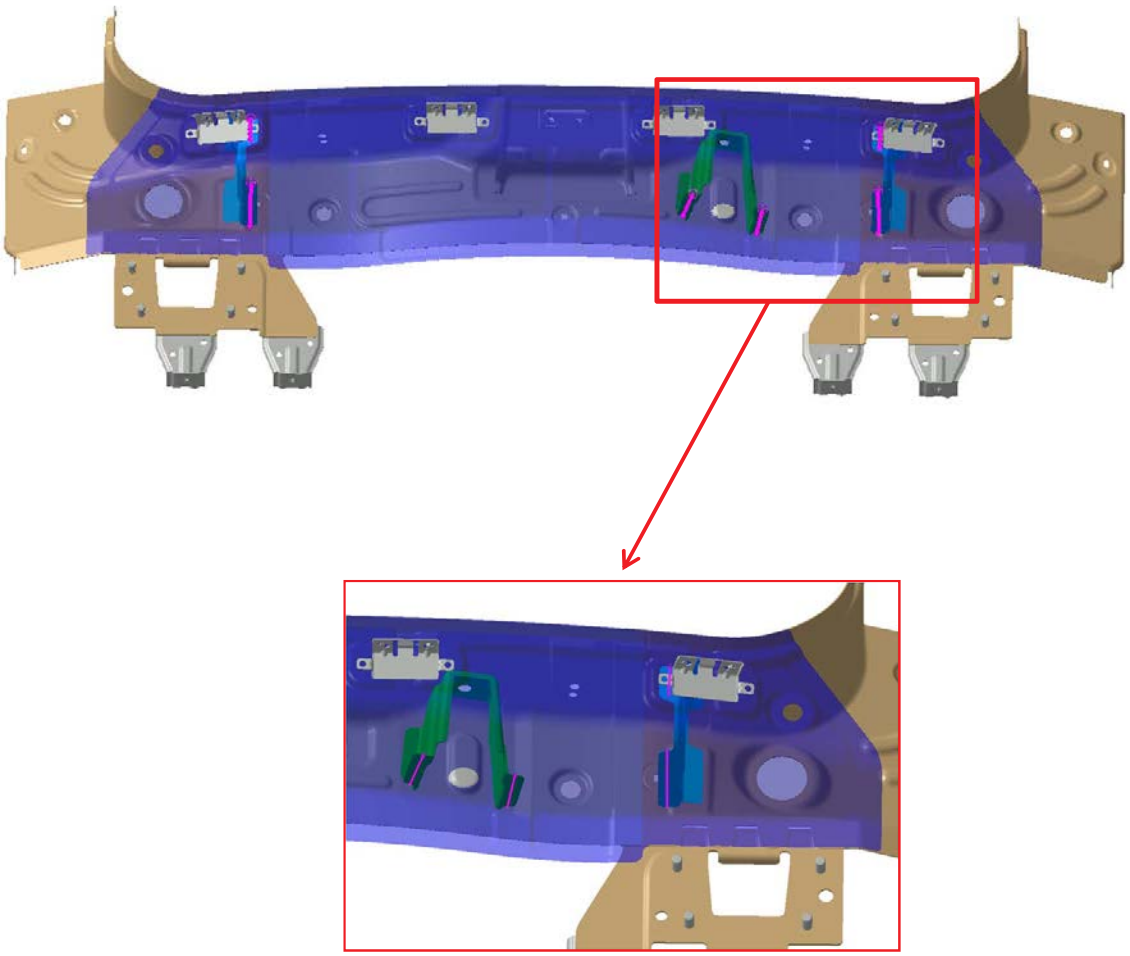
Symmetric

Q30390

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front floor assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length 170 mm × 2 (symmetric) • Sealing level: C • Actual coating panel: Front floor assembly • Manual
Front floor assembly and center floor body assembly				

■ Rear End Outer Panel and Spare Tire Bracket

Welding and Coating Drawing for Body in White

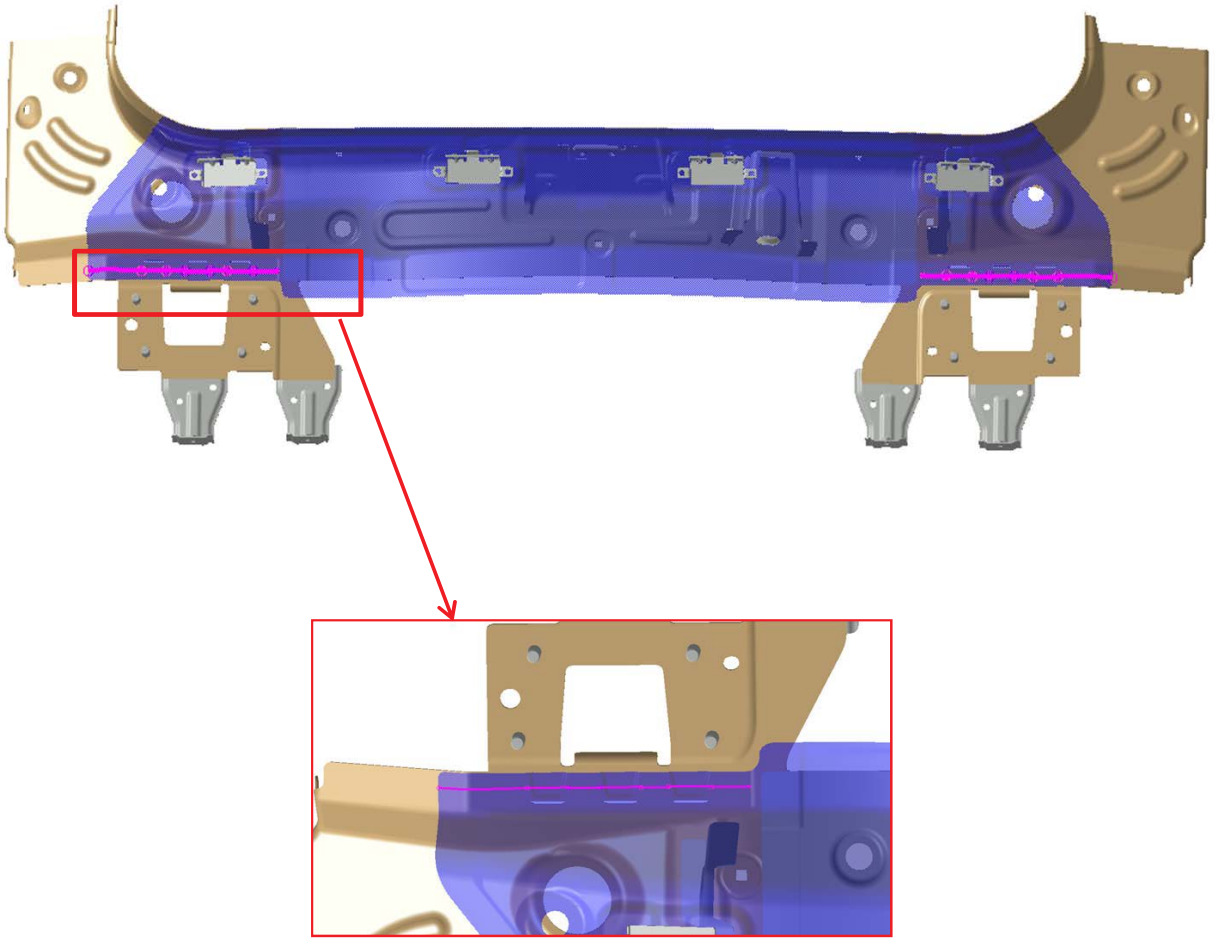


Q30400

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear end outer panel and spare tire bracket	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length: Left side and right side are symmetrical, there are 6 sections, overall length: 425 mm • Sealing level: C • Outsourcing
Rear end outer panel and rear left/ right end inner panel				

■ **Rear End Outer Panel and Rear End Left/Right Connecting Plate**

Welding and Coating Drawing for Body in White

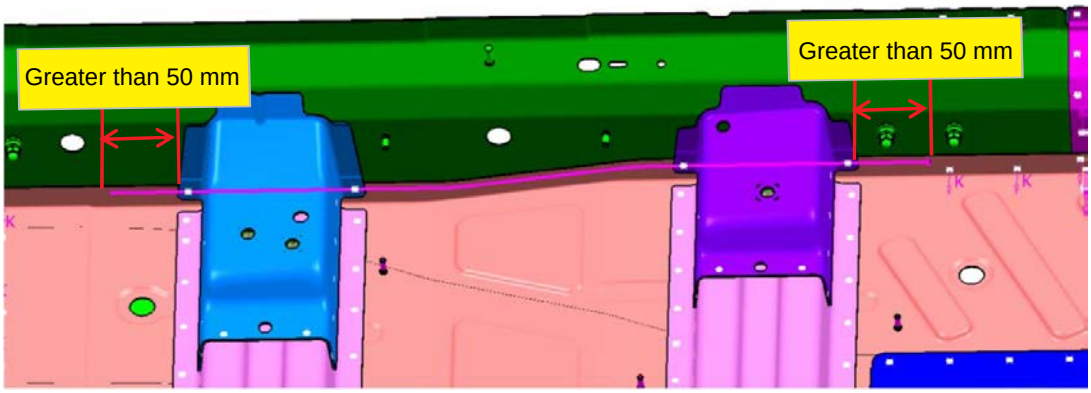


Q30410

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear end outer panel and rear end left/right connecting plate	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length: Left side and right side are symmetrical, overall length: 450 mm • Sealing level: C • Outsourcing
Rear end outer panel and rear left/ right anti-collision box bracket				

■ Left/Right Doorsill Assembly

Welding and Coating Drawing for Body in White



Front floor and doorsill inner panel are glued, the front and rear coatings exceed seat beams for 50 mm.

☆ Main Sealing Area

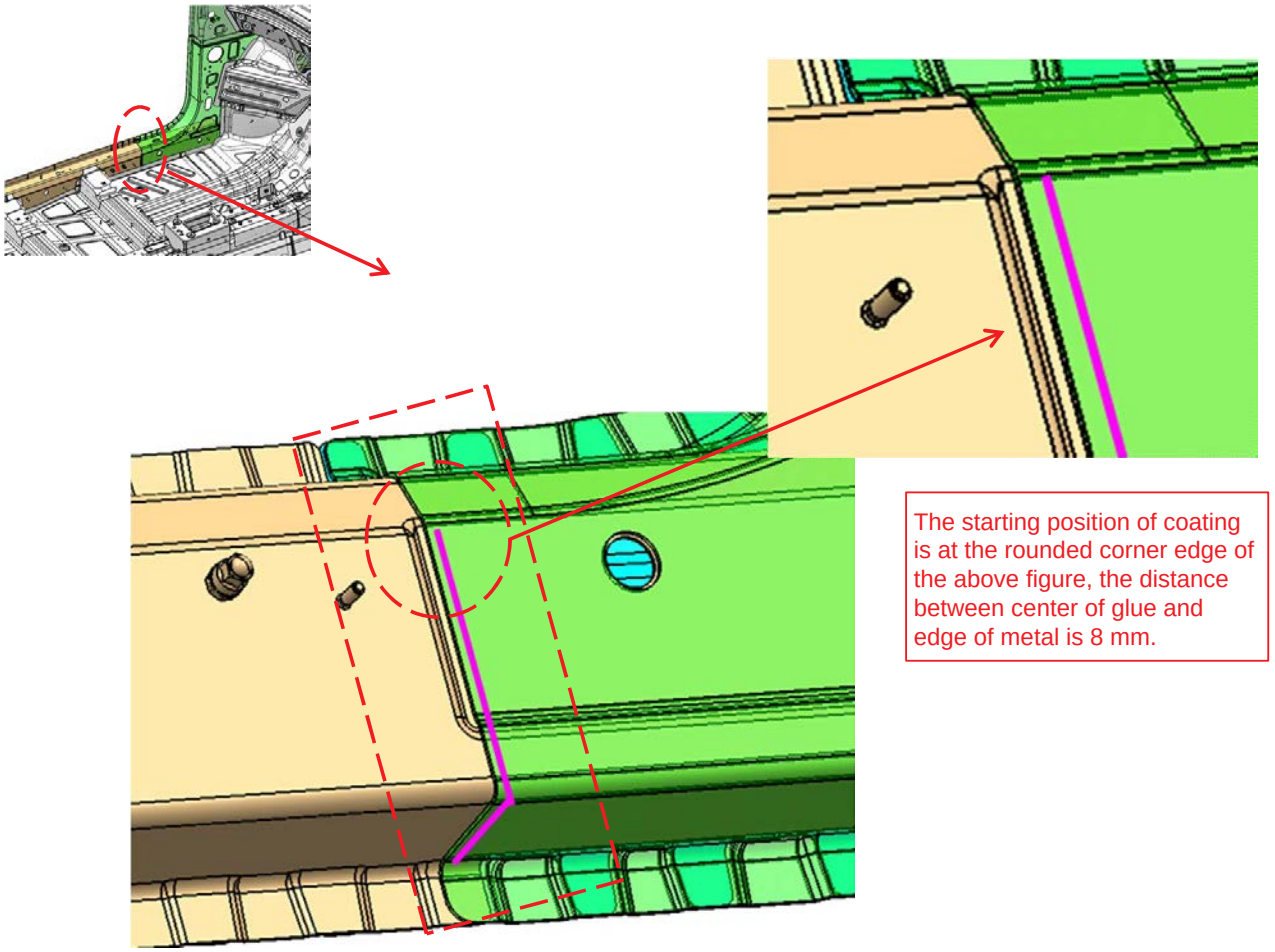
Symmetric

Q30420

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right doorsill assembly	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ4	• Overall length: 655 × 2 (-symmetric) mm • Sealing level: A
Front floor assembly, left doorsill assembly				
Front floor assembly, right doorsill assembly				

■ Front Left/Right Riser Assembly

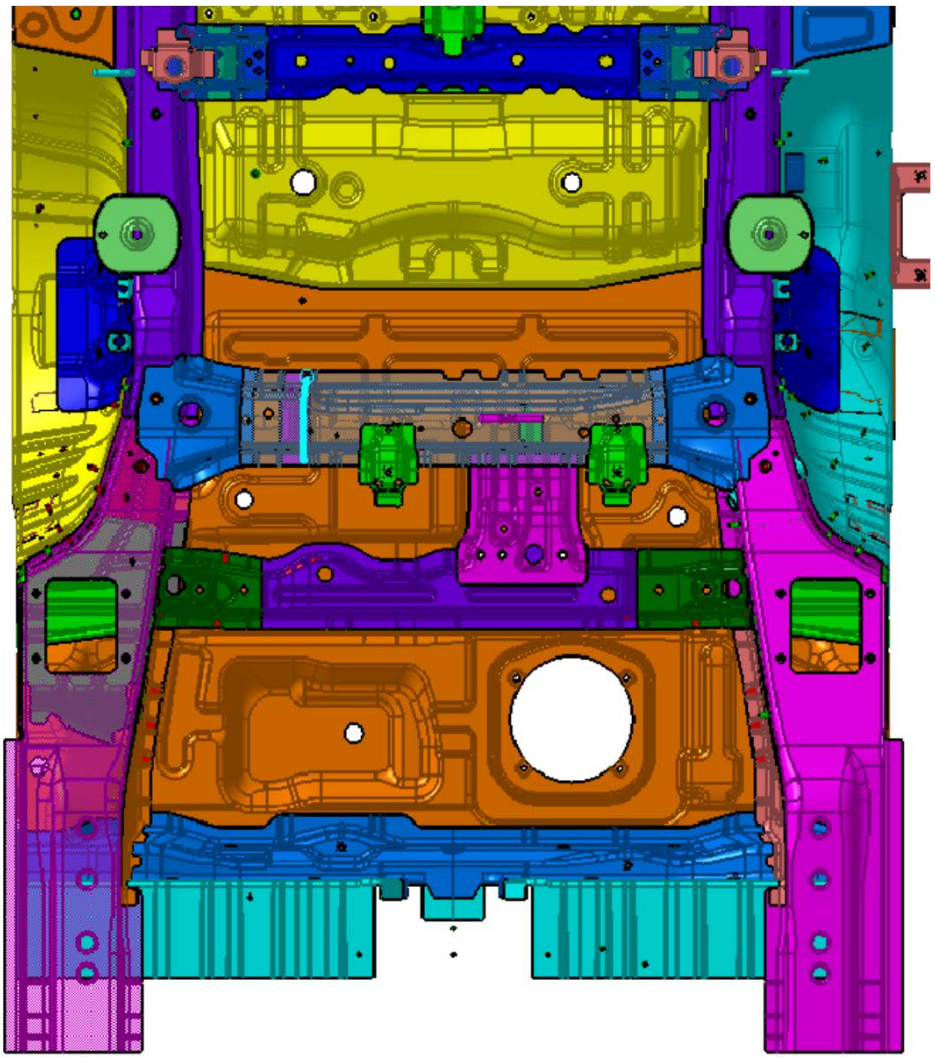
Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front left/right riser assembly	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ4	• Overall length: 154 × 2 (-symmetric) mm • Sealing level: A • The distance between center of glue and edge of sheet metal is 8 mm
Front left riser assembly, left doorsill assembly				
Front right riser assembly, right doorsill assembly				

■ Rear Floor Body Assembly

Welding and Coating Drawing for Body in White

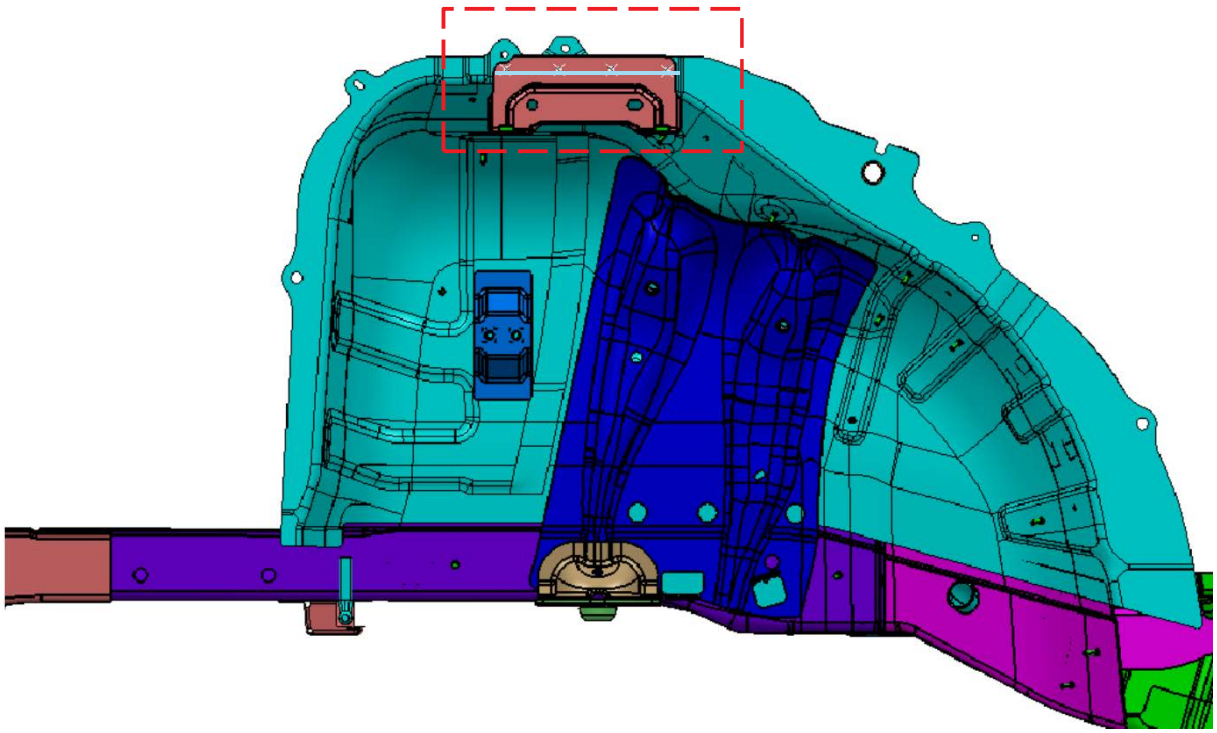


Q30440

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear floor body assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Overall length: 169 mm • Sealing level: A • Coating station: Complete rear floor frame assembly OP10 • Manual
Rear floor body assembly and rear floor crossmember Ⅰ assembly				

■ **Rear Right Side Rail Sub-assembly**

Welding and Coating Drawing for Body in White

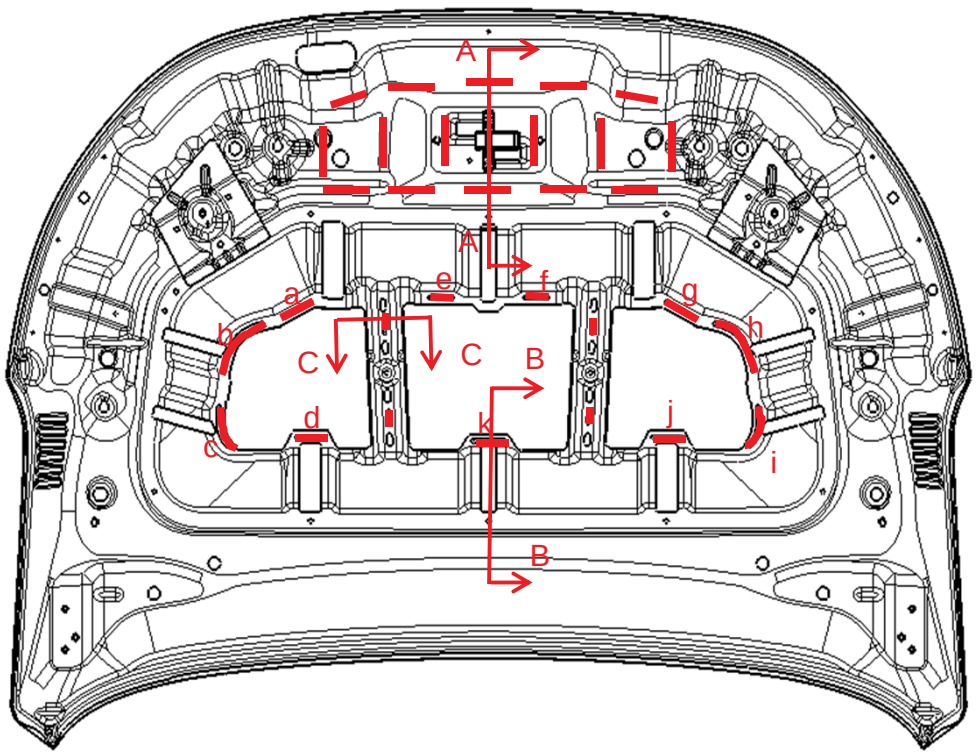


Q30450

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear right side rail sub-assembly	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Overall length 186 mm, only on the right side • Sealing level: A • Coating station: Rear right inner wheel house • Manual
Rear right wheel house inner panel fuel filler pipe mounting bracket				

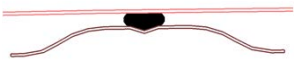
■ Hood

Welding and Coating Drawing for Body in White



A-A

B-B



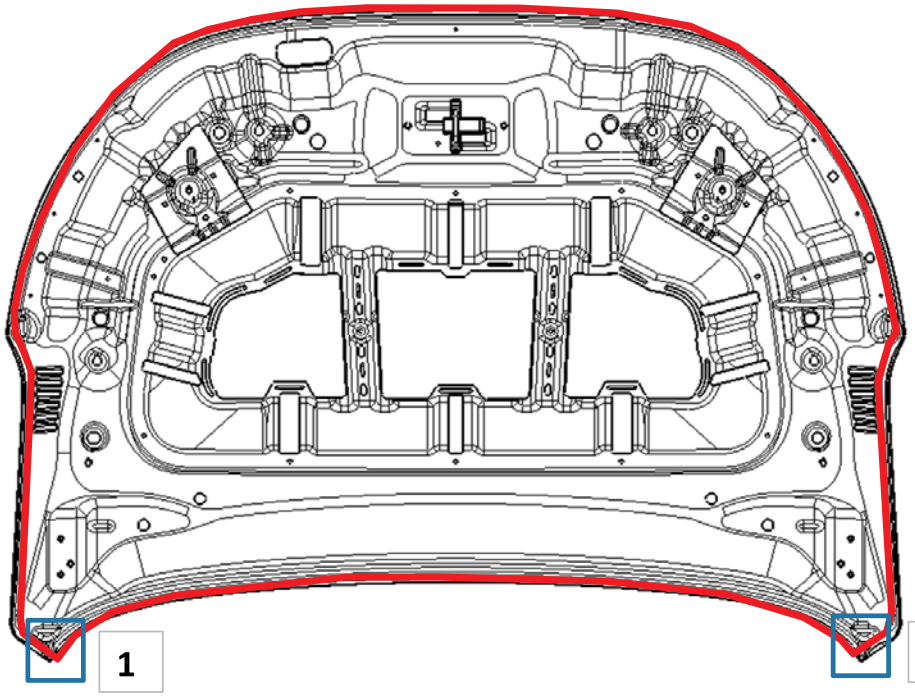
C-C

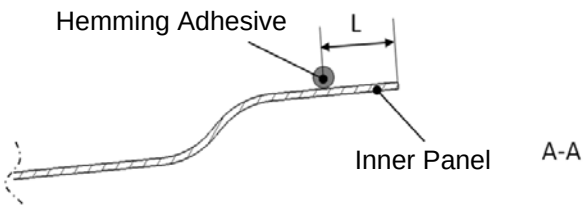
Q30460

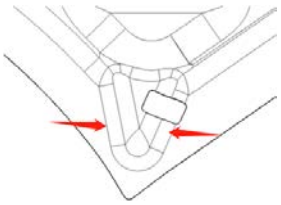
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
A. Between hood support panel and hood outer panel	B11-4102811 damping adhesive Z69	Damping (expanding damping adhesive): √	8 mm ～ 10 mm	1. Damping adhesive: Apply adhesive from the bottom of adhesive tank, the height is 8 mm - 10 mm. At section A, the length of 5 sections near the front part of hood is about 65 mm, the length of 5 sections at the rear is about 60 mm, the remaining vertical 6 sections are about 90 mm; At section B, there are 11 sections, a section is 50 mm, b section is 105 mm, c section is 65 mm, d section is about 50 mm, e section is about 40 mm, f section is about 40 mm, g section is about 50 mm, h section is about 105 mm, i section is about 65 mm, j section is about 50 mm, k section is about 50 mm; At section C, there is 4 sections on left and right, length of each section is about 20 mm. Overall length of damping adhesive is about 1915 mm. 2. The adhesive is applied continuously and evenly.
B. Between hood inner panel and hood outer panel				
C. Between hood inner panel and hood outer panel				

■ Hood Inner/Outer Panel Edge Covering

Welding and Coating Drawing for Body in White







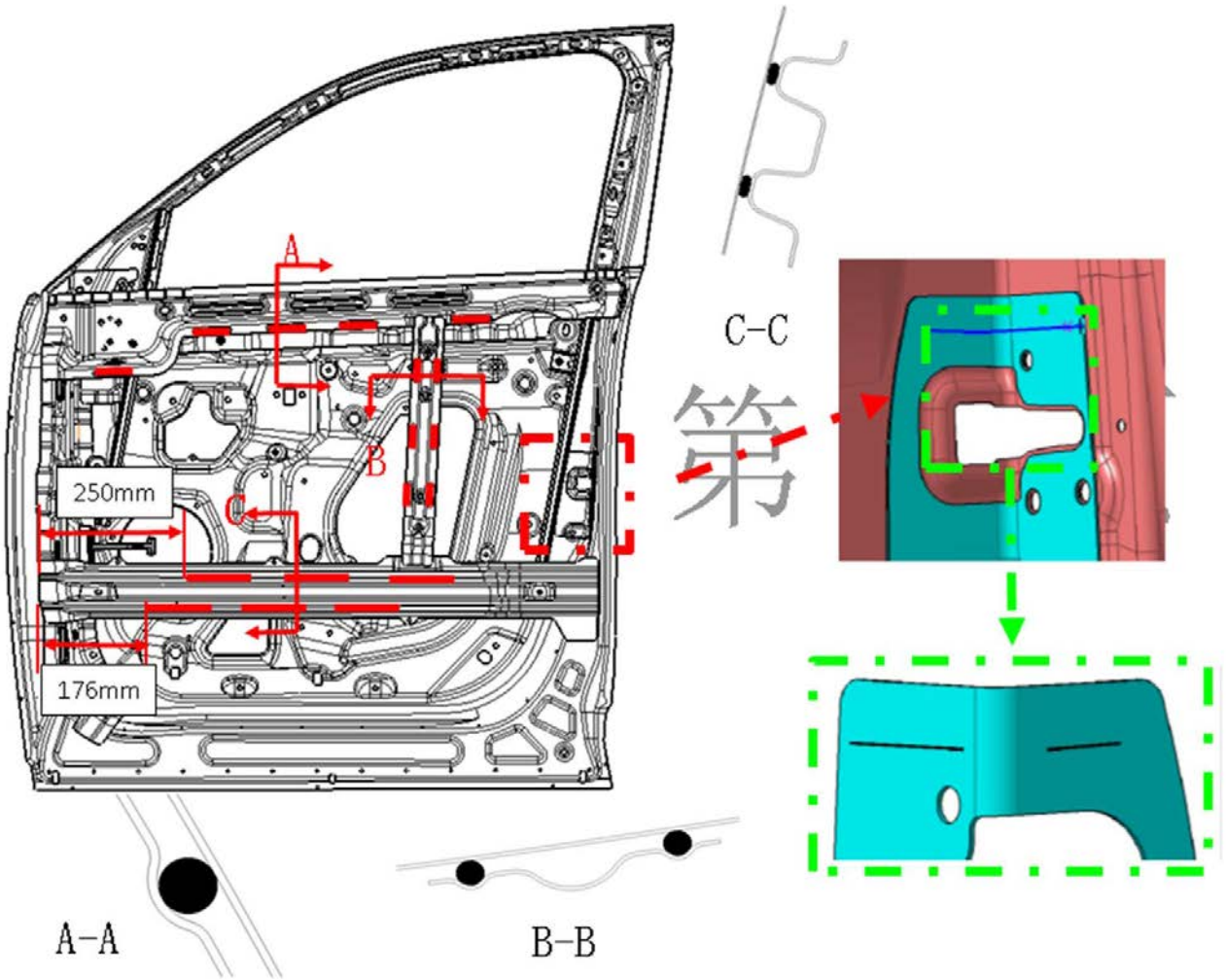
After the dent structure of the two inner panels (positions 1 and 2) leads to the hemming, hemming adhesive is broke at this section. The product evaluation accepts the glue breakage here, and the evaluation will not be made here during the autopsy.

Q30470

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Hood inner/outer panel edge covering	B11-4102511 hemming adhesive	Bonding (hemming adhesive, structural adhesive): √	1.5 mm ～ 2.5 mm	• Hemming adhesive: Height is 1.5 mm ～ 2.5 mm, distance between center of adhesive and edge is 8 ～ 10 mm. Overall length of hemming adhesive is about 5050 mm. • Adhesive is applied continuously and evenly on hood welding inner panel.

■ **Front Door**

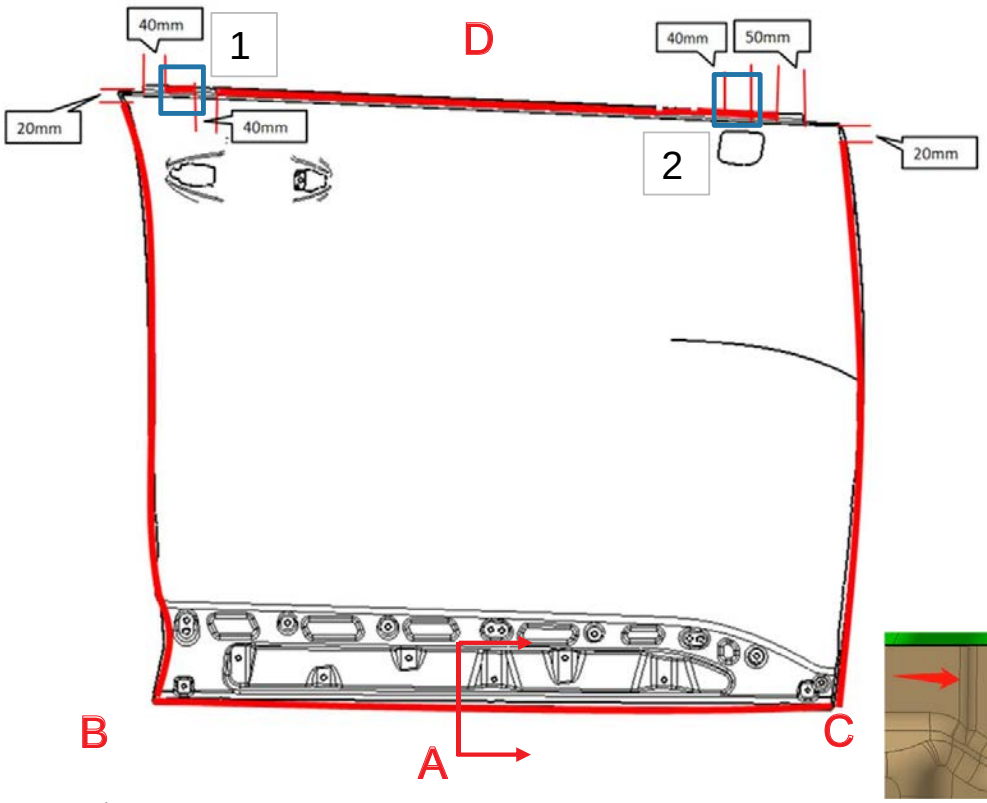
Welding and Coating Drawing for Body in White

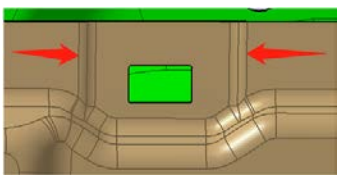


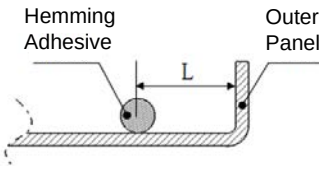
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
A. Between front door waist reinforcing plate and front door outer panel	B11-4102811 damping adhesive	Sealing (spot welding seal gum thumb glue): √ Bonding (hemming adhesive, structural adhesive): √ Damping (expanding damping adhesive): √	8 mm ～ 10 mm	1. Damping adhesive: Apply adhesive from the bottom of adhesive tank, the height is 8 mm ～ 10 mm. There are 5 sections at section A, the adhesive length near B-pillar is 35 mm, the length of other section is about 60 mm; At section B, there are 6 sections, length of each section is about 32 mm; At section C, there are 6 sections, the length of each section is about 130 mm and the spacing is 60 mm from left to right in order according to the size shown in illustration from left end of bumper. Overall length of damping adhesive is about 1247mm*2. 2. Spot welding seal gum: Apply seal gum continuously between front door lock reinforcing plate and front door inner panel according to the marking direction, with the starting point of engraved line on the upper of reinforcing plate as the starting point of gum application, the height is 2 ~ 3 mm, and the length of spot welding seal gum is about 84*2 mm, it belongs to diagonal type. 3. The seal gum is applied continuously and evenly, the operation is symmetrical.
B. Between front door handle reinforcing plate and front door outer panel				
C. Between front door impact beam and front door outer panel				
Between front door lock reinforcing plate and front door inner panel	B11-4102613A spot welding seal gum		2 mm ～ 3 mm	

■ Front Door Inner/Outer Panel Edge Covering

Welding and Coating Drawing for Body in White







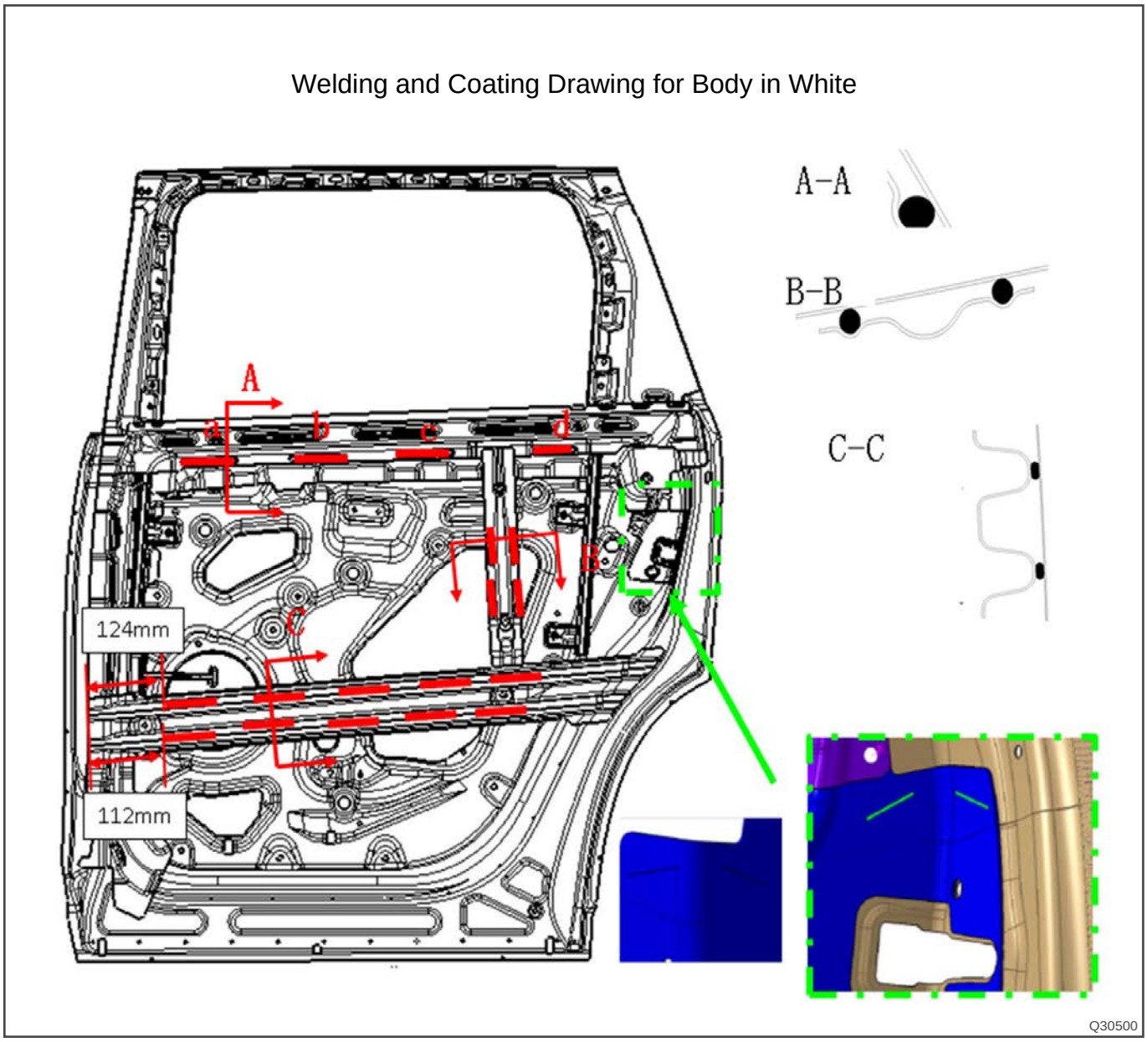
A-A

After the dent structure of the two inner panels (door frames 1 and 2) leads to the hemming, hemming adhesive in this section is narrow or broken. The product evaluation accepts the glue breakage here, and the evaluation will not be made here during the autopsy.

Q30490

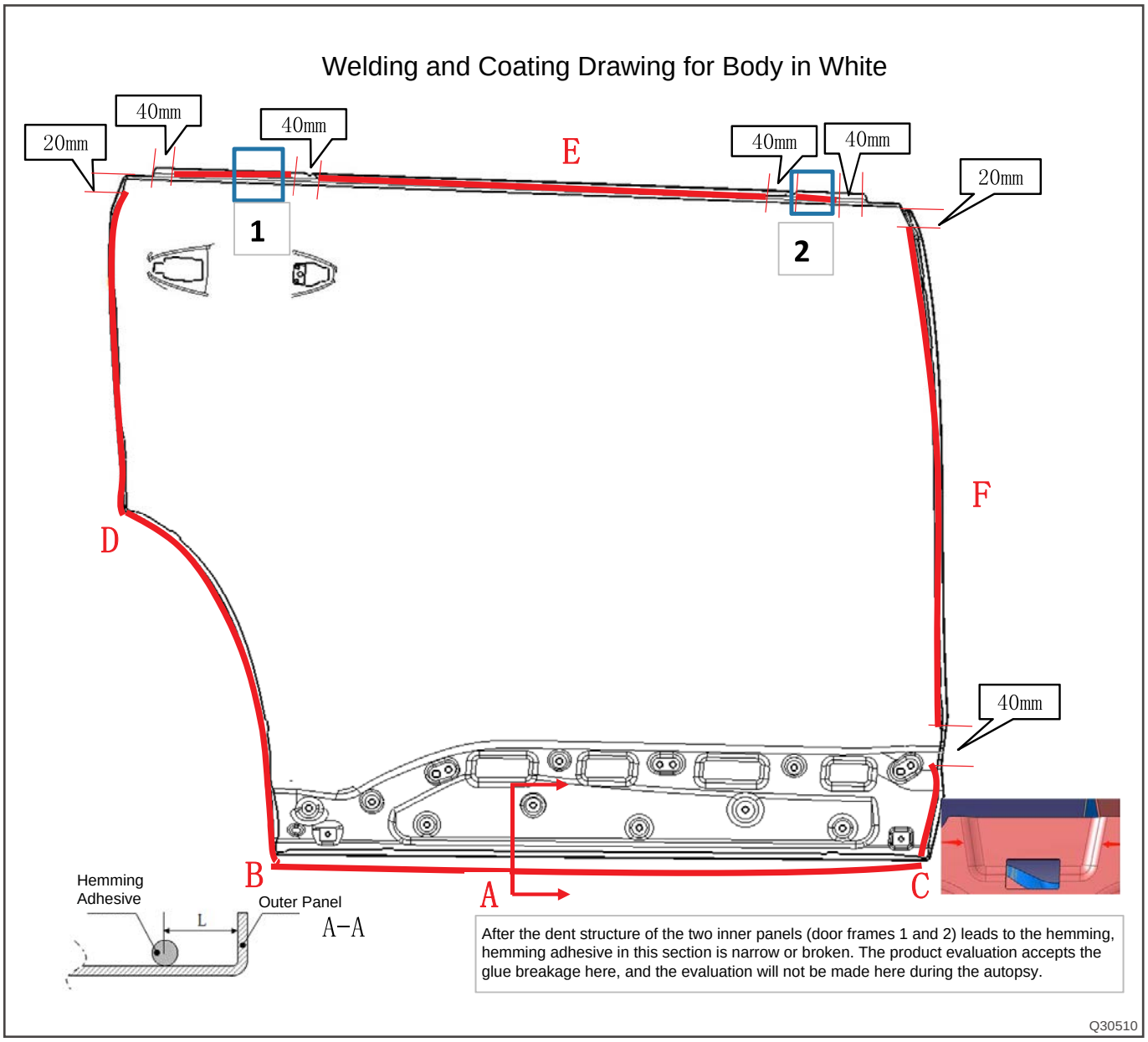
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Front door inner/ outer panel edge covering	B11-4102511 hemming adhesive	Bonding (hemming adhesive, structural adhesive): √	1.5 mm ～ 2.5 mm	1. Hemming adhesive: Height is 1.5 - 2.5 mm, distance between center of adhesive and edge is 9 - 11 mm, there is circular arc transition on the B and C at lower corner, distance between center of arc adhesive and edge is 14 - 16 mm, adhesive is applied along R corner on the D at upper weather bar, ensure that the adhesive does not sag, adhesive end area is shown in the figure (- symmetric). Overall length of hemming adhesive is about 3686*2 mm. 2. The seal gum is applied continuously and evenly, the operation is symmetrical.
Front door outer panel and front door waist reinforcing plate edge covering				
Rear right side rail assembly and rear floor body assembly				

■ **Between Rear Door Waist Outer Reinforcing Plate and Rear Door Outer Panel**



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
A. Between rear door waist outer reinforcing plate and rear door outer panel	B11-4102811 damping adhesive	Sealing (spot welding seal gum thumb glue): √ Bonding (hemming adhesive, structural adhesive): √ Damping (expanding damping adhesive): √	8 mm ～ 10 mm	1. Damping adhesive: Apply adhesive from the bottom of adhesive tank, the height is 8 mm ～ 10 mm. There are 4 sections at section A, a, b, c are about 90 mm, d is about 50 mm; At section B, there are 4 sections, length of each section is about 50m; At section C, there are 10 sections, the length of each section is about 80mm and the spacing is 60 mm from left to right in order according to the size shown in illustration from left end of bumper. Overall length of damping adhesive is about 1320mm*2. 2. Spot welding seal gum: Apply seal gum continuously between rear door lock reinforcing plate and front door inner panel according to the marking direction, with the starting point of engraved line on the upper of reinforcing plate as the starting point of gum application, the height is 2 ~ 3 mm, and the length of spot welding seal gum is about 67*2 mm, it belongs to diagonal type. 3. The seal gum is applied continuously and evenly, the operation is symmetrical.
B. Between rear door handle reinforcing plate and rear door outer panel				
C. Between rear door impact beam and rear door outer panel				
Between rear door lock reinforcing plate and rear door inner panel	B11-4102613A spot welding seal gum		2 mm ～ 3 mm	

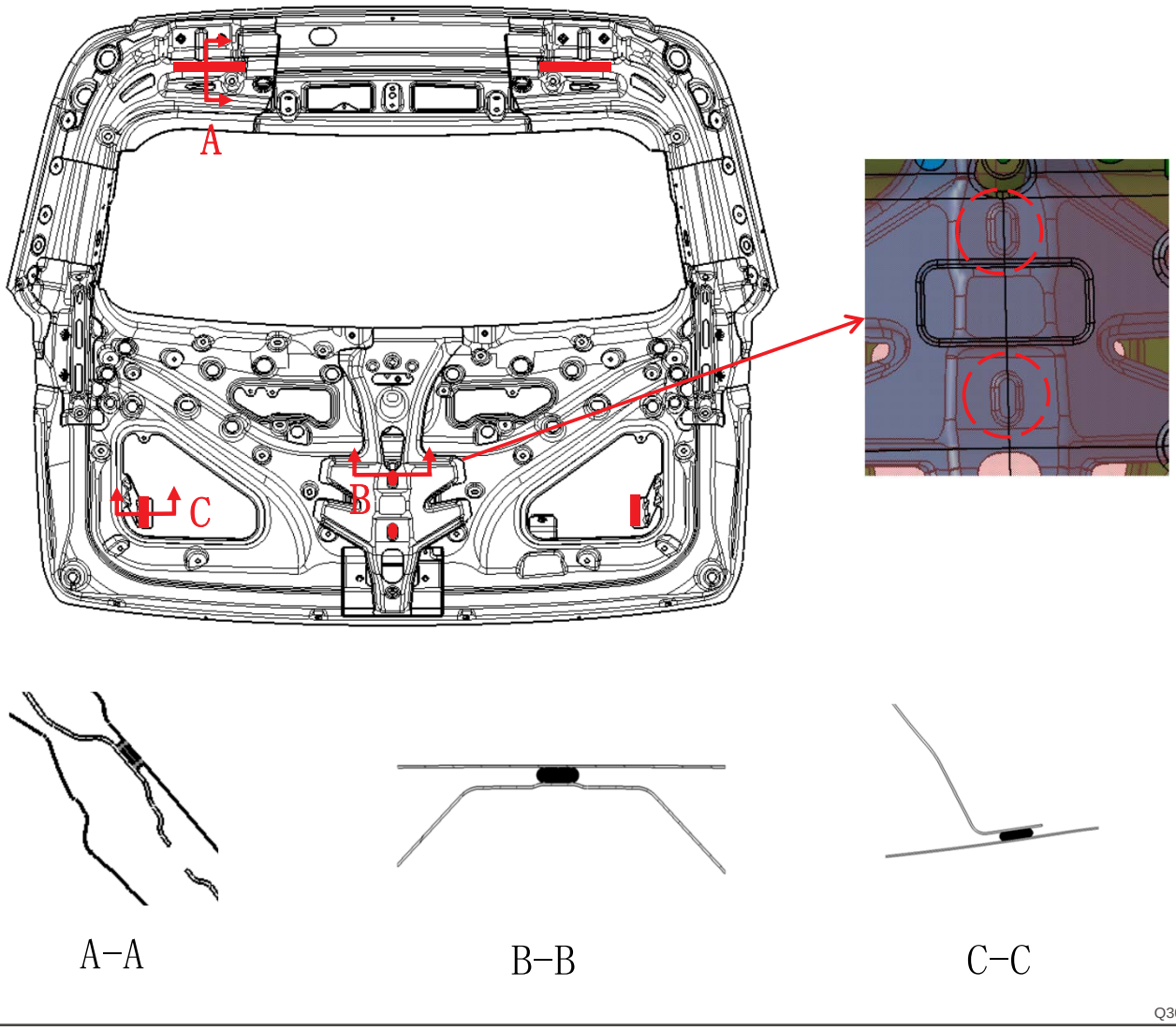
■ Rear Door Inner/Outer Panel Edge Covering



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Rear door inner/ outer panel edge covering	B11-4102511 hemming adhesive	Bonding (hemming adhesive, structural adhesive): √	1.5 mm ～ 2.5 mm	1. Hemming adhesive: Height is 1.5 - 2.5 mm, distance between center of adhesive and edge is 9 - 11 mm, there is circular arc transition on the B and C at lower corner and D at the corner, distance between center of arc adhesive and edge is 14 - 16 mm, adhesive is applied along R corner on the E at upper weather bar and F on the front, ensure that the adhesive does not sag, adhesive end area is shown in the figure; Overall length of hemming adhesive is about 3592*2mm. 2. The adhesive is applied continuously and evenly.
Rear door outer panel and rear door waist outer reinforcing plate edge covering				
Rear right side rail assembly and rear floor body assembly				

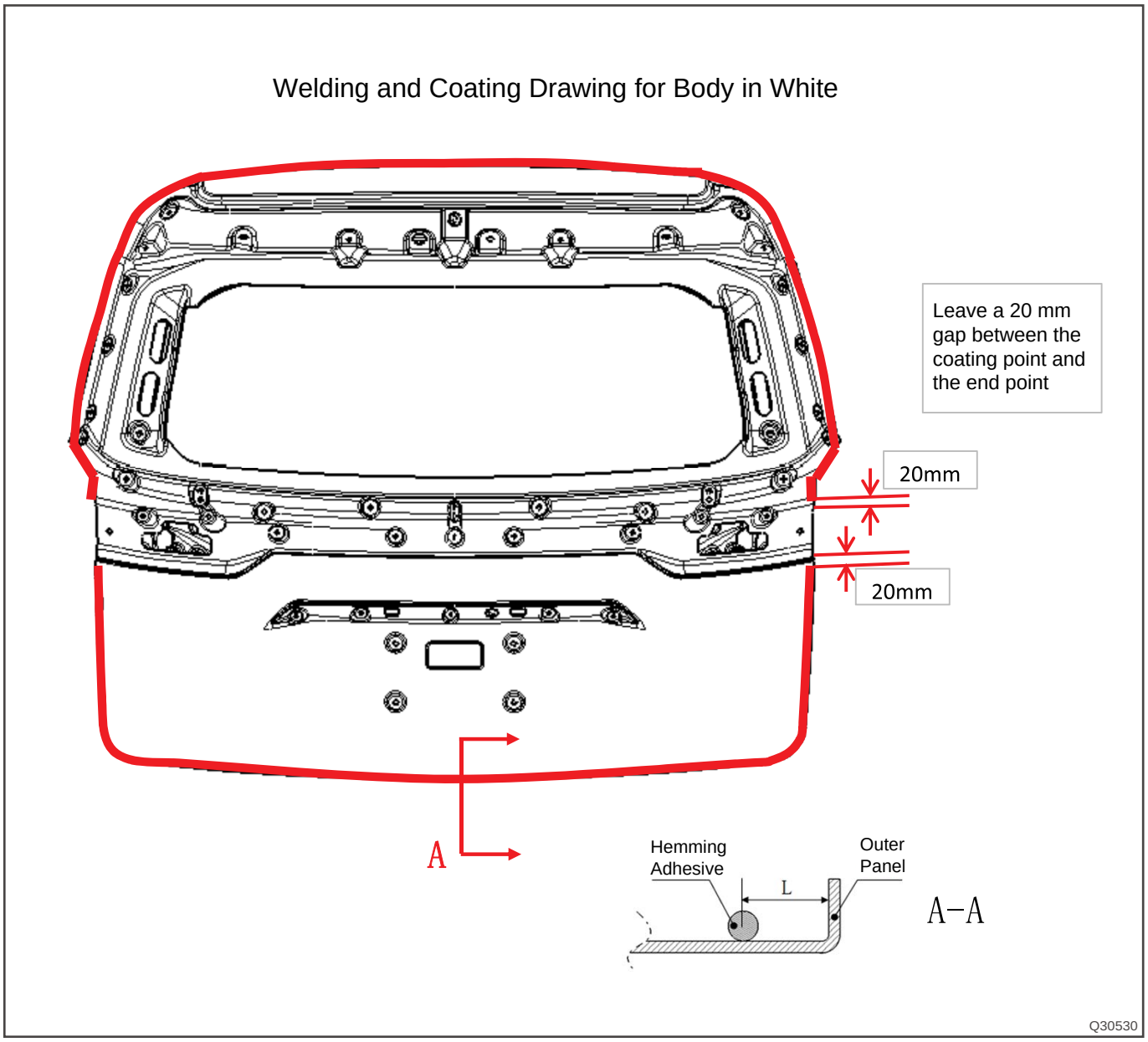
■ **Between Back Door Left/Right Hinge Reinforcing Plate Assembly and Outer Panel**

Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Between back door left/right hinge reinforcing plate assembly and outer panel	B11-4102811 damping adhesive	Damping (expanding damping adhesive): √	6 mm ～ 8 mm	1. Damping adhesive: Apply adhesive from the bottom of adhesive tank, the height is 6mm ～ 8mm. At section A, there are 2 sections on left and right, each length is about 108 mm; At section B, there are 2 spot welding seal gums; At section C, there are 2 sections on left and right, each length is about 25 mm. Overall length of damping adhesive is about 266 mm. 2. The adhesive is applied continuously and evenly.
B. Between rear wiper motor reinforcing plate and outer panel				
C. Between back door inner panel and outer panel				

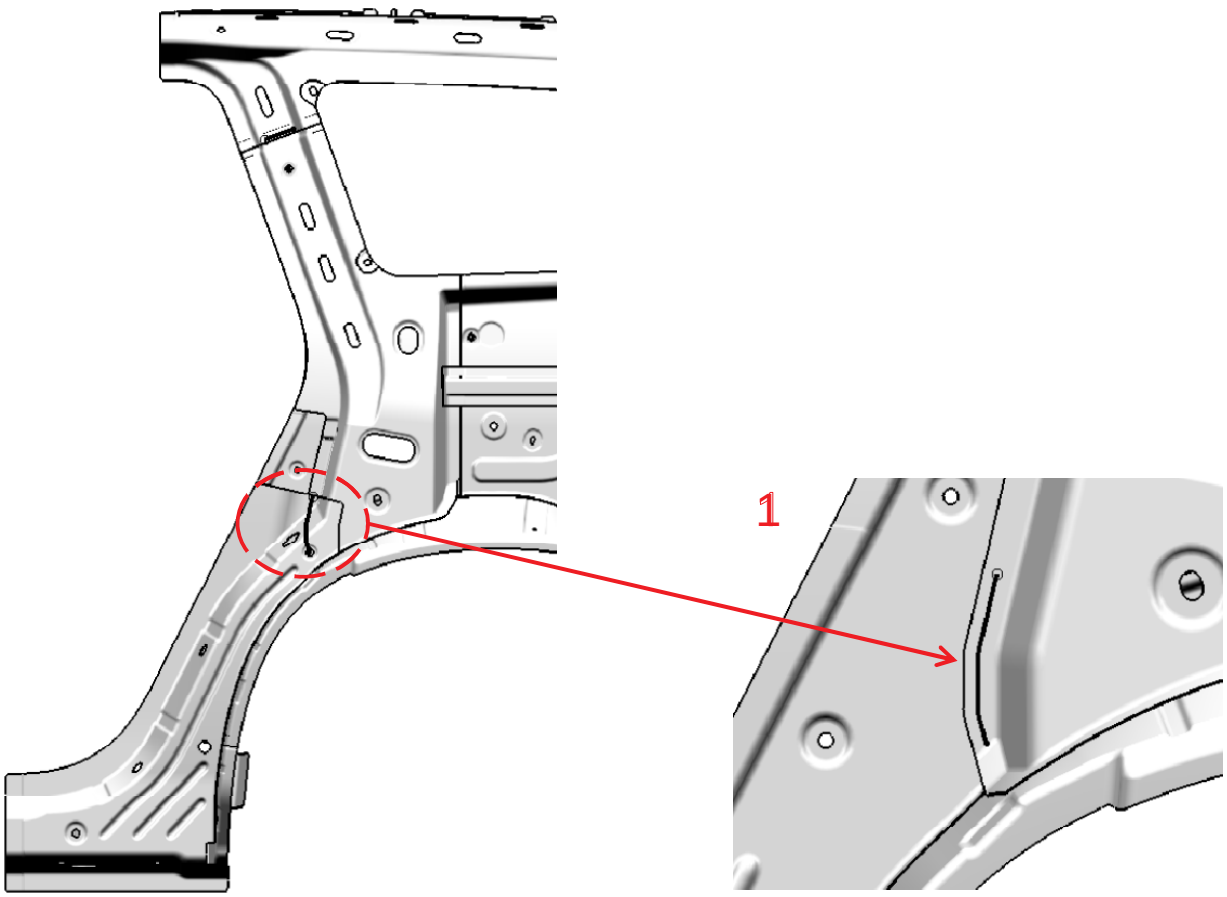
■ Back Door Inner/Outer Panel Edge Covering



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Back door inner/ outer panel edge covering	B11-4102511 hemming adhesive	Bonding (hemming adhesive, structural adhesive): √	1.5 mm ～ 2.5 mm	Hemming adhesive: At section A, height is 1.5 mm ～ 2.5 mm, distance between center of adhesive and edge is 9 mm ～ 11 mm. The adhesive end or avoiding area at the corner is shown in the figure, which is symmetrical. Overall length of hemming adhesive is about 4442 mm. 2. The adhesive is applied continuously and evenly.

■ C-pillar and D-pillar Assembly

Welding and Coating Drawing for Body in White

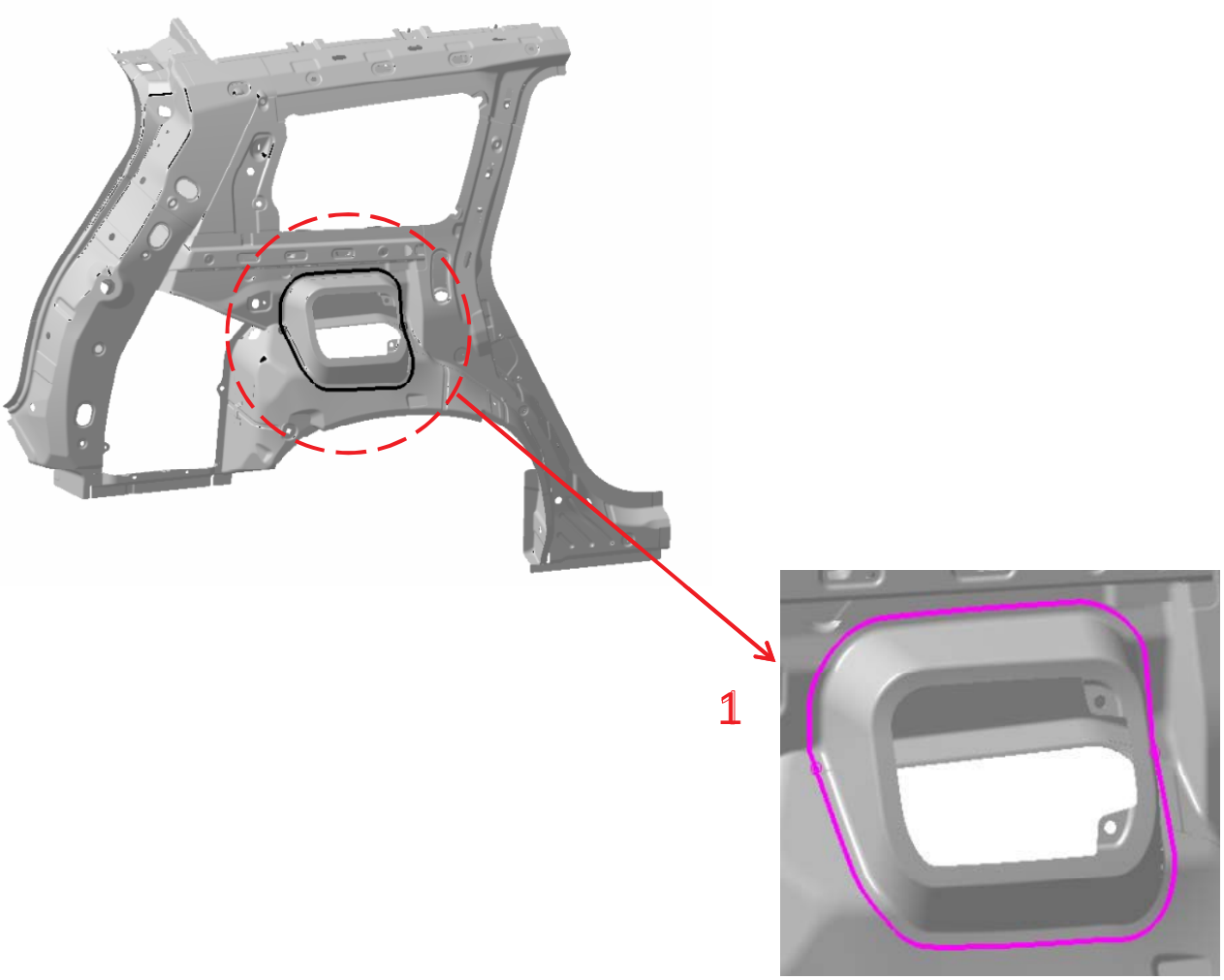


Q30560

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
C-pillar and D-pillar assembly	M14-4102311 structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ3	• Coating diameter is φ3mm, there is 1 section, overall length of coating on left and right is about 79 mm*2 • The seal gum is applied continuously and evenly, the operation is symmetrical
Between left C-pillar upper reinforcing plate and left C-pillar lower inner panel				
Rear right side rail assembly and rear floor body assembly				

■ C-pillar and D-pillar Assembly

Welding and Coating Drawing for Body in White

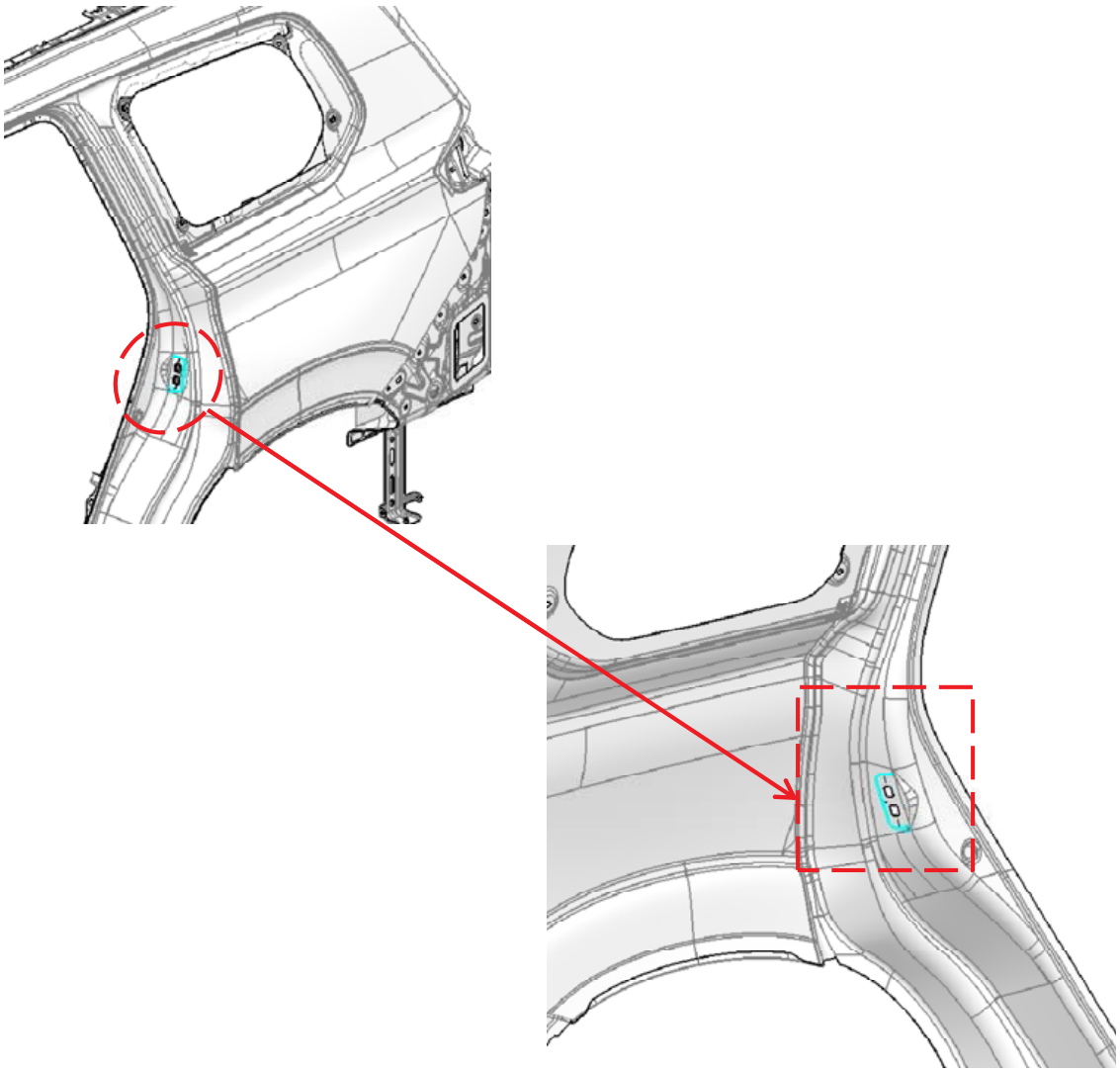


Q30570

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
C-pillar and D-pillar assembly	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue)	Φ4	• Spot welding seal gum: Coating diameter is φ4 mm, overall length is about 1216 mm; • The adhesive is applied continuously and evenly, only on the right side.
Between fuel filler cap and right C-pillar inner panel				
Between fuel filler cap and rear right wheel house outer panel body				

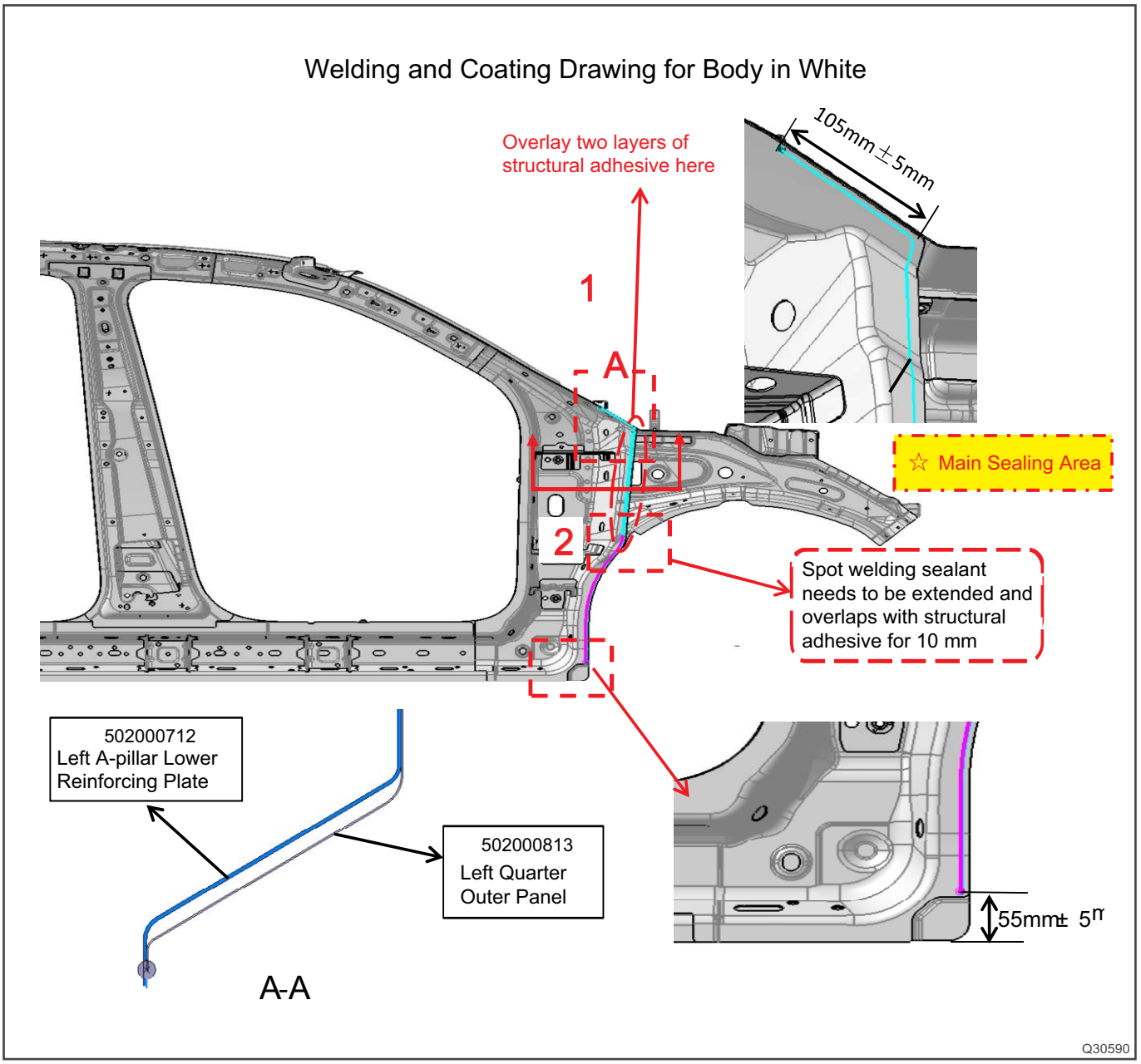
■ Quarter Assembly - Left (Symmetric)

Welding and Coating Drawing for Body in White



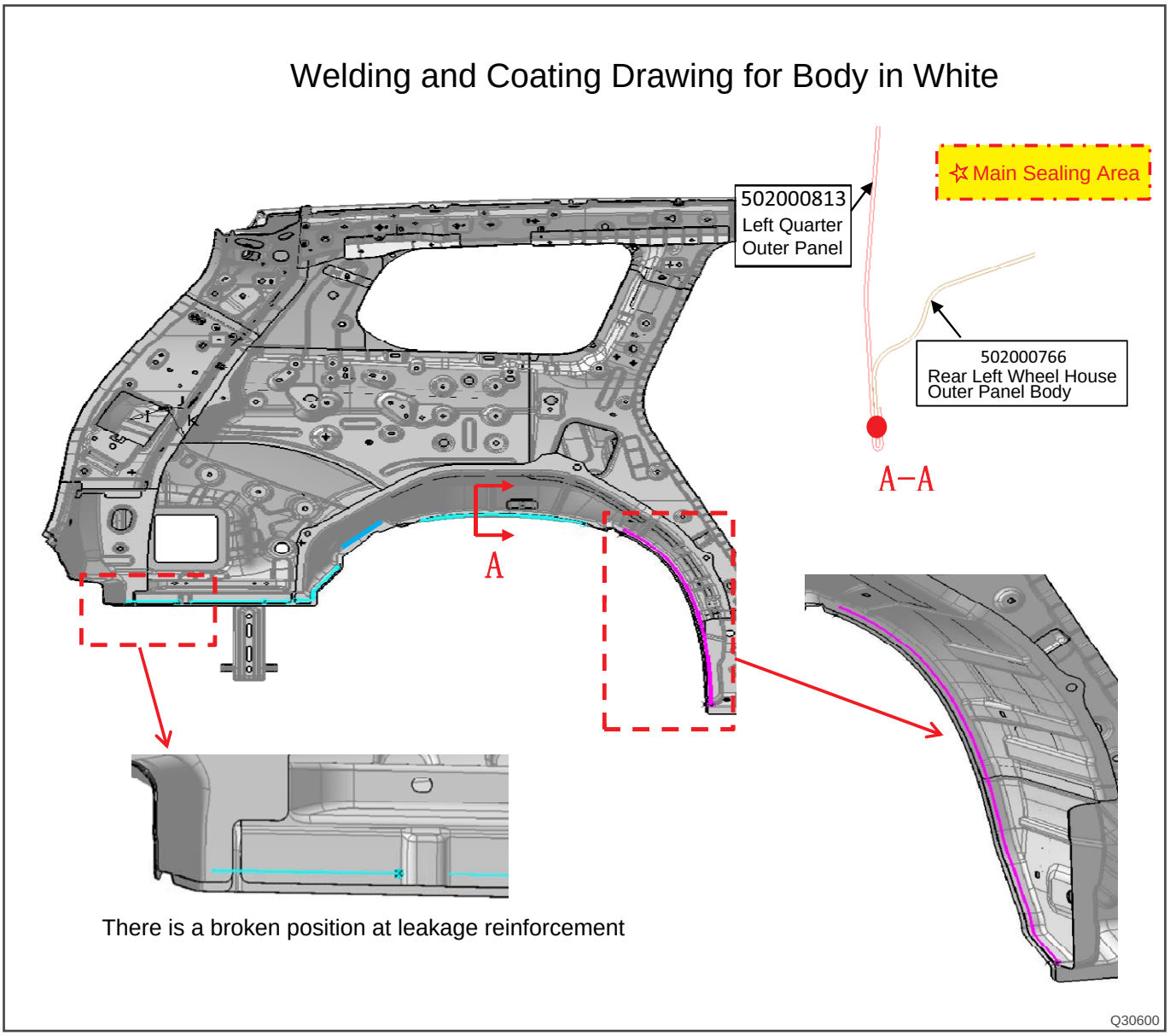
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Quarter assembly - left (symmetric)	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	• Coating diameter is φ4 mm, overall length of coating on left and right is about 130 mm*2 • The seal gum is applied continuously and evenly, the operation is symmetrical • Manual
Between left quarter outer panel and C-pillar, D-pillar assembly				

■ **Left Quarter Assembly (Symmetric)**



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left quarter assembly (symmetric)	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	• Position 1: Coating diameter of structural adhesive is φ4 mm, there are 2 sections, overall length on left and right is about 849*2 mm. • Position 2: Coating diameter of spot welding seal gum is φ4 mm, overall length on left and right is about 435*2 mm. • The seal gum is applied continuously and evenly, the operation is symmetrical. • Manual
Left quarter outer panel and left A-pillar lower reinforcing plate	B11-4102613A spot welding seal gum			

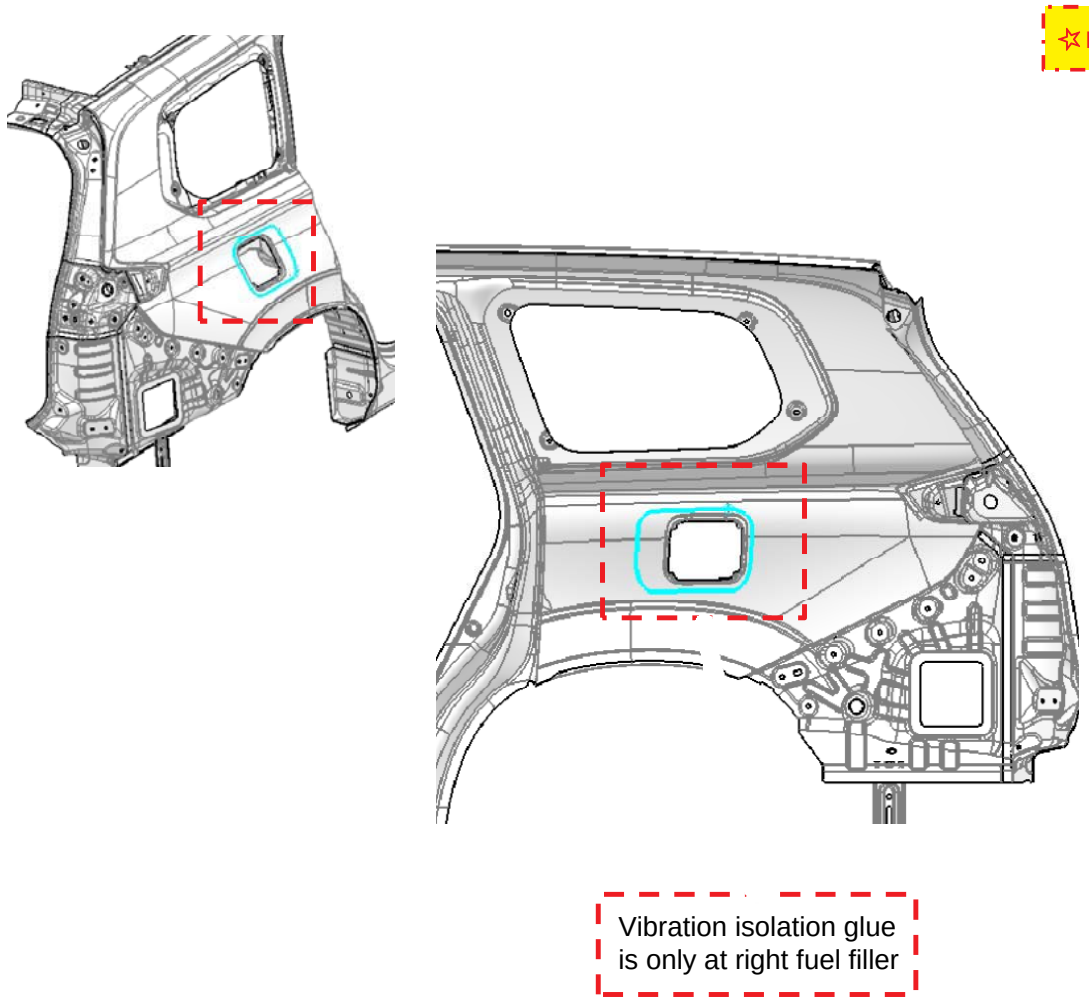
■ **Left/Right Quarter Assembly**



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Left/right quarter assembly	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	• Structural adhesive: Coating diameter is φ4 mm, there are 2 sections, overall length on left and right is about 980 mm*2 • Seal gum: Coating diameter is φ4 mm, there is 1 section, overall length on left and right is about 610 mm*2 • The seal gum is applied continuously and evenly, the operation is symmetrical • Manual
Between left/right quarter outer panel and left/right quarter inner panel rear assembly	B11-4102613A spot welding seal gum			

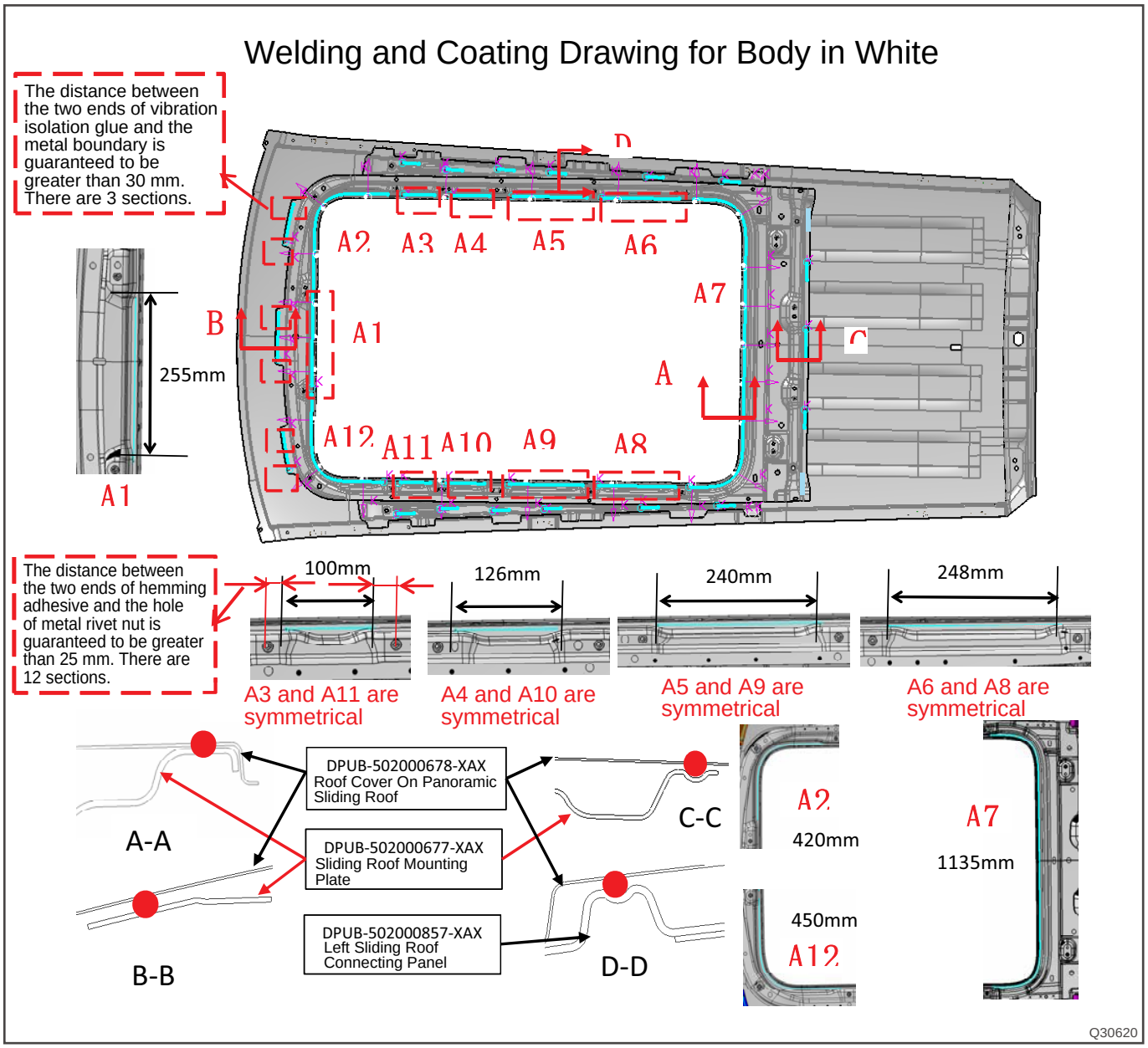
■ **Quarter Assembly - Right (Only at Right Fuel Filler)**

Welding and Coating Drawing for Body in White



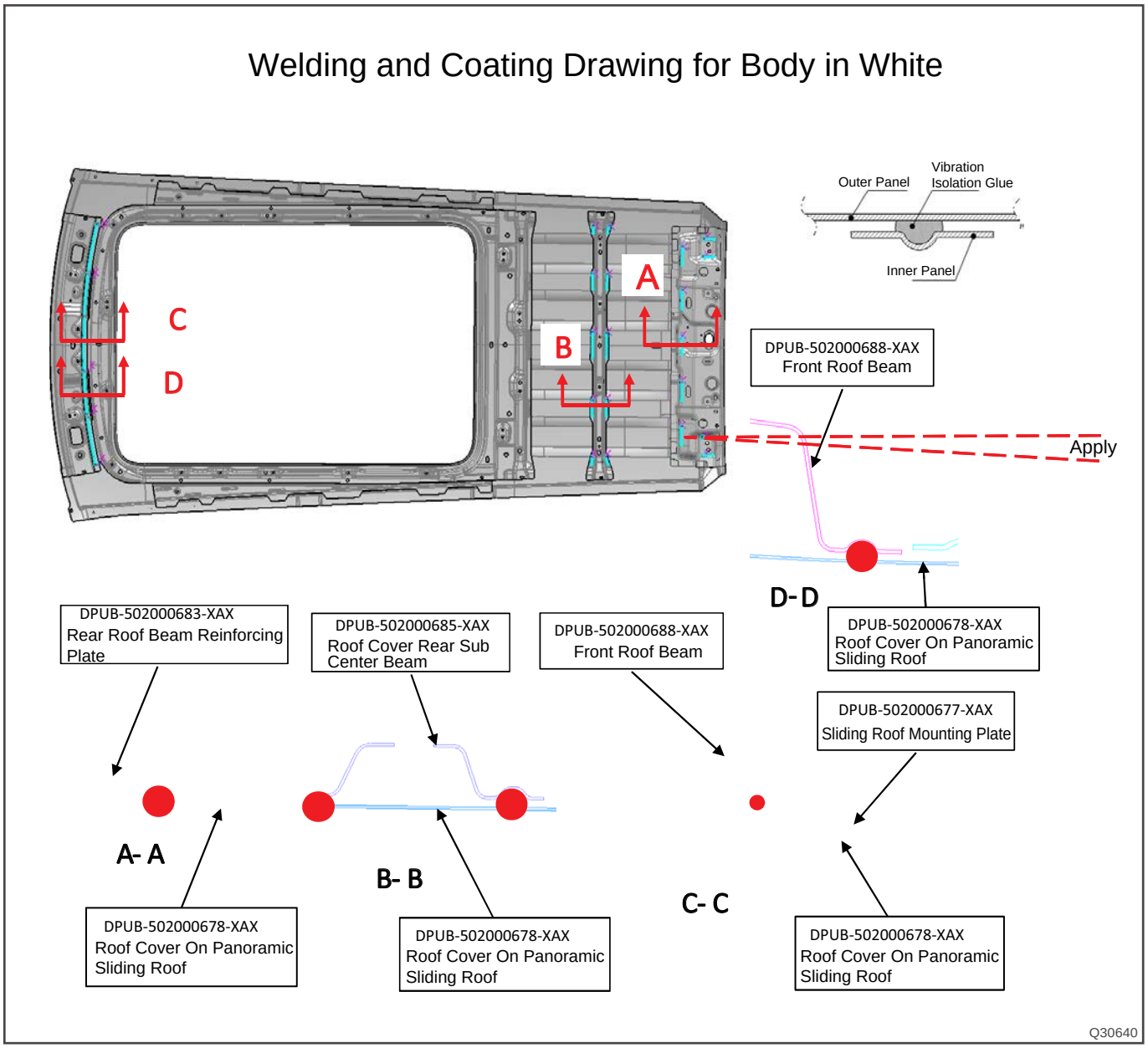
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Quarter assembly - right (only at right fuel filler)	B11-4102811A damping adhesive	Damping (expanding damping adhesive): √	Φ8	• Coating diameter is φ8 mm, distance between center of adhesive and edge is 4 ～ 6 mm, length is about 792 mm • The adhesive is applied continuously and evenly • Manual
Between right quarter outer panel and rear right wheel house outer panel body				

■ Roof Cover Assembly - with Sliding Roof



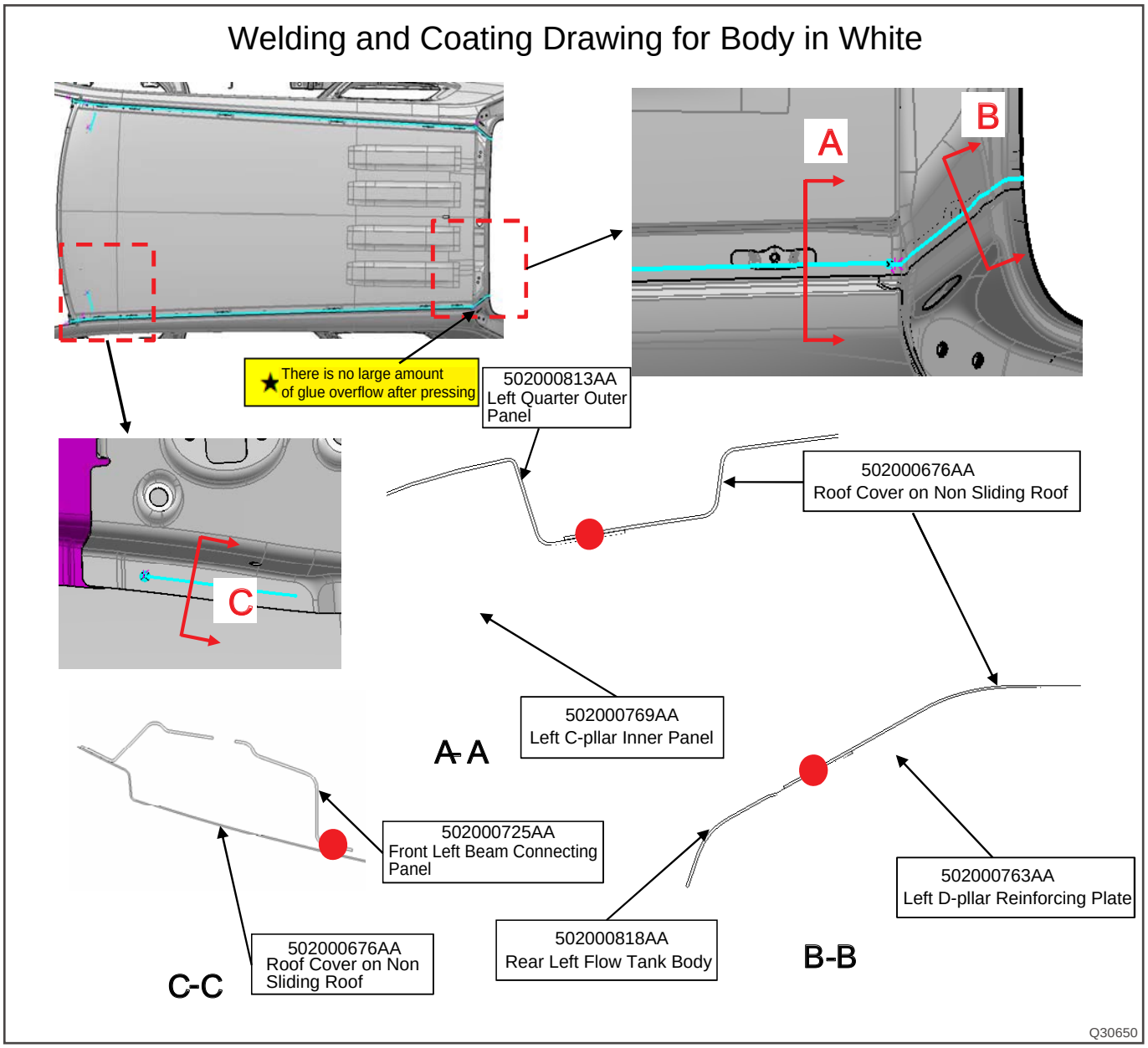
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Roof cover assembly - with sliding roof	B11-4102511 hemming adhesive B11-4102811 damping adhesive	Bonding (hemming adhesive, structural adhesive): √ Damping (expanding damping adhesive): √	2 - 3 mm 4 ~ 8 mm	1. At section A: Coating diameter of hemming adhesive is φ2 - 3 mm, distance between center of adhesive and edge is 6 ～ 8 mm, there are 12 sections, length is about 3700 mm. 2. At section B: Coating diameter of damping adhesive is φ4 ~ 8 mm, there are 3 sections, distance between center of adhesive and edge is 10 mm. Coating length on both sides is about 88 mm, coating length in the middle is about 115 mm, and the overall length is about 291 mm. At section C: Coating diameter of damping adhesive is φ4 ~ 8 mm, there are 5 sections, adhesive is applied along adhesive tank, length is about 315 mm. 3. At section D, coating diameter of damping adhesive is φ4 ~ 8 mm, there are 12 sections symmetrical coating, adhesive is applied along adhesive tank. Overall length of coating on left and right is about 320.2 mm*2; 4. Adhesive is applied continuously and evenly. 5. Perform coating operation by robot.
Between panoramic sliding roof cover and sliding roof mounting plate				
Between panoramic sliding roof cover and left/right sliding roof connecting plate				

■ Body Assembly - Sliding Roof (Roof Cover Beam Area)



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly - sliding roof (roof cover beam area)	B11-4102811 damping adhesive 505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √ Damping (expanding damping adhesive): √	Φ4 ~ 8 mm Φ5 mm	1. At A, B: Coating diameter of damping adhesive is φ4 ~ 8 mm, there are 15 sections, adhesive is applied along adhesive tank. Length is about 812 mm; 2. At C: Coating diameter of structural adhesive is φ3 mm, there are 3 sections (both sides and middle), length is about 376 mm; 3. At D: Coating diameter of damping adhesive is φ4 ~ 8 mm, there are 2 sections, adhesive is applied along adhesive tank. Length is about 278 mm; 4. The adhesive is applied continuously and evenly.
Damping adhesive between panoramic sliding roof cover and rear roof beam reinforcing plate				
Structural adhesive between sliding roof mounting plate and front roof beam				
Damping adhesive between panoramic sliding roof cover and front roof beam				
Damping adhesive between panoramic sliding roof cover and rear sub center beam				

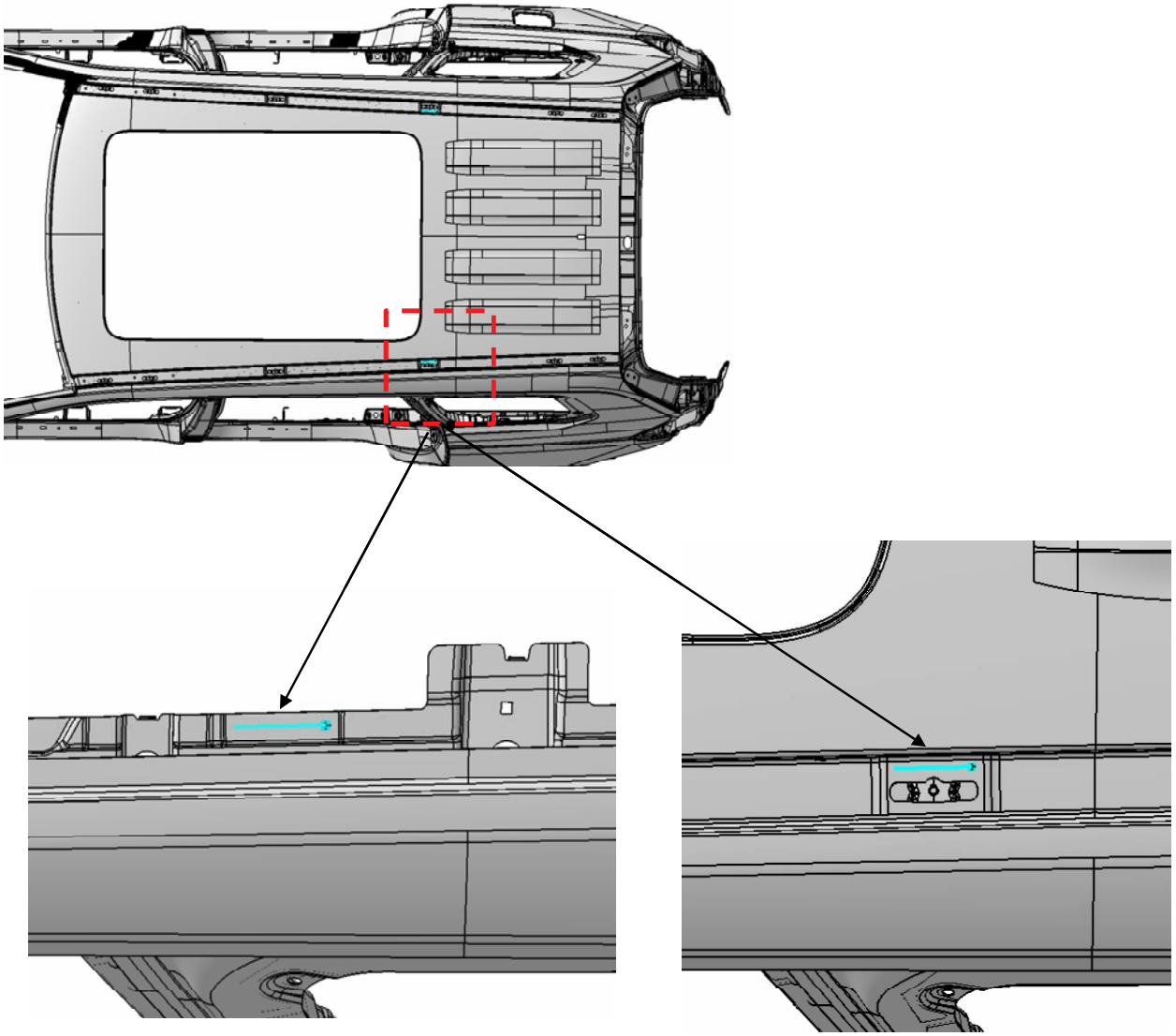
■ Body Assembly (Roof Cover Area) (Symmetric)



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (roof cover area) (symmetric)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	1. Hemming adhesive: At section A and section B, coating diameter is φ3 mm, distance between center of adhesive and edge is 6 ～ 8mm, overall length of coating on left and right is about 2554.4 mm*2; 2. Damping adhesive: At section C, the distance between the two ends of coating and the edge of sheet metal step is greater than 30 mm, overall length of coating on left and right is about 82 mm*2; 3. The adhesive is applied continuously and evenly, the operation is symmetrical.
Between left quarter outer panel and roof cover without sliding roof				
Between rear left gutter channel body and roof cover without sliding roof				
Between front left beam connecting plate and roof cover without sliding roof				

■ **Body Assembly (Roof Cover Area) (Symmetric)**

Welding and Coating Drawing for Body in White



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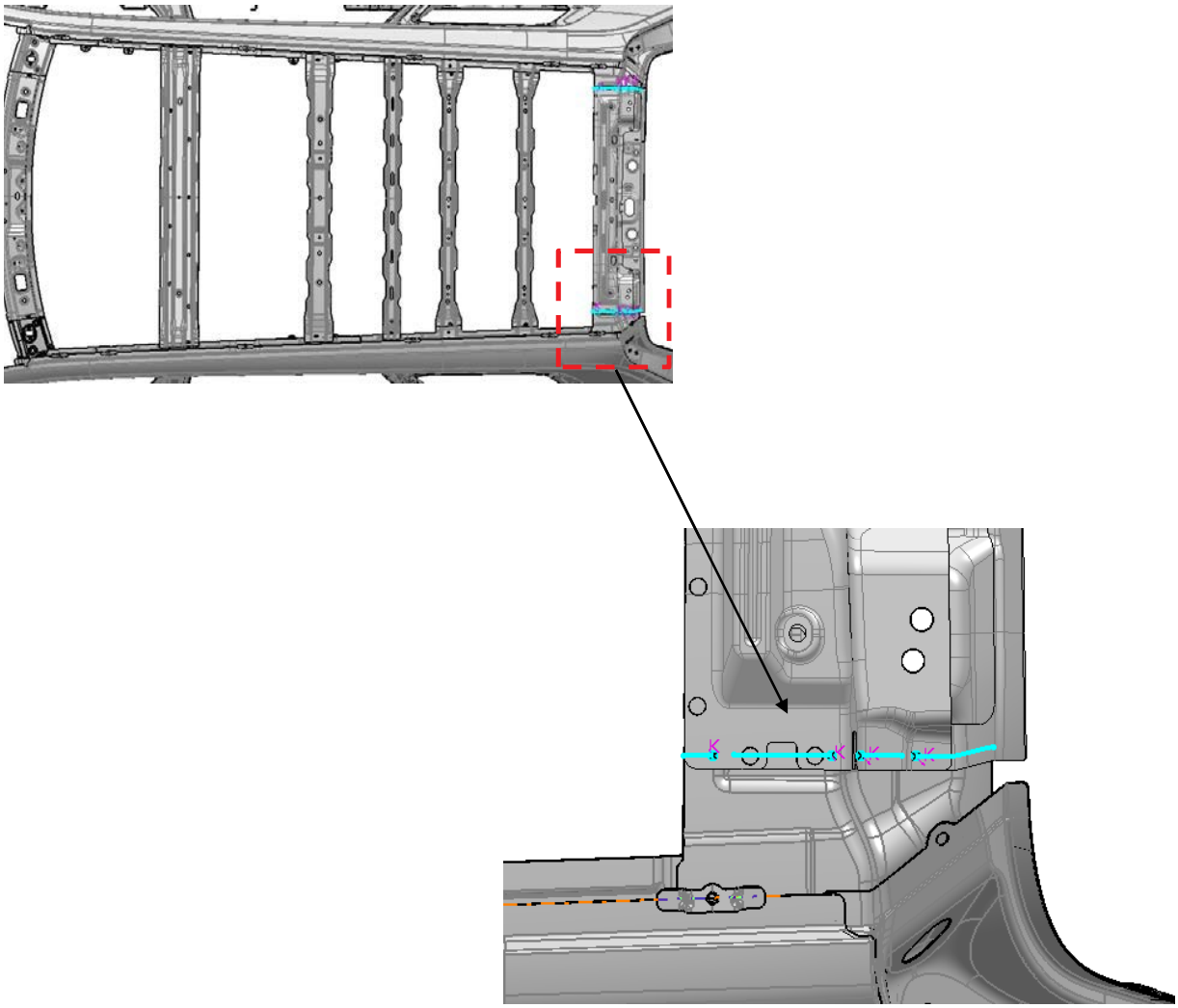
Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (roof cover area) (symmetric)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	1. Coating diameter is φ4 mm, distance between center of adhesive and edge is 6 ～ 8 mm, there is 1 section, overall length of coating on left and right is about 56 mm*2; 2. The adhesive is applied continuously and evenly, the operation is symmetrical.
Left quarter assembly and panoramic sliding roof cover				
Rear right side rail assembly and rear floor body assembly				

■ **Body Assembly (Roof Cover Area) (Symmetric)**

Welding and Coating Drawing for Body in White

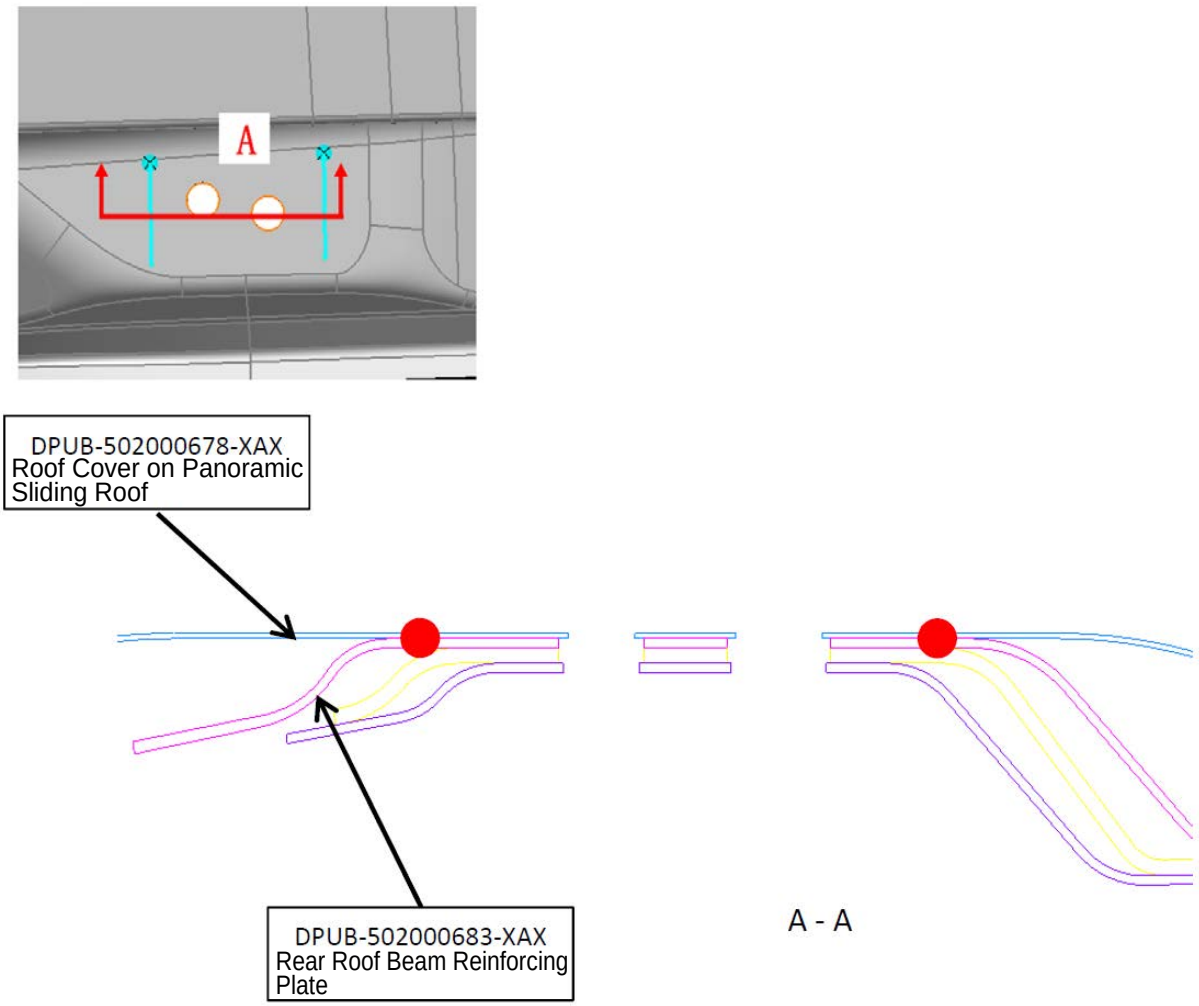


Q30670

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (roof cover area) (symmetric)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	1. Coating diameter is φ4 mm, distance between center of adhesive and edge is 6 ～ 8 mm, there is 4 section, overall length of coating on left and right is about 126mm*2; 2. The adhesive is applied continuously and evenly, the operation is symmetrical.
Left D-pillar reinforcing plate and rear roof beam assembly				
Rear right side rail assembly and rear floor body assembly				

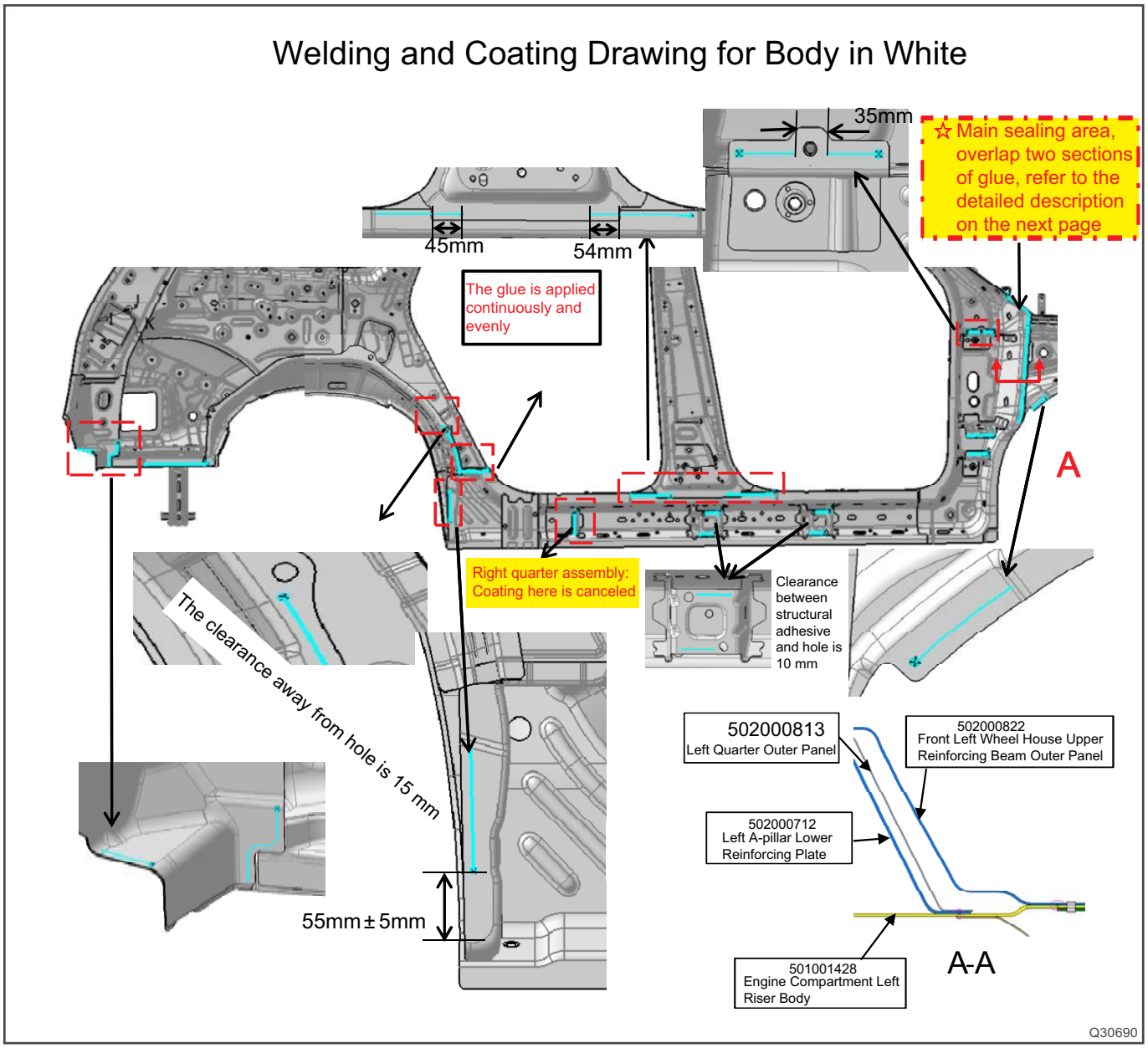
■ **Body Assembly (Rear End Area) (Symmetric)**

Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (rear end area) (symmetric)	505000011AA shock structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ5	1. Hemming adhesive: Coating diameter is φ3 mm, there are 2 sections, the coating position is shown in the figure, distance between center of adhesive and edge is 6 ～ 8 mm, overall length of coating on left and right is about 74 mm*2; 2. The adhesive is applied continuously and evenly, the operation is symmetrical.
Between rear beam reinforcing plate and roof cover				
Rear right side rail assembly and rear floor body assembly				

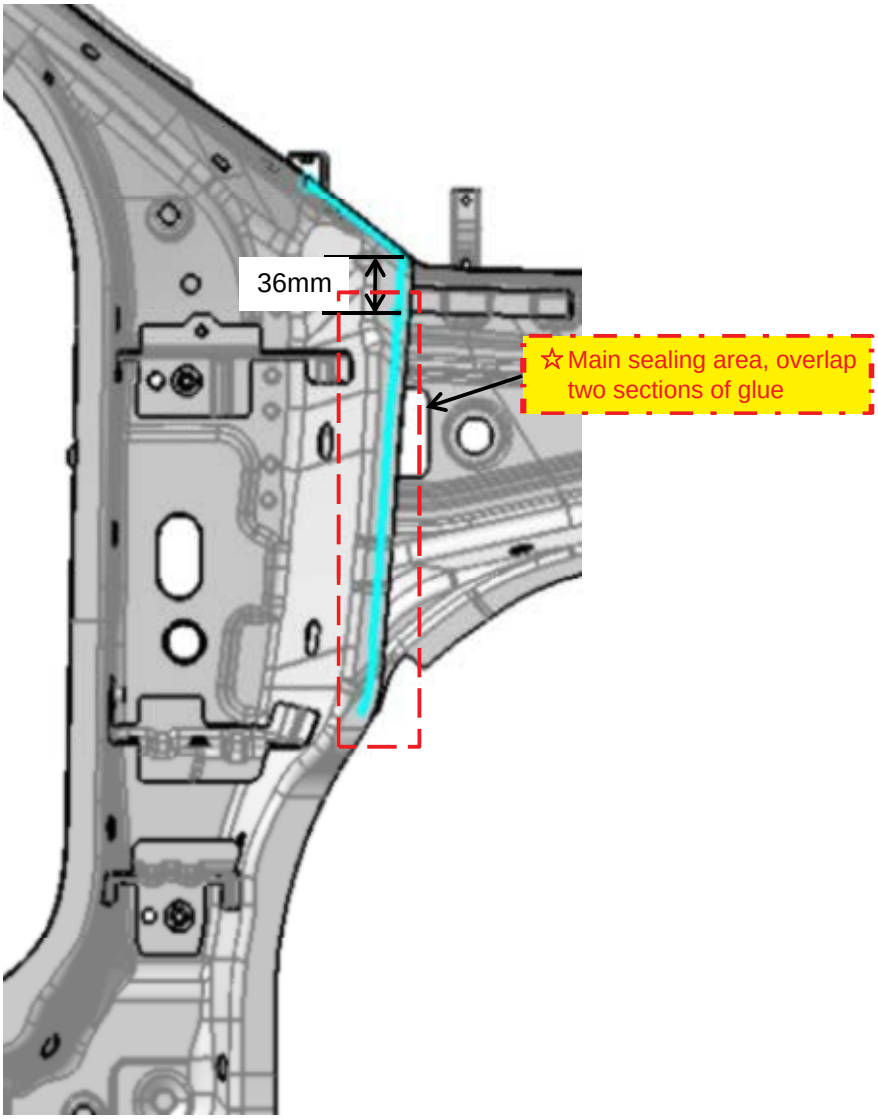
■ Body Assembly (Quarter Area) (Symmetric)



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (-quarter area) (symmetric)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	1: Structural adhesive: Coating diameter is φ4 mm, there are 18 sections, overall length on left and right is about 2002 mm*2; 2. The adhesive is applied continuously and evenly, the operation is symmetrical.
Between left quarter assembly and lower assembly				

■ **Body Assembly (Quarter Area) (Symmetric)**

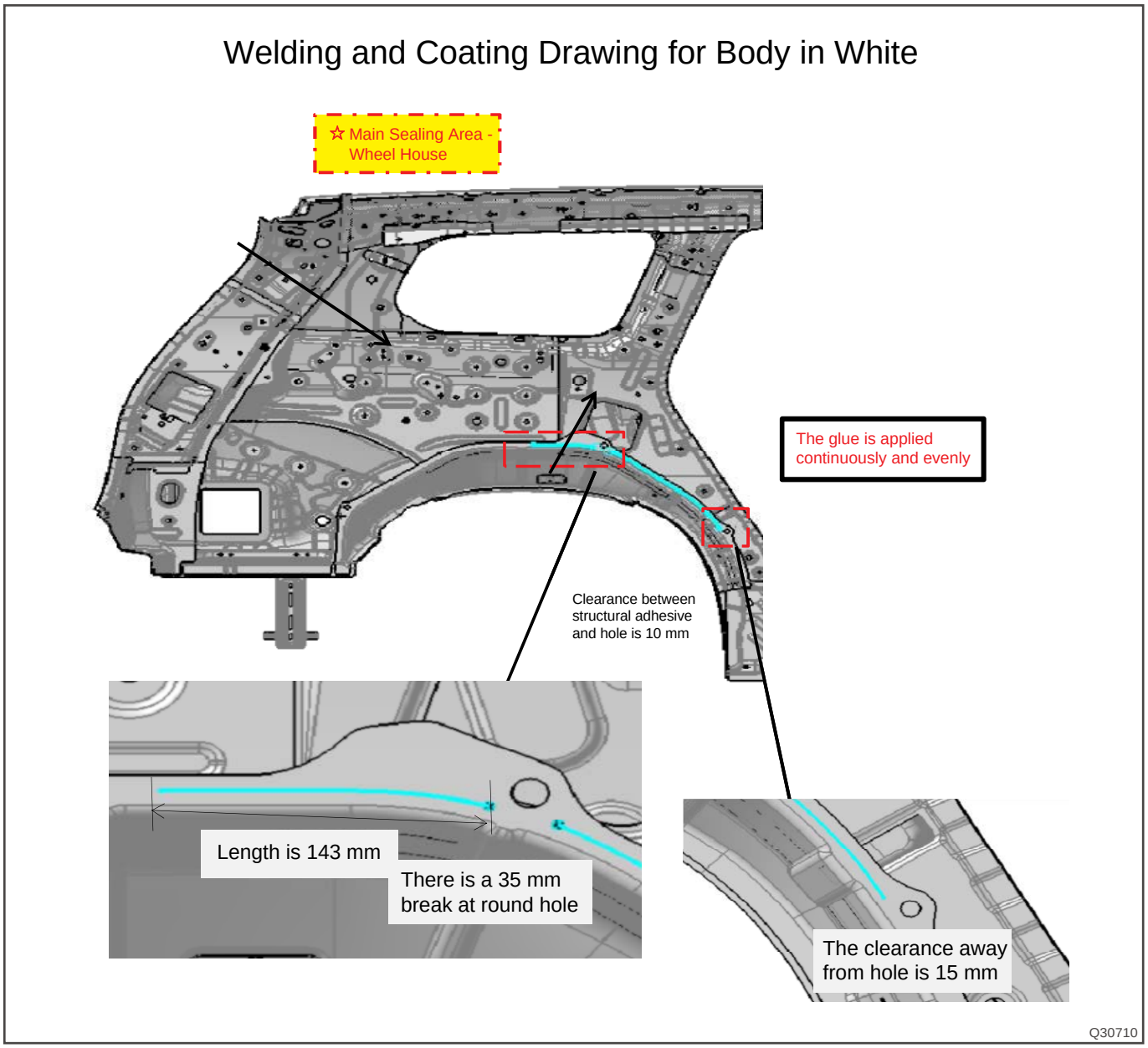
Welding and Coating Drawing for Body in White



Q30700

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (-quarter area) (symmetric)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	1: Structural adhesive: Coating diameter is φ4 mm, there are 1 sections, overall length on left and right is about 338mm*2; 2. The adhesive is applied continuously and evenly, the operation is symmetrical.
Between left quarter assembly and lower assembly				
Rear right side rail assembly and rear floor body assembly				

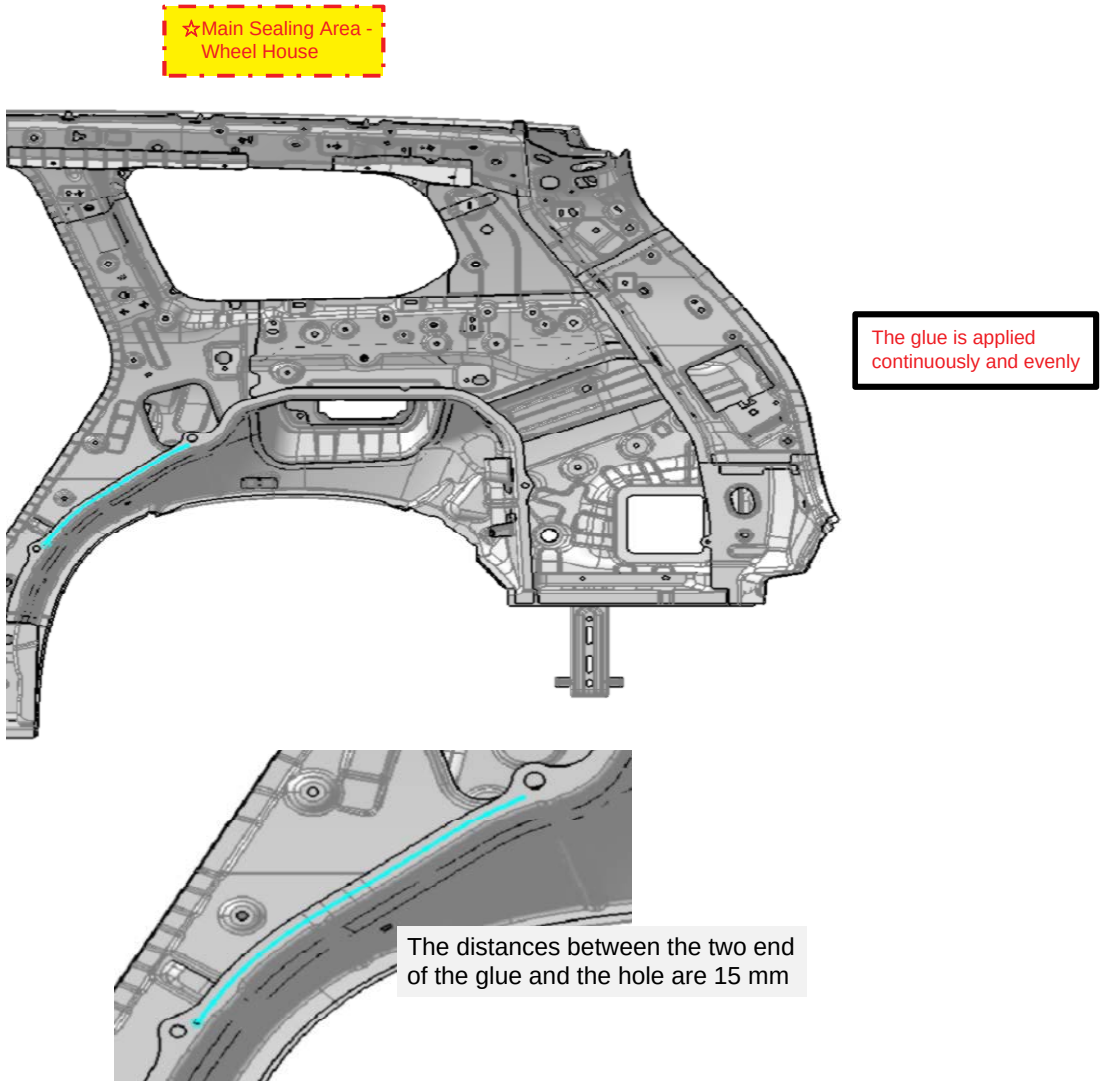
■ Body Assembly (Quarter Area)



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (-quarter area)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	• Hemming adhesive: Coating diameter is φ4 mm, there are 2 sections, length is about 484 mm; • The adhesive is applied continuously and evenly, the operation is symmetrical.
Between left quarter assembly and lower assembly				

■ Body Assembly (Quarter Area)

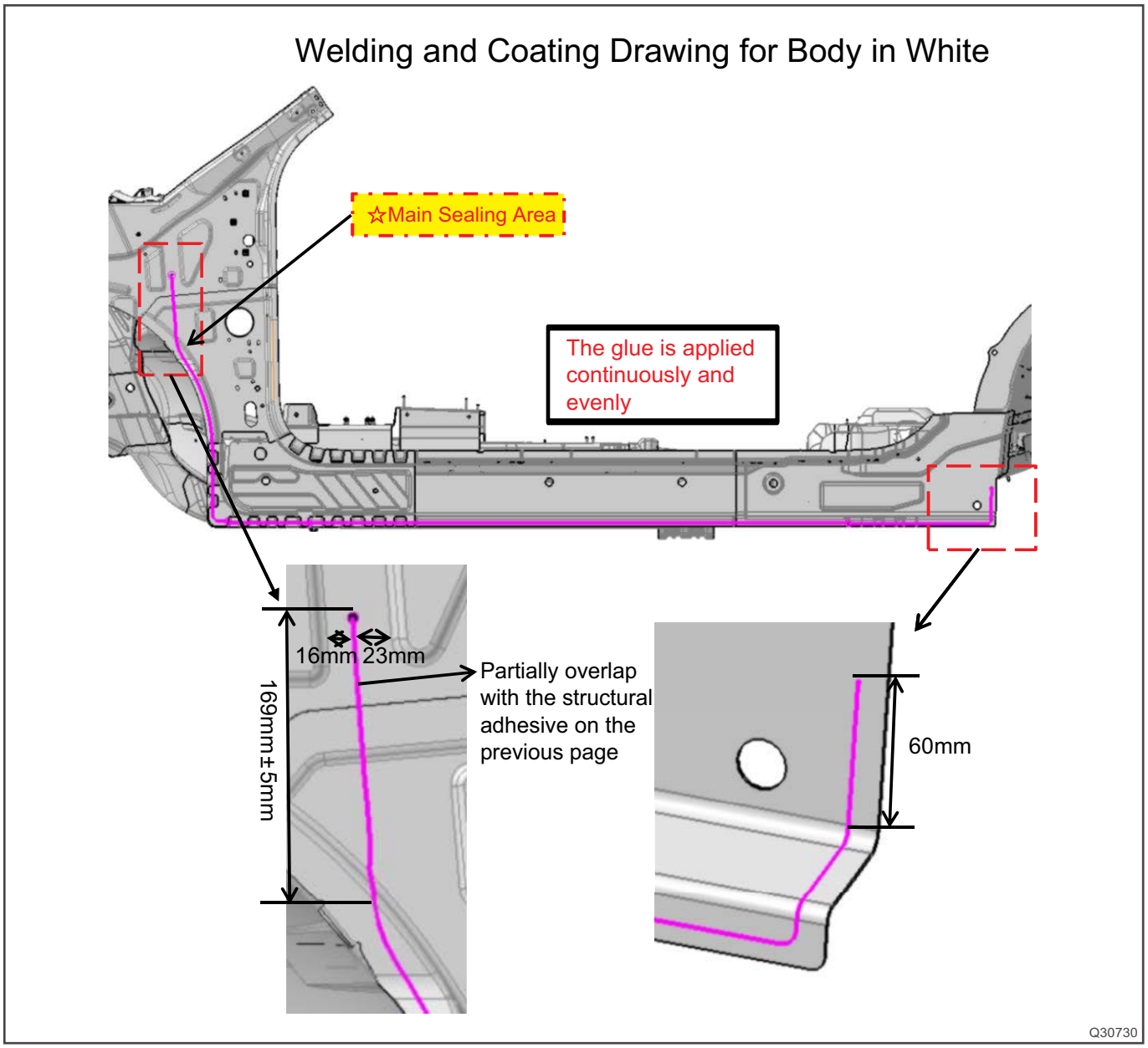
Welding and Coating Drawing for Body in White



Q30720

Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (-quarter area)	505000012AA structural adhesive	Bonding (hemming adhesive, structural adhesive): √	Φ4	• 1. Hemming adhesive: Coating diameter is φ4 mm, there is 1 section, length is about 344 mm. • 2. The adhesive is applied continuously and evenly, the operation is symmetrical.
Between right quarter assembly and lower assembly				

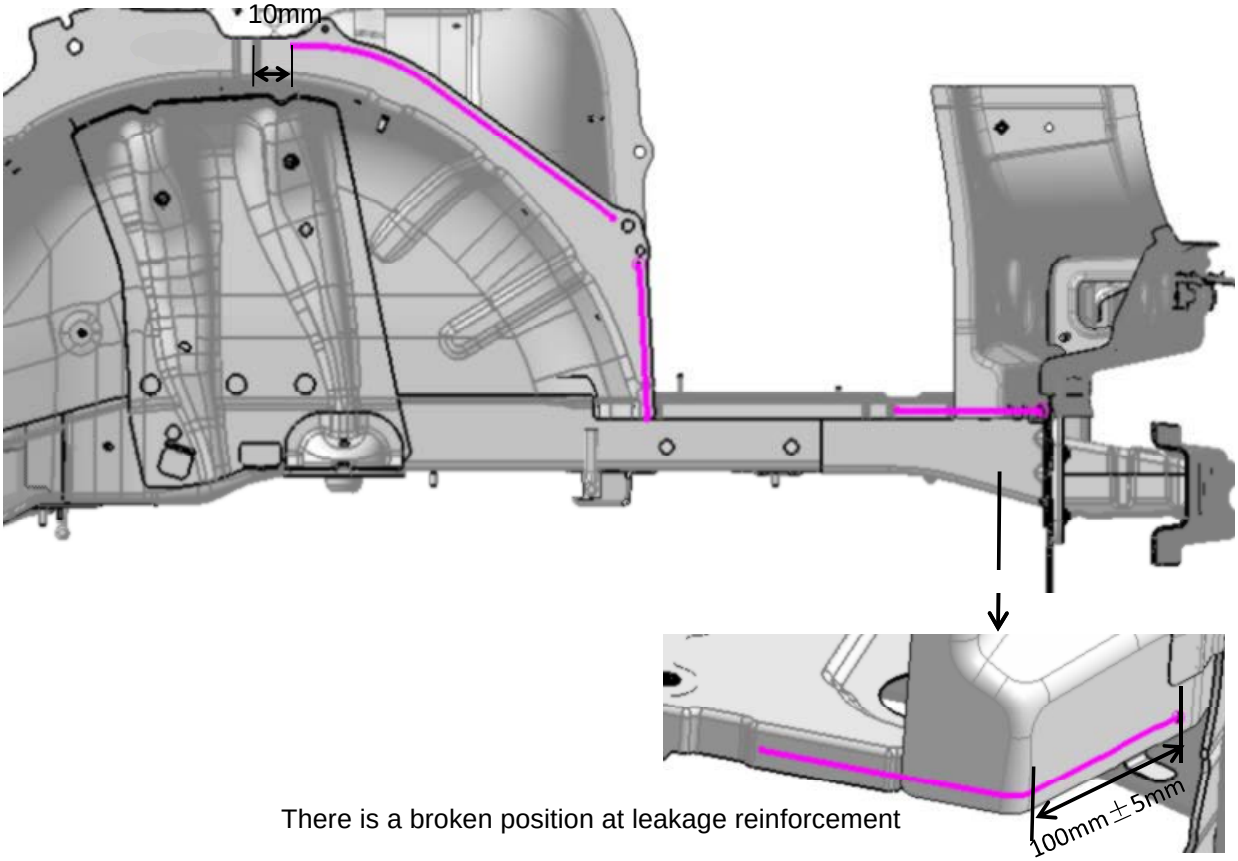
■ Body Assembly (Quarter Area) (Symmetric)



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (-quarter area) (symmetric)	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √	Φ4	• Spot welding seal gum: Coating diameter is φ4 mm, there are 3 sections, overall length on left and right is about 2548 mm*2; • The seal gum is applied continuously and evenly, the operation is symmetrical.
Between left quarter assembly and lower assembly				

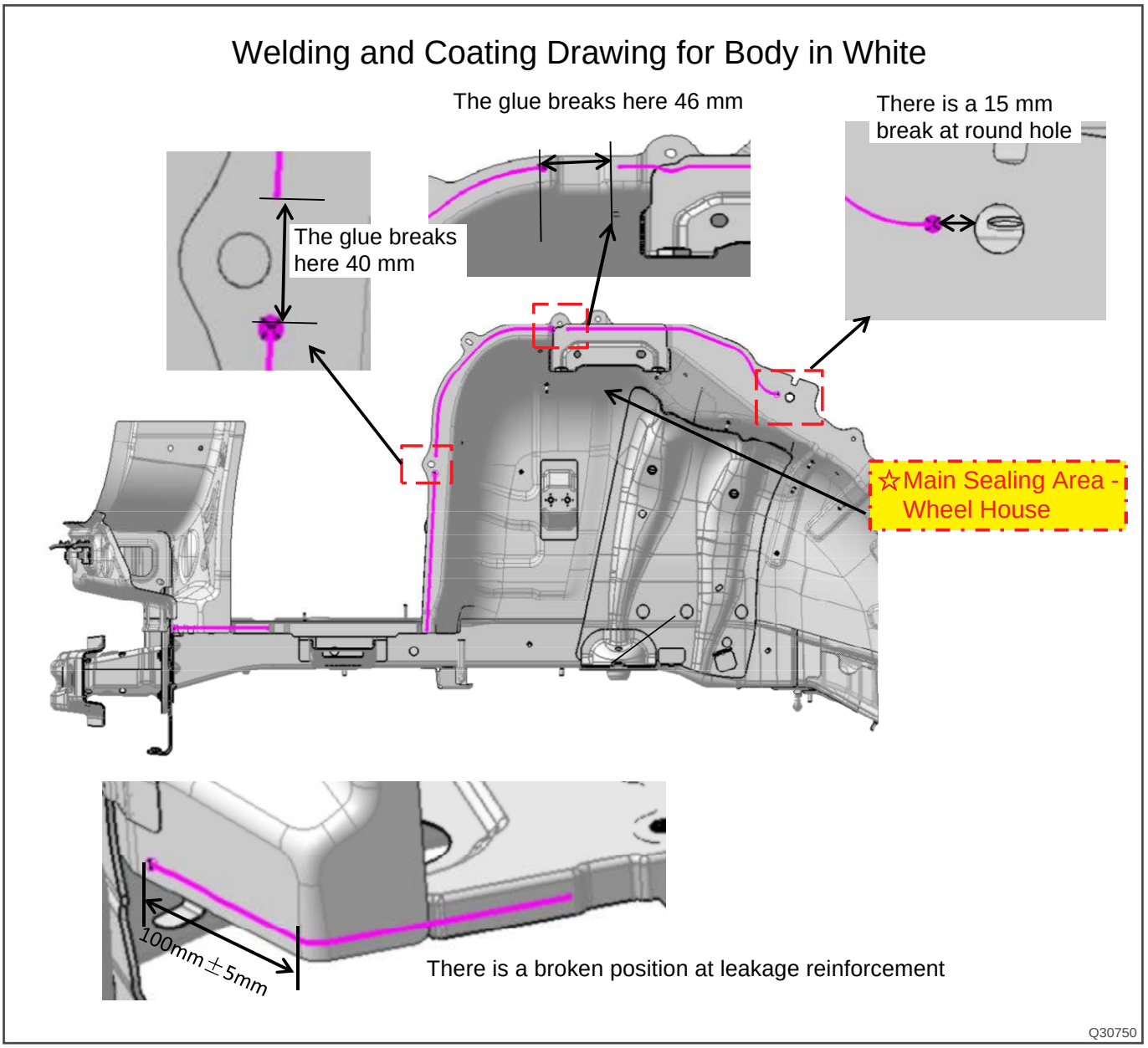
■ **Body Assembly (Quarter Area) (Only Left Side)**

Welding and Coating Drawing for Body in White



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Body assembly (-quarter area) (only left side)	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √ Bonding (hemming adhesive, structural adhesive): √	Φ4	• Spot welding seal gum: Coating diameter is φ4 mm, there are 4 sections, overall length is about 935 mm; • The seal gum is applied continuously and evenly, only for left side operation.
Left quarter assembly and lower assembly				

■ **Body Assembly (Quarter Area) (Only Right Side)**



Coating Position	Coating Type	Coating Purpose	Height (mm)	Coating Requirement
Right quarter assembly and lower assembly	B11-4102613 spot welding seal gum	Sealing (spot welding seal gum thumb glue): √ Bonding (hemming adhesive, structural adhesive): √	Φ4	• Spot welding seal gum: Coating diameter is φ4 mm, there are 4 sections, overall length is about 1182mm; • The seal gum is applied continuously and evenly, only for right side operation.
Right quarter assembly and lower assembly				

4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:
In the procedure of repairing body, professional technicians need to use beam calibrator, electronic measurement system, body metal plate repair machine, welding machine and various polishing and cutting tools to ensure that the vehicle can restore to the original level in terms of geometric dimensions and usage performance. However, sometimes there are missing failure, which may cause serious consequences for driving system and assembly suspension failure when repairing the accident vehicle. Therefore, in addition to checking the necessary body geometric dimensions, special attention must be paid to the following components:

- Check to make sure that the steering mechanism and steering link can operate correctly within the number of rotations of steering wheel, and visually check for bent or cracked parts.
- Check all components of the driving system (such as fork pipe/rail arm, suspension sliding arm, steering knuckle, lateral stabilizer bar, frame, and mounting) for bending, twist and crack.
- Check wheel and tire for damage, concentric rotation and unbalance. Check the tire pattern and tire wall for cuts, and check the tire pressure.
- Check engine/transmission/exhaust system mounting for damage.
- Perform a road test to ensure vehicle driving ability, finally deliver the vehilcle to users.

5 Removal & Installation

5.1 Removal & Installation

■ Removal

⚠ Caution

- **Before replacing the critical parts of the body, it’s necessary to use the universal body calibration frame to calibrate the body, and then determine the damaged parts to be replaced. Before welding, it is necessary to perform accurate positioning of components, and then carry out measurement to ensure that the components meet the requirements of body dimensions before welding. In the process of welding, measure frequently to ensure the correct assembly.**
- **It’s necessary to understand the welding and assembly relationship among body metal plates before removal. Please refer to Body Metal Plate Components View. Cutting the parts separately is not suggested. The rigidity, driving safety and service convenience of the vehicle will be affected after cutting and welding.**

(1) Remove all plates and components related with replacement components.
(2) Remove sealant and anti-corrosion materials if necessary.
(3) Locate, mark and drill all factory welding points that connect components to be replaced.
(4) Remove the damaged replacement component.
(5) Remove the residue material.

■ Installation

⚠ Caution

- **After installation, check whether the fastening is firm and there can be no looseness.**

(1) Treat the mating surface beforehand if necessary.
(2) Select the correct welding method according to original vehicle welding type. Use shielded welding where it’s inconvenient for resistance welding. If plug welding is selected, drill holes for plug welding on new parts, and determine the diameters and spaces of plug welding holes according to the original welding points.
(3) Place new parts on the vehicle temporally.
(4) Assemble and secure the new components with the calibration support (locate service plate correctly).
(5) Measure positions of new parts to ensure their correct assembly dimensions.

(6) Perform the corresponding welding.
(7) Clear all welding surfaces.
(8) Spray the primer.
(9) Spray the sealant and anti-corrosion materials if necessary.
(10) Install all related plates and components.

12.11 INFORMATION AND REPAIR OF PLASTIC PANEL

1 Warnings and Precautions

1.1 Warnings

In order to avoid possible property loss, personal injury or death, always follow the instructions below before repair.

(1) Use service materials in a well ventilated environment because the soot particles produced by the service materials are toxic.

(2) Apply protective cream to exposed skin to prevent skin irritation.

1.2 Precautions

In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

(1) Wear rubber gloves.

(2) Wear protective glasses when using compressed air and sanding.

(3) Immediately clear any mixture that contacts your skin because mixture solidifies quickly.

(4) Wear dust boot and protective glasses when grinding or sanding.

(5) Clean your skin with cold water to reduce the slight irritation of resin dust on your skin.

(6) Avoid service materials sticking to your clothes.

(7) After using, close all service material containers. Dust or moisture will pollute service materials and reduce service effect.

2 System Overview

2.1 System Description

- The materials of interior and exterior surface covering parts are modified PP, ABS, PC + ABS and PVC (-artificial leather materials), which are all thermoplastic plastics and its modified materials. The materials of interior and exterior non-surface covering parts also uses POM, PA and HDPE materials etc. Thermosetting plastic is mainly used as construction part in electronic appliance and safety component. Repairing thermoplastic part uses hot soldering iron plastic materials to fill the welding machine, but the common service uses replacement method. Thermosetting plastic can use epoxy resin or other harder two-component service materials. In this chapter, its service method is simply introduced while the service is not suggested.
- Thermosetting plastic refers to the plastic that can solidify or has insoluble (melting) characteristics under heating or other conditions, such as phenolic plastic, epoxy plastic, etc. Thermoplastic refers to the plastic that can be repeatedly heated, softened, cooled and hardened within a specific temperature range, such as polyethylene, polytetrafluoroethylene, etc. Thermoplastic and thermosetting plastics can be either hard plastic or soft plastic.

3 Inspection and Adjustment

3.1 Repair of Thermosetting Plastic Dent

■ Repair

⚠ Warning
• **Wear rubber gloves.**

(1) Clean and dry the components to be repaired.

(2) Heat the dent position with a hot air blower until the dent can be flattened with an appropriate tool.

(3) Polish the dent area with abrasive paper/emery paper.

(4) Then clean service area with cleaner and dry it out for 5 minutes.

(5) Apply a thin layer of adhesive on it and dry it out for 10 minutes.

(6) Fill the uneven surface with adhesive and smooth it with trowel.
(7) Accelerate solidifying process with infrared lamp, adjust the temperature to 60 - 70 ˚C and heat it for 15 minutes.
(8) Polish the dent area with abrasive paper.
(9) Remove dust and debris.
(10) Apply a thin layer of adhesive on it and dry it out for 10 minutes.
(11) Restore paint surface according to the repairing procedure on paint surface of plastic parts.

3.2 Repair of Thermosetting Plastic Scratch

■ **Repair**

⚠ **Warning**
• **Wear rubber gloves.**

(1) Clean and dry the components to be repaired.
(2) Remove protruding materials with abrasive paper.
(3) Then clean service area with cleaner and dry it out for 5 minutes.
(4) Apply a layer of adhesive on it and dry it out for 10 minutes.
(5) Fill the uneven surface with adhesive and smooth it with trowel.
(6) Accelerate solidifying process with infrared lamp, adjust the temperature to 60 - 70 ˚C and heat it for 15 minutes.
(7) Polish the dent area with abrasive paper.
(8) Remove dust and debris.
(9) Apply a thin layer of adhesive on it and dry it out for 10 minutes.
(10) Restore paint surface according to the repairing procedure on paint surface of plastic parts.

3.3 Repair of Thermosetting Plastic Crack (The Length is Less Than 100 mm)

■ **Repair**

⚠ **Warning**
• **Wear rubber gloves.**

(1) Clean and dry the components to be repaired.
(2) Chisel crack end for 5 mm and polish crack to V-shape to eliminate internal stress and protruding area.
(3) Then clean service area with cleaner and dry it out for 5 minutes.
(4) Apply a layer of adhesive on it and dry it out for 10 minutes.
(5) Stick reinforcing tape to the back of service part with adhesive and overlap the damaged part for at least 20 mm.
(6) Accelerate solidifying process with infrared lamp, adjust the temperature to 60 - 70 ˚C and heat it for 15 minutes.
(7) Fill the front part of crack with adhesive and smooth it with trowel.
(8) Accelerate solidifying process of the front part of crack with infrared lamp.
(9) Polish the dent area with abrasive paper.
(10) Apply a thin layer of adhesive on it and dry it out for 10 minutes.
(11) Remove dust and debris.
(12) Apply a layer of adhesive on it and dry it out for 10 minutes.
(13) Restore paint surface according to the repairing procedure on paint surface of plastic parts.

12.12 PAINT COATING

1 Warnings and Precautions

1.1 Warnings

Be sure to observe the following instructions before mixing paint and painting, to prevent property damage, personal injury or even death.

(1) In the process of mixing and spraying paint, diffuse solvents can cause serious respiratory disease. It's necessary to operate in strict accordance with the manufacturers' instruction manual of paint, device and safety device. When performing the operation of this procedure, wear special labor protection appliances such as gas mask, anti-static clothing, protective glasses and gloves etc. to prevent injury.

1.2 Precautions

Never mix paint systems of different manufacturers or substitute products before mixing paint and painting. When incompatible products are mixed, the following phenomena will occur:

(1) Primer peels off.

(2) Adhesion between coatings is poor.

(3) Curing is not completely.

(4) Gloss is reduced.

(5) Color accuracy is poor.

(6) Coating is damaged (dent, bubble, wrinkle without gloss).

1.3 Precautions during Finish Varnish Maintenance and Repair

(1) Avoid washing vehicle in direct sunlight.

(2) Avoid using strong soap and chemical detergent.

(3) Use the brushless automatic car-cleaning equipment.

(4) Avoid using products containing acid and alkali.

(5) Do not use a brush or broom to remove snow or ice.

(6) After cleaning it completely, wipe the remaining rinse water immediately and forbid to make it dry on the surface. It is recommended to dry it with soft chamois leather.

(7) When the defect on the surface can be eliminated by polishing, the vehicle can be polished.

(8) If the surface defect is not serious, try to eliminate the repairing area.

(9) Avoid removing too much celluloid paint, otherwise it cause the paint damage prematurely.

(10) Use electric polishing device in strict accordance with the requirements recommended by the polishing manufacturer. Do not use wax or silicone products to cover the vortex imprinting (the imprinting will reappear soon and make the user unsatisfied).

1.4 Precautions of Anti-corrosion Treatment

(1) When spraying sound insulation or anti-corrosive materials, preventive measures must be taken to avoid spraying into component openings (such as door locks, window regulator slots, window regulators and seat belt retractors) and any moving and rotating components. After spraying the materials, make sure that all drain holes on the body are open.

(2) When using open flame to repair the body, it's necessary to remove the foamed sound insulation materials at the repair areas. When reinstalling the sound insulation materials, avoid inhaling dust that is harmful to the human body.

(3) When performing the operation of this procedure, wear special protective glasses and gloves to prevent injury.

(4) When the vehicle leaves the factory, it's necessary to deal with the body metal plates by means of spraying electrophoretic primer. After repairing and / or replacing parts, it's necessary to deal with all exposed metal surfaces with anti-rust primer.

(5) If the original coating or anti-corrosive material is burnt during welding or heating operation, remove it and carry out anti-corrosion treatment again.

(6) When carrying out collision service, the metal will be exposed, and it’s necessary to spray these surfaces with special anti-corrosion materials.

(7) Sealant can prevent water and dust from entering the vehicle and it has anti-corrosion function. The original sealed joint is obvious, if these seals are damaged, reseal to calibrate them. Reseal the connection of the newly replaced plate. The sealant used should be flexible after curing and painting. Fill the opening seams sealed with sealant with high consistency filler. Perform operation according to the instructions for the selected material.

(8) The sound insulation material can control the general noise level in the vehicle. When the sound insulation layer is damaged due to service operation or replacing new panels, it’s necessary to replace it with the same material.

2 System Overview

2.1 Description & Operation

■ Paint Coating Description

Paint is a kind of mixed liquid, which can be applied on a variety of base material. After the paint is dry, it forms a solid paint film to protect the base material and beautify the appearance. When the vehicle is delivered out of the factory, the following four layers of paint have been applied to make it have good anti-corrosion and gloss. It mainly consists of the following types:

- Electrophoretic primer
- Intermediate paint
- Pigmented paint
- Celluloid paint (transparent external coating)

■ Main functions of electrophoretic primer:

- Anti-rust
- Improve the adhesion during working
- Provide limited filling capability

■ Functions of intermediate paint:

- Filling capability
- Isolation/sealing
- Serve as the pigmented paint

■ Main functions of pigmented paint:

- Enrich the color
- Improve the gloss

■ Functions of celluloid paint:

- It contains ultraviolet-proof materials, which can resist the ultraviolet rays in the sun.
- Resist the corrosion of environmental dust (acid rain) on the paint surface.
- Make the paint surface friction resistant.
- Make paint surface have better gloss.

■ Requirements of spraying paint

- Restore the repaired part to its original appearance; During repair, it is necessary to observe the spraying paint process specified by the manufacturer, refer to Tips on Spraying Process of Paint with Rigid Surface.

2.2 Daily Maintenance of Vehicle Paint Surface

The maintenance of the body aims mainly to prevent the early aging and damage of the coating to keep the body clean and beautiful. In addition, keeping the body clean helps to find the damage of the body coating at any time to repair it in time.

■ Washing Body

- It’s necessary to wash the body frequently to keep good paint surface and beauty of the body. However, it should not be performed in strong sunlight or in low temperature condition. In any case, do not wash it until body surface cools. Wash the dirt on the body surface with pressure water flow when using spraying-water washing, and then scrub the body surface with soft and clean sponge or towel from top to bottom. If car detergent is used, wash it with large amount of water. When using the high-pressure washing machine, do not turn the nozzle directly to transmission, steering gear, radiator, engine cover, rubber

protective parts of various components and external ornaments. After washing the car, use high-quality white gauze to dry the body surface. Never use gasoline, kerosene, trichloroethylene, strong alkaline water and alcohol to scrub the body surface and organic glass surface.

■ Cleaning Body

- Before using the wax on the car body coating, remove the oxide, road dirt, oil stain and the dirt that cannot be cleaned firstly. Do not scrape off the asphalt or gasoline stains on the body and bumper, and do not use gasoline or fabric decontamination agent, but use special decontamination products to remove them in time.
- For cleaning of body exterior ornaments and light alloy, firstly use soapy water or water that adds a small amount of decontamination agent or detergent, and then wash with a large amount of water. For scrubbing of windshield and door glass, it is better to use the washer fluid supplied by EXEED service station so as to obtain high-quality scrubbing effect, instead of using silicone based products.

■ Waxing and Polishing Body

- Waxing the body surface is one effective method that protects the gloss of paint coating surface. Wax can protect the paint coating surface well because after waxing, enough grease is kept on the paint surface, which cuts off the contact between water, air and the paint coating, and the coating is free from oxidization, which can effectively prevent the body surface from being eroded. Before waxing, make sure that the body surface is clean and dry; if the paint surface is discolored or oxidized, it’s necessary to paint it before waxing.
- It’s better to use the waxing tool for polishing wax. If not, wax it with a soft napkin or a soft and lint-free cotton or flannel. Because waxing will change in the sunlight in most cases, sometimes there will be spots on the body surface when waxing in the sunlight, do not wax it in the direct sunlight.
- Water droplet test can be used to check if waxing the body is good. If the water forms a water ball on the body surface, it proves there is the wax layer, otherwise, it needs to be cleaned and waxed.
- Do not wipe off the wax on the body too early and polish it after drying. Polishing the body paint should be carried out when the surface is clean and dry with a polisher (or by hand). Polishing any plastic parts is forbidden.

■ Restoring Scratch on Body Surface

- When the scratch on the body surface is not serious and does not reach the metal, the special paint repair spraying tank can be used. Spraying the paint marked the same color to the scratch surface. The repaired paint will be dry in the air.
- If the scratch on the body surface has damaged the metal with rust stain, remove the rust firstly, then scratch the putty with rubber or nylon scraper, and then perform general repair treatment for the paint and coating surface.

■ Maintenance of Bottom Protective Layer

- There is a protective layer on the bottom of the car, which has a permanent anti-chemical corrosion and mechanical trauma. The car bottom may contact with the road during driving, causing damage to the protective layer of the car bottom. It needs regular inspection and timely service.

■ Treatment of Cavity Anti-corrosion

- If the external temperature is very high, the wax may flow out of the cavity, which can be removed with a plastic scraper. At this time, pay attention to safety and environmental protection. All cavities that may be corroded on the car have been filled with wax for anti-corrosion before leaving factory. Maintenance is free in general condition.

3 Specifications

3.1 Paint Specifications

No.	Material Name	Note
1	Khaki white pearl paint	/
2	Blood red flashing finish paint	/
3	Princess blue metallic finish paint	/
4	Dazzling orange metallic finish paint	/

No.	Material Name	Note
5	Carbon crystal black metallic finish paint	/
6	Celadon gray metallic finish paint	/

4 Diagnostic Information and Steps

4.1 Problem Symptoms Table

Hint:
Use symptoms table below to help determine cause of problem. The black box in the table means the treatment method of product defects.

Symptom	Cause Analysis	Treatment Method
Efflorescence	1. The paint film is strongly eroded, such as strong ultraviolet ray. 2. The paint mix ratio is not correct during application. 3. Light and weather resistance of coating is poor. 4. Do not wash the car frequently or do not wash it completely. 5. The selected car cleaner is not suitable or the polishing wax is too coarse.	1. Polishing and beatifying treatment. ☐ 2. General grinding, polishing and beatifying treatment. ☐ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair. ■
Peeled off Paint on Plastic Parts	1. The adhesion between the coating and the base material is too poor or the upper coating is harder than the lower coating. 2. The coating is too thick, and the paint film is eroded by moisture, acid and alkali in the air. 3. The recoatability of the lower coating is not good, or the treatment is not good; the upper coating have defects such as pinholes, exposed bottom, etc.	1. Polishing and beatifying treatment. ☐ 2. General grinding, polishing and beatifying treatment. ☐ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair. ■
Honeycomb Cracks	1. Do not mix primer coating completely before spraying it. 2. Finish paint coating is too thick. 3. Floating coating is too thick.	1. Polishing and beatifying treatment. ☐ 2. General grinding, polishing and beatifying treatment. ☐ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair. ■
Bird Droppings Erosion	1. Bird droppings erode.	1. Polishing and beatifying treatment (mild erosion). ■ 2. General grinding, polishing and beatifying treatment (moderate erosion). ■ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair (-severe erosion). ■
Abrasion Imprinting	1. The paint film harness is not enough. 2. Hard objects scratch.	1. Polishing and beatifying treatment (minor scratches). ■

Symptom	Cause Analysis	Treatment Method
		2. General grinding, polishing and beatifying treatment (rough scratches). ■ 3. Depth grinding, polishing and refurbishing treatment. □ 4. Local spraying paint and repair (-scratch). ■
Corrosion	1. The paint film at the edge is thinner. 2. Collision damage causes corrosion. 3. Acid and alkali erode.	1. Polishing and beatifying treatment. □ 2. General grinding, polishing and beatifying treatment. □ 3. Depth grinding, polishing and refurbishing treatment. □ 4. Local spraying paint and repair (It is necessary to repair metal plate before spraying paint and repairing if there is serious corrosion). ■

Symptom	Cause Analysis	Treatment Method
Peeled off Paint	1. The adhesion between the coating and the base material is too poor or the upper coating is harder than the lower coating. 2. The coating is too thick, and the paint film is eroded by moisture, acid and alkali in the air. 3. The recoatability of the lower coating is not good, or the treatment is not good. 4. The upper coating have defects such as pinholes, exposed bottom, etc.	1. Polishing and beatifying treatment. ☐ 2. General grinding, polishing and beatifying treatment. ☐ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair (It is necessary to repair metal plate before spraying paint and repairing if there is serious corrosion). ■
Acid Rain Erosion	1. Acid rain erodes	1. Polishing and beatifying treatment (mild erosion). ■ 2. General grinding, polishing and beatifying treatment (moderate erosion). ■ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair (-severe erosion). ■
Loss of Gloss	1. The paint film is strongly eroded by acid, alkali, electric arc, sea water and salt mist. 2. The maintenance method of the paint film is not correct in the severe condition. 3. Durability of paint itself is not enough. 4. When the paint is applied, the incorrect mix ratio causes poor durability of the paint film.	1. Polishing and beatifying treatment (mild loss of gloss). ■ 2. General grinding, polishing and beatifying treatment (moderate loss of gloss). ■ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair (-severe loss of gloss). ■
Bubble	1. When the paint film is exposed to the humid environment for a long time, the moisture penetrates into the paint film and moisture raises bubbles when the temperature rises. 2. Base materials are corroded by penetrating materials. 3. The paint film is eroded by gasoline, acid and alkali.	1. Polishing and beatifying treatment. ☐ 2. General grinding, polishing and beatifying treatment. ☐ 3. Depth grinding, polishing and refurbishing treatment. ☐ 4. Local spraying paint and repair (It is necessary to repair metal plate before spraying paint and repairing if there is serious corrosion). ■

5 Removal & Installation

5.1 Examples of Common Paint Film Defects Treatment Process

(1) Clean the surface to be polished with degreasing material before polishing.

(2) Make the sponge wet firstly and squeeze out the excessive water.

(3) Apply a small amount of polishing wax to the surface to be polished, and adjust the speed of polishing machine.

(4) After the sponge contacts the paint surface, start the machine with the speed of 2500 - 3000 r/min. Then press it for 3 - 5 seconds gently before polishing.

⚠ Caution

- **During operation, keep the machine moving smoothly and gently, and avoid operating too long to avoid overheating and burning the paint surface.**

(5) Wipe off excessive polishing wax with waxing cloth.

5.2 Example of General Grinding, Polishing and Beatifying Treatment Process

(1) Clean the surface to be polished with degreasing material before polishing.

(2) Apply a appropriate amount of polishing paste to the surface to be polished, adjust the speed of polishing machine.

(3) After the polishing wool pad contacts the paint surface, start the machine with the speed of 2500 - 3000 r/min.

⚠ Caution

- **Keep the machine moving smoothly and gently and avoid grinding too much. Make sure that the grinding time is as short as possible and the grinding area is as small as possible.**

(4) Make the sponge wet firstly and squeeze out the excessive water; Apply a small amount of polishing wax to the surface to be polished, and start the machine with the speed of 2500 - 3000 r/min after the sponge contacts the paint surface. Then press it for 3 - 5 seconds gently before polishing.

⚠ Caution

- **During operation, keep the machine moving smoothly and gently, and avoid operating too long to avoid overheating and burning the paint surface.**

5.3 Example of Depth Grinding and Polishing Treatment Process

(1) Grind the damaged paint surface with # 2000 waterproof abrasive paper, make it parallel and contact with the paint surface to be ground, and carry out circular grinding.

(2) Clean grinding dust on the surface.

(3) Apply a appropriate amount of polishing paste to the surface to be polished, adjust the speed of polishing machine.

(4) After the polishing wool pad contacts the paint surface, start the machine with the speed of 2500 - 3000 r/min.

⚠ Caution

- **Keep the machine moving smoothly and gently and avoid grinding too much. Make sure that the grinding time is as short as possible (3 - 5 seconds) and the grinding area is as small as possible.**

(5) Make the sponge wet firstly and squeeze out the excessive water; Apply a small amount of polishing wax to the surface to be polished, and start the machine with the speed of 2500 - 3000 r/min after the sponge contacts the paint surface. Then press it for 3 - 5 seconds gently before polishing.

⚠ Caution

- **During operation, keep the machine moving smoothly and gently, and avoid operating too long to avoid overheating and burning the paint surface.**

5.4 Tips on Spraying Process of Paint with Rigid Surface

Hint:
Take the wing as an example to illustrate the local spraying (paint repair) process.

⚠ Caution

- **All paint repairs on rigid surfaces must comply with Geely standards. Confirm the repair area and select the repair scope, such as partial repair, whole pair repair, and whole vehicle repair; If it is collision damage, perform the corresponding repair after repairing metal plate or spray paint after replacing parts according to the damage condition.**

(1) If the scratch on the wing is severe, use local spraying (paint repair) process.
(2) Grind (circularly grind) the damaged paint surface with # P500 wet (waterproof) abrasive paper.
(3) Degrease and clean it with degreasant after grinding.
(4) When spraying he primer, try to control the scope of the primer and make sure the coating at the edge should be gradual instead of stair-step shape.
(5) Flash off for 4 - 5 minutes, and dry it and bake it for 20 - 30 minutes. The temperature of baking finish house is 70 - 80 ˚C.
(6) After baking, carry out the wet polishing with # P800-1000 abrasive paper.
(7) Grind it with # 2000 fine waterproof abrasive paper and expand grinding range.
(8) After polishing is completed, use sticky gauze to remove dust before spraying the paint.
(9) Spray the base coat.
    - Air pressure: 150 - 200 kPa
    - Spraying distance: 20 - 30 cm

⚠ Caution

- **The spraying range is slightly wider in one layer than in one layer for transition.**

(10) Flash off for 2 - 3 minutes, and spray the second base coat until the interface position is not obvious.
    - Air pressure: 150 - 200 kPa
    - Spraying distance: 20 - 30 cm
(11) Flash off for 4 - 5 minutes, and dry it for 20 - 30 minutes.
    - The temperature of baking finish house is 70 - 80 ˚C
(12) After drying is completed, use sticky gauze to remove dust before spraying the varnish.
(13) When spraying celluloid paint, the spraying range should cover the base coat range completely.
    - Air pressure: 150 - 200 kPa
    - Spraying distance: 20 - 30 cm
(14) Flash off for 2 - 3 minutes, and spray the second celluloid paint, the spraying range should cover the first varnish range completely.
    - Air pressure: 150 - 200 kPa
    - Spraying distance: 20 - 30 cm
(15) After spraying celluloid paint is completed, immediately replace it with barge saliva or add interface additive or thiner into the original celluloid paint.
(16) Spray barge saliva or diluted celluloid paint for 2 - 3 times at interface position.
(17) Bake it for 20 - 30 minutes in the baking finish house.
    - The temperature of baking finish house is 70 - 80 ˚C

5.5 Repairing Procedure of Paint Surface on Plastic Part Surface

Three basic requirements for the paint surface repairing on plastic part surface:

- The paint and plastic have certain adhesion without damaging mechanical properties.
- The paint film shall be flexible enough to deform with the plastic without cracks.
- The original particles and coarse texture on some plastic part surfaces.

Repairing procedure of paint surface on plastic part surface:

- Repairing of paint surface on plastic primer refers to the above local spraying process, and pay attention to low-temperature baking.

- Baking condition is 70 - 80 ˚C for 20 - 30 minutes.