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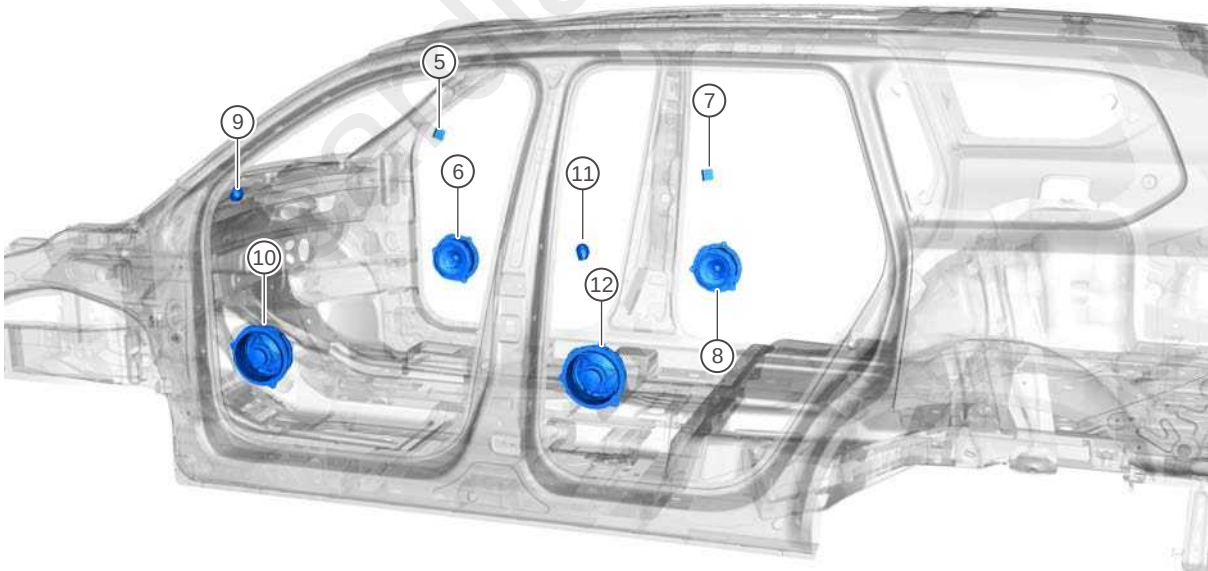
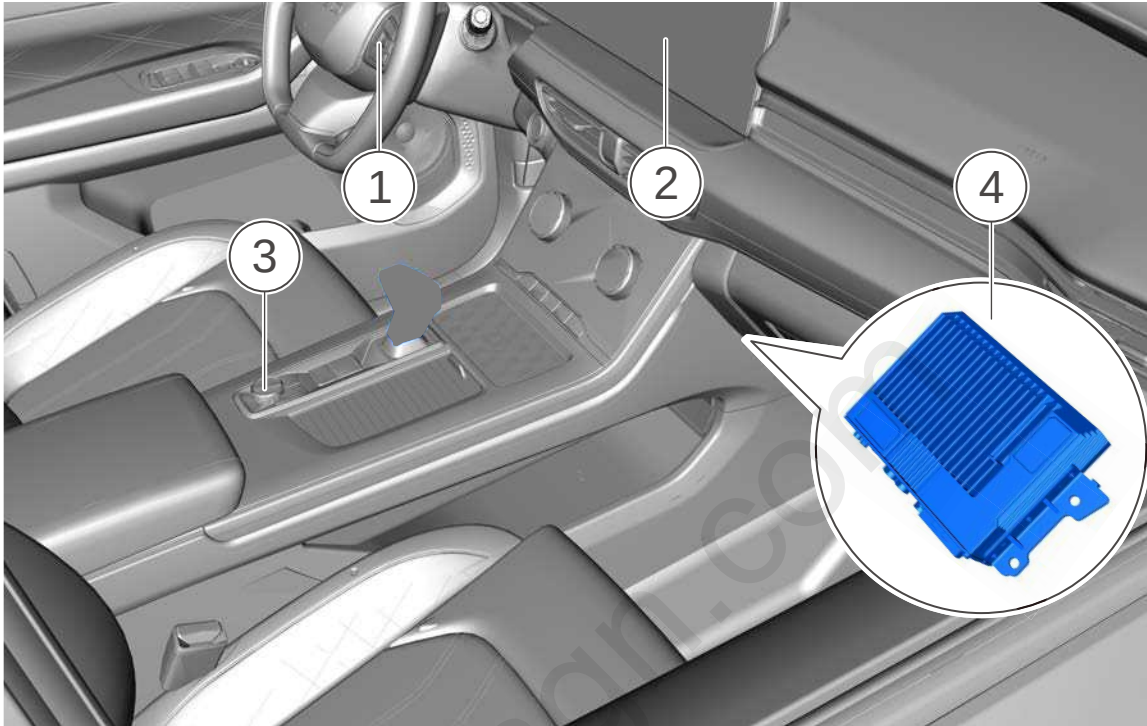
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11.1 AUDIO/VISUAL SYSTEM

1 System Overview

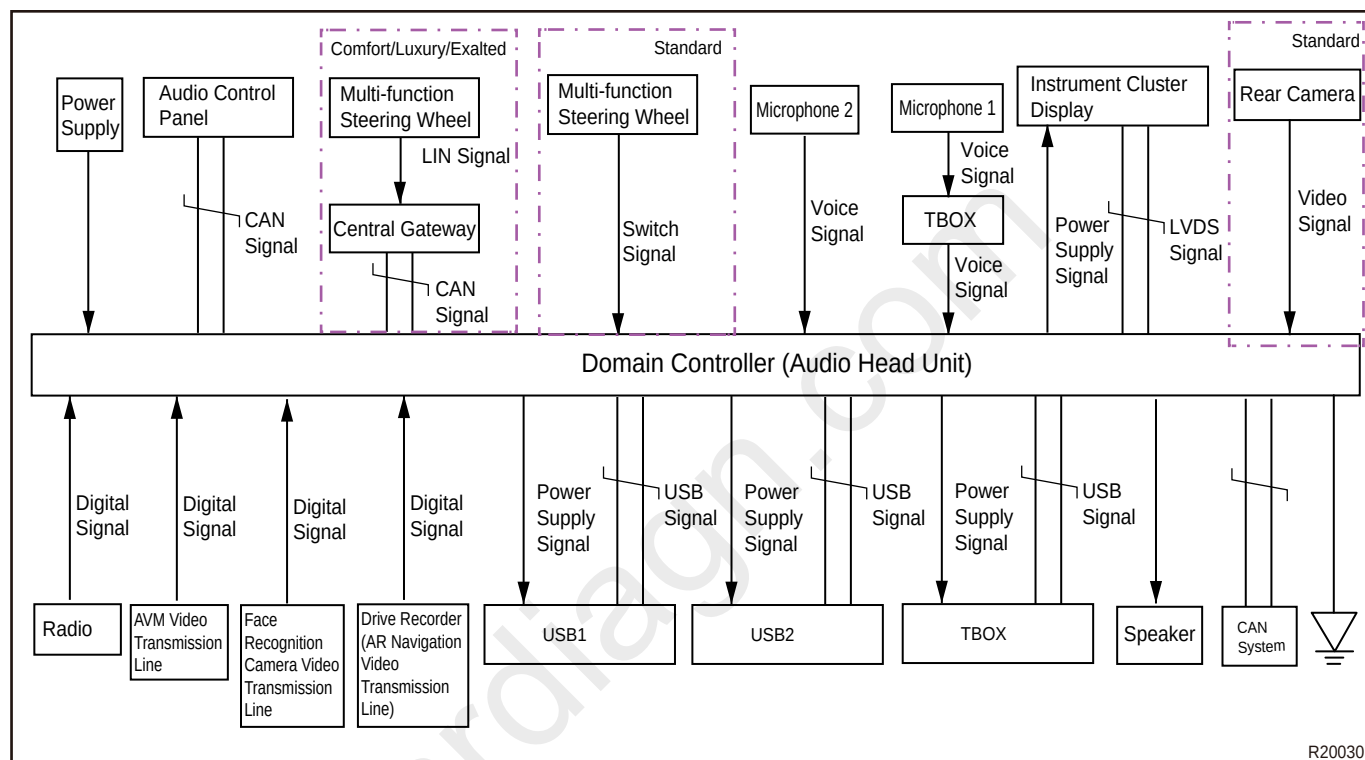
1.1 System Components Diagram



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

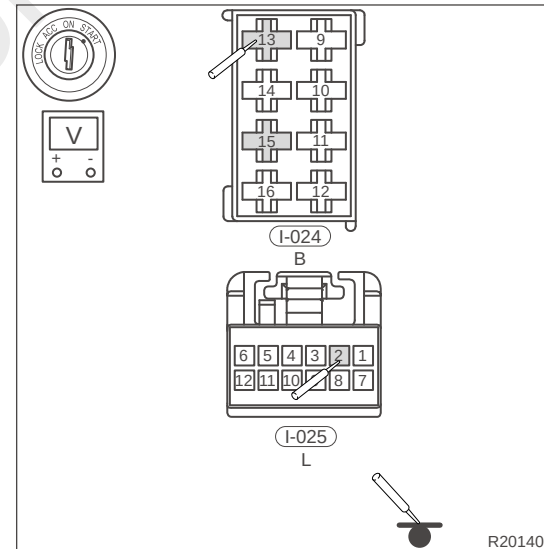
OK

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.

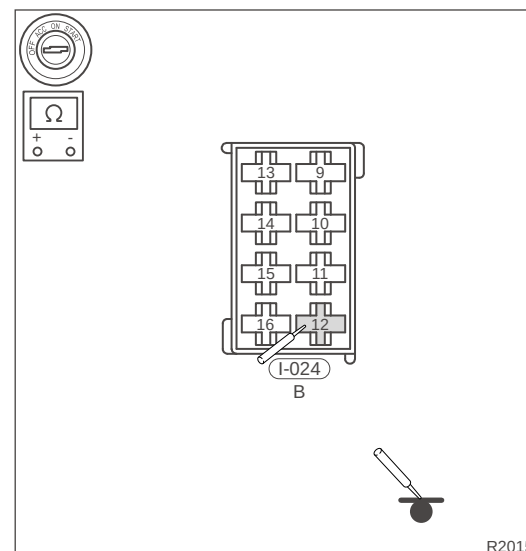
Multimeter Connection	Condition	Specified Condition
I-024 (B15) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
I-025 (C2) - Body ground		Not less than 12 V
I-024 (B13) - Body ground		Not less than 12 V



R20140

- (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

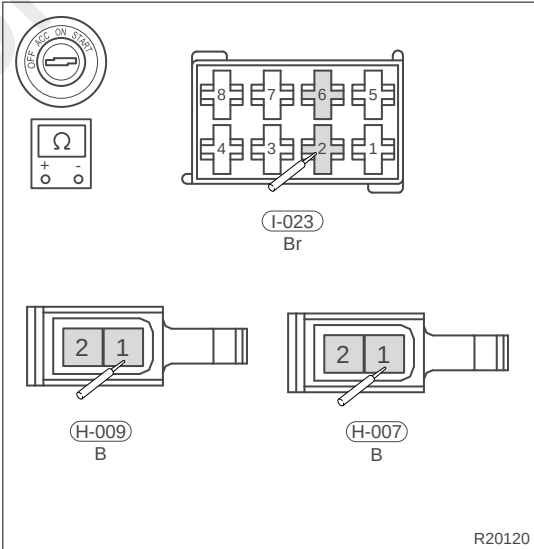
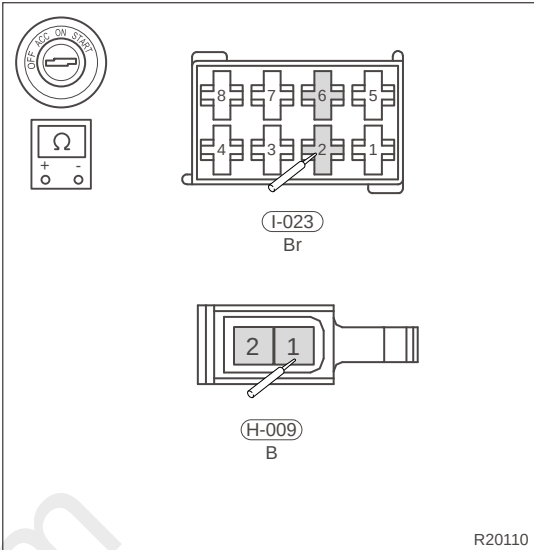
OK

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

- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- 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

- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the tuner antenna connectors B-093 and I-030.
- 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

- Connect all the connectors.
- Connect the negative battery cable.
- Use diagnostic tester to clear DTCs.
- Start the engine.
- 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
---	-------------------

- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Remove domain controller from malfunctioning vehicle, then install it to a new vehicle and perform a test.
- 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.

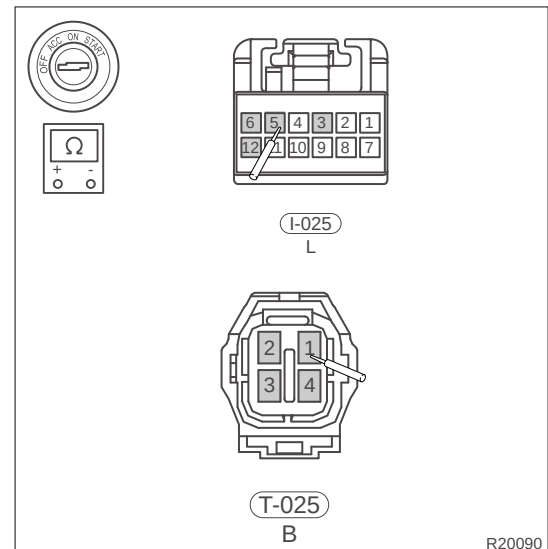
OK**System is normal****NG****2 Check face recognition camera**

- (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:

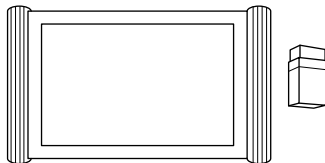
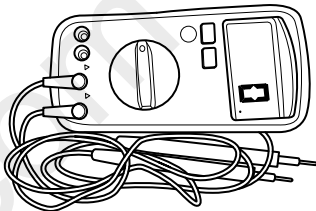
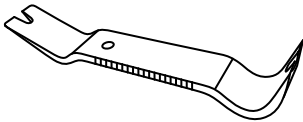
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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

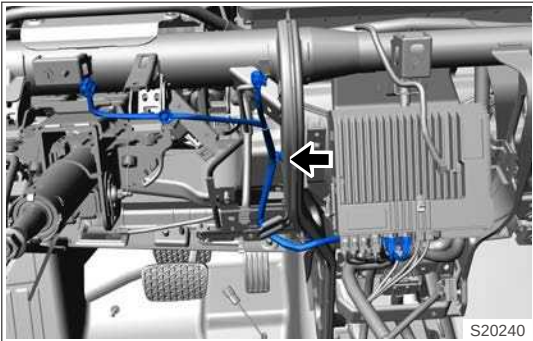
3.2 Domain Controller

■ Removal

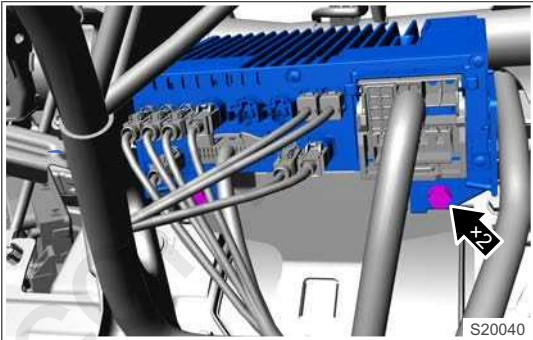
Hint:

- 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

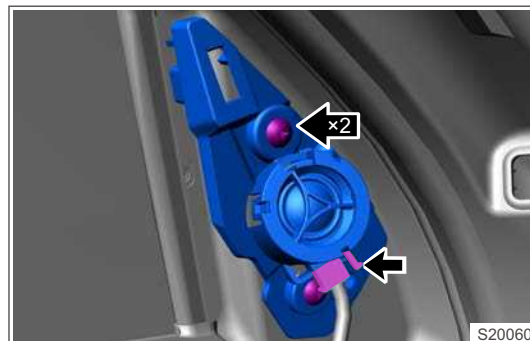
■ Removal

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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (2) Install the front left door protector assembly.

3.4 Front Left Woofer

■ Removal

Hint:

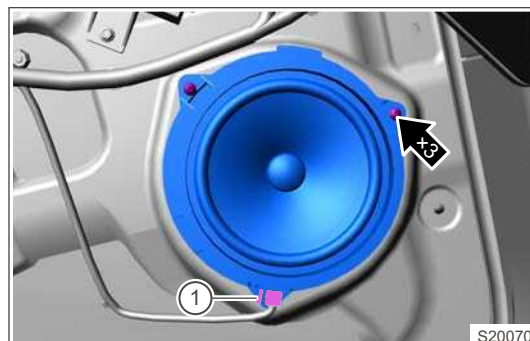
Use same procedures for right and left sides (take left side as an example).

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:
 $1.5 \pm 0.5 \text{ N m}$



■ 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

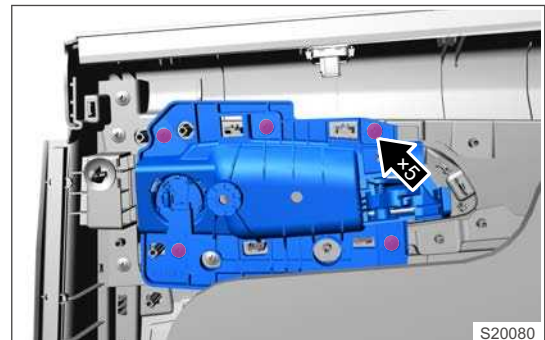
- Be sure to wear safety equipment to prevent accidents, when removing rear left tweeter.
- Appropriate force should be applied when removing rear left tweeter. Be careful not to operate roughly.

(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:

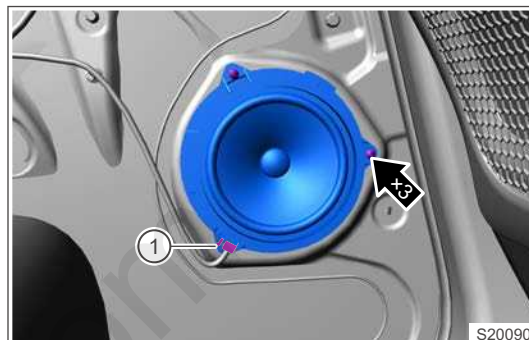
Use same procedures for right and left sides (take left side as an example).

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:
 $1.5 \pm 0.5 \text{ N m}$

**■ 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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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.

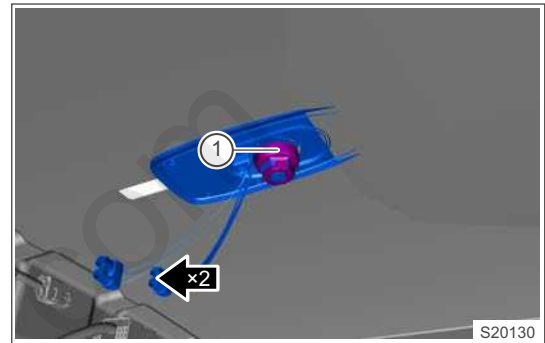
3.8 Combined Antenna

■ 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: $5 \pm 1 \text{ N}\cdot\text{m}$
- (2) Install the rear part of roof.

11.2 INSTRUMENT CLUSTER SYSTEM

1 Warnings and Precautions

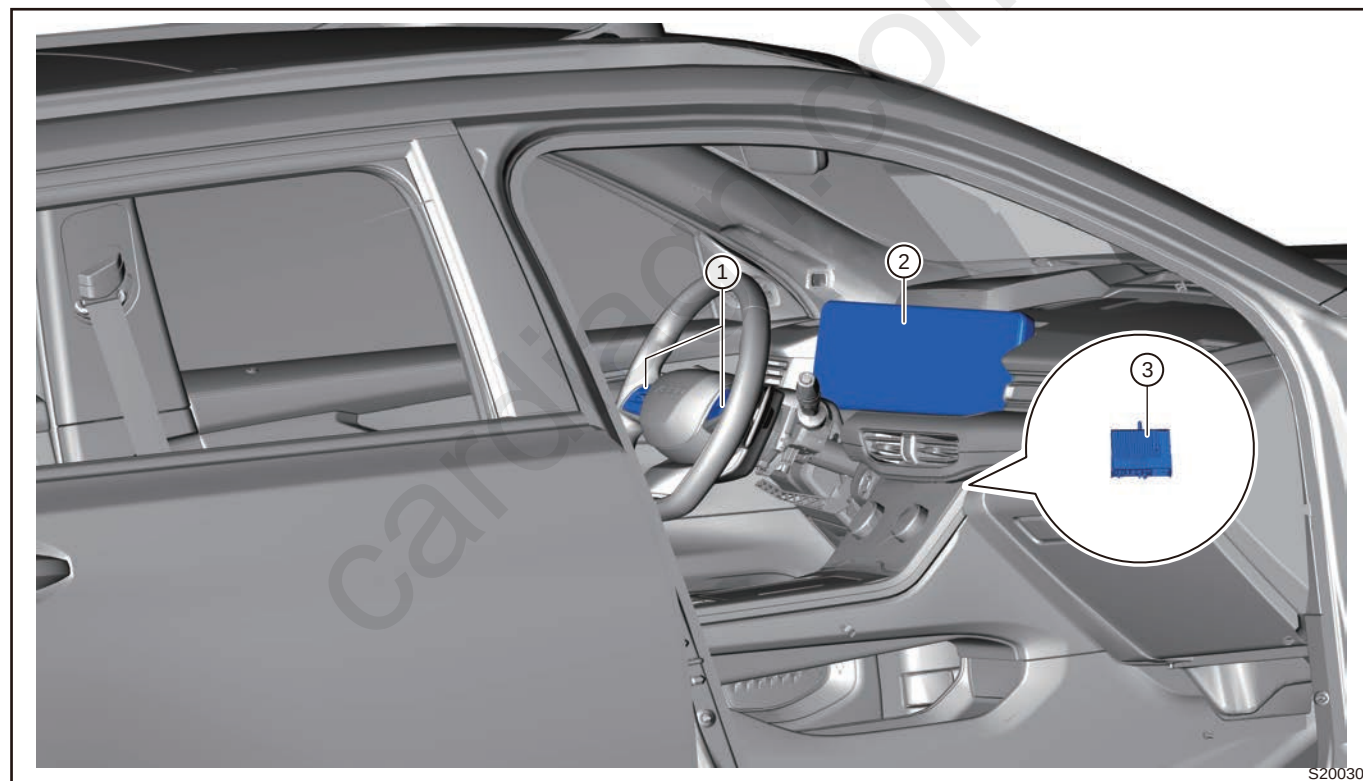
1.1 Precautions

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

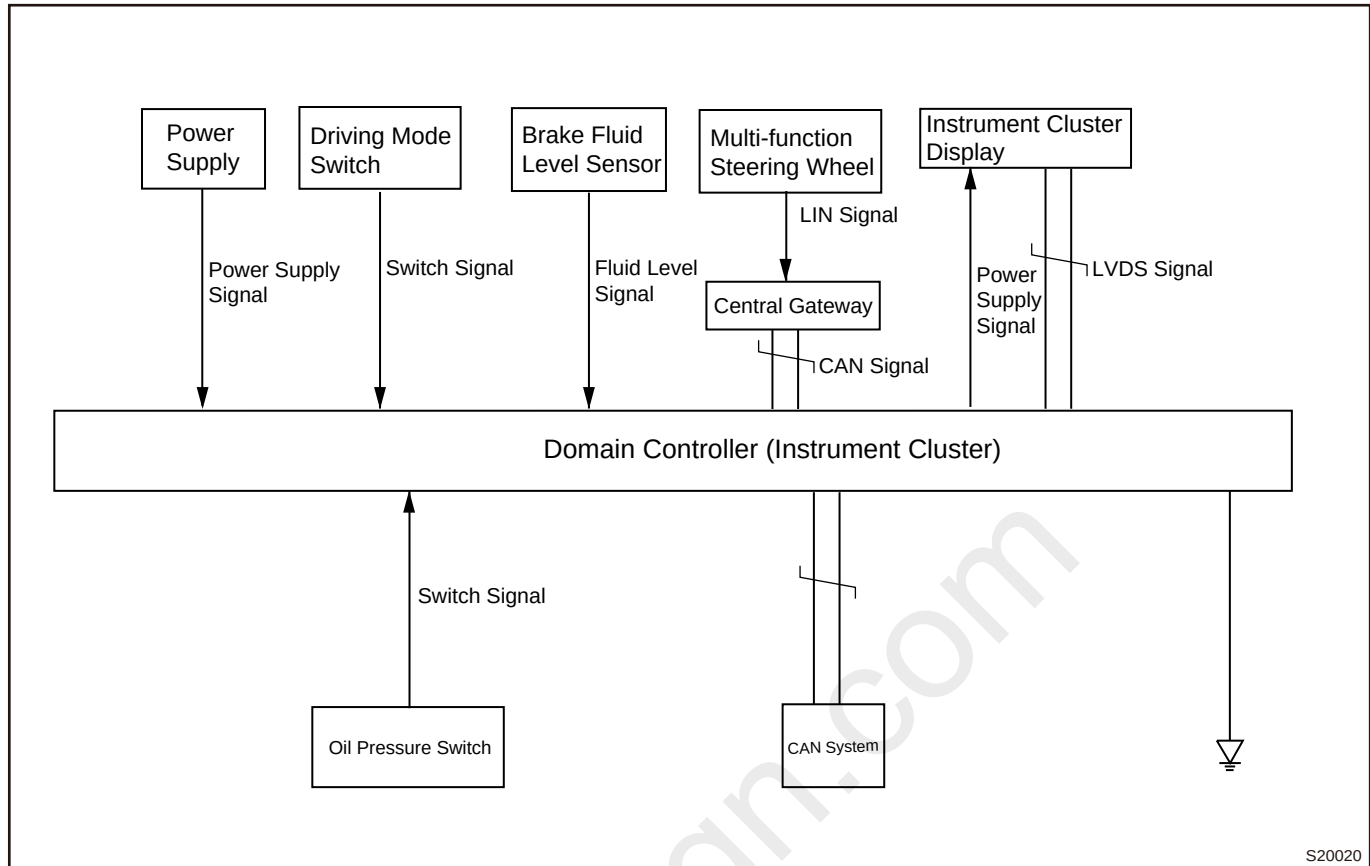
2.1 Instrument Cluster



S20030

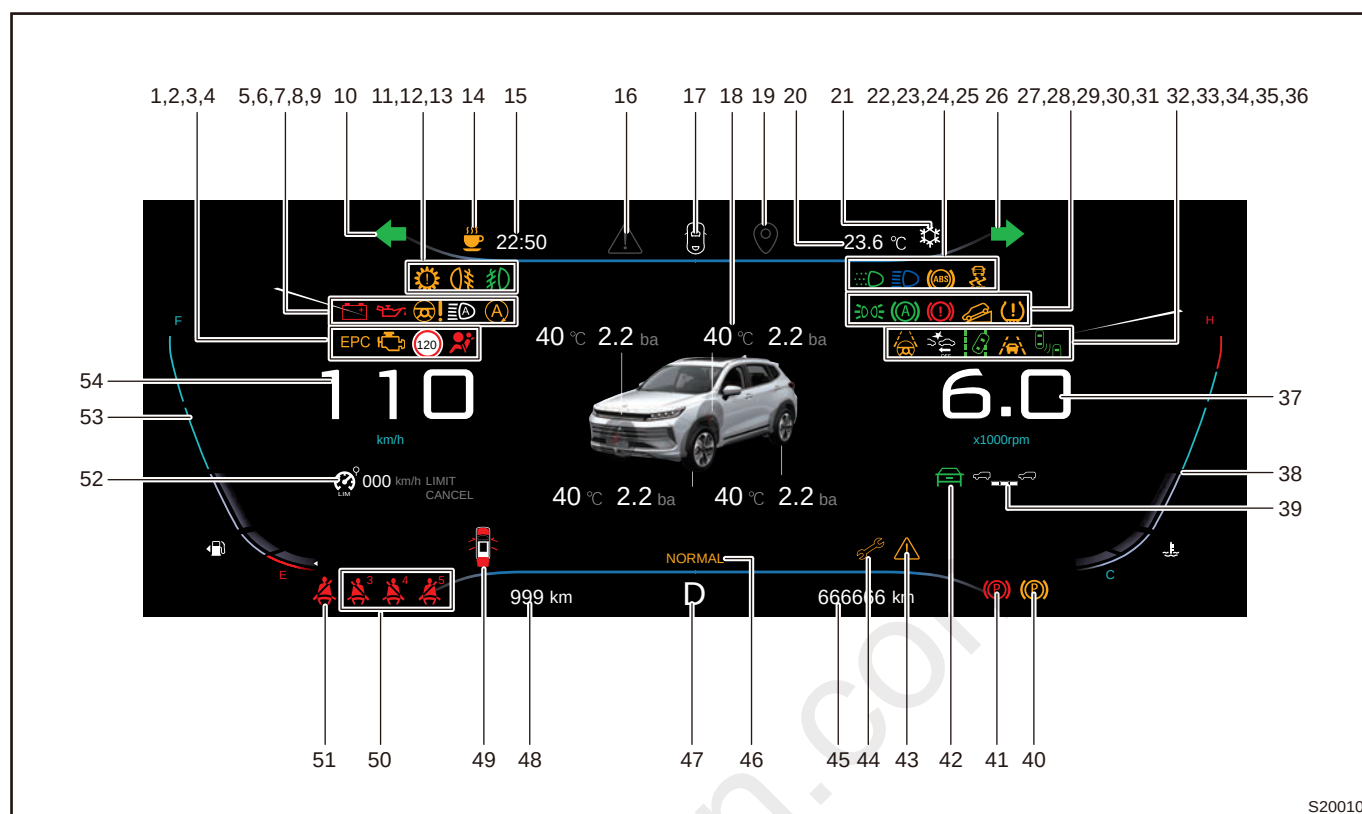
1	Steering Wheel Quick Button	2	Hyperscreen
3	Domain Controller		

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



S20010

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".

Show Menu	
EXEED V10.61 > Diagnostic Program	
TX/TXL	LX
VX	New TXL
TX(2021)	Generic Service
Exeed	
S20221001	

(2) Click "System Selection" .

Show Menu	
EXEED V10.61 > VX	
Health Report	
System Selection	
ECU Online Programming	
Exeed VX	
S20222001	

(3) Click "DMC (Infotainment Domain Controller)"

Show Menu

EXEED V10.61 > VX > System Selection

EMS (Engine Management System)	TCU (Transmission Control Unit)
BCM (Body Control Module)	ESP(IEPB)(Electronic Stability Program (Integration Electrical Park Brake))
EPS (Electronic Power Steering)	AIPM (Integrated Panel Module)
CLM (Climate Module)	DMC (Infotainment Domain Controller)
AVM (Around View Monitor Module)	PDC (Parking Distance Control)
BSDL (Blind Spot Detection Left)	BSDR (Blind Spot Detection Right)
PEPS (Passive Entry And Passive Start System)	FCM (Front Camera Module)

Exeed VX

S20223001

(4) Click “Reset Vehicle Maintenance”

Show Menu







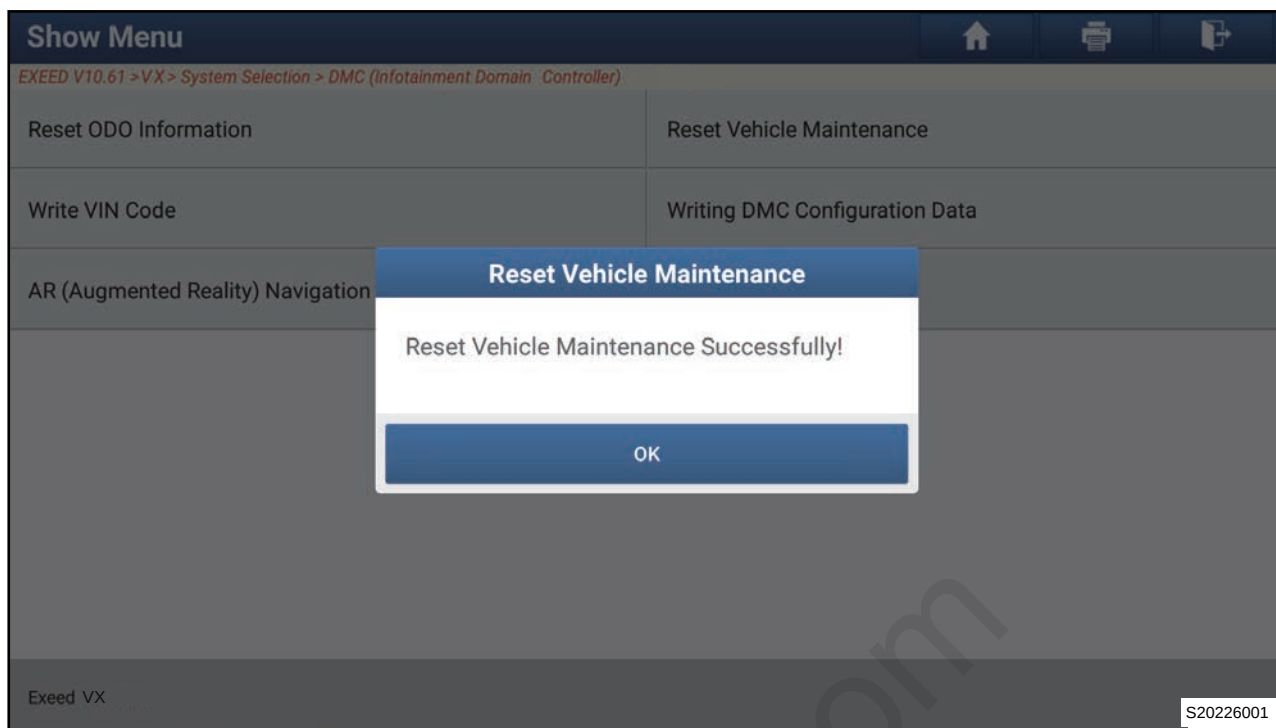
EXEED V10.61 > VX > System Selection > DMC (Infotainment Domain Controller)

Reset ODO Information	Reset Vehicle Maintenance
Write VIN Code	Writing DMC Configuration Data
AR (Augmented Reality) Navigation Calibration	

Exeed VX

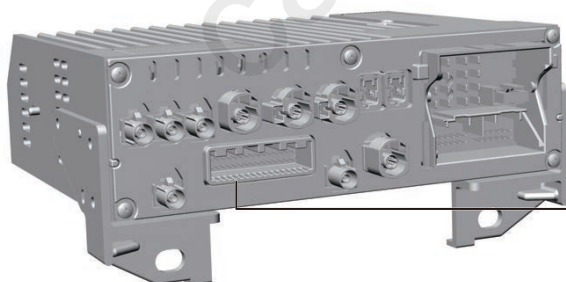
S20225001

(5) Reset Vehicle Maintenance Successfully

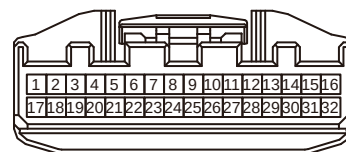


3 Diagnosis & Testing

3.1



仪表



S20060

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.

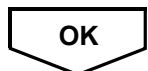
Hint:

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
----	------------



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)

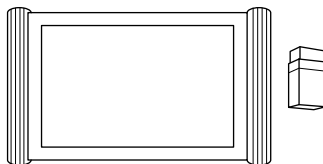
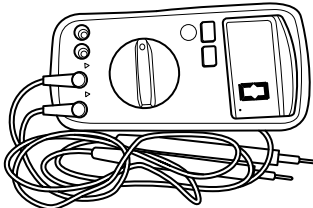
DTC	U0164-87	Lost Communication with A/C Control Unit
DTC	U0141-87	Lost Communication with Reversing Radar
DTC	U0142-87	Lost Communication with Around View Monitor Module
DTC	U0230-87	Lost Communication with PLG-Missing Message
DTC	U0100-87	Lost Communication with Engine Control System Module
DTC	U0129-87	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

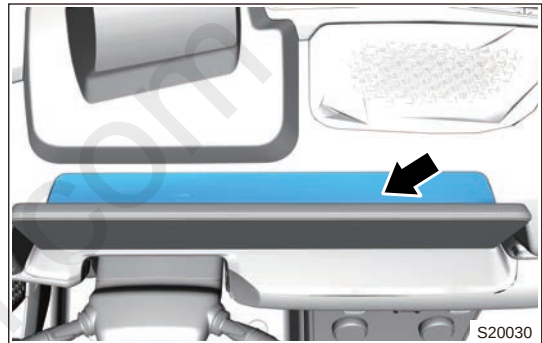
4.2 Dual LCD

■ Removal

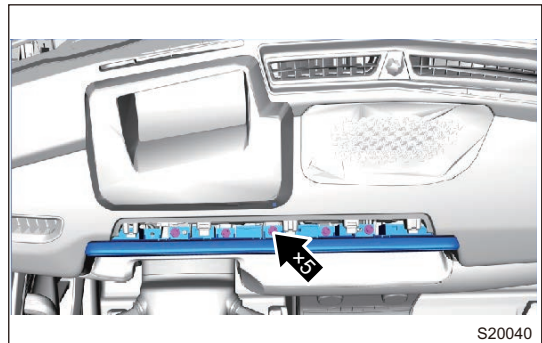
Warning

- **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.**

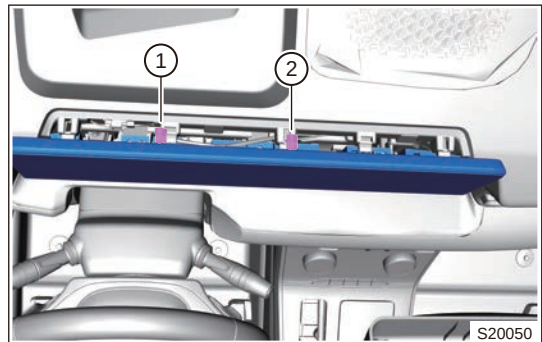
- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.
- (3) Using an interior crow plate, pry off screw block cover.



- (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.

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11.3 DRIVING ASSIST SYSTEM

1 Warnings and Precautions

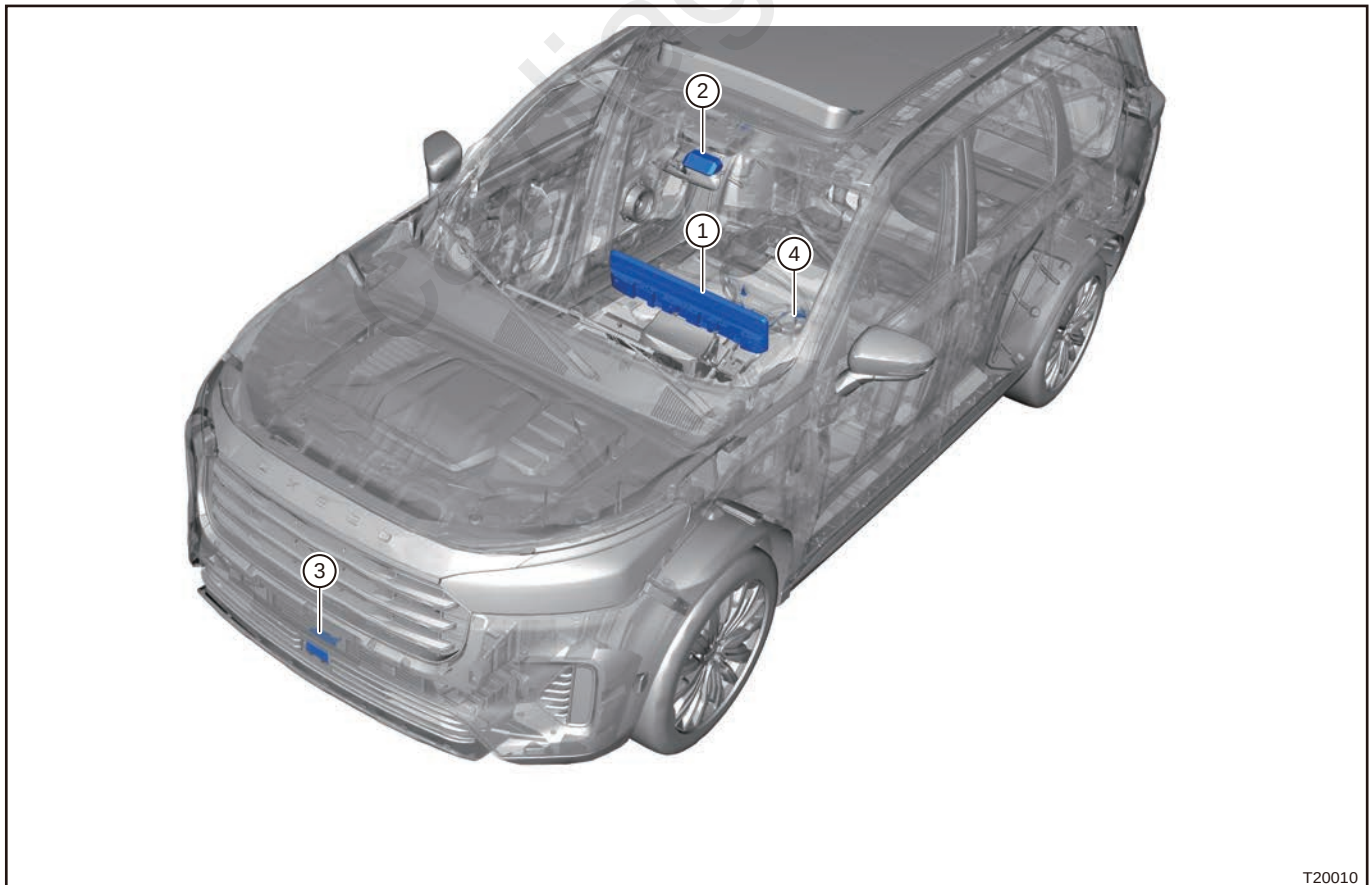
1.1 Precautions

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



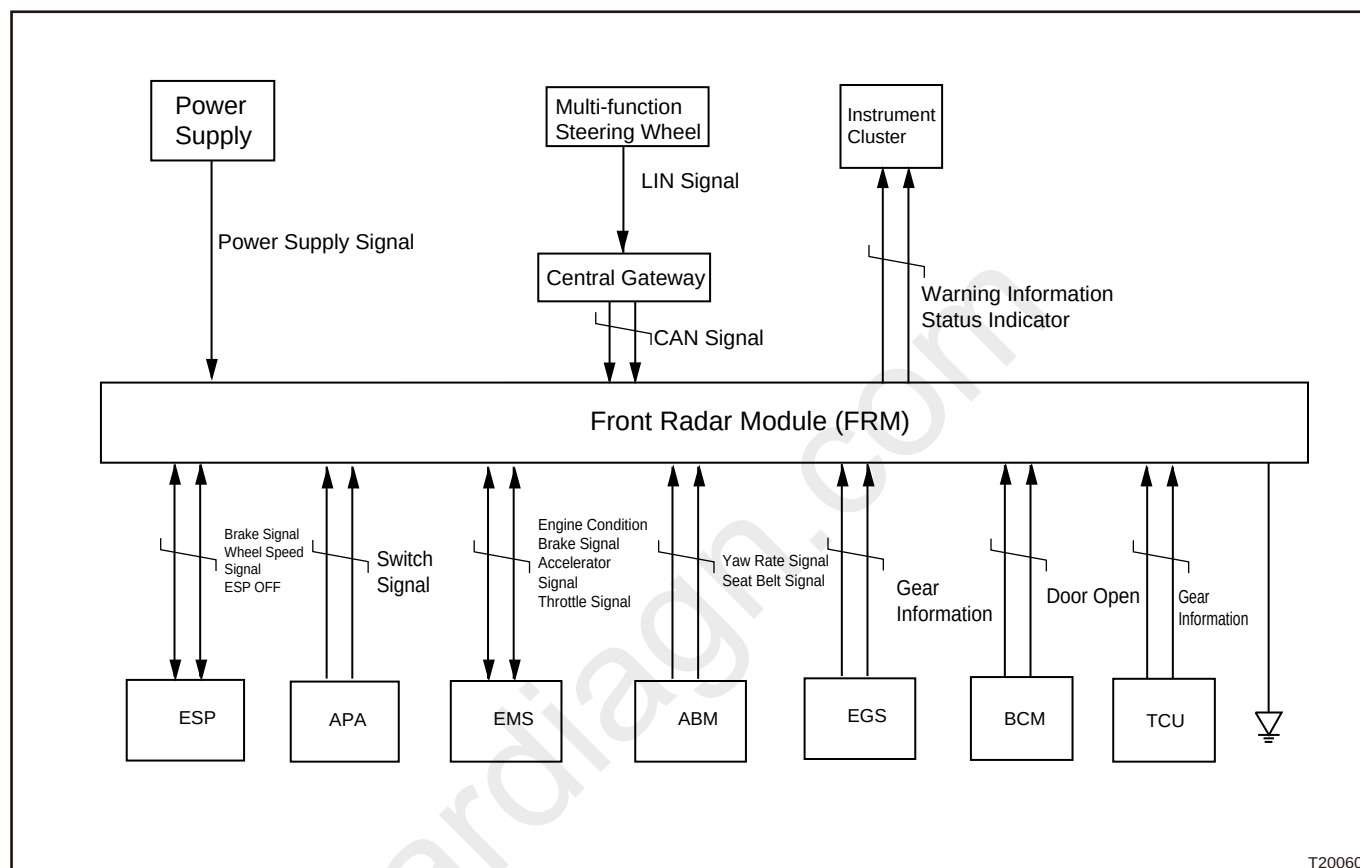
T20010

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.

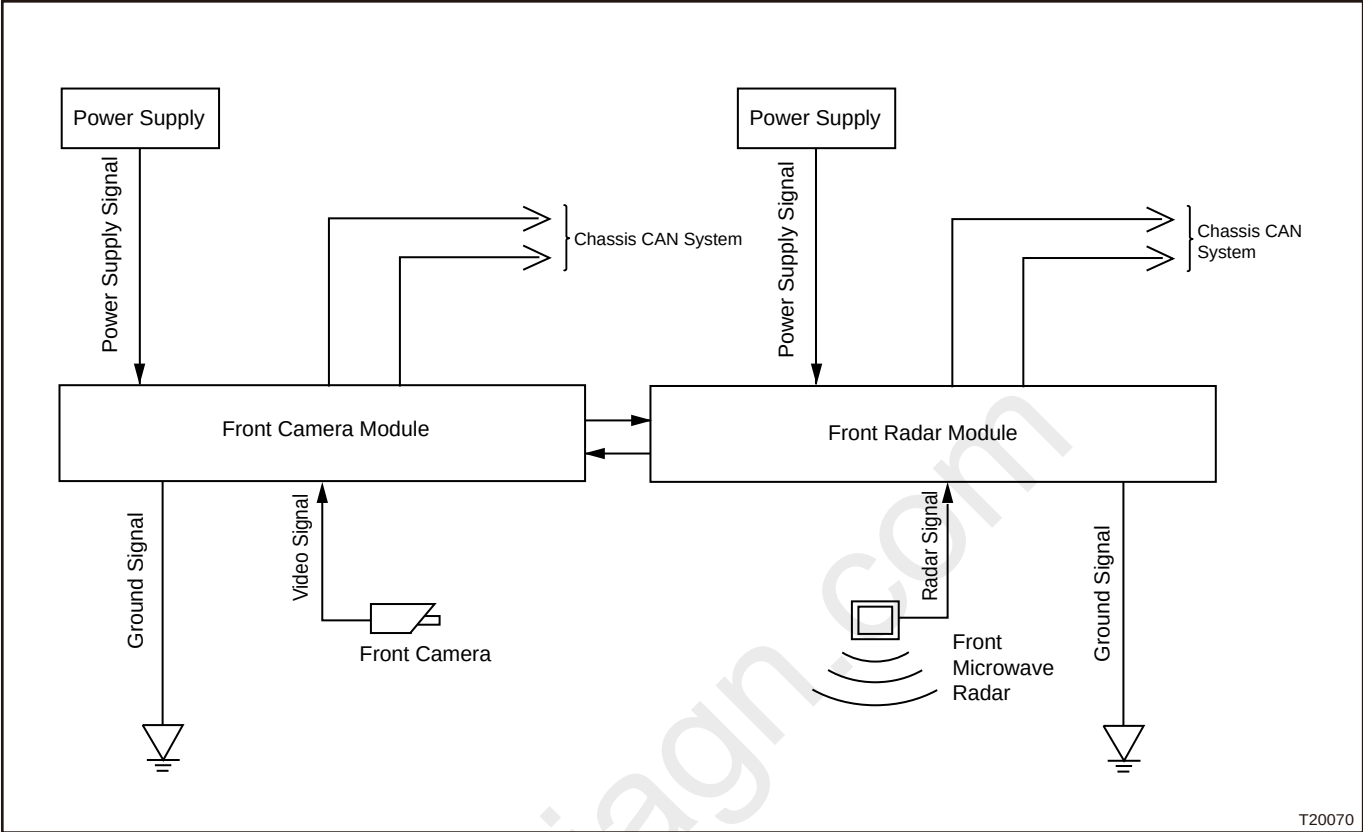
Limitations or termination conditions:

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 rely 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:
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.	• 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

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 $\leq$ 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	 The display shows a top-down view of a car on a road with dashed lane lines. The text '车道偏离预警' (Lane Departure Warning) is at the top. The time '18:00' and temperature '24°C' are in the corners. The car is centered in the lane. The icon is labeled T20250.
Lane assist system activated	 The display shows the same top-down view as the standby state, but with green dashed lines indicating the active lane boundaries. The text '车道偏离预警' (Lane Departure Warning) is at the top. The time '18:00' and temperature '24°C' are in the corners. The car is centered in the lane. The icon is labeled T20260.
System malfunction	 The display shows the same top-down view, but with yellow dashed lines indicating the lane boundaries. The text '系统故障' (System Malfunction) is in the center. The text '车道偏离预警' (Lane Departure Warning) is at the top. The time '18:00' and temperature '24°C' are in the corners. The car is centered in the lane. The icon is labeled T20270.
Front camera covered	 The display shows the same top-down view, but with yellow dashed lines indicating the lane boundaries. The text '前摄像头表面需要清洁' (Front camera surface needs cleaning) is in the center. The text '车道偏离预警' (Lane Departure Warning) is at the top. The time '18:00' and temperature '24°C' are in the corners. The car is centered in the lane. The icon is labeled T20280.

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

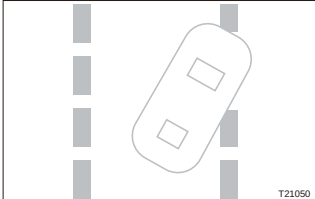
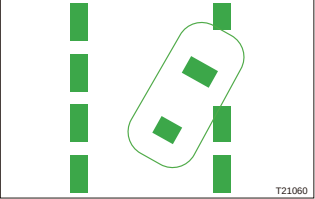
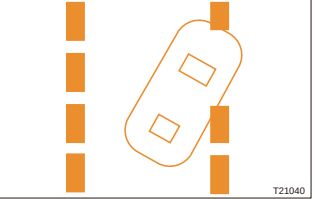
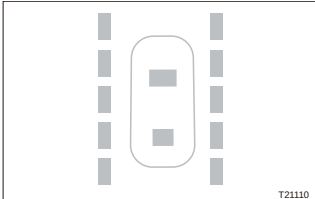
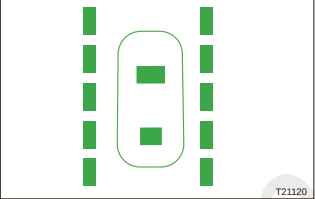
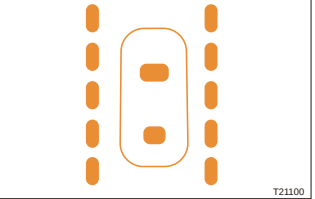
The lane departure intervention function can be turned on or off through the central screen setting item.

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.

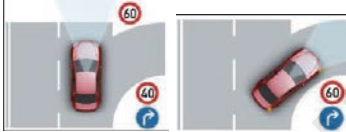
TSR system state meter display

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 image 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 IX : 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 turn 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 $\leq$ 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 $\geq$ 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:

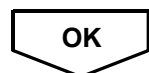
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check fuse
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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
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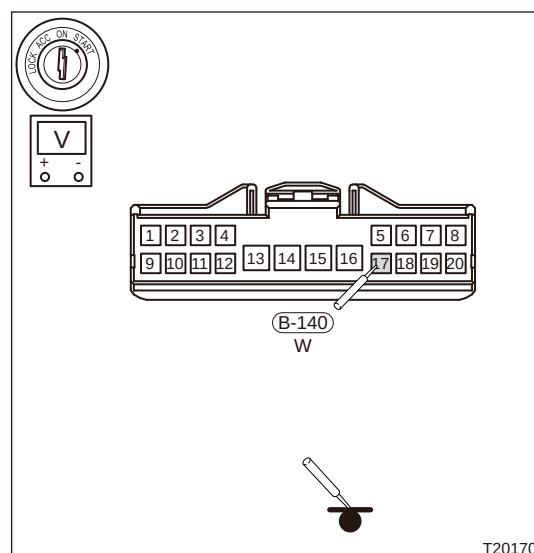


2	Check instrument panel fuse box output voltage
---	--

Use circuit diagram as a guide to perform the following inspection procedures:

- Turn ENGINE START STOP switch to ON.
- 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

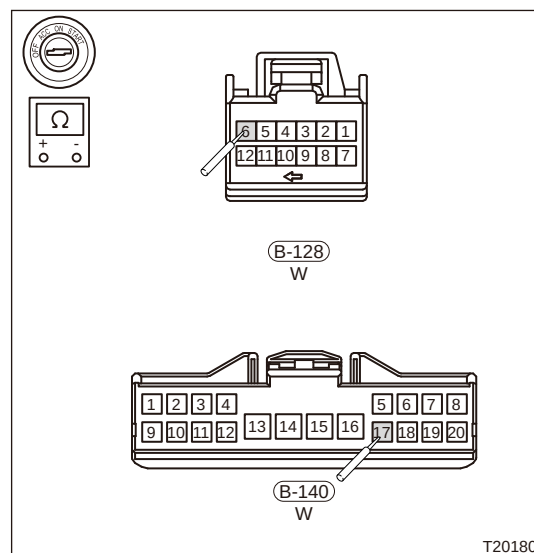
3

Check wire harness for open

Use circuit diagram as a guide to perform the following inspection procedures:

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect front camera module connector B-128 and instrument panel fuse box connector B-140.
- 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"	$\leq 1 \Omega$



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
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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	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.

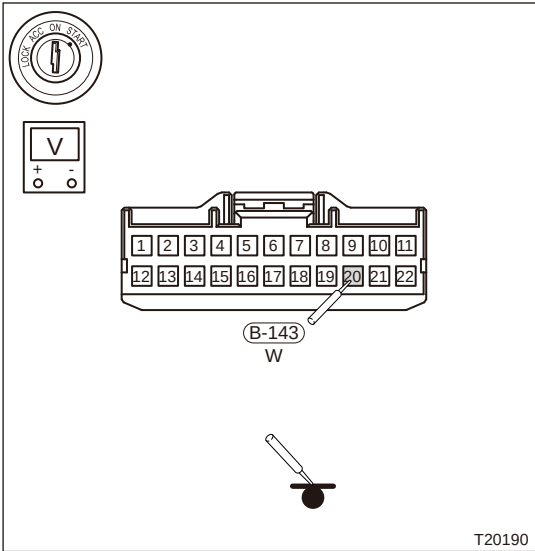
NG	Replace fuse
----	--------------

OK

2	Check instrument panel fuse box output voltage
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- (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

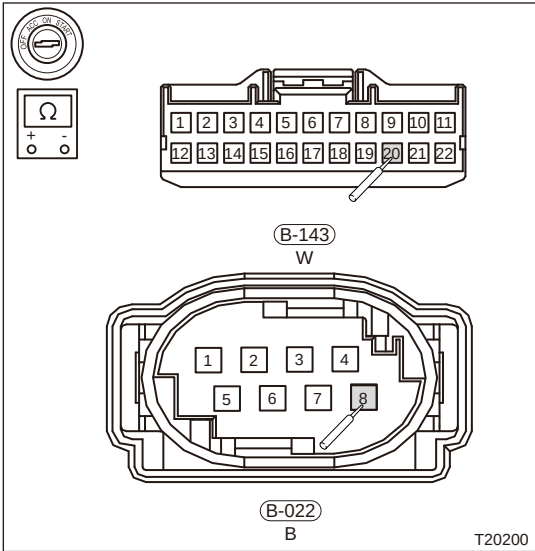
OK

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"	$\leq 1 \Omega$



NG

Handle and repair related wire harness

OK

Replace microwave radar module assembly

DTC	C106409	Drive Test Active
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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:

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

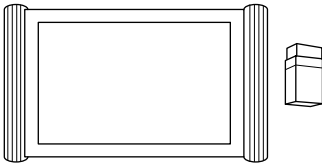
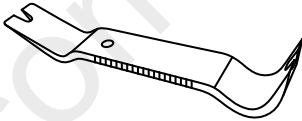
2	Check if front radar operates normally
----------	---

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

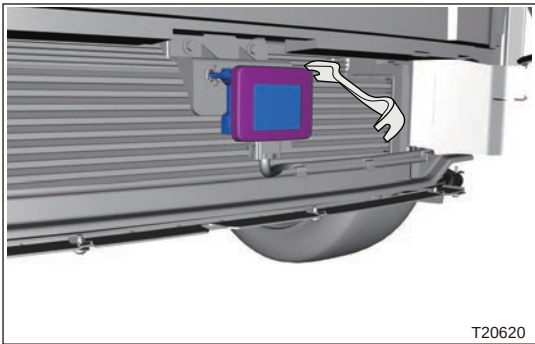
- Be sure to wear necessary safety equipment to prevent accidents, when removing front bumper assembly.
- Appropriate force should be applied, when removing front bumper assembly. Be careful not to operate roughly.
- Try to prevent body paint surface from being scratched, when removing front bumper assembly.
- 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.

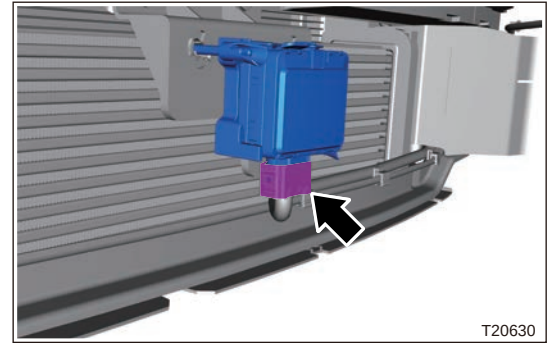
(2) Disconnect the negative battery cable.

(3) Remove the front bumper assembly.

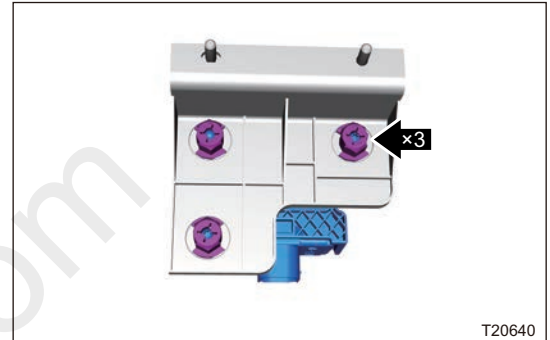
(4) Using an interior crow plate, pry off microwave radar cover.



- (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

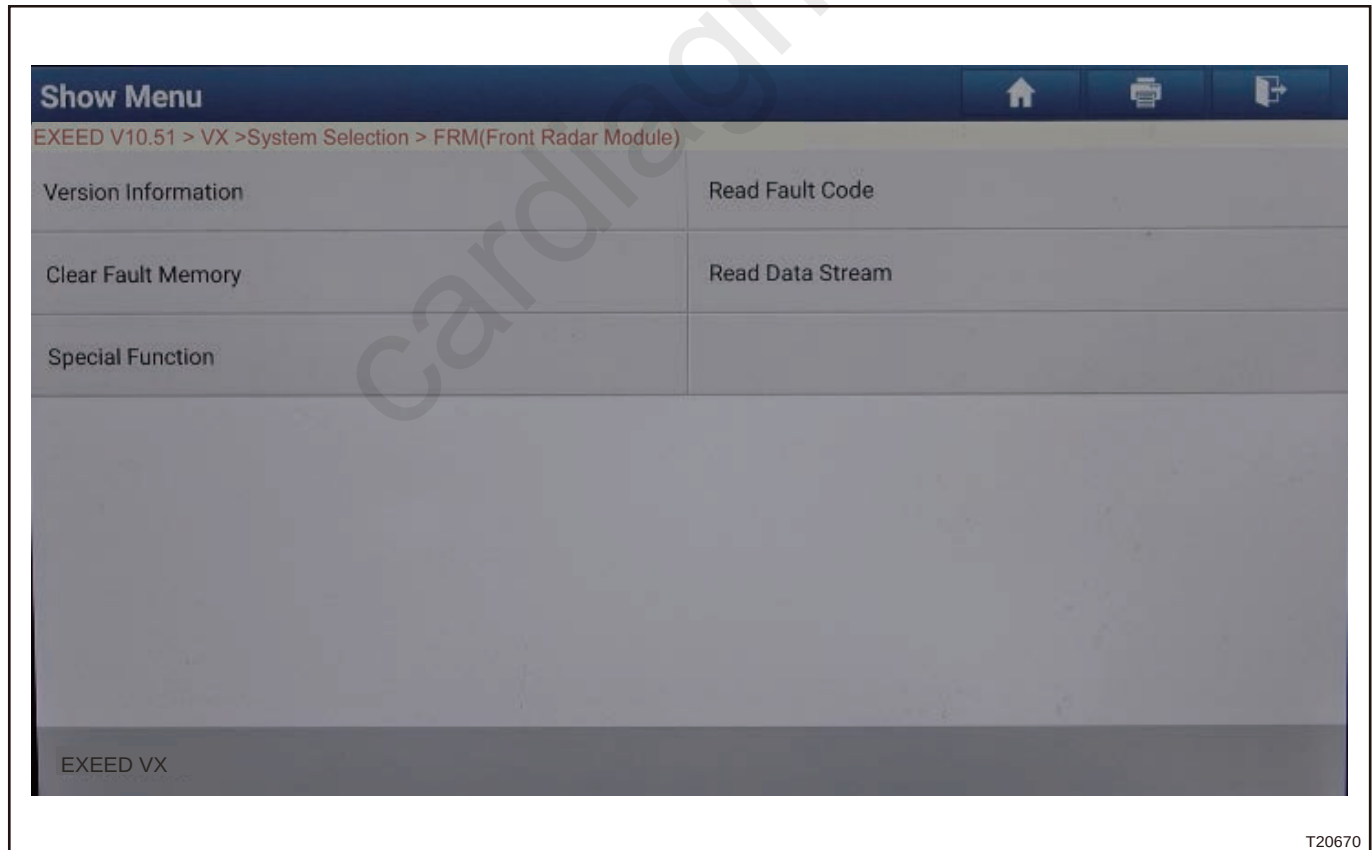
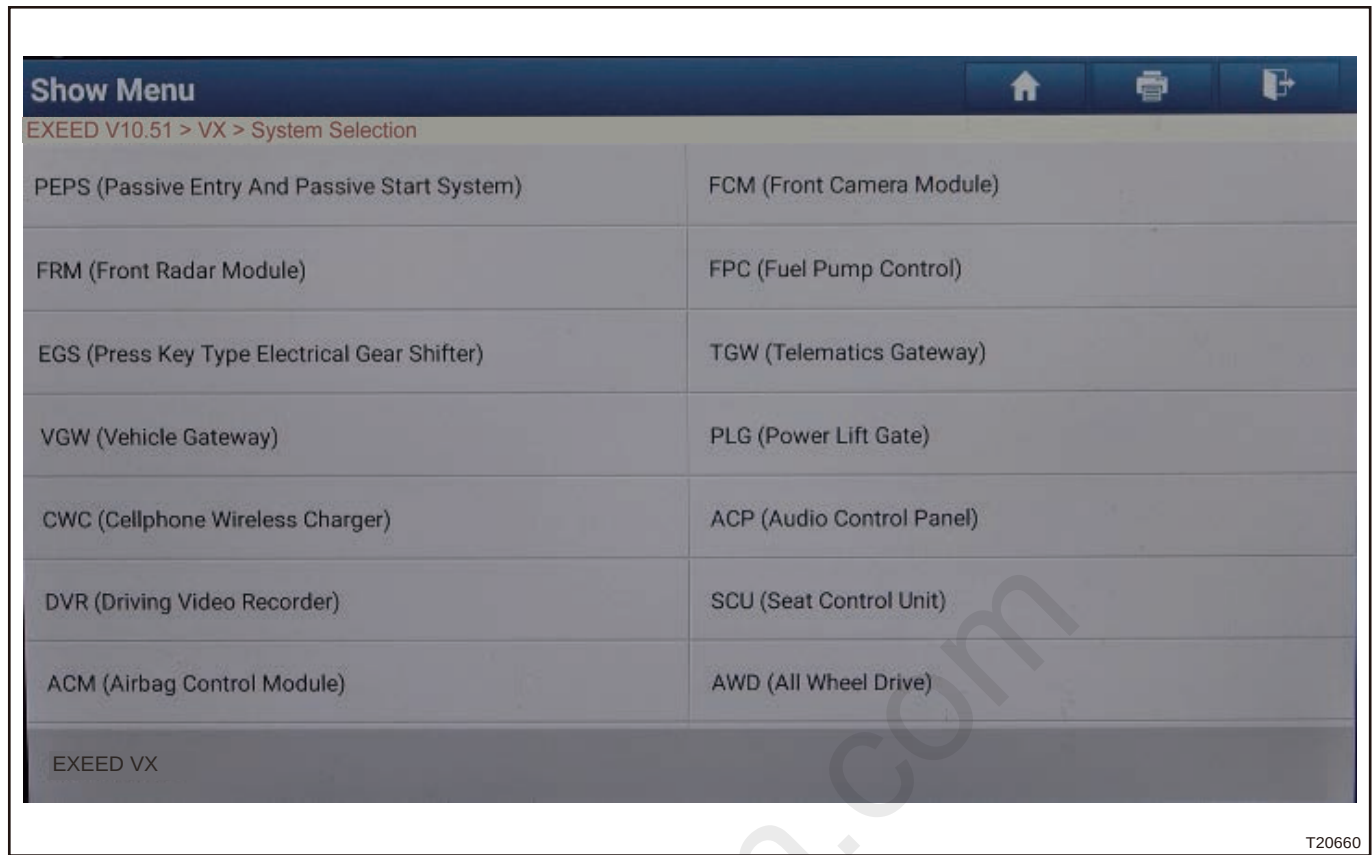
- Try to prevent body paint surface from being scratched, when installing front bumper assembly.
- Make sure that front bumper is installed correctly and fitting clearance between front bumper and body is appropriate, when installing front bumper assembly.

- (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.

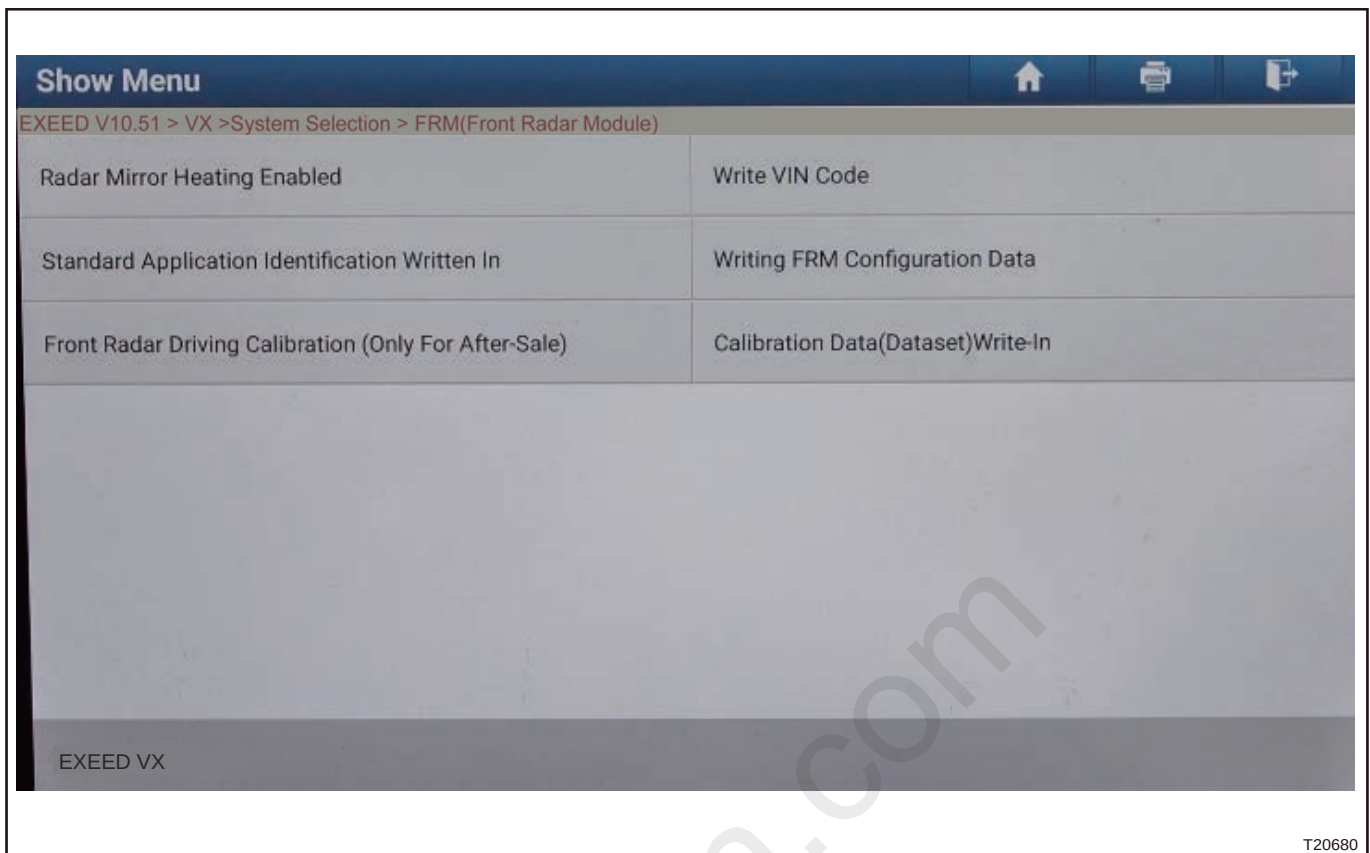
■ Matching Learning

■ Writing VIN code

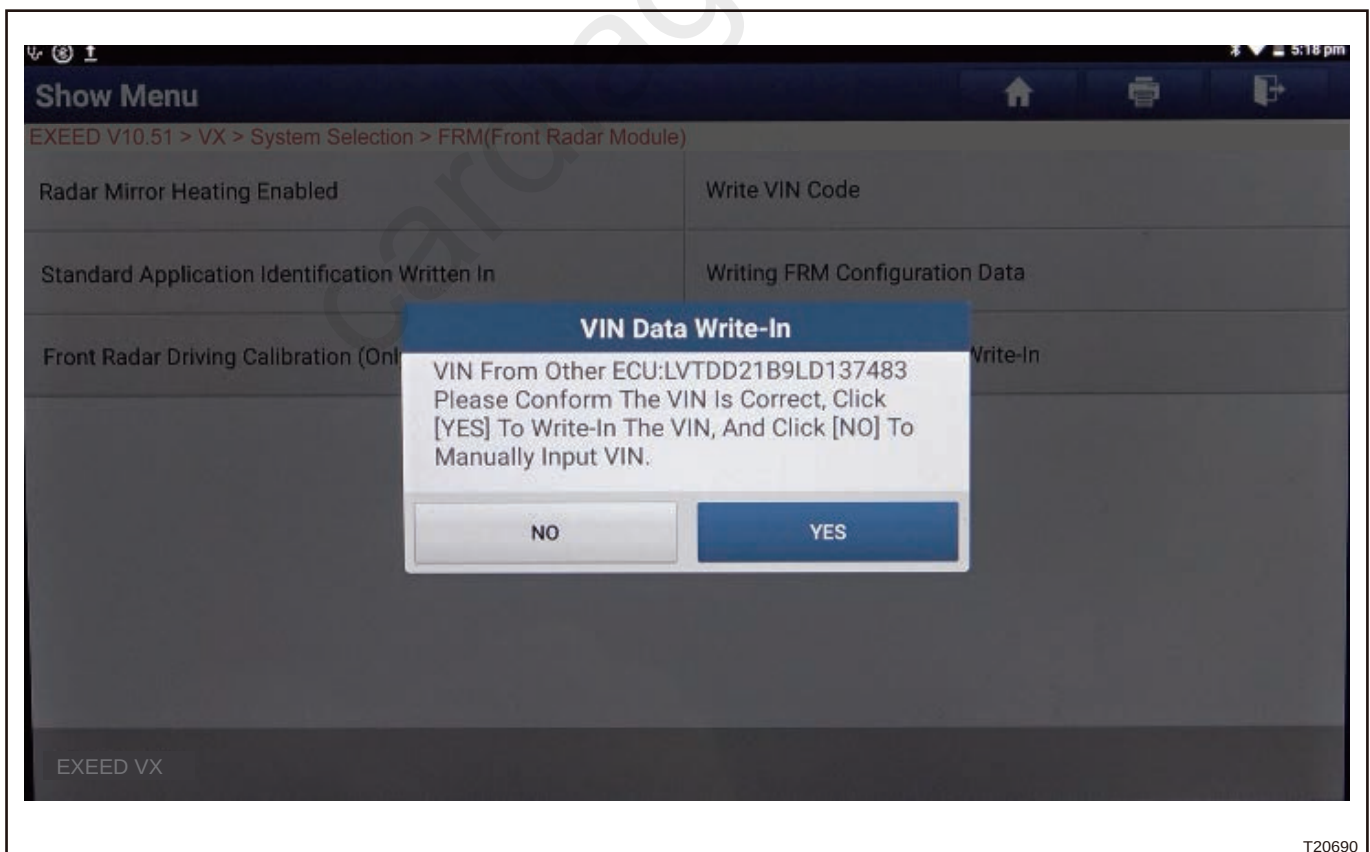
- (1) Connect diagnostic tester, enter the system, select model and click special operation.



(2) Click "Write VIN Code" .



- (3) Compare VIN code displayed on screen with vehicle. If the code is same, click “Yes” , otherwise click “No” and input it manually.



- (4) Input corresponding VIN code and click “OK” .

■ Front radar after-sales driving calibration

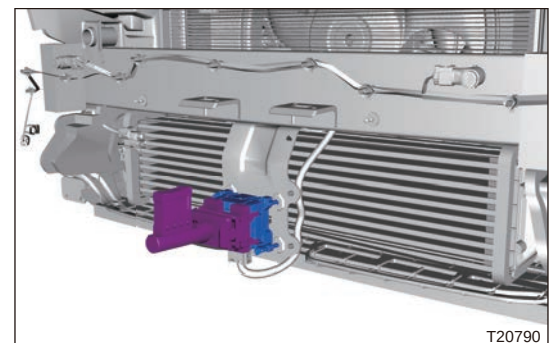
Use a spirit level to calibrate the vertical direction of radar. The requirements for calibration are as follows:

- 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/s ²	Longitudinal acceleration is too low
Maximum longitudinal acceleration	1.0 m/s ²	Longitudinal acceleration is too high
Maximum lateral acceleration	2.0 m/s ²	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° .



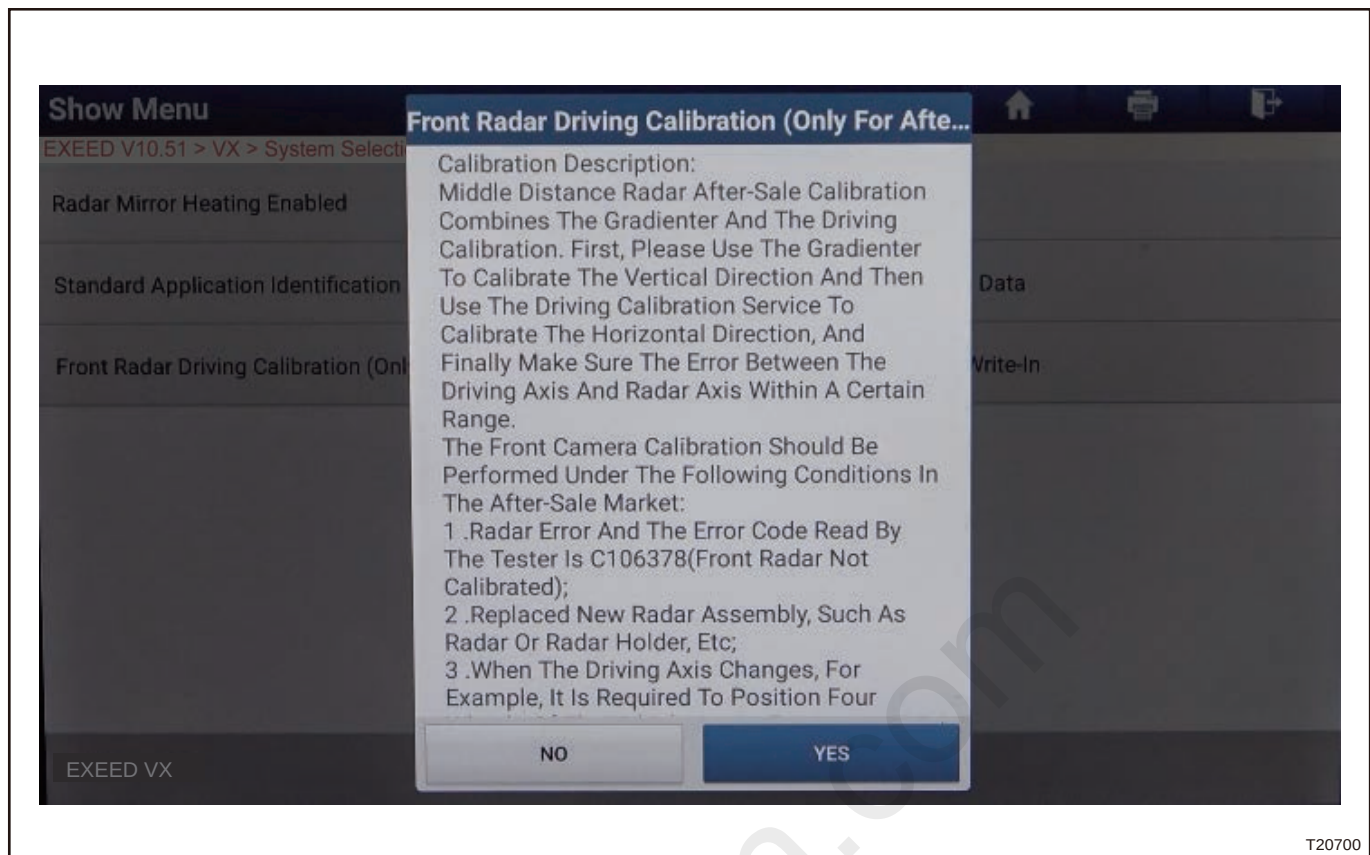
WARNING

Turn off factory mode before calibrating.

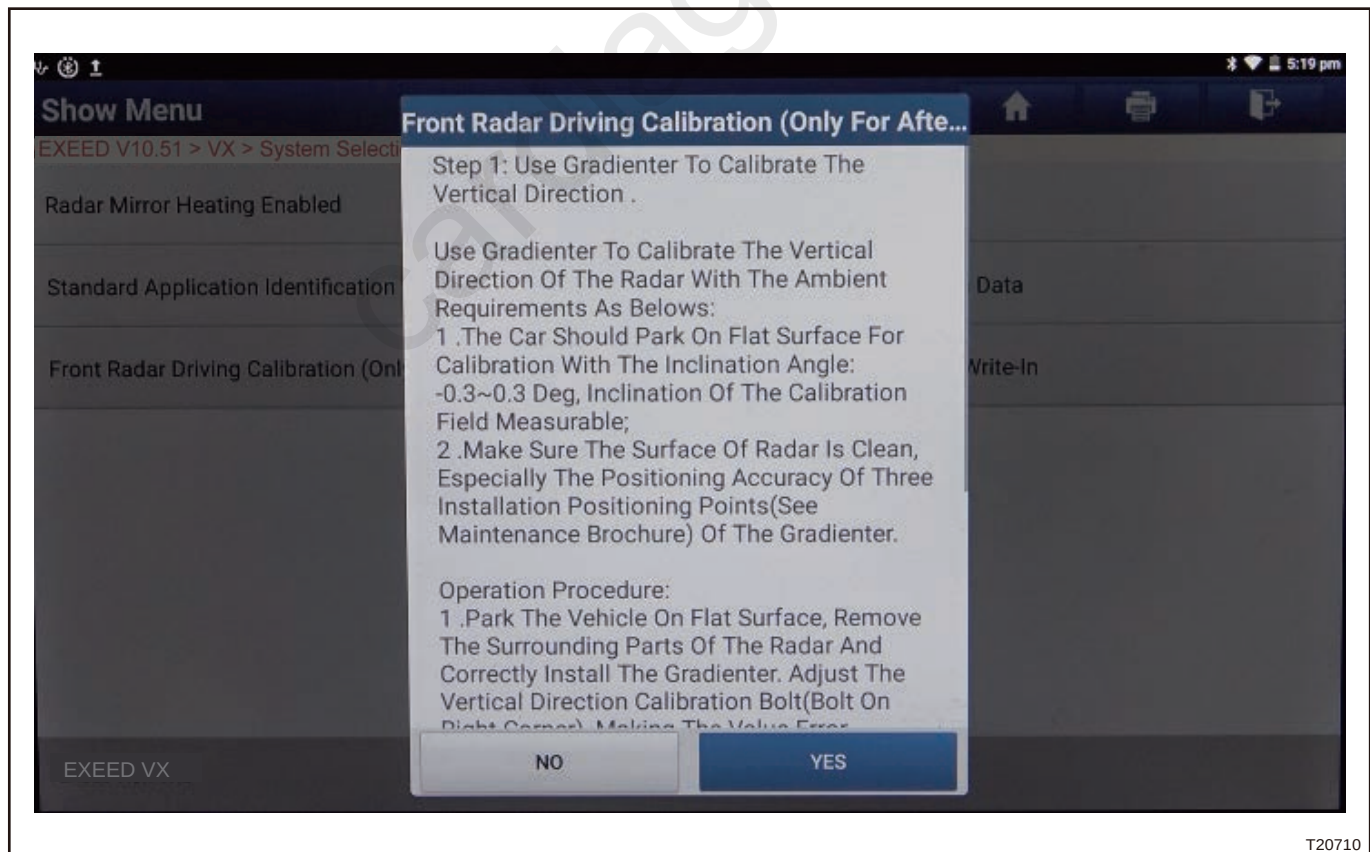
- (1) Click “Front Radar After-sales Driving Calibration” .



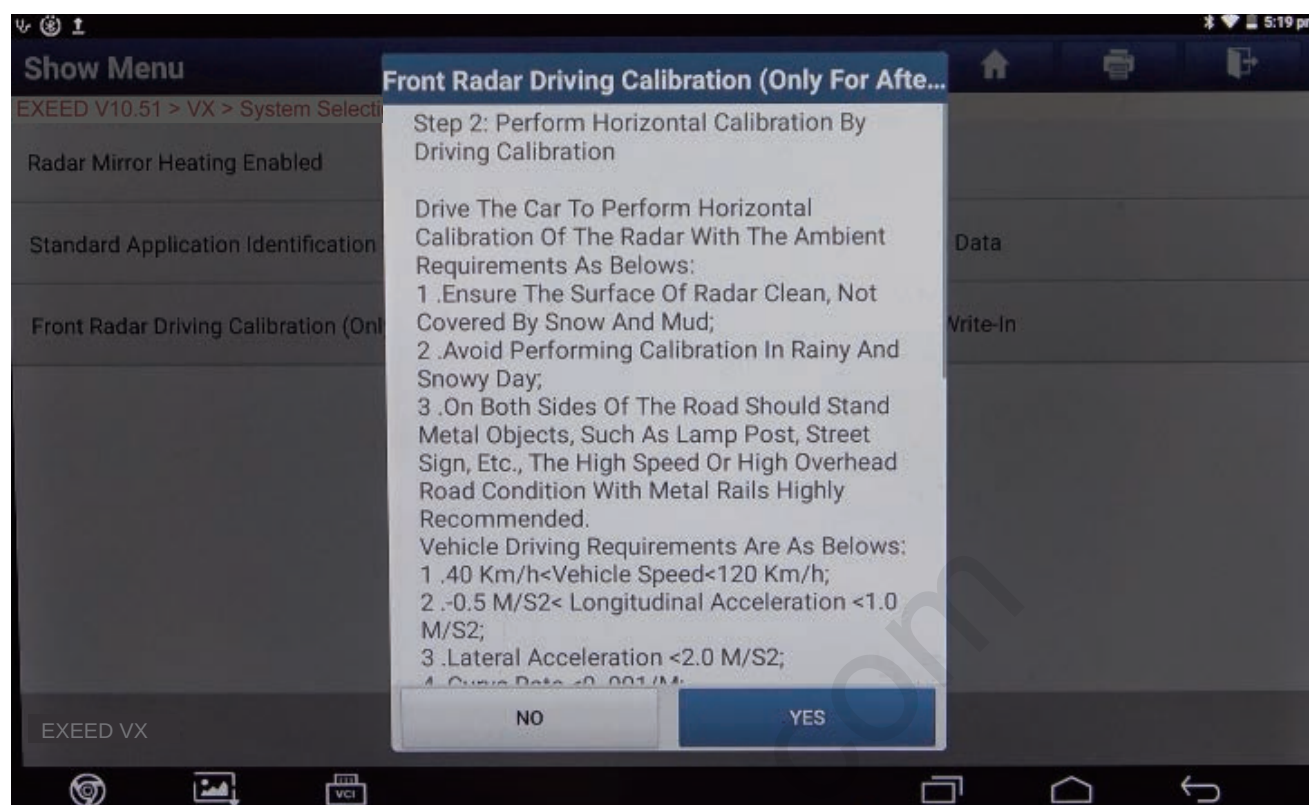
- (2) Turn off factory mode before calibration.
- (3) Read precautions, confirm and click “Yes” .



- (4) Use front collision warning tool to calibrate vertical direction, and click "Yes" after completing items prompted by diagnostic tester.

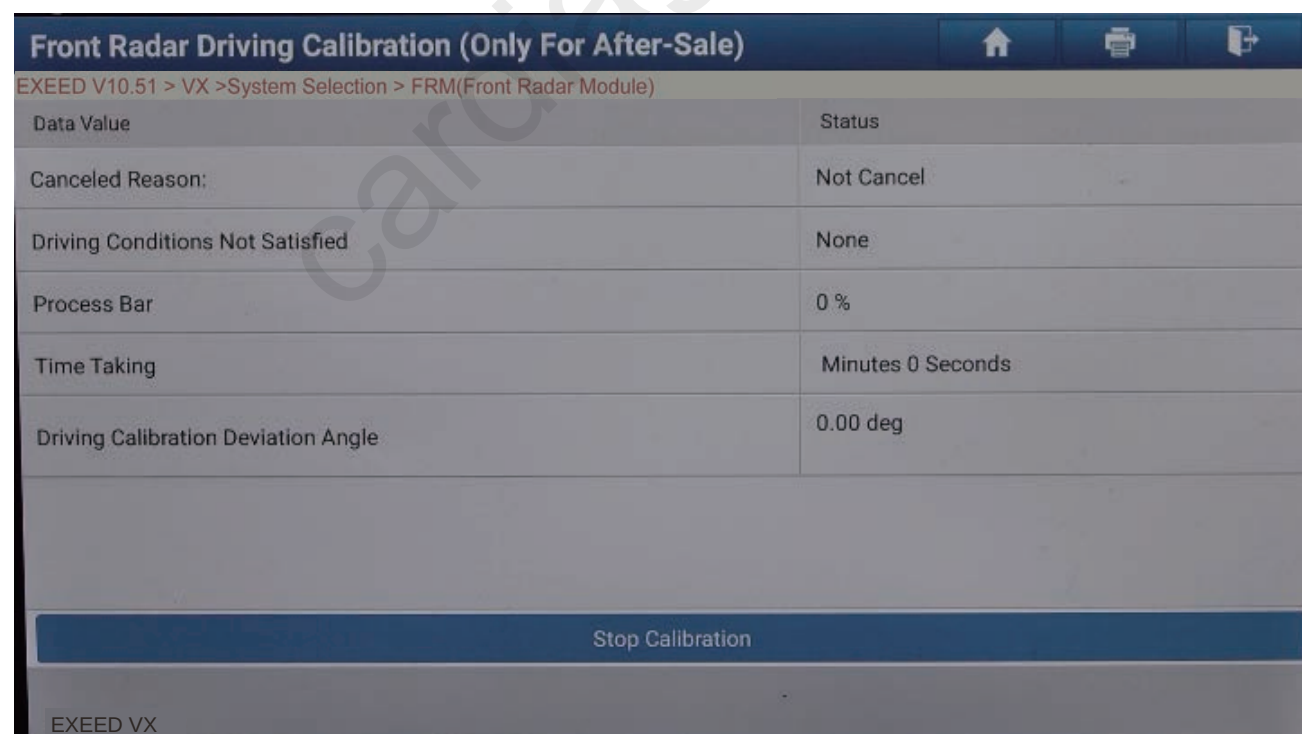


- (5) Calibrate horizontal direction with driving calibration, and click "Yes" .



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

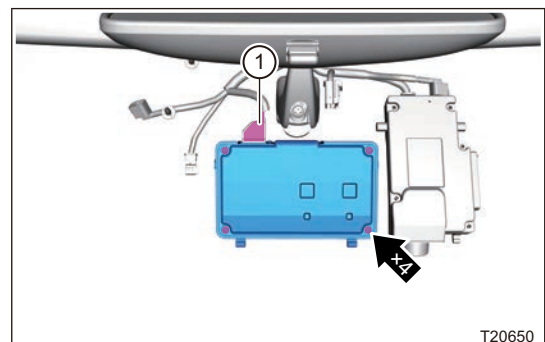
Calibration may fail if following conditions occur:

- 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.

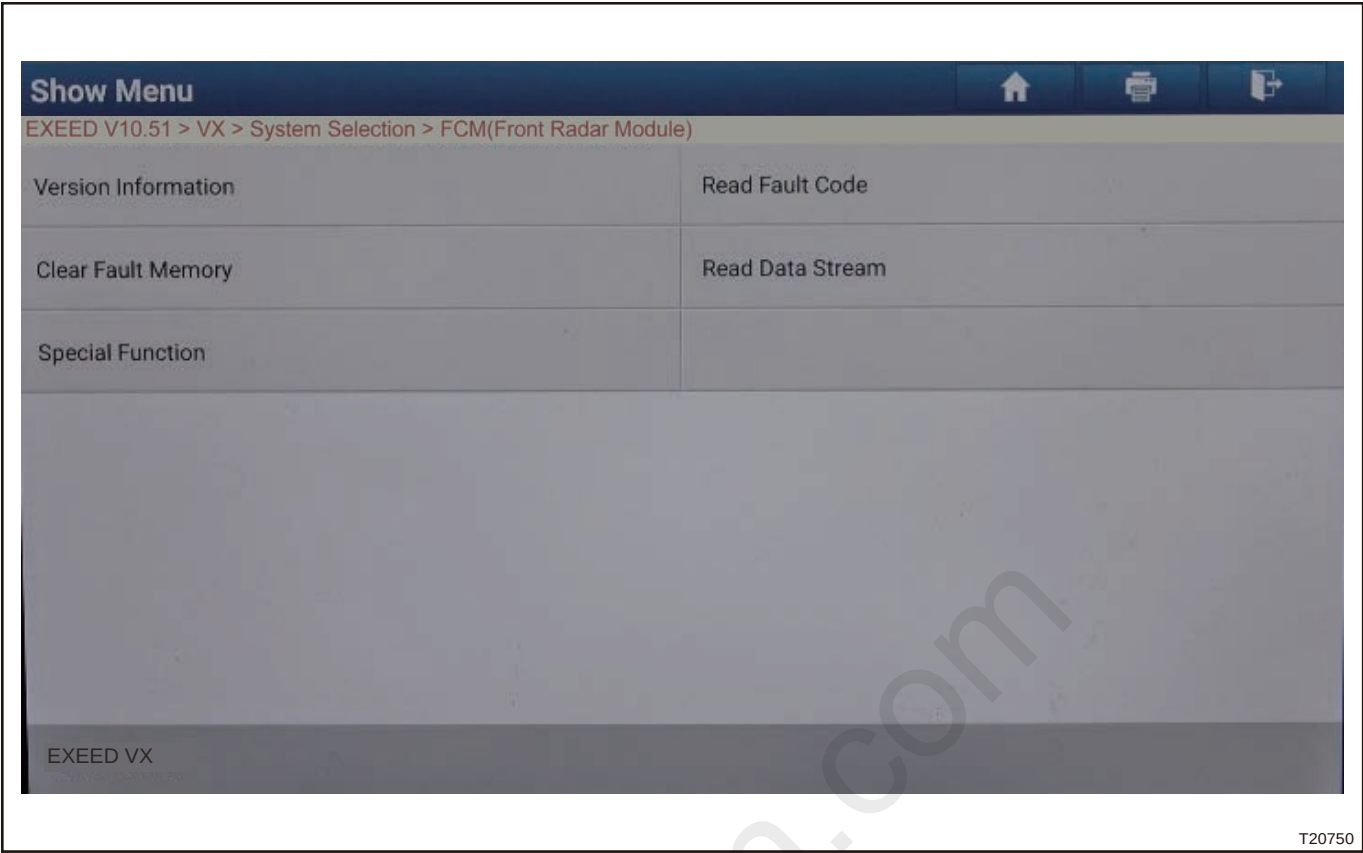
■ Matching Learning

■ Writing VIN code

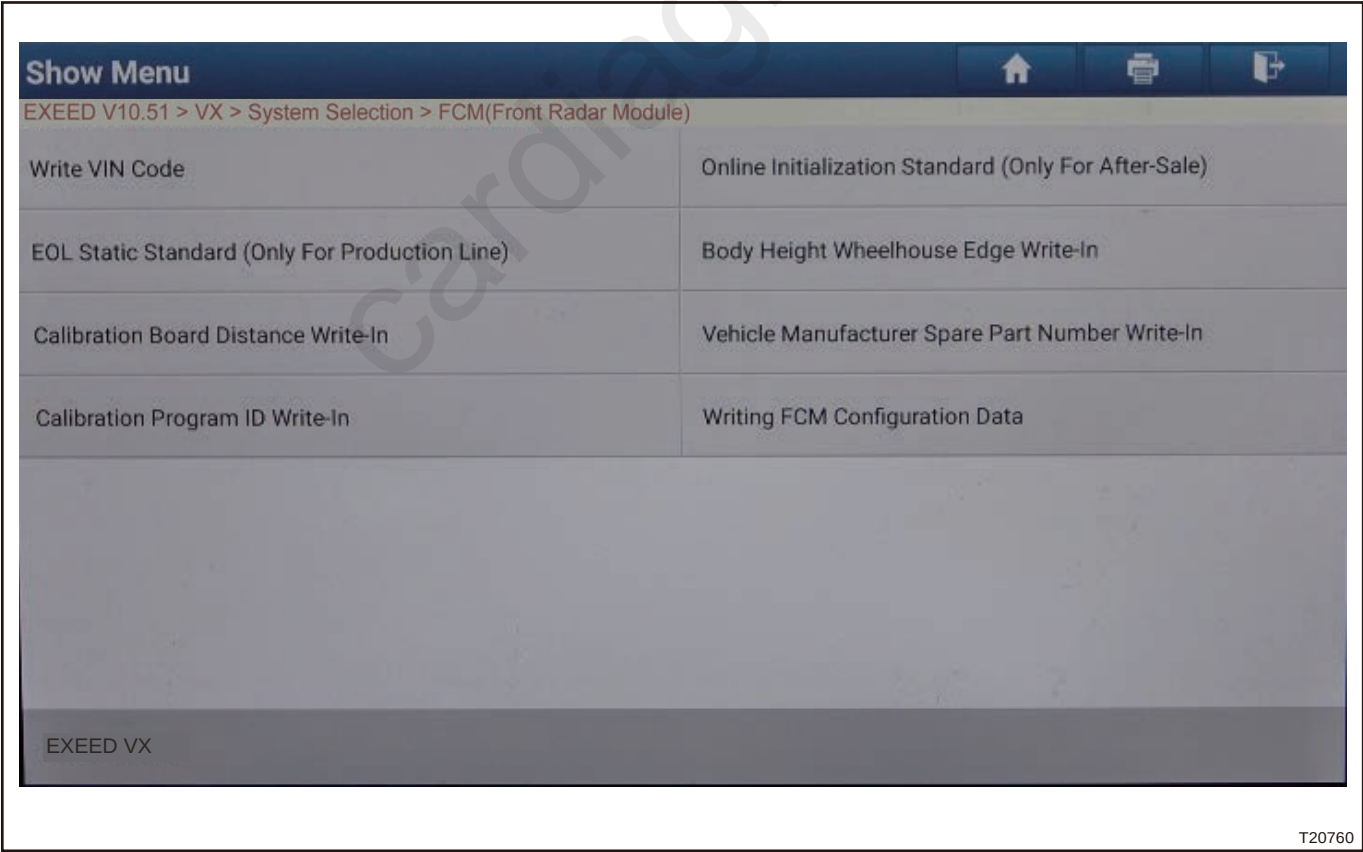
- (1) Connect diagnostic tester, enter the system, select model and click special operation.



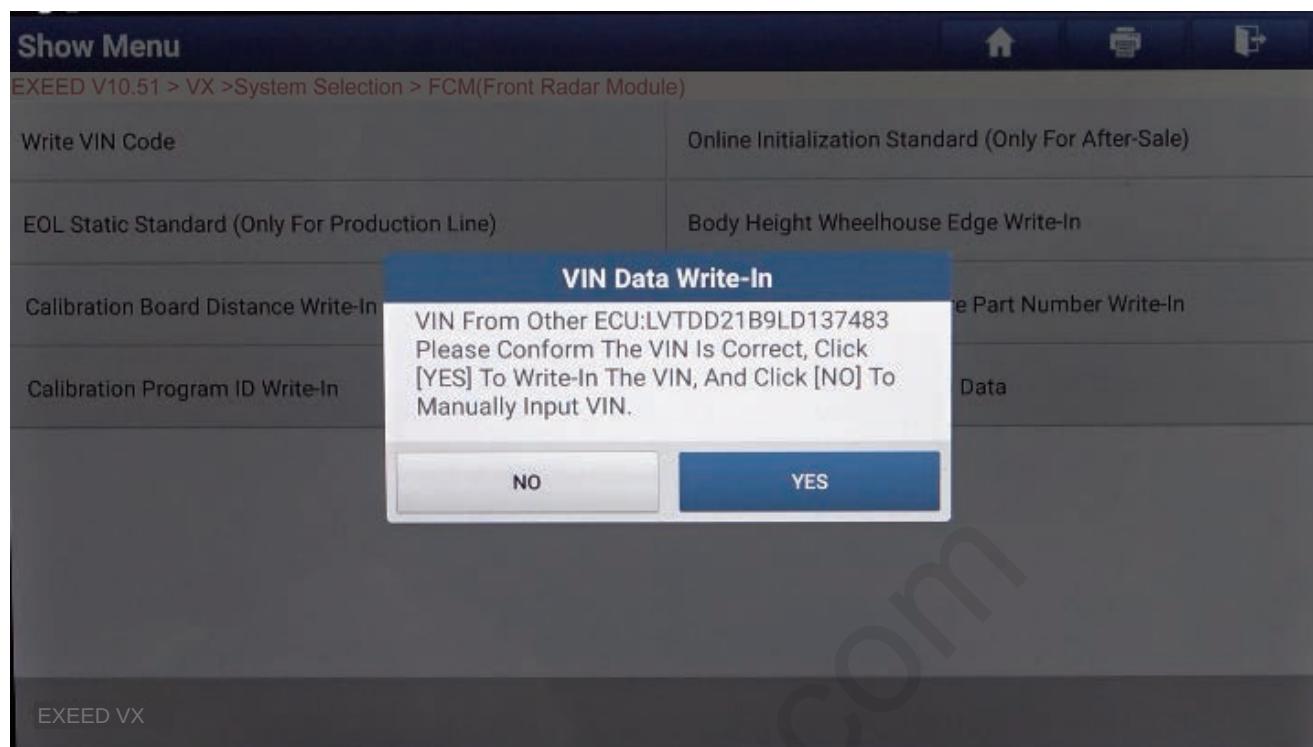
T20740



(2) Click “Write VIN Code” .



(3) Compare VIN code displayed on screen with vehicle. If the code is same, click “Yes” , otherwise click “No” and input it manually.

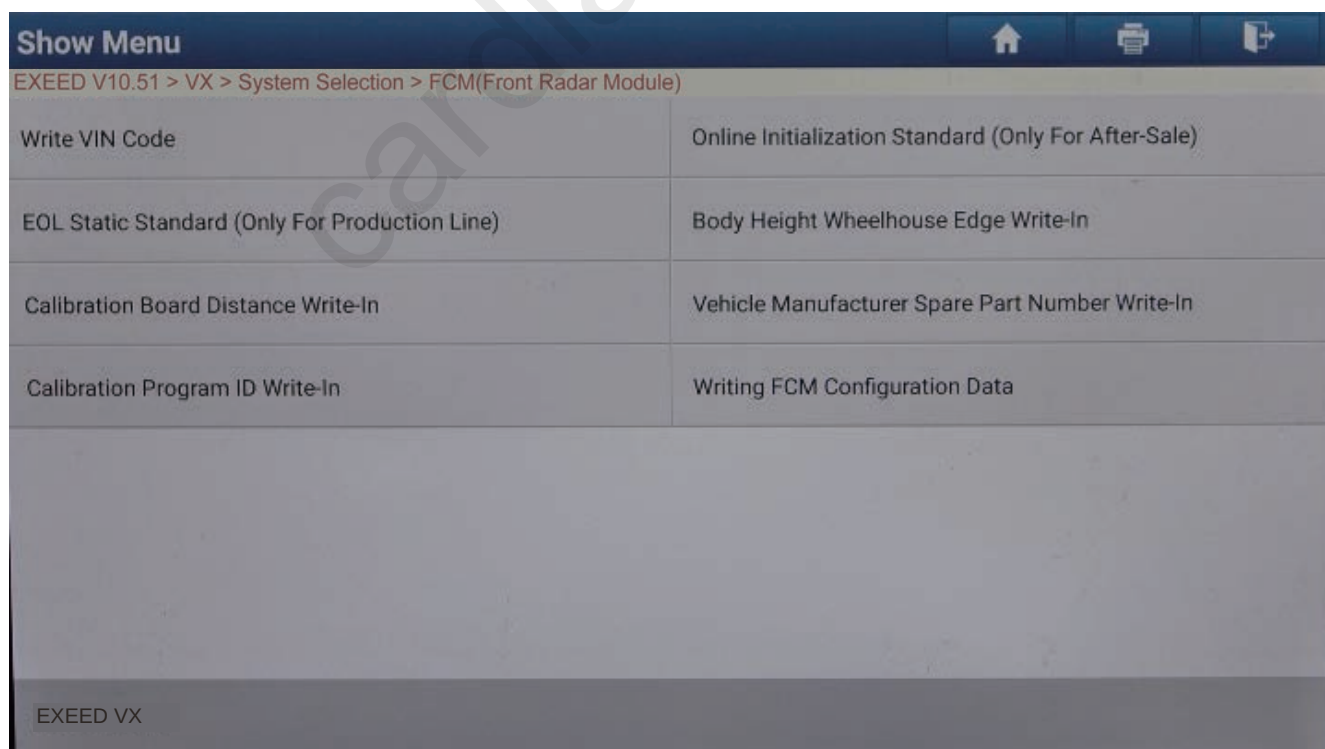


T20770

(4) Input corresponding VIN code and click "OK" .

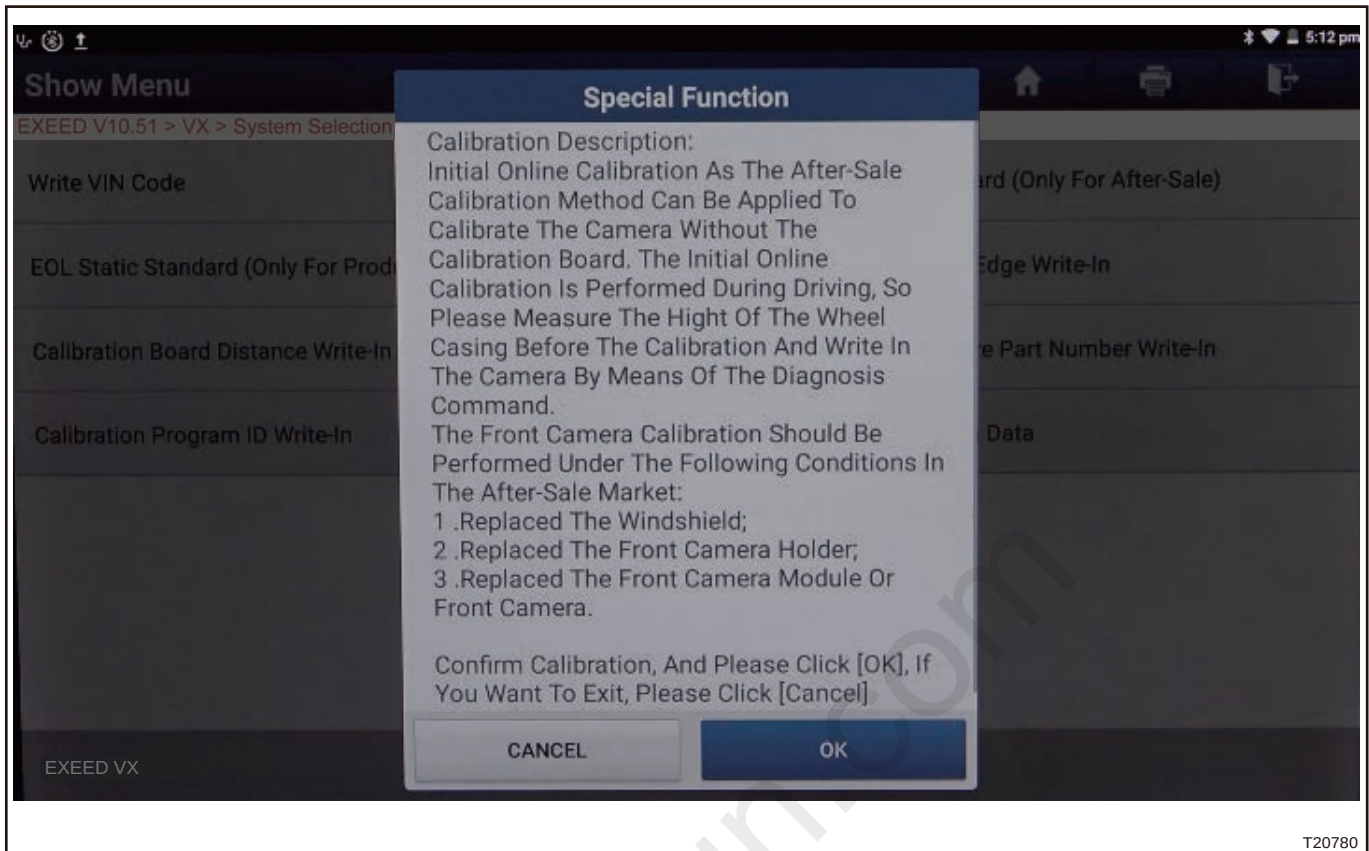
■ **Online initialization calibration**

(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

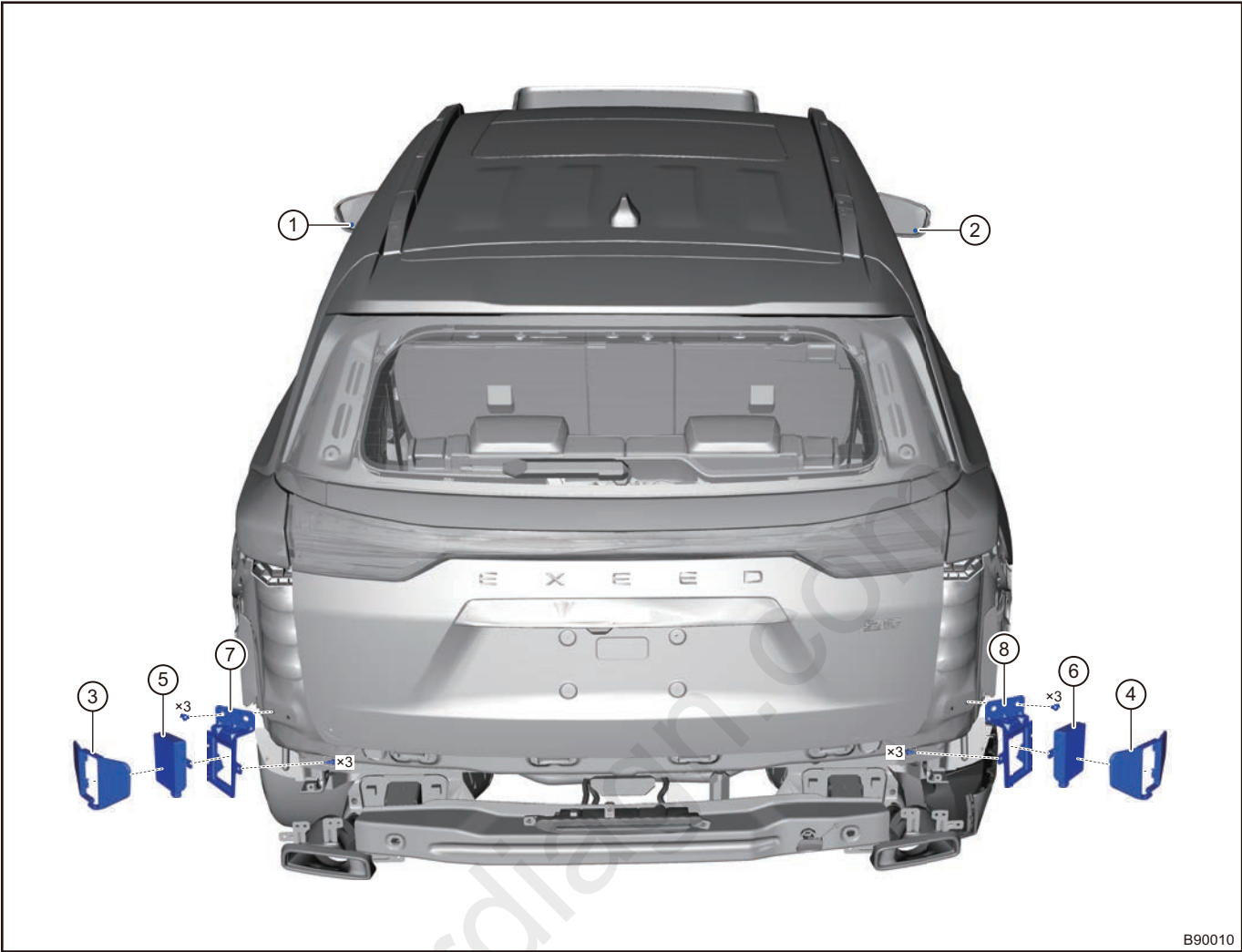
Detection target: Car, truck, motorcycle, bicycle. Because the reflection cross-sectional areas of motorcycle and bicycle are relatively small, the detection distance will be shorter than that of car and truck. The blind spot detection system does not alarm for stationary objects, and the minimum detection 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.

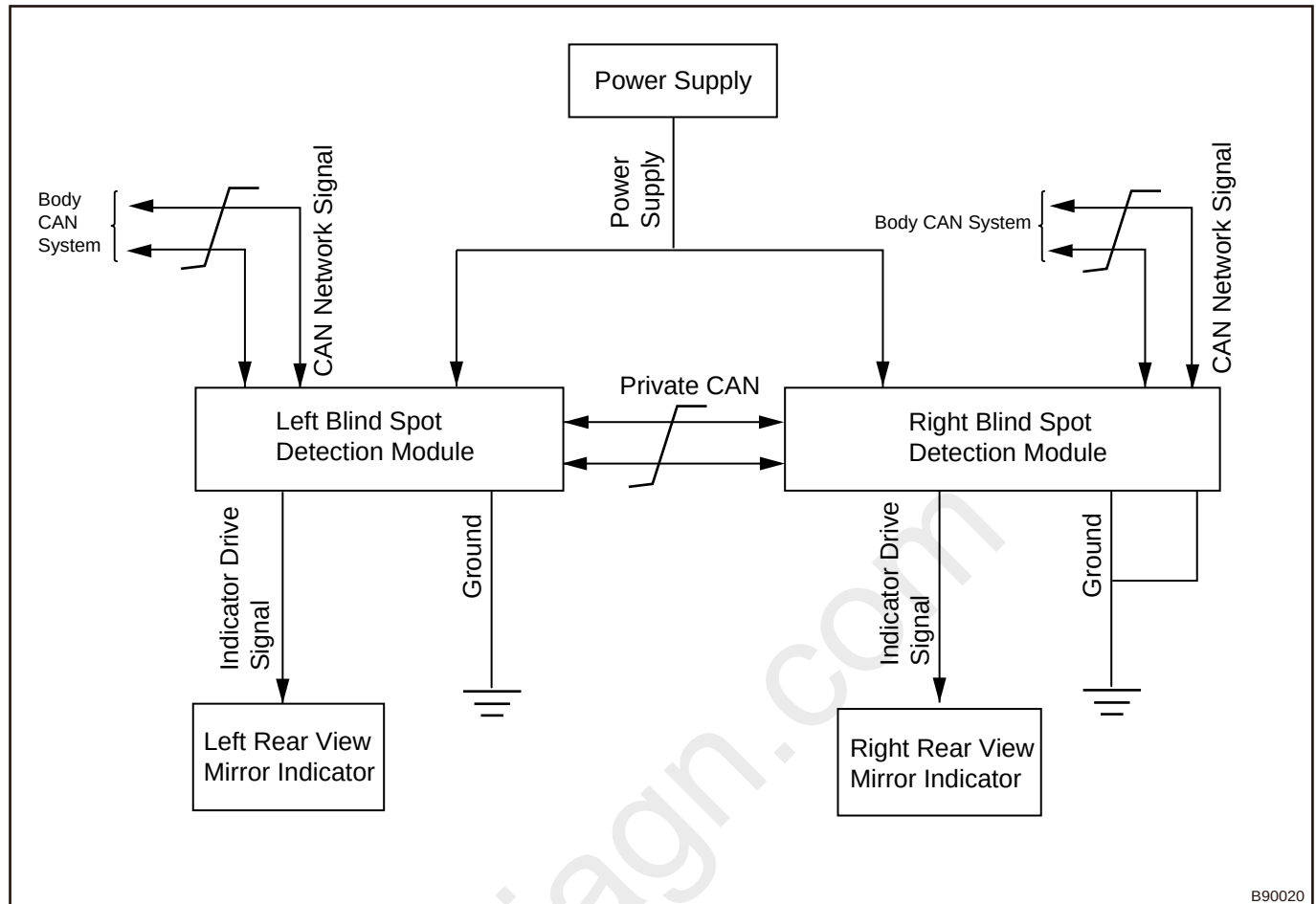
1.2 Description



B90010

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



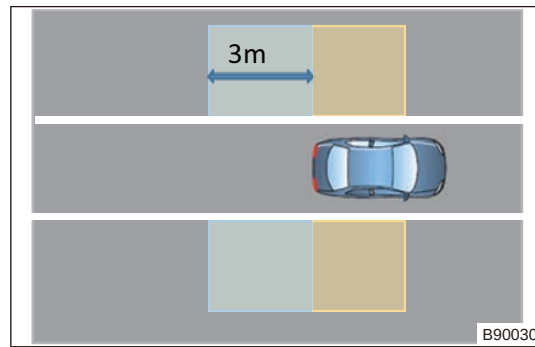
The control module is integrated inside the radar sensor. The radar communicates with the vehicle network through CAN bus. The communication between left radar sensor and right radar sensor is carried out through private CAN. BSDL receives vehicle speed signal, ignition switch status signal, turn signal 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.



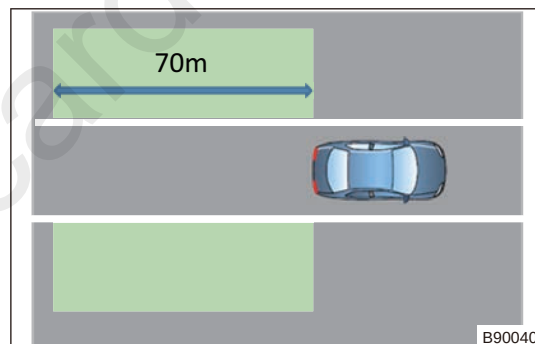
- Blind spot detection function is activated: The vehicle is activated in forward gear or neutral gear, and the vehicle speed is 5 km/h or more.

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.



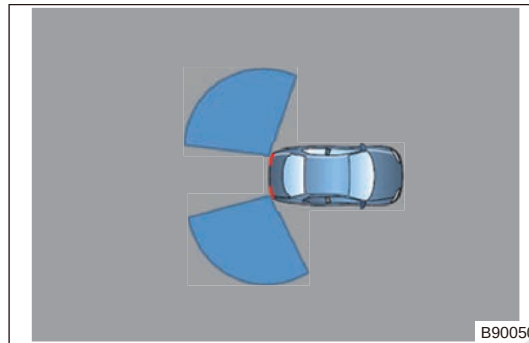
- Lane change assist function is activated: The vehicle is activated in forward gear or neutral gear, and the vehicle speed is 5 km/h or more.

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.



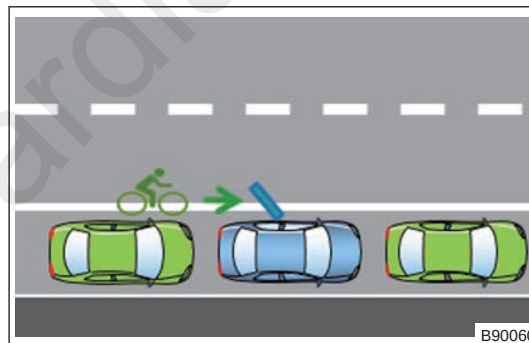
- Reversing assist function is activated: The vehicle is in reverse gear and the reverse speed is lower than 10 km/h.

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)

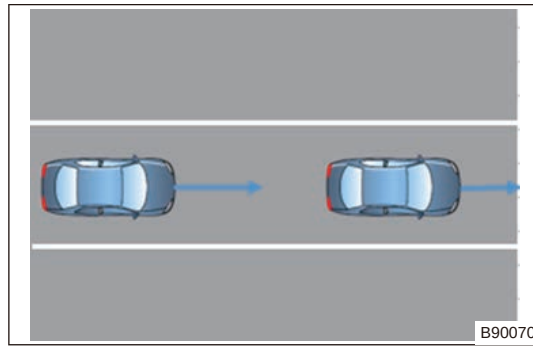
The door opening warning function detects the approaching vehicles and bicycles in the rear of the adjacent lanes through sensors, and gives an alarm when there is a risk of the door opening, so as to prompt the driver not to open the door at this time.



- 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

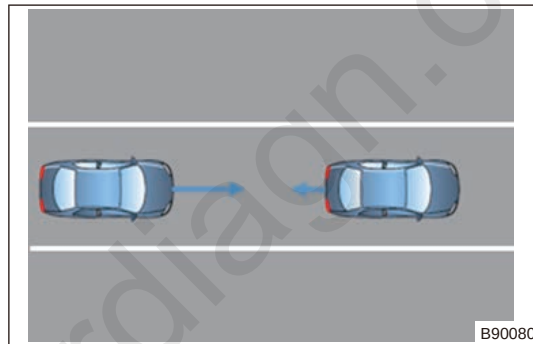
Close Vehicle Warning (CVW) when moving forward function: When this vehicle is moving forward or stationary in the lane. The target vehicle quickly approaches this vehicle in the same lane. At this time, the target vehicle is at risk of collision with this vehicle. The target vehicle will be warned by 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 $\times 30/2.4s$, 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

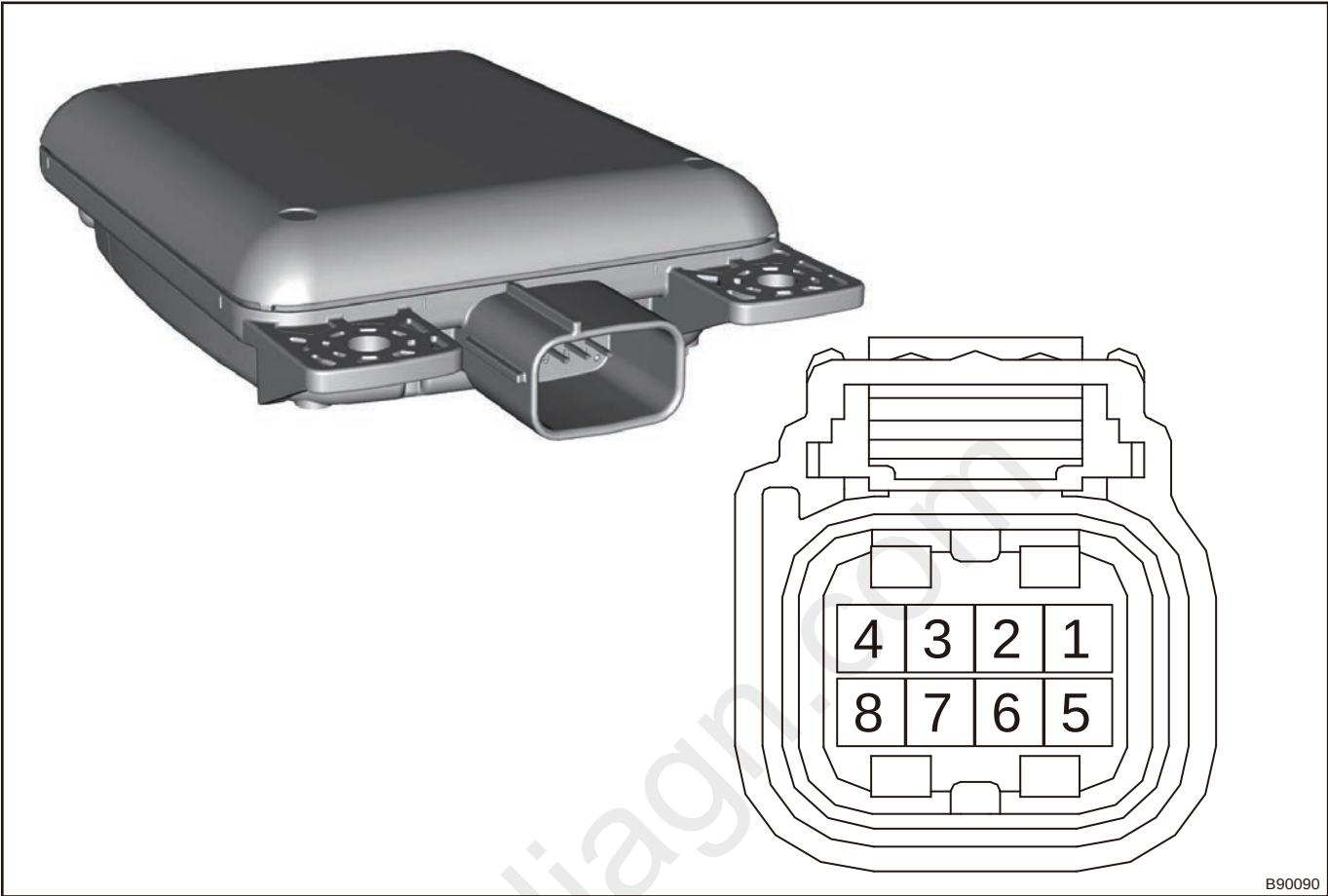
Hint:

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

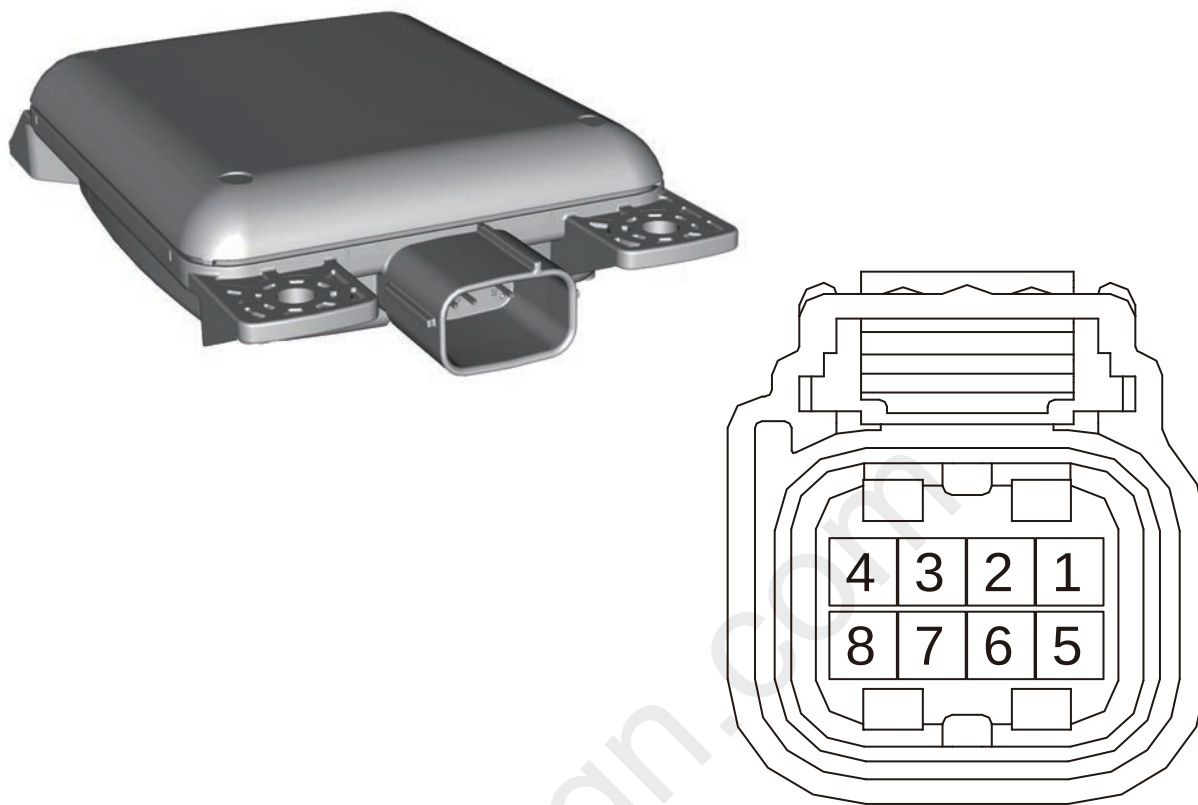
2.2 Blind Spot Detection Module Terminal Definition

■ 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



B90100

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:

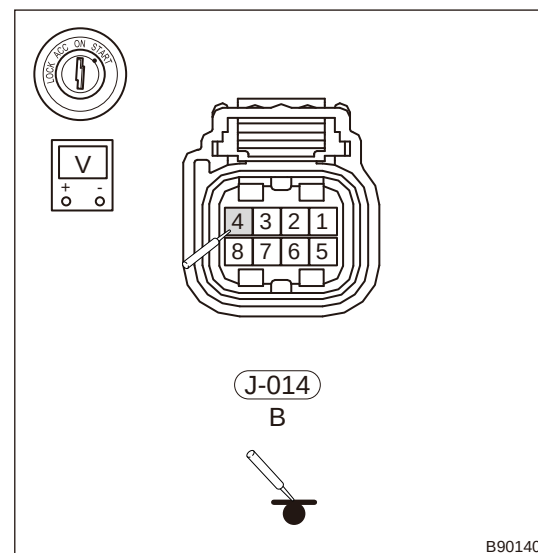
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1

Check module output

Use circuit diagram as a guide to perform the following inspection procedures:

- Turn ignition switch to ON.
- 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.



B90140

OK

Exchange the warning LED test. (rear view mirror lens)

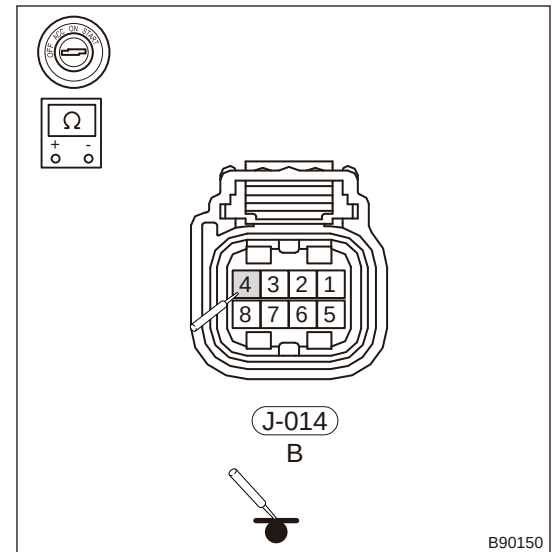
NG

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	$\leq 1 \Omega$

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:

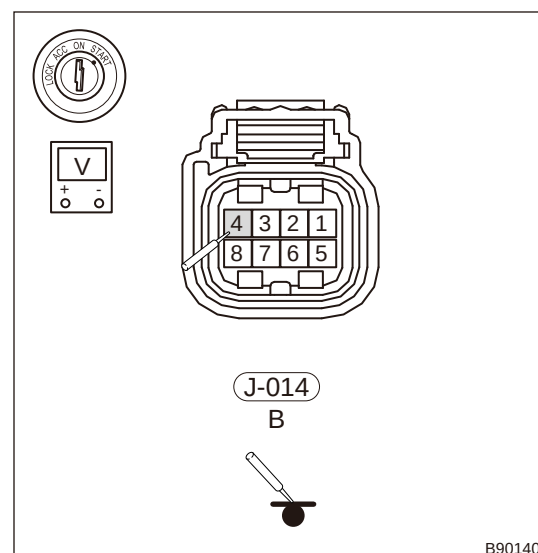
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check module output
---	---------------------

Use circuit diagram as a guide to perform the following inspection procedures:

- Turn ignition switch to ON.
- Disconnect left blind spot detection module connector J-014 and left outside rear view mirror connector F-016.
- 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



- 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	$\leq 1 \Omega$

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:

- Use the diagnostic tester to perform module configuration.

OK

Perform running test after clearing DTCs

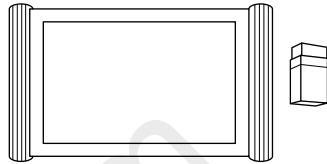
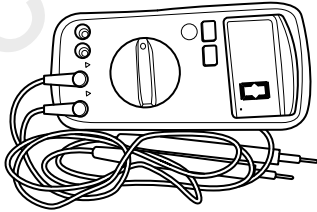
DTC	U124188	Private CAN Bus Off
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DTC	DTC Definition	Possible Causes
U124188	Private CAN Bus Off	/

1	Refer to “CAN COMMUNICATION” for troubleshooting
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3 ON-VEHICLE SERVICE

3.1 Tools

Tool Name	Tool Drawing
X-431 PAD Diagnostic Tester	 RCH0001006
Digital Multimeter	 RCH0002006

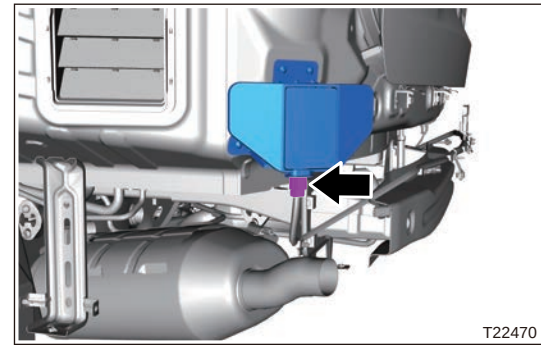
3.2 Blind Spot Detection Module

■ Removal

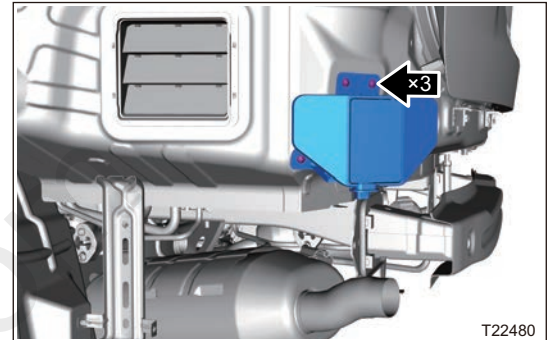
Warning
- Removal and Installation of left and right modules are the same. Take left side as an example below. - Be sure to wear safety equipment to prevent accidents, when removing blind spot detection module. - Operate carefully to prevent damage to blind spot detection module, when removing blind 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.

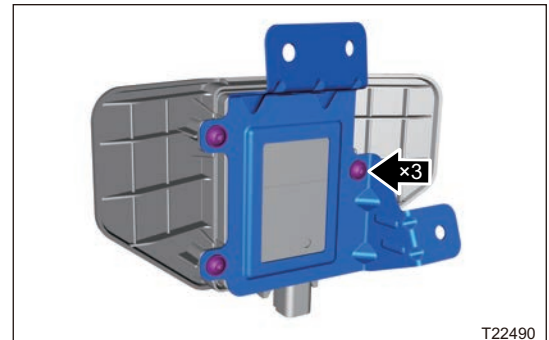
- (4) Disconnect the left blind spot detection radar module connector.



- (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

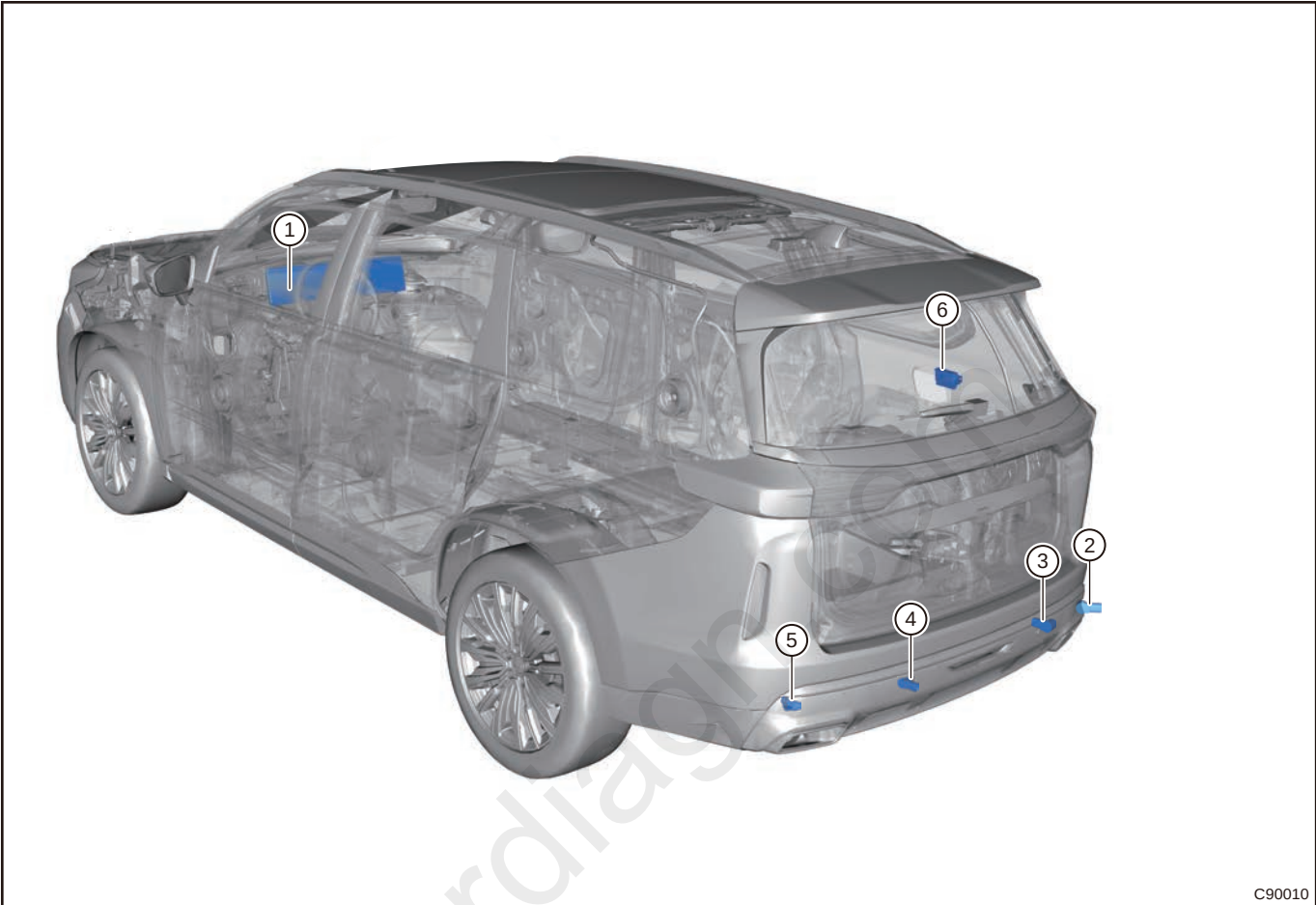
In order to avoid dangerous operation and damage to the vehicle, always follow the instructions below before repair.

- (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

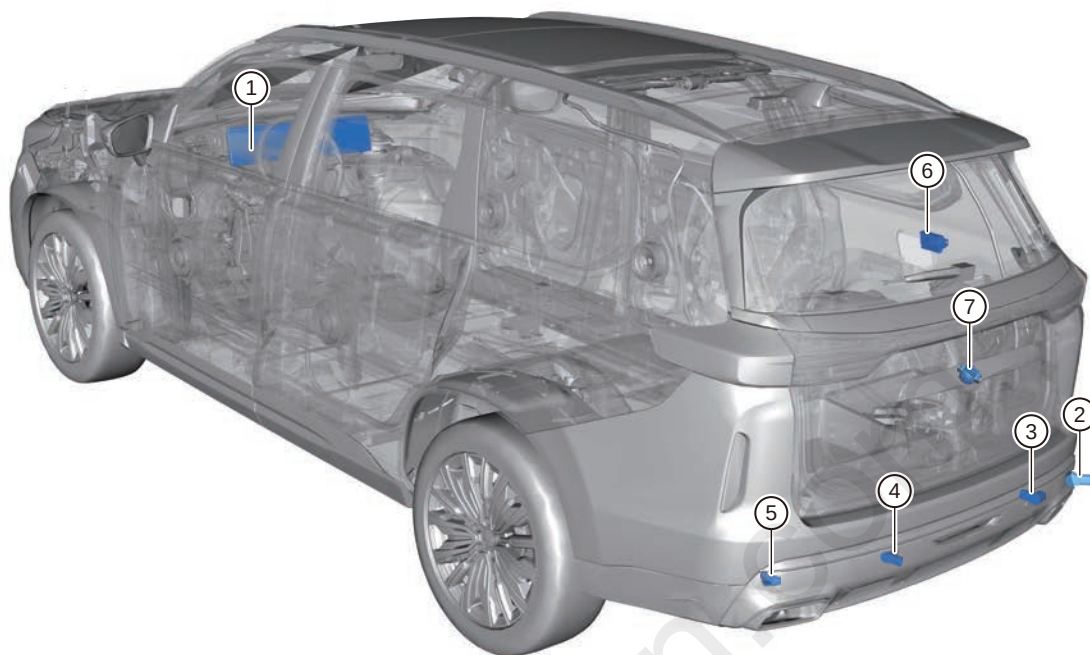
■ Reverse Radar System



C90010

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



C90020

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



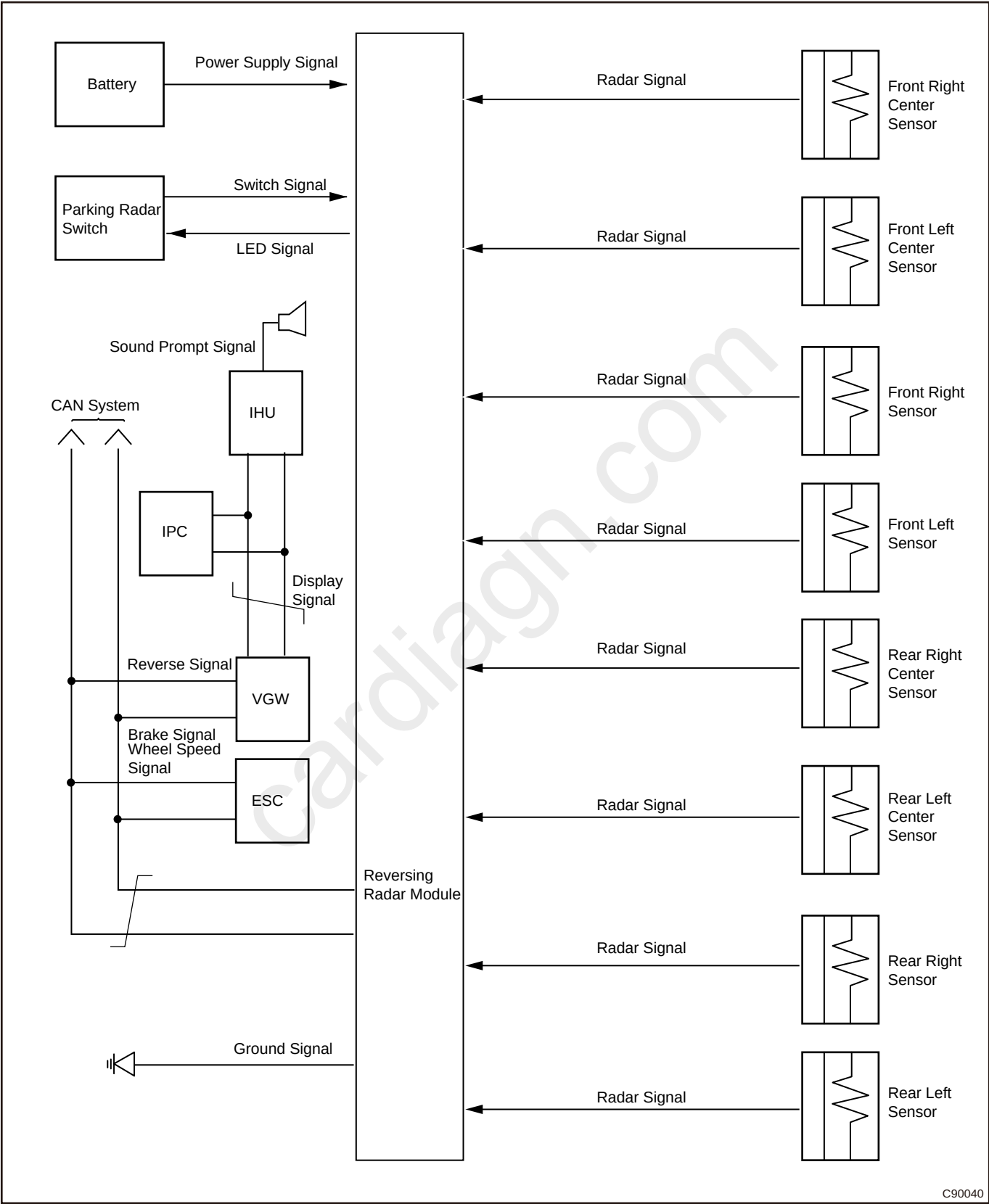
C90030

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

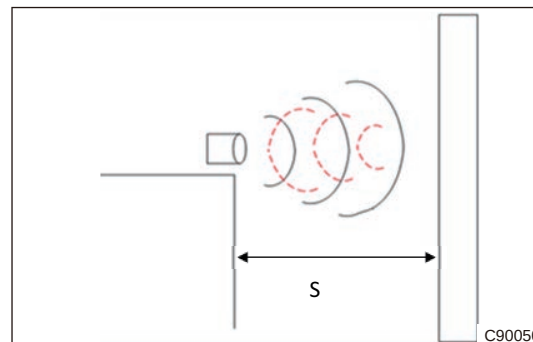
■ System Schematic Diagram



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 ($S = t \times 340 \div 2$) 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

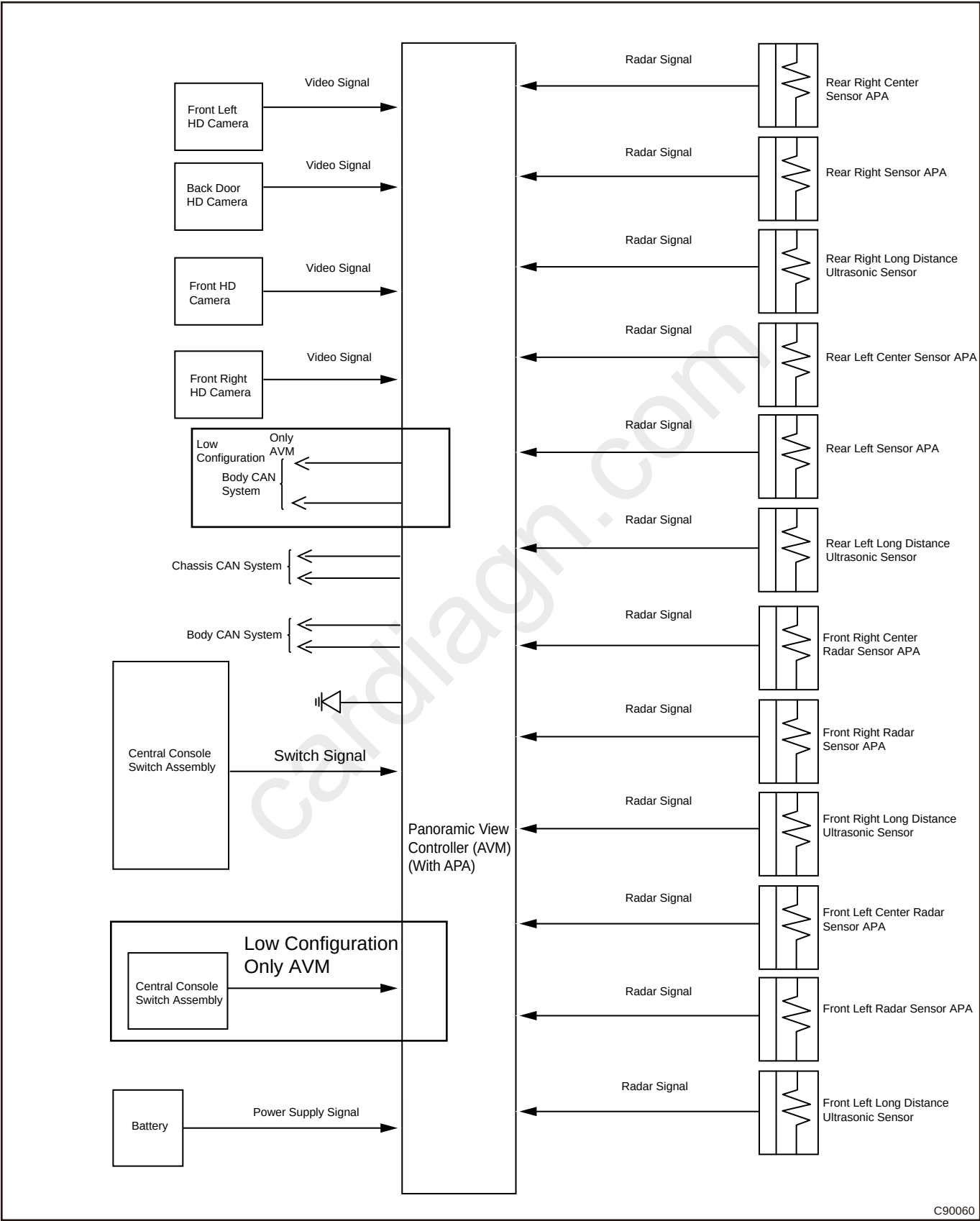
- Be careful not to scratch the lens when cleaning dirt or snow on the surface of camera.
- Use the displayed route and aerial view as reference. Displayed route and aerial view are greatly affected by numbers of passenger in vehicle, fuel amount, vehicle location, road surface condition and road surface grade.

Activation Condition		System Activation	Exit Condition	
Preconditions	Trigger Condition		Corresponding Exit Condition	Priority Exit Condition
Vehicle speed < 20 km/h	Shift to R	R is activated	Exit R position, the duration is longer than 15 seconds, and there is no effective operation within the duration	Vehicle speed > 30 km/h
	AVM switch is pressed	AVM switch is activated	Press AVM switch again	
			Operate other high priority switches	
	Turn on the turn signal light	Turn signal light is activated	Turn off the turn signal light and there is no effective operation within 500 ms	
			Operate other high priority switches	
	Steering wheel angle > 190°	Steering wheel angle is activated	Steering wheel angle is less than 180° and the duration is longer than 1 seconds, and there is no effective	

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.

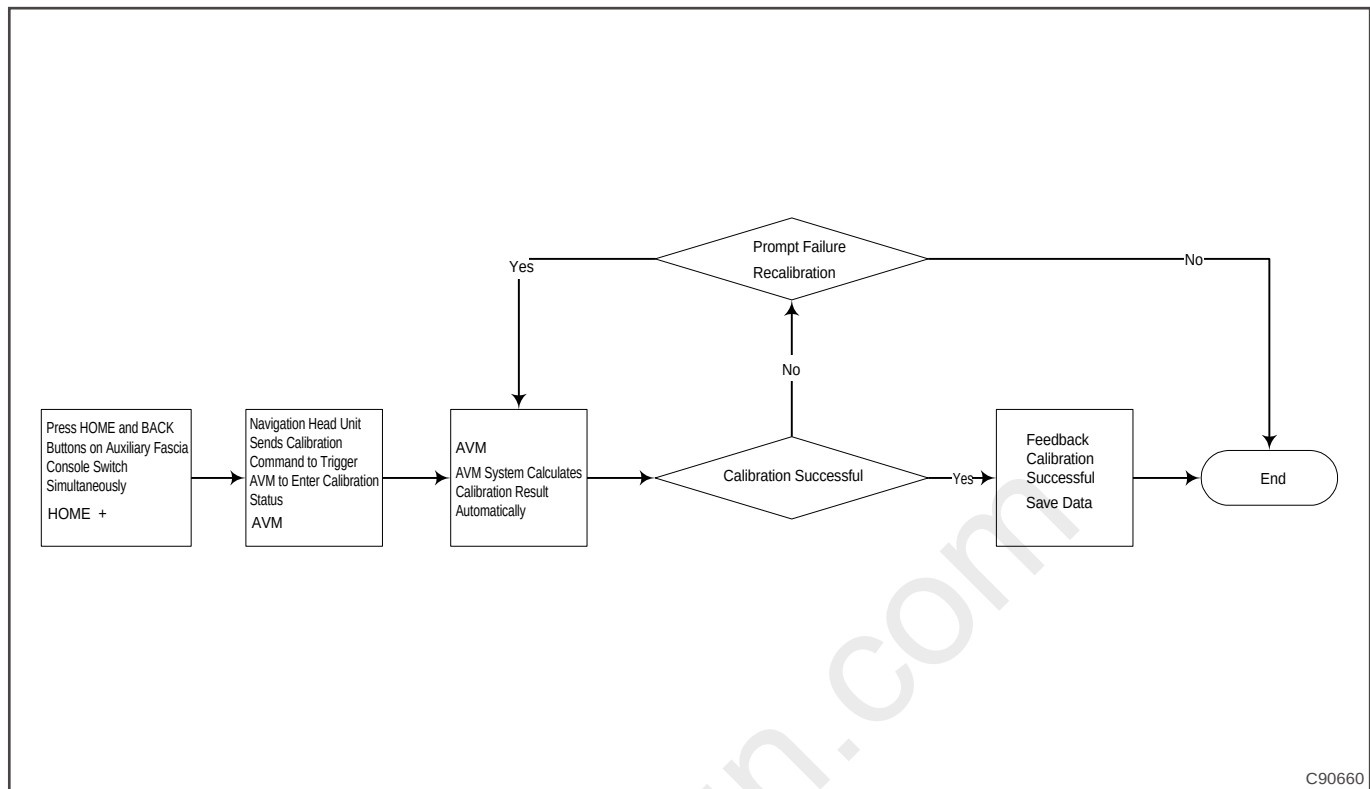
Caution

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.

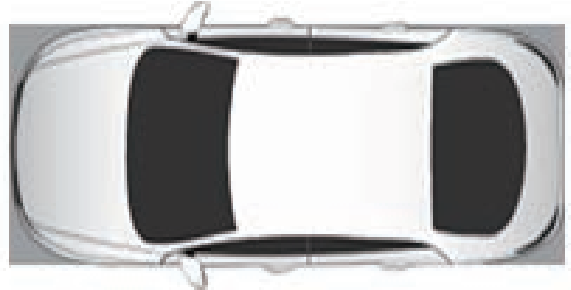
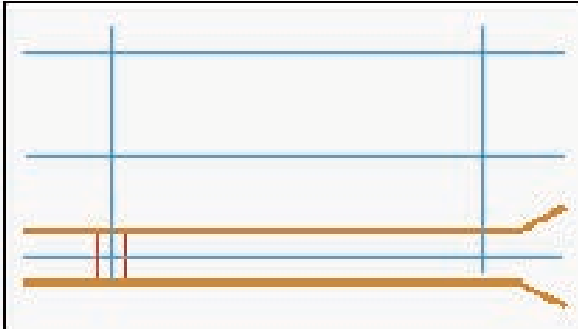
Caution

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)

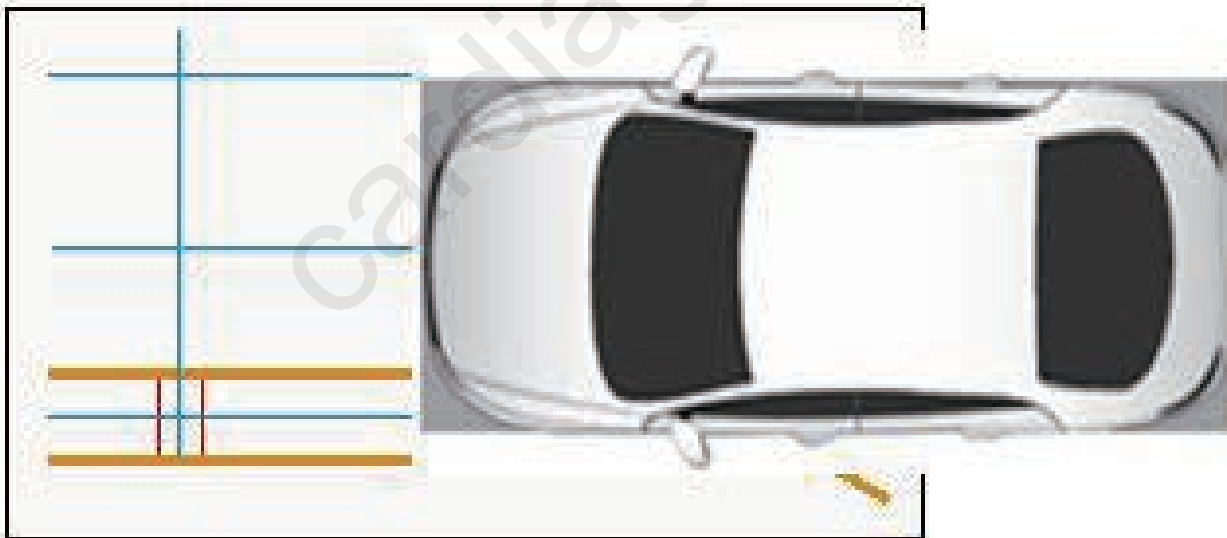
When the vehicle to be calibrated enters the calibration station, the steps are as follows:

- (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:



C90670

- (2) Driving the vehicle forward, slightly adjust the steering wheel and make the front wheels enter the guide rails, as shown in the illustration:



C90680

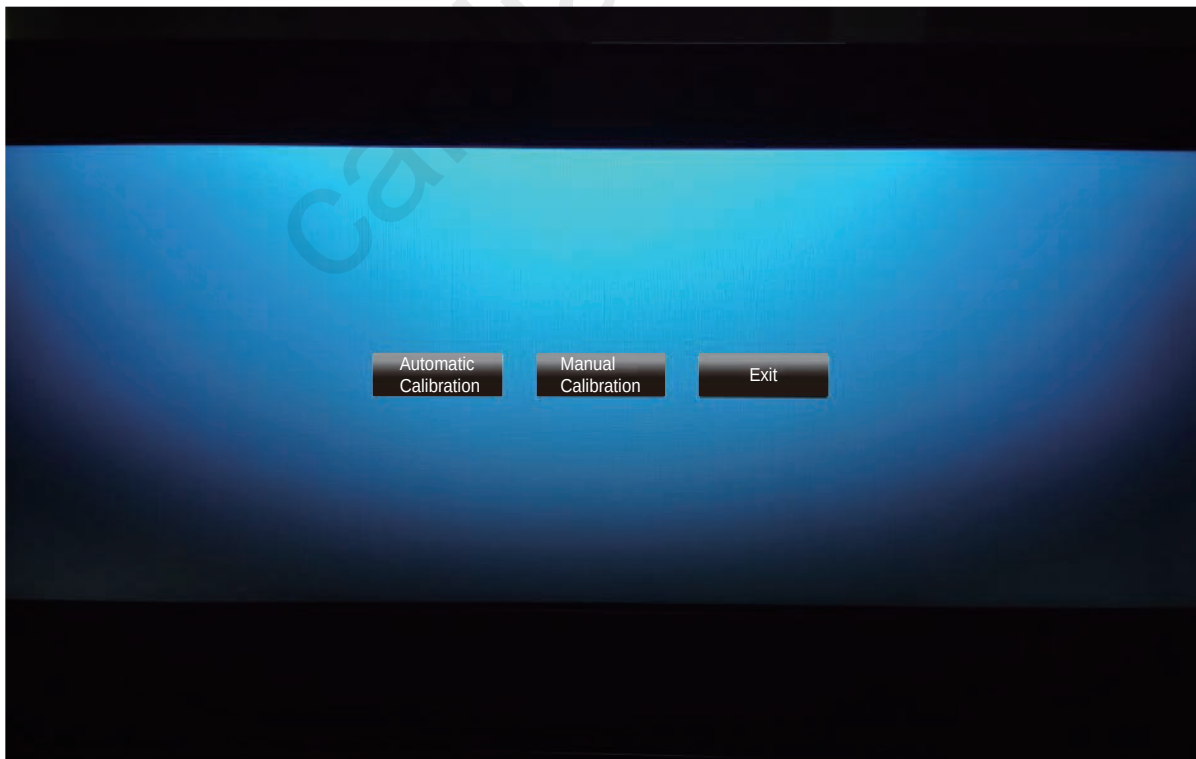
- (3) Continues to drive along the guide rail, stops after front wheel enters the position, so that the two front wheels naturally enter the slot, and confirm that the front wheel axis is consistent with the center position of slot, as shown in the following illustration:



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

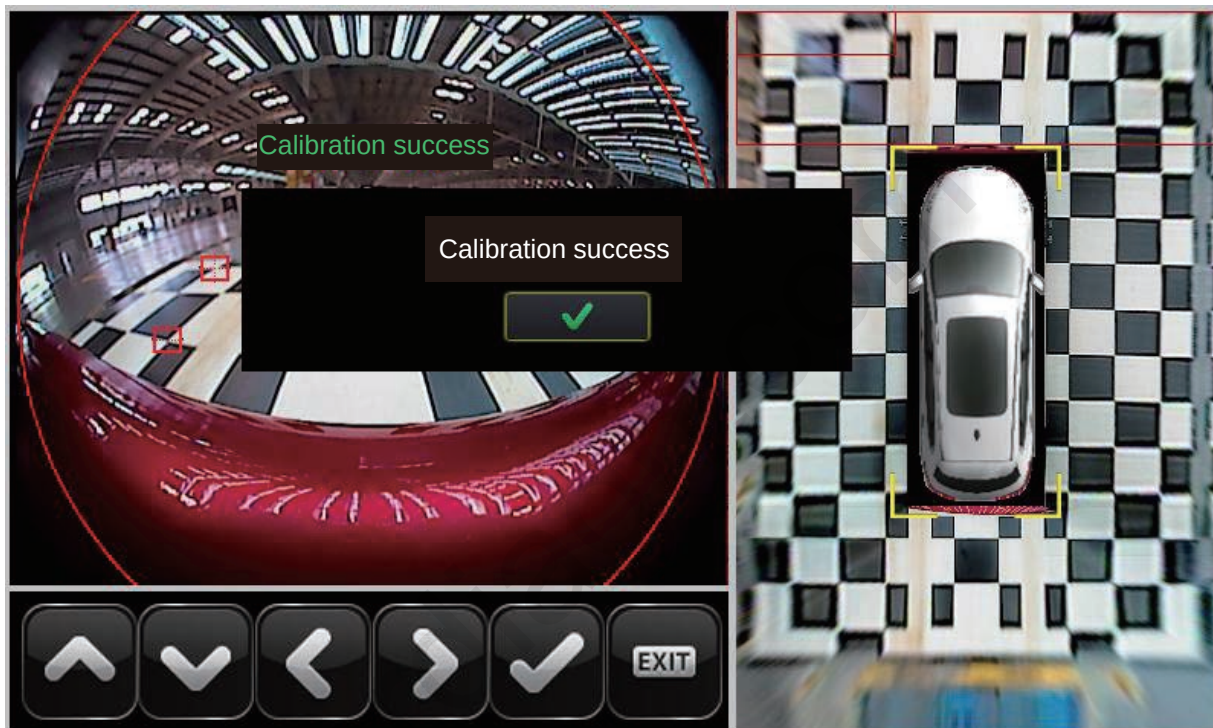
Caution

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)**

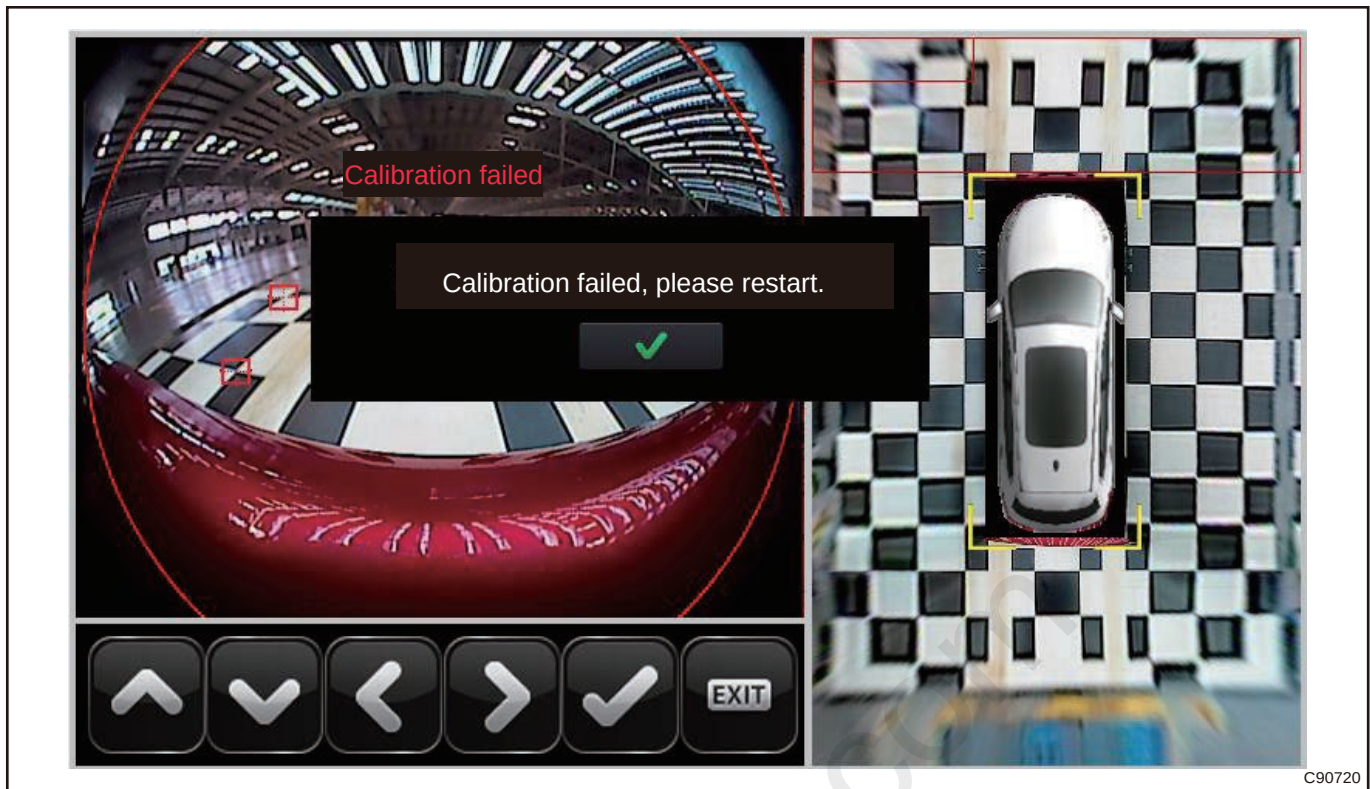
After step 2, the panoramic view monitor system will restart and automatically start the calibration action. After about 10 seconds, the audio display will prompt the calibration result.

- (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.

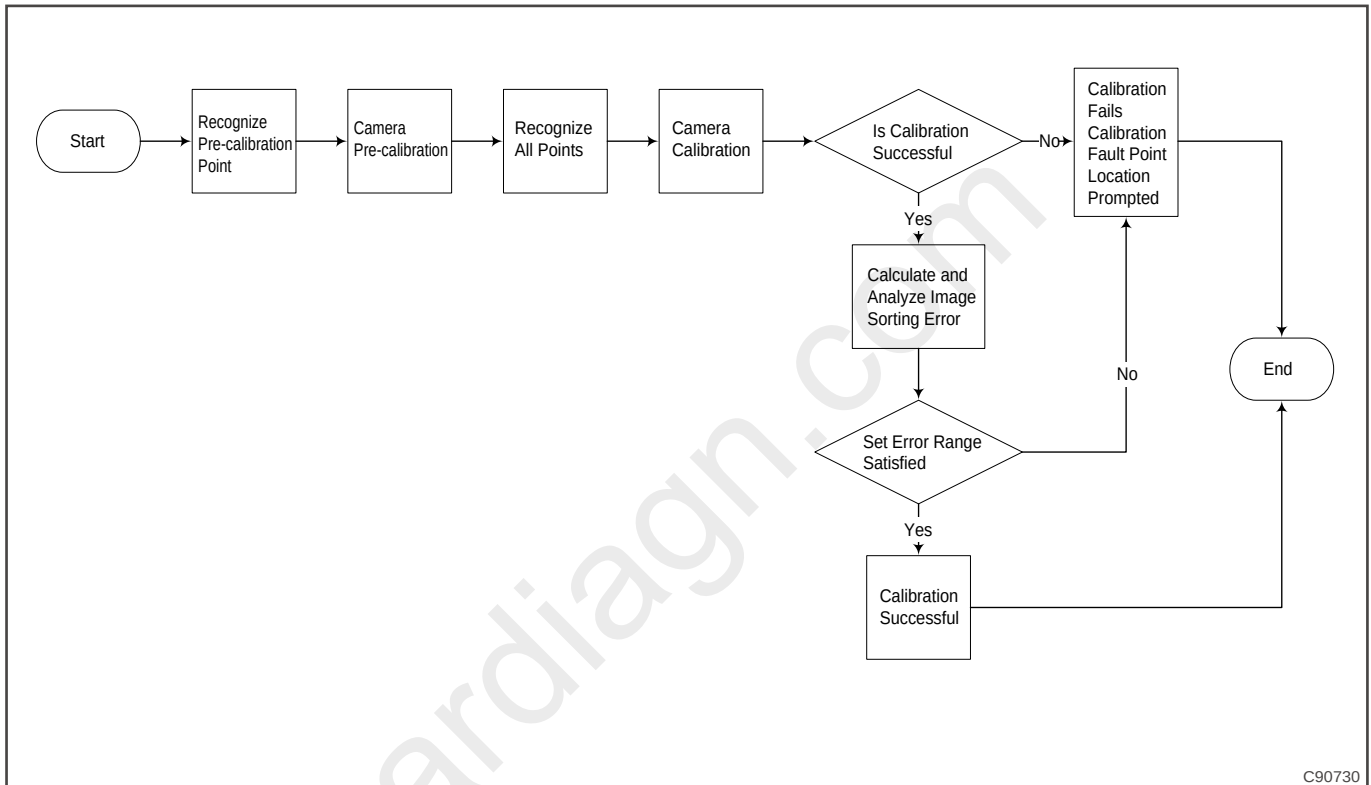
■ Solution Method

- 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 ($S = (1/n * \sum(E_{pos_i}^2))^{(1/2)}$) 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.

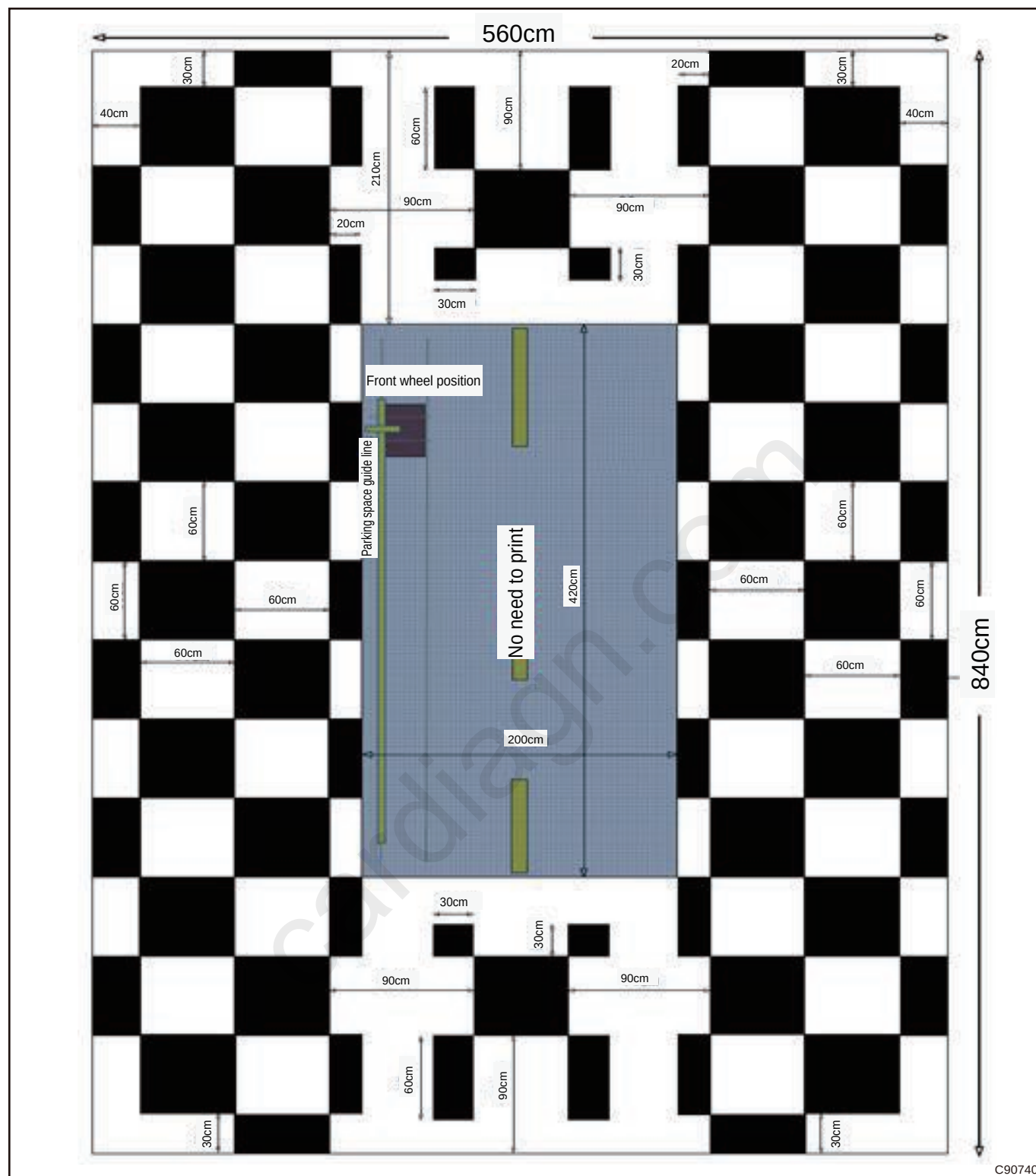
■ Calibration Procedure



■ 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 $\pm 0.5^\circ$. 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 $\pm 10\text{mm}$ for any 2 meters length. If the construction conditions permit, it is recommended to be controlled within $\pm 5\text{ mm}$.

■ Light Condition

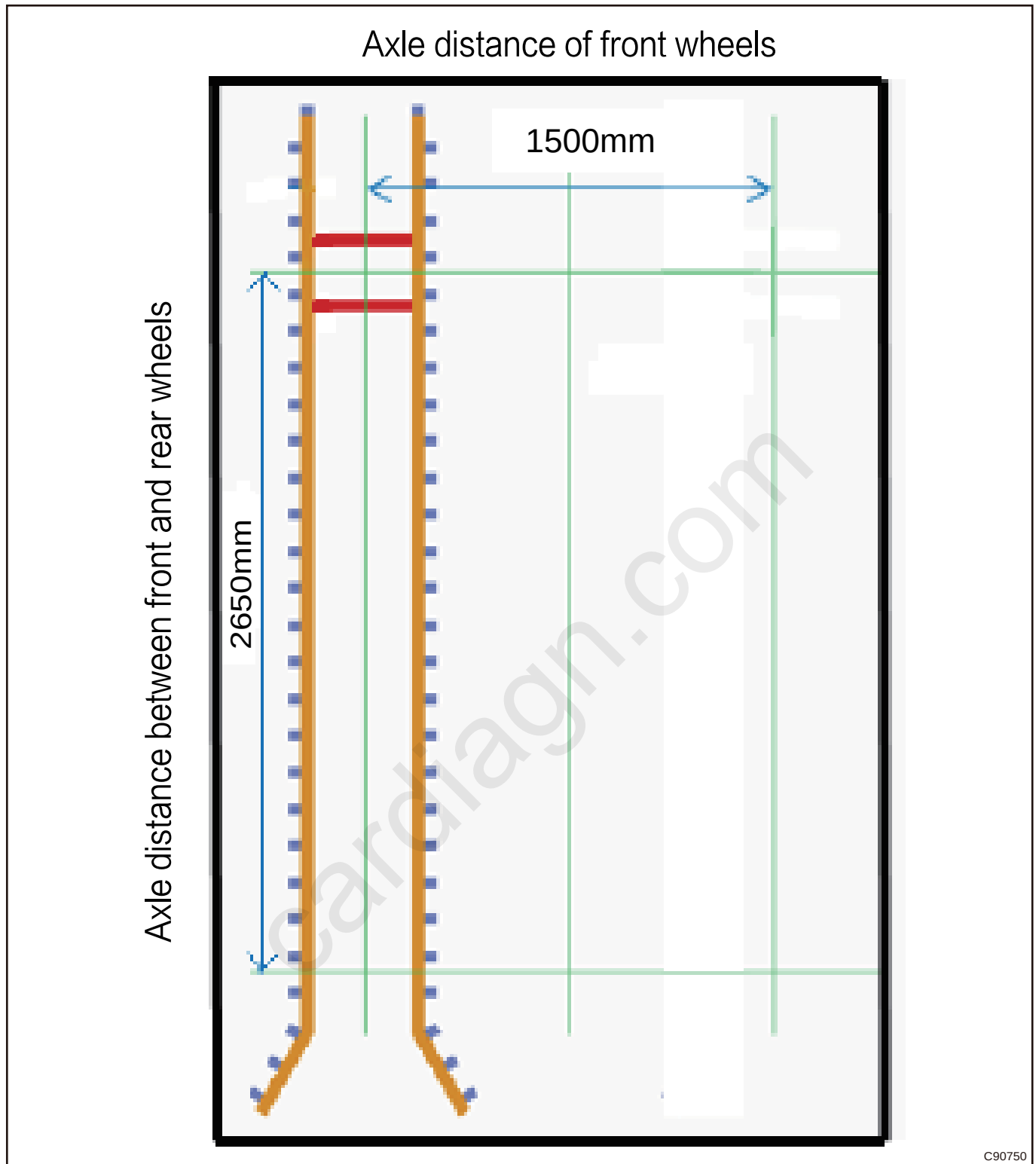
The ambient lighting requirements of the calibration site are mainly diffuse light, LED lighting (LED tube specification: 1.2 meters long, 6500 K color temperature, power above 16 W), using LED tube vertical lighting, requiring ambient brightness between 300 lux and 1000 lux (It is recommended to use 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

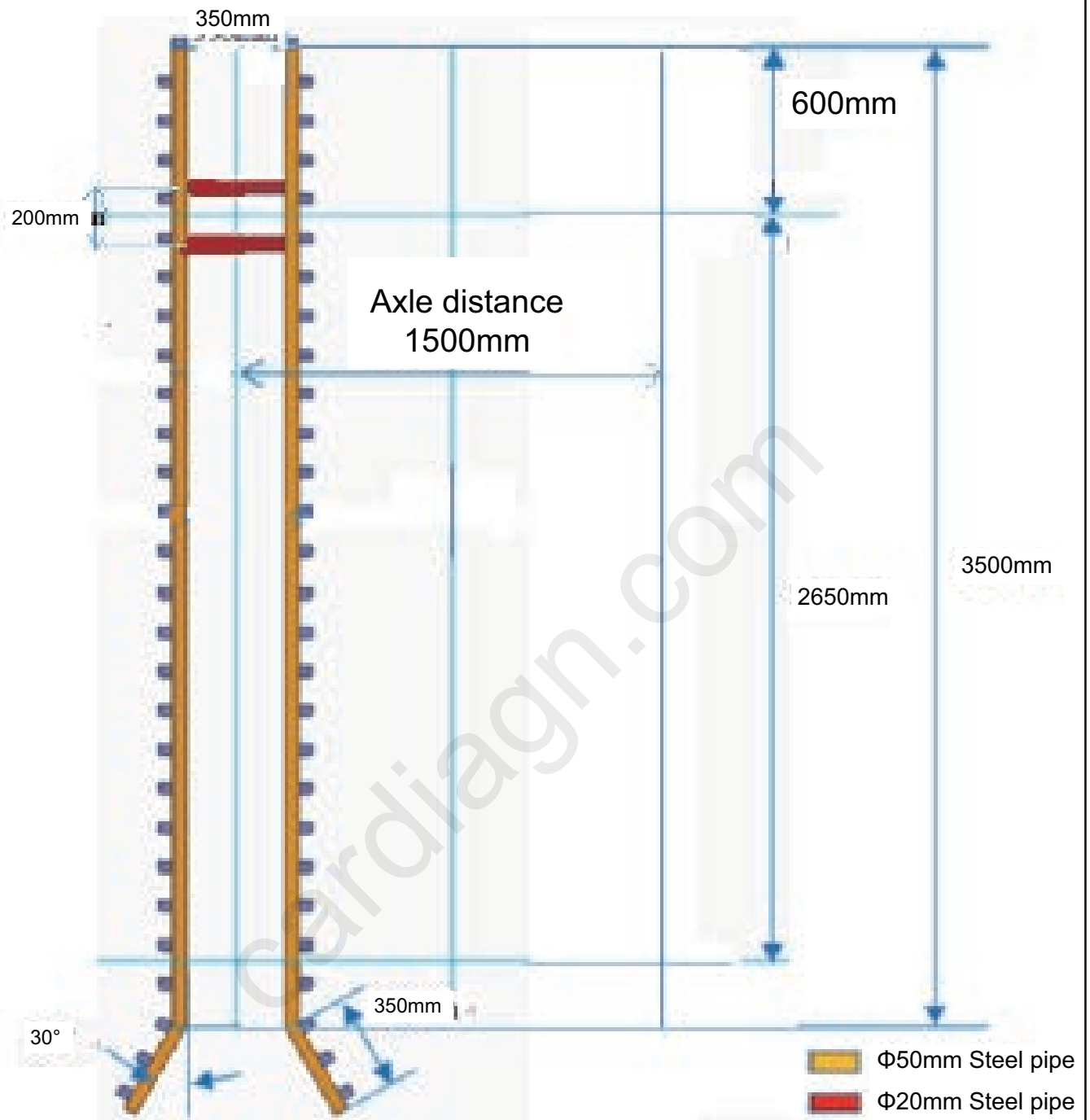
It is recommended to use black and white acrylic matt outdoor paint (for example: Nadis acrylic outdoor paint) for the calibration of the site. When it comes to wear resistance and matt performance, a better matt paint specification can be selected according to the actual situation to achieve better 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

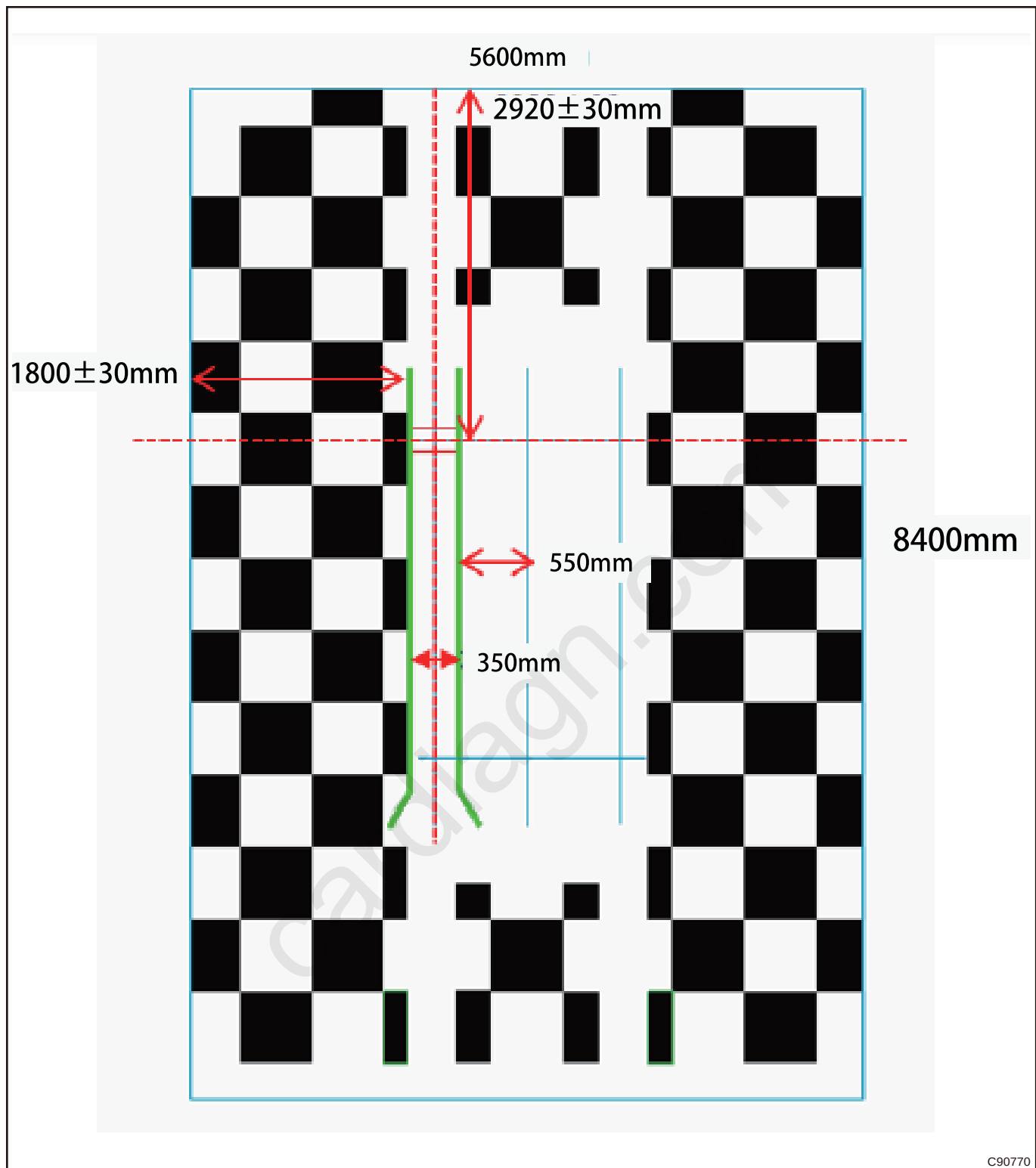
- (1) Ground construction and laying: The cement floor is used to ensure that the cement floor and the surrounding floors are laid on the same plane, and treat the cement surface with a matte.
- (2) Vehicle positioning device: The vehicle positioning adopts a single-sided and dual-rail positioning method, 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.



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;

- 1628



■ 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

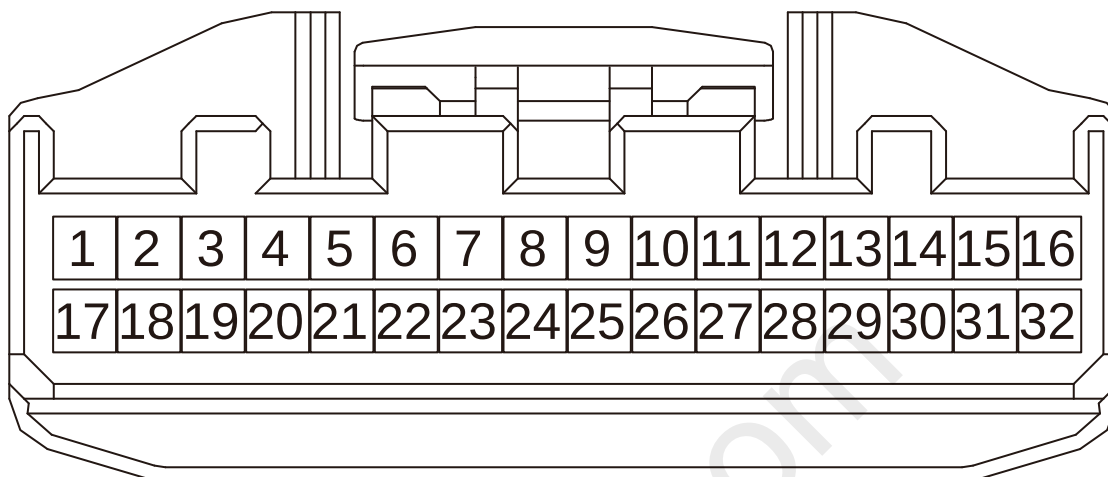
Hint:

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

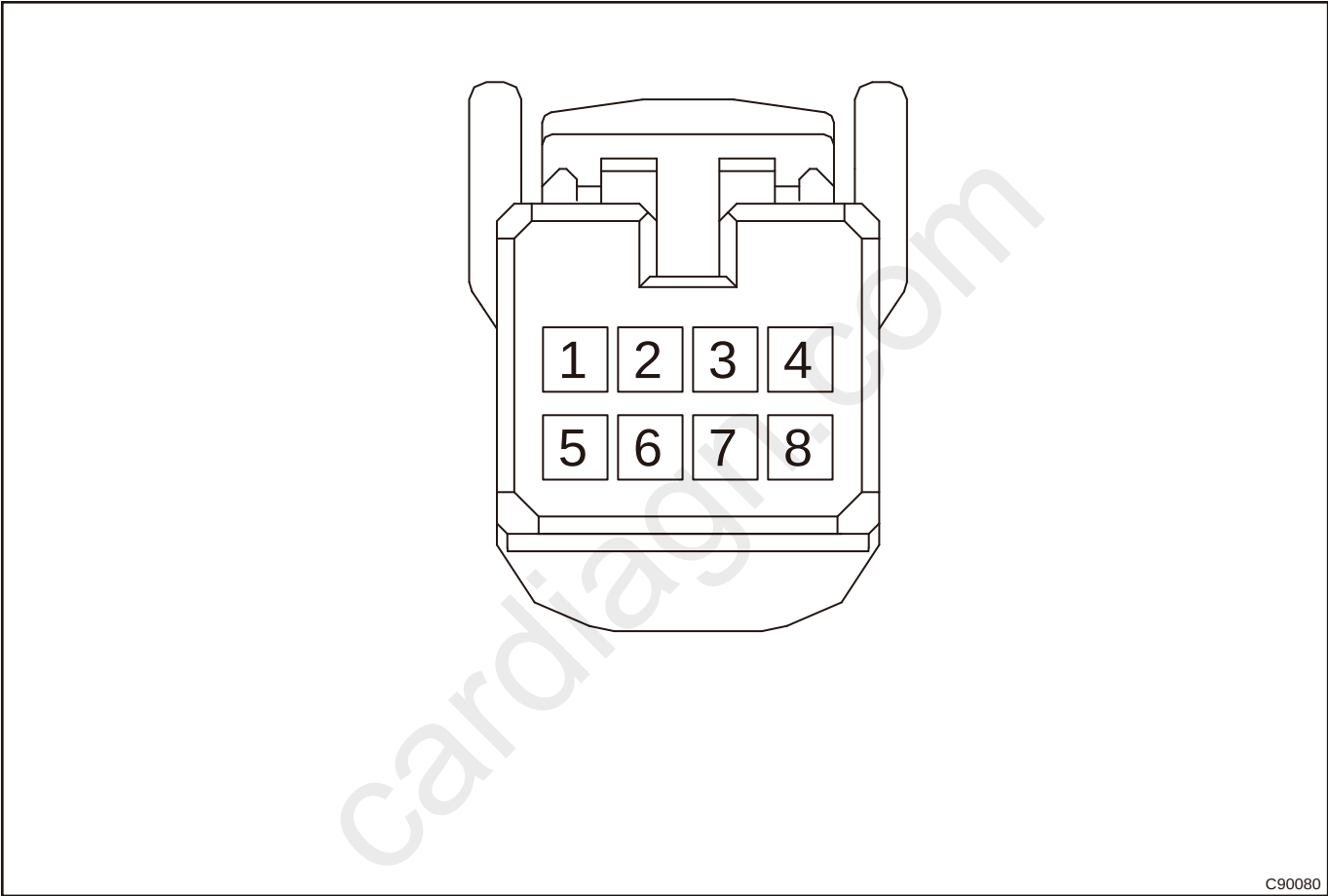


C90070

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)

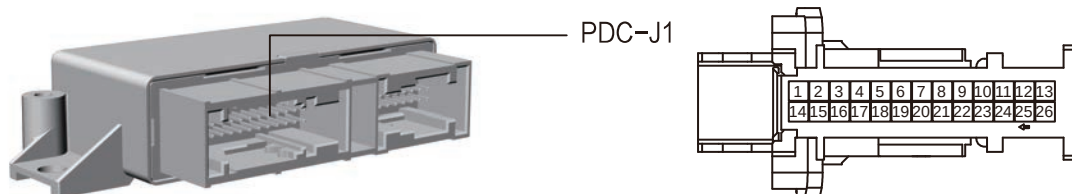
PIN	Description	PIN	Description
12	-	28	-
13	-	29	-
14	Chassis - CAN_L	30	Chassis - CAN_L
15	-	31	Power Supply
16	Ground	32	Power Supply

■ Panoramic Controller (Without APA) - A Terminal Definition



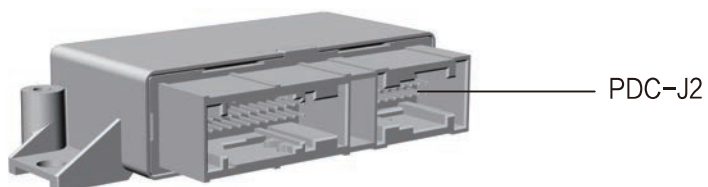
PIN	Description	PIN	Description
1	-	5	-
2	CAN H	6	CAN L
3	Ignition Signal	7	Switch Signal
4	Ground	8	Power Supply

■ 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

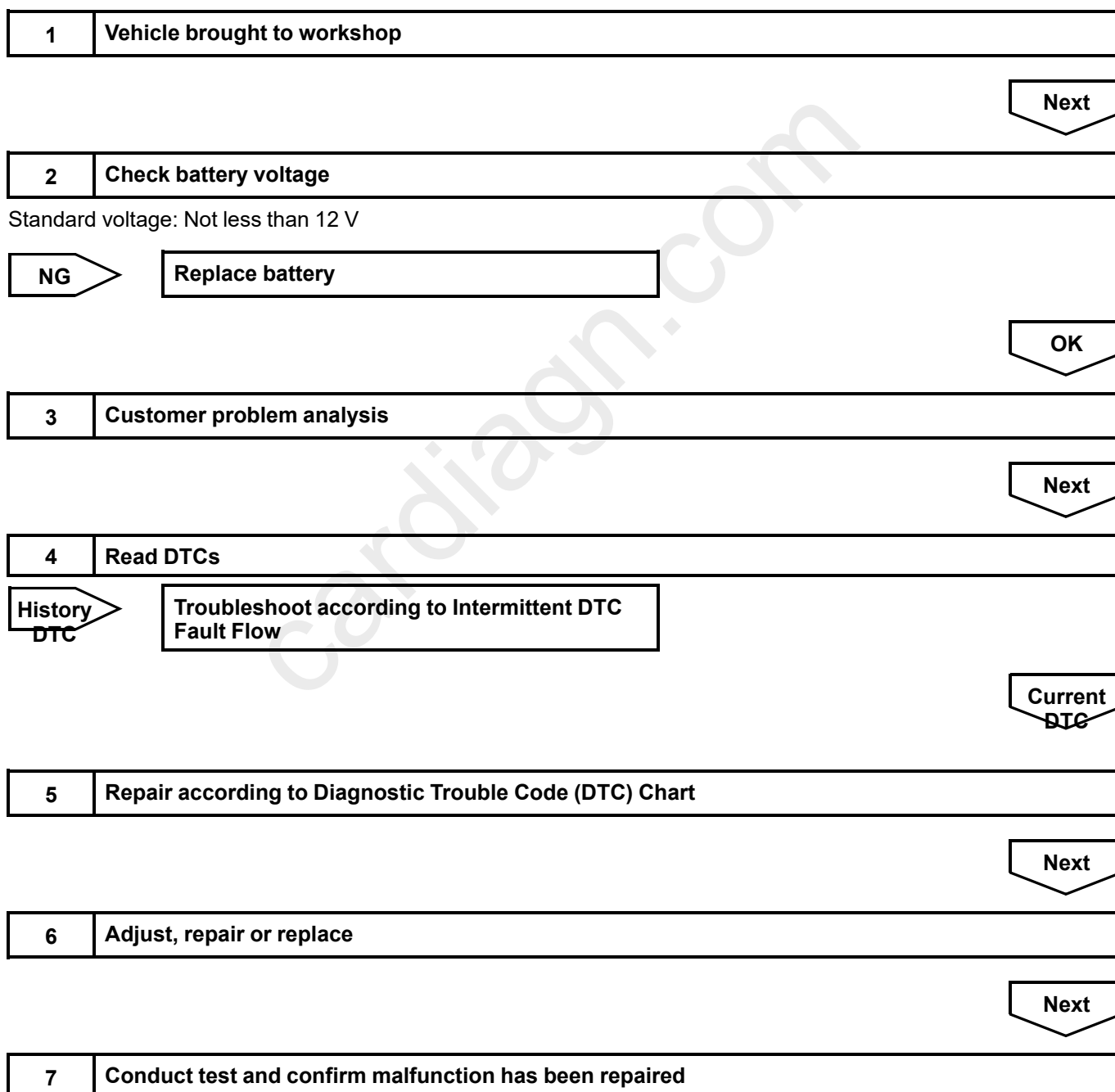
Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation

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.



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.

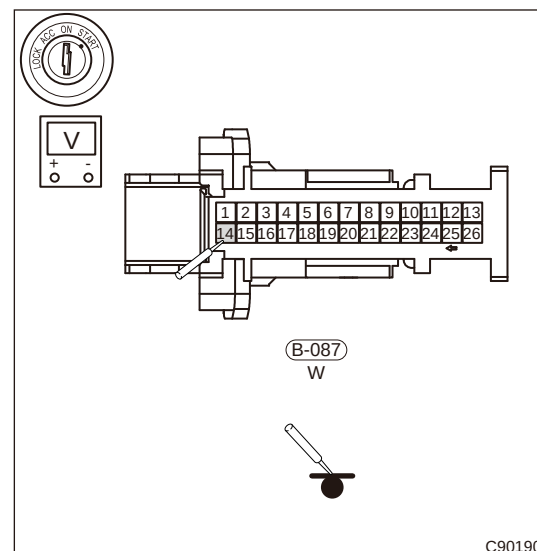
NG	Replace fuse
-----------	---------------------

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

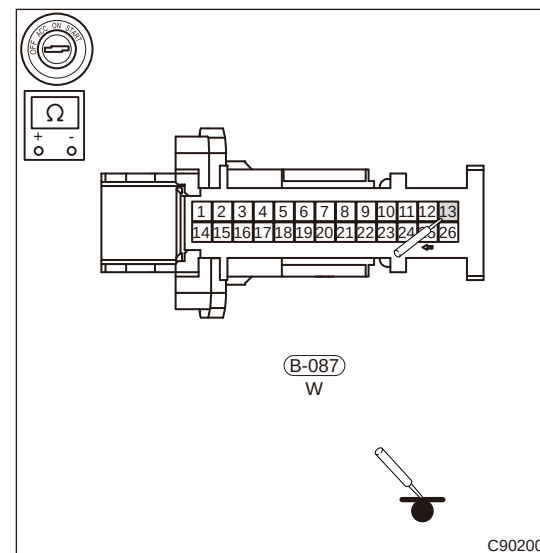
OK

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"	$\leq 1 \Omega$



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.

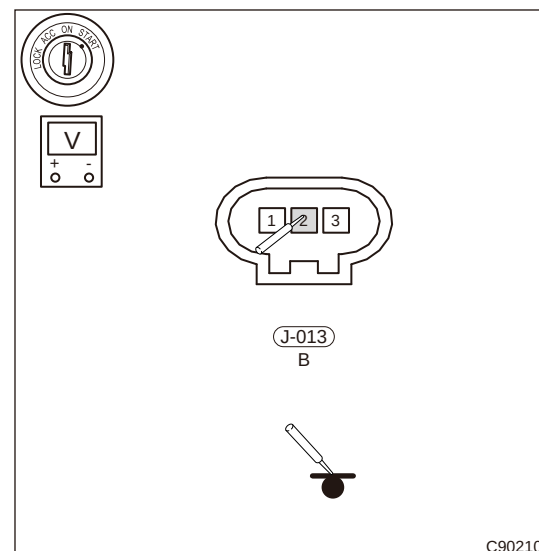
Hint:

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
----------	--

- Check sensor connectors, controller connectors for corrosion, poor contact, displacement and repair it if any symptom occurs.
- Check the continuity of sensor wire harness and replace wire harness if open circuit malfunction occurs.
- Disconnect parking radar controller connector B-087 and rear left radar sensor connector J-013.
- Turn ENGINE START STOP switch to ON, shift the shift lever to R.
- 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



C90210

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.

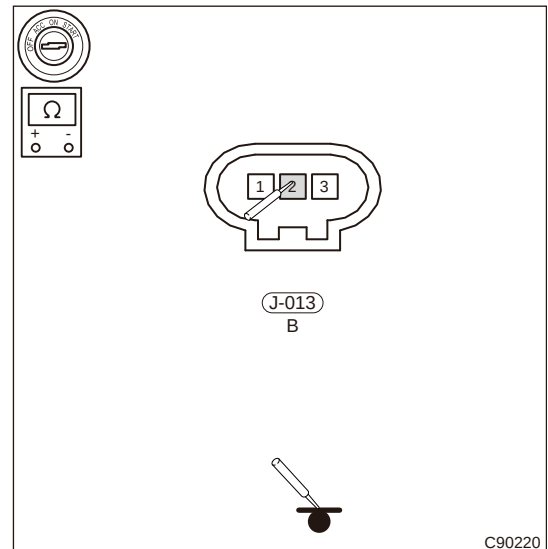
Hint:

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

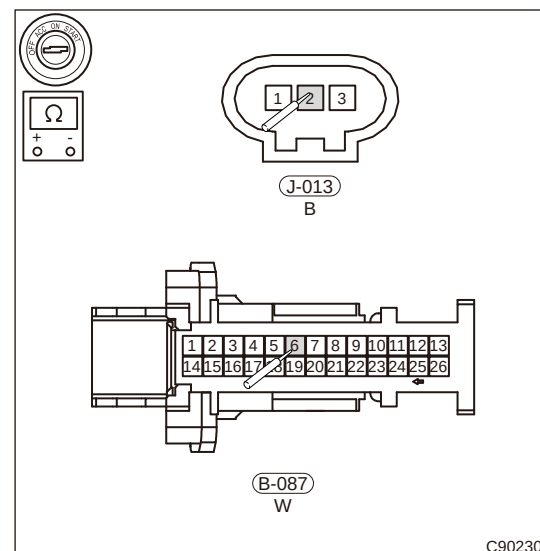
- Turn ENGINE START STOP switch to "OFF", disconnect the negative battery cable.
- Disconnect parking radar controller connector B-087 and rear left radar sensor connector J-013.
- Check for continuity between J-013 (2) and body ground with ohm band of digital multimeter.

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	$\leq 1 \Omega$



C90230

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

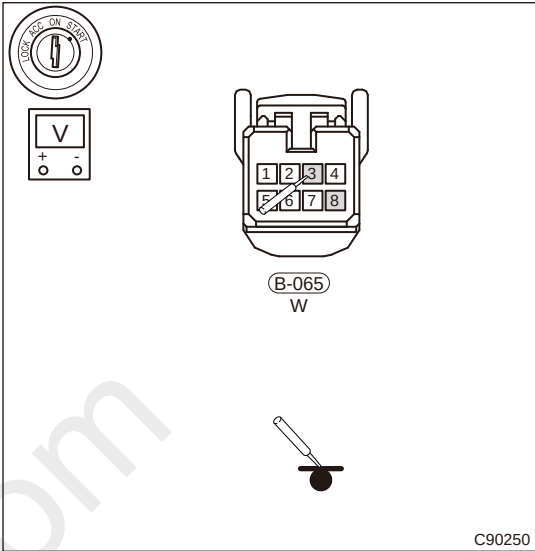
Replace engine compartment fuse and relay box

OK

5 Check AVM module power supply wire harness

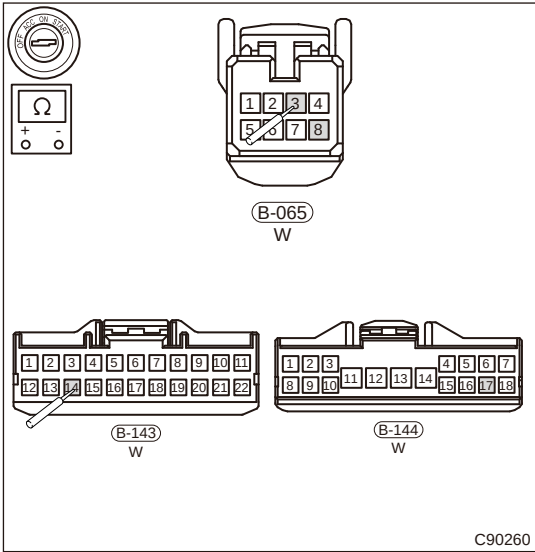
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the AVM connector B-065.
- (c) Using a digital multimeter, check if the voltage between terminal B-065 (8), (3) and body ground is normal.

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	$\leq 1 \Omega$
B-065 (8) - B- 144 (17)	Always	$\leq 1 \Omega$



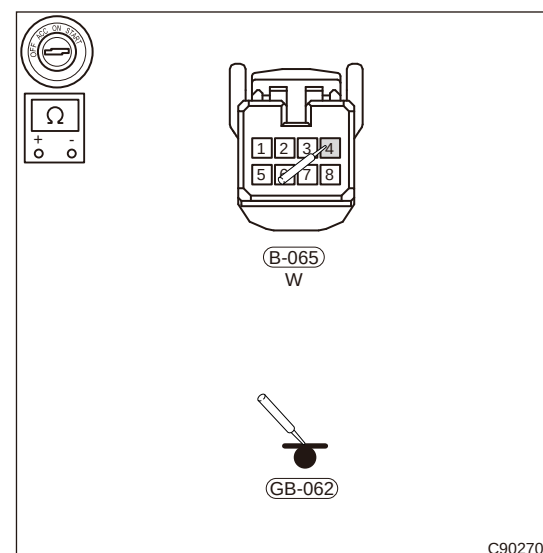
NG Repair or replace wire harness

OK

6 Check AVM module ground circuit

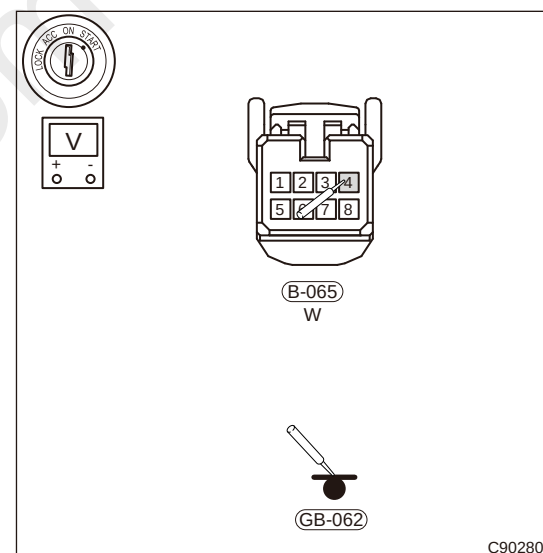
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect AVM module connector.
- (c) Using digital multimeter, check for continuity between terminals (4) of B-065 and ground wire harness connector GB-062 to check for open in ground wire harness.

Multimeter Connection	Condition	Specified Condition
B-065 (4) - GB-062	Always	$\leq 1 \Omega$



- (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:

- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- 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
----------	---

- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect panoramic view monitor control module connector B-068 and front camera connector Q-011.
- 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	$\leq 1 \Omega$

- (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	$\leq 1 \Omega$

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:

- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- 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
----------	---

- Turn ENGINE START STOP switch to "OFF", disconnect the negative battery cable.
- Disconnect panoramic view monitor control module connector B-069 and left rear view mirror camera connector F-014.
- 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	$\leq 1 \Omega$
B-069 (2) - F-014 (2)	Always	$\leq 1 \Omega$

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	$\leq 1 \Omega$
B-070 (2) - H-010 (2)	Always	$\leq 1 \Omega$

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	$\leq 1 \Omega$
B-071 (2) - T-013 (2)	Always	$\leq 1 \Omega$

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:

- Connect the diagnostic tester.
- Read data stream "input status" .
- 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

- Turn ENGINE START STOP switch to OFF.
- Remove the old AVM switch.
- Install new switch and perform running test.

OK

Replace AVM switch

NG

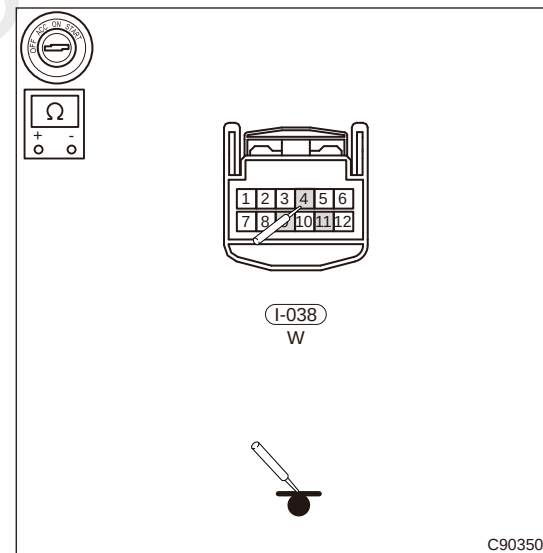
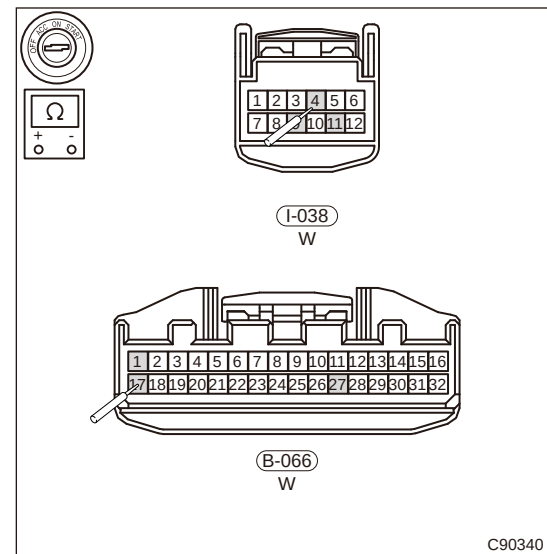
3 Check for open or short in wire harness

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect central console switch connector I-038 and AVM module connector B-66.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.
- 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	$\leq 1 \Omega$
I-038 (4) - B-066 (17)	Always	$\leq 1 \Omega$
I-038 (11) - B-066 (27)	Always	$\leq 1 \Omega$

- 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

- Connect diagnostic tester and clear DTCs.
- Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
- 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:

- Turn ENGINE START STOP switch to OFF.
- Remove the used APA switch.
- Install new switch and perform running test.

OK

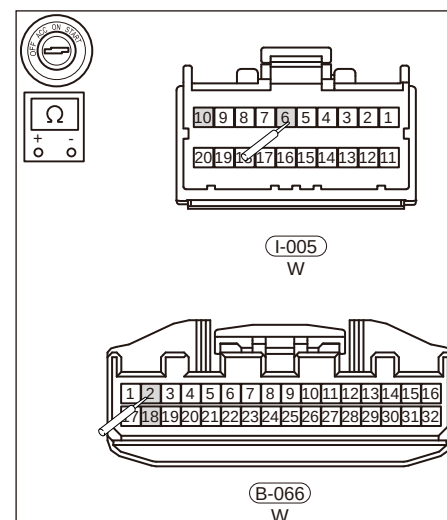
Replace APA switch

NG

2 Check for open or short in wire harness

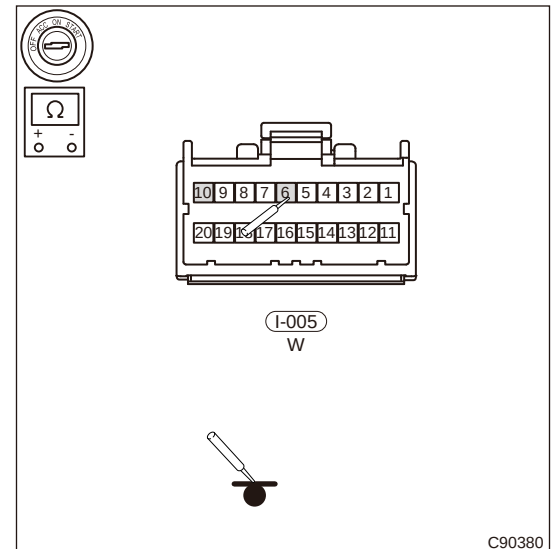
- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect APA switch connector I-005 and AVM module connector B-066.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.
- 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	$\leq 1 \Omega$
I-005 (10) - B-066 (18)	Always	$\leq 1 \Omega$



- (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:

- Turn ENGINE START STOP switch to OFF.
- Remove the used PDC switch
- Install new switch and perform running test.

OK

Replace PDC switch

NG

2 Check for open or short in wire harness

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect PDC switch B-087 and AVM module connector B-066.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Check for broken, bent, protruded or corroded terminals.
- Check if related connector pins are in good condition.
- 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.

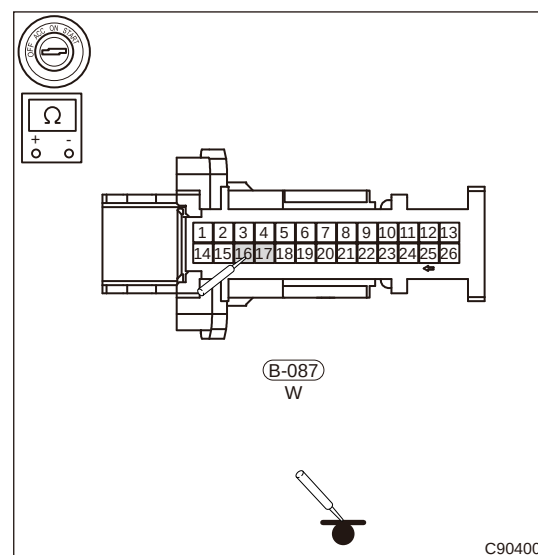
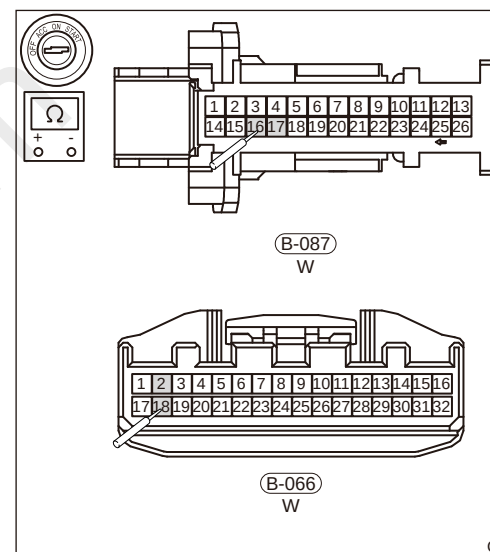
Multimeter Connection	Condition	Specified Condition
B-087 (J1-16) - B-066 (18)	Always	$\leq 1 \Omega$
B-087 (J1-17) - B-066 (2)	Always	$\leq 1 \Omega$

- 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

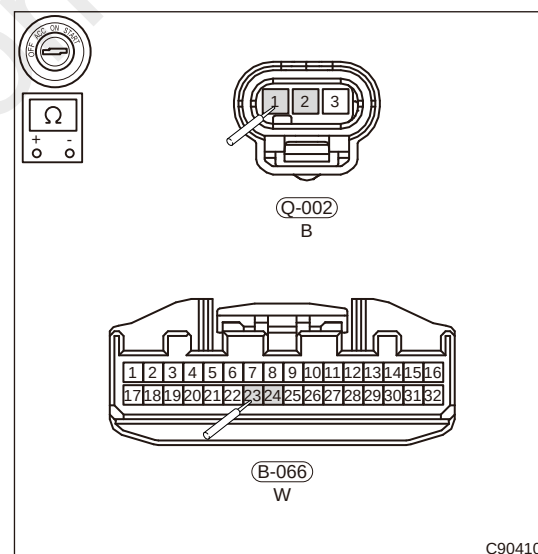
Use circuit diagram as a guide to perform the following inspection procedures:

- Turn ENGINE START STOP switch to OFF.
- Remove the old front left long distance ultrasonic sensor.
- 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

- Turn ENGINE START STOP switch to OFF.
- Disconnect AVM module connector B-066 and front left long distance ultrasonic sensor connector Q-002.
- 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	$\leq 1 \Omega$
B-066 (24) - Q-002 (2)	Always	$\leq 1 \Omega$



C90410

NG
Replace wire harness and connector
OK
3 Reconfirm DTCs

- Connect diagnostic tester and clear DTCs.
- Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
- 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
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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.

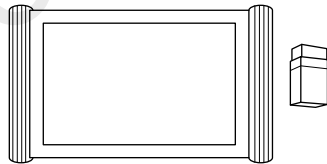
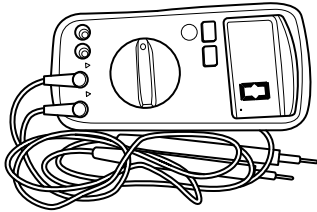
Hint:

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

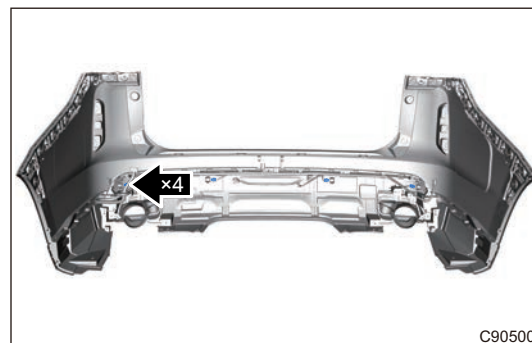
■ Removal

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.

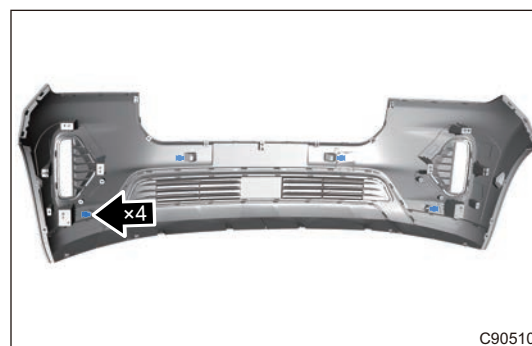
4.3 Front Radar Sensor (If Equipped)

■ 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.

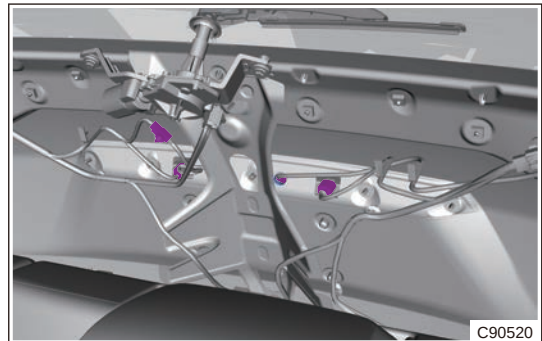
4.4 Rear Camera Assembly (If Equipped)

■ Removal

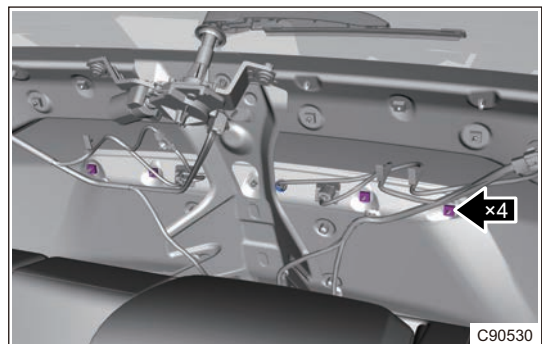
Warning

- **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.

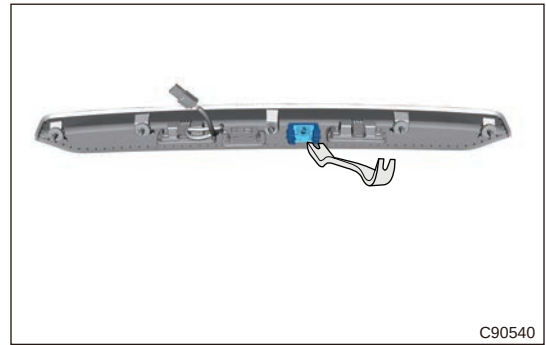


- (5) Remove 4 fixing nuts from license plate light protector.



- (6) Remove the license plate light protector.

- (7) Remove the rear camera assembly with interior crow plate.



C90540

■ 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.

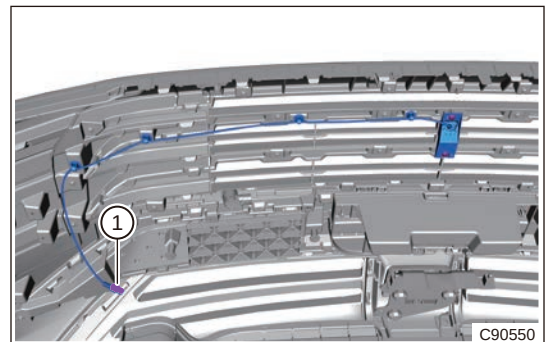
4.5 Front Camera Assembly (If Equipped)

■ Removal

Warning

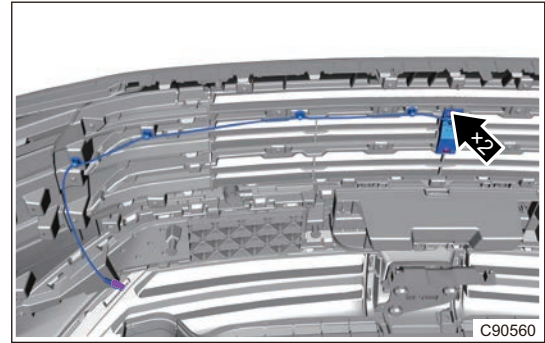
- **Be sure to wear necessary safety equipment to prevent accidents, when removing front camera assembly.**
- **Appropriate force should be applied when removing front camera assembly. Be careful not to operate roughly.**

- (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.



C90550

- (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)

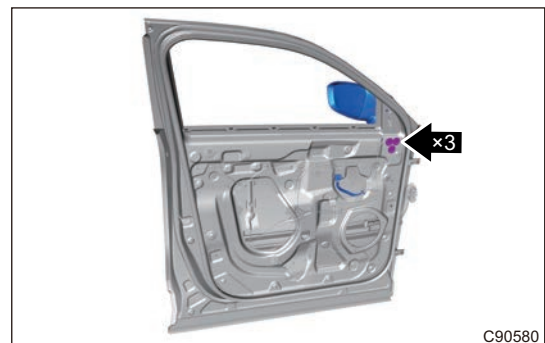
Warning

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.

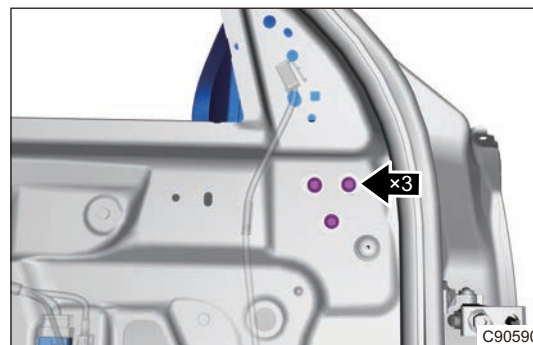
- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.
- (3) Remove the front left door protector assembly.
- (4) Disconnect the left outside rear view mirror connector.



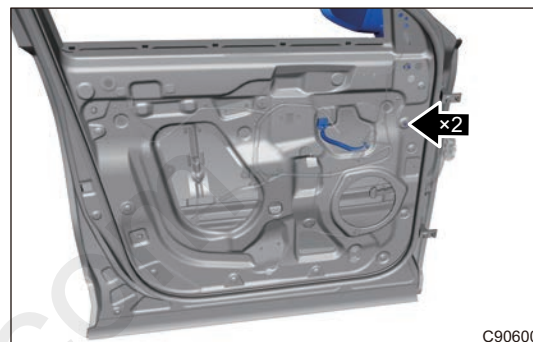
- (5) Remove 3 plugs from left door sheet metal assembly.



- (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: $7 \pm 1 \text{ N}\cdot\text{m}$

- (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.

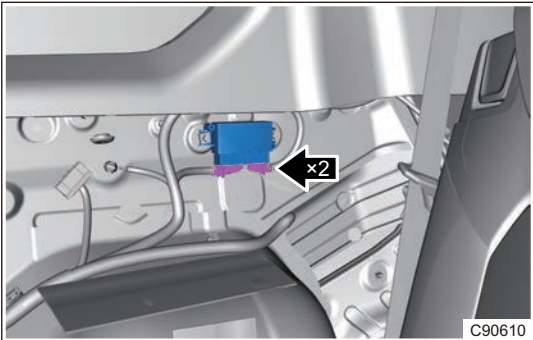
4.7 Reversing Radar Control Module Assembly

■ Removal

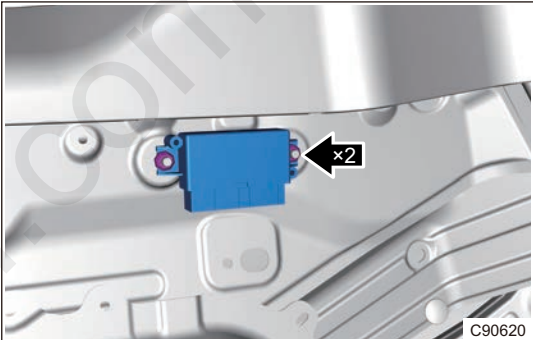
Warning

- 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)

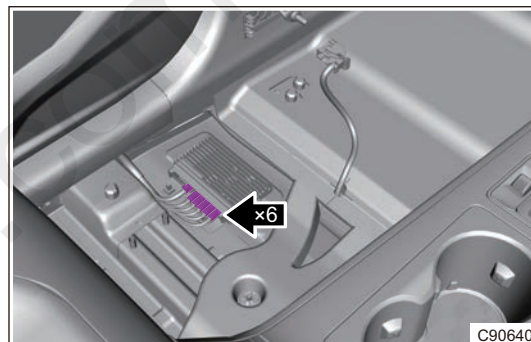
■ Removal

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.

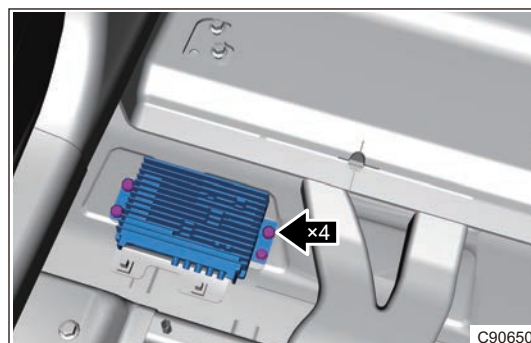
- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.
- (3) Remove the front passenger seat assembly.
- (4) Turn over the front floor carpet.



- (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.

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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.

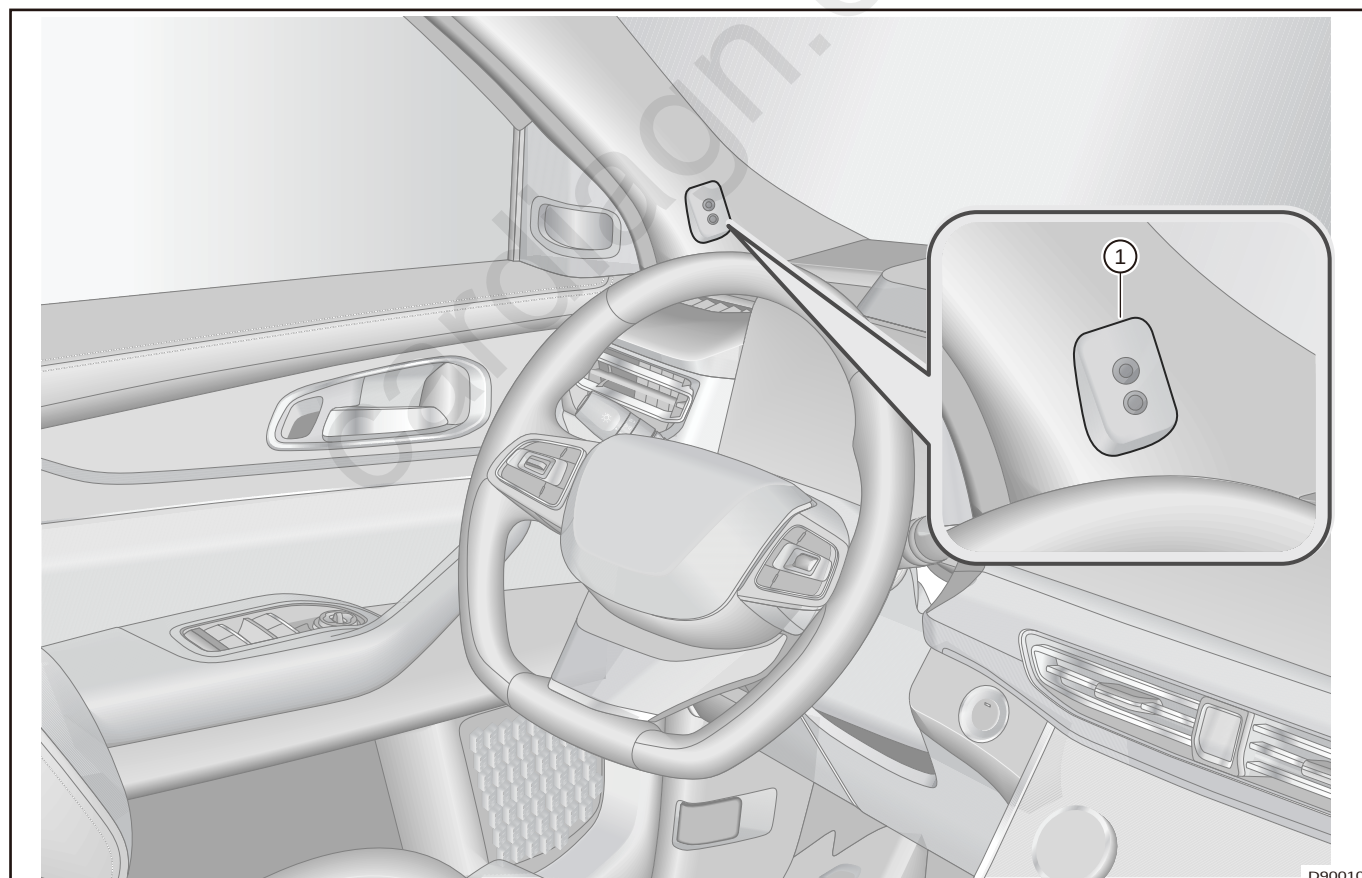
- (1) Be sure to wear necessary safety equipment to prevent accidents, when removing fatigue monitoring camera.
- (2) Appropriate force should be applied when removing fatigue monitoring camera. Be careful not to operate roughly.
- (3) Try to prevent interior and body paint surface from being scratched 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

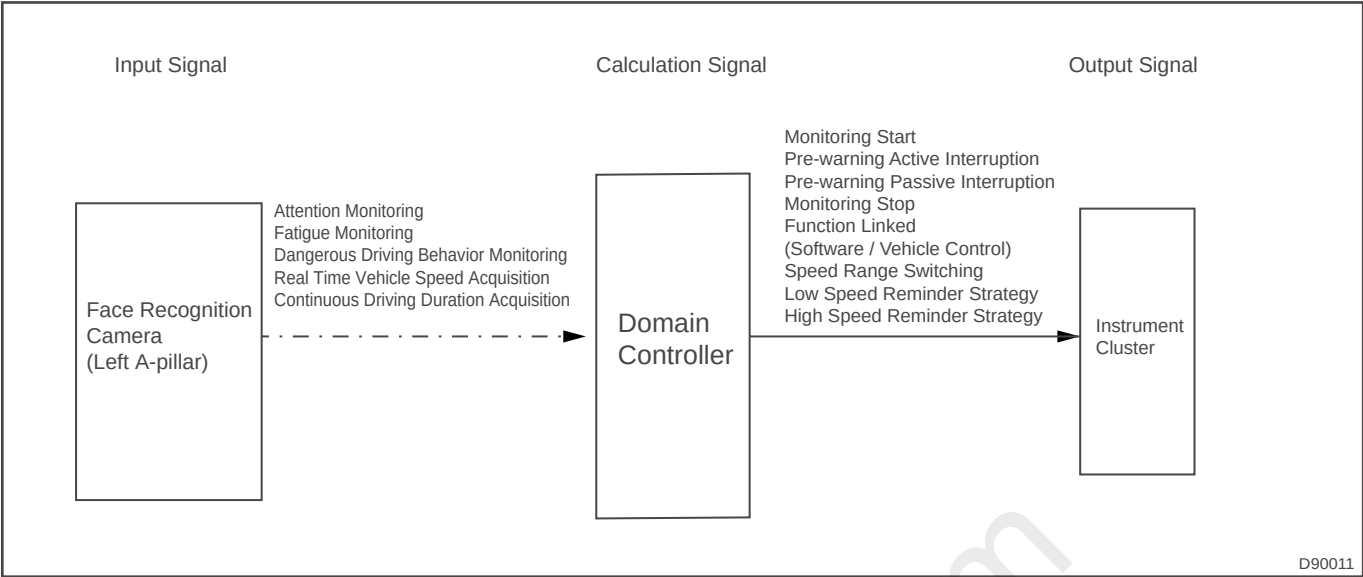


D90010

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		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		
	Eyes closed for a long time		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	$0 \text{ km/h} \leq \text{vehicle speed} < 60 \text{ km/h}$	Generally in special road section, congested road section and urban road section.
	$60 \text{ km/h} \leq \text{vehicle speed} < 120 \text{ km/h}$	Generally in urban express lanes, loops and highway, vehicle speed is relatively high, short-term loss of attention may lead to danger.
	Vehicle speed $> 120 \text{ km/h}$	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 than 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 $\leq$ 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 $\geq$ 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 $\geq$ 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 $\geq$ 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

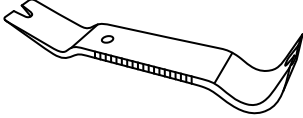
Multiple triggers: Basic prompt strategy of multiple triggers does not make degradation distinction.

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

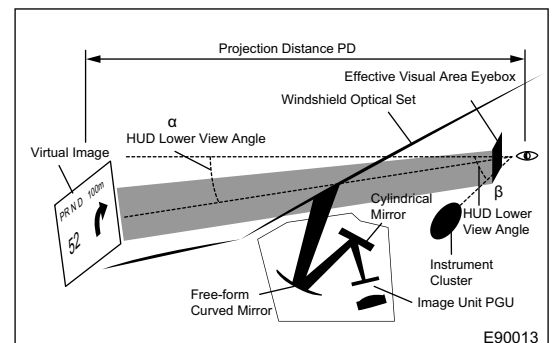
Head up display, call HUD for short, is a driving assist instrument used in vehicle. It is a kind of integrated optical electronic equipment composed of electronic components, display components, controllers, etc. Through optical system and electronic control, HUD projects driving information (such as 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.



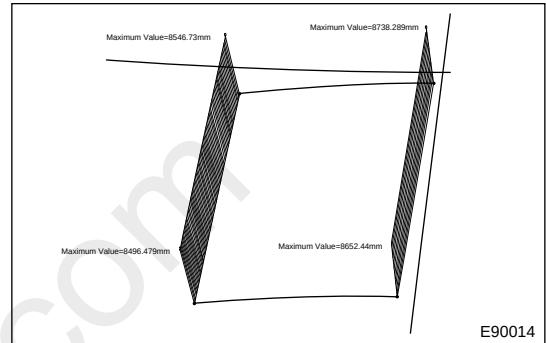
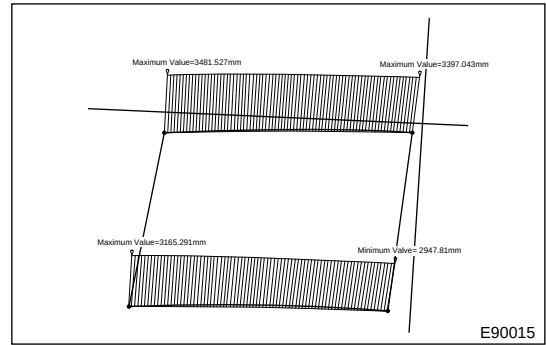
■ Windshield demand

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.



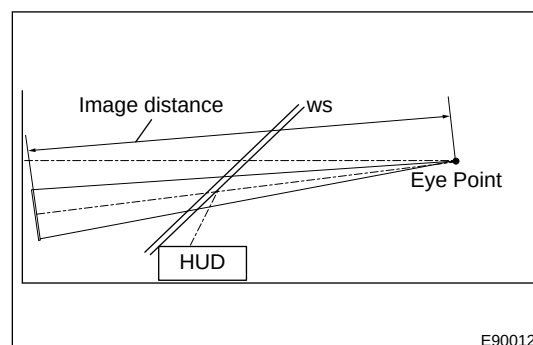
■ Image parameters

(1) The main parameters of M32T HUD image are as follows:

Type	Parameters	Tolerance Requirements	Note
Image size	241 mm x 80 mm	$\pm 6 \%$	Calculated based on FOV and projection distance
Image distance	2300 mm	$\pm 6 \%$	/
Field of view angle	$6^\circ \times 2^\circ$	$\pm 6 \%$	/
Lower view angle	3.5°	$\pm 0.3^\circ$	/
Left view angle	0°	$\pm 0.5^\circ$	
Eye box size	130 mm $\times$ 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	$\geq 10,000$ cd/m ²	/	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 $6^\circ \times 2^\circ$.
- (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 $\geq 10,000$ 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 $\leq 5\%$.

■ 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 $\pm$ 10 %	Low voltage recovery time	< 500 ms $\pm$ 10 %	Delay time from low voltage to normal voltage

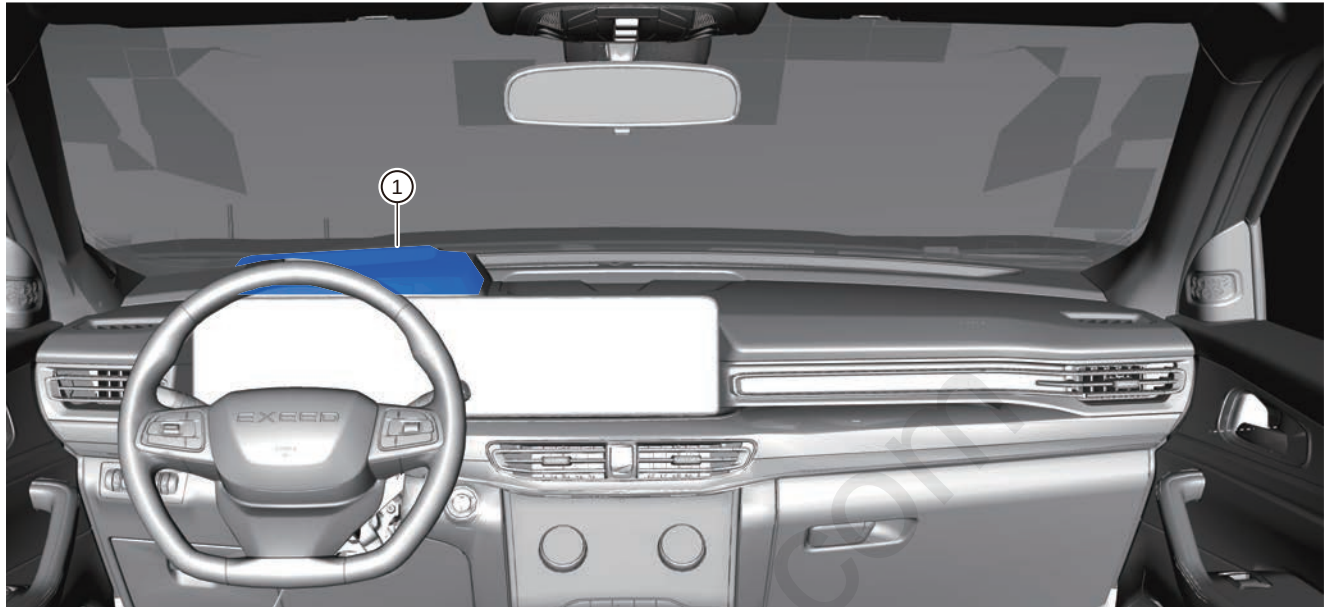
HUD		CAN		Description
Data Stream/ Others	Voltage Value	Data Stream/ Others	Voltage Value	
High voltage recovery time	200 ms $\pm$ 10 %	High voltage recovery time	< 500 ms $\pm$ 10 %	Delay time from high voltage to normal voltage
Note description: - Setting voltage of DTC is 9 ~ 16 V and delay time is 200 ms $\pm$ 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 $\pm$ 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)	$\leq$ 0.2 mA

2.2 System Component Diagram

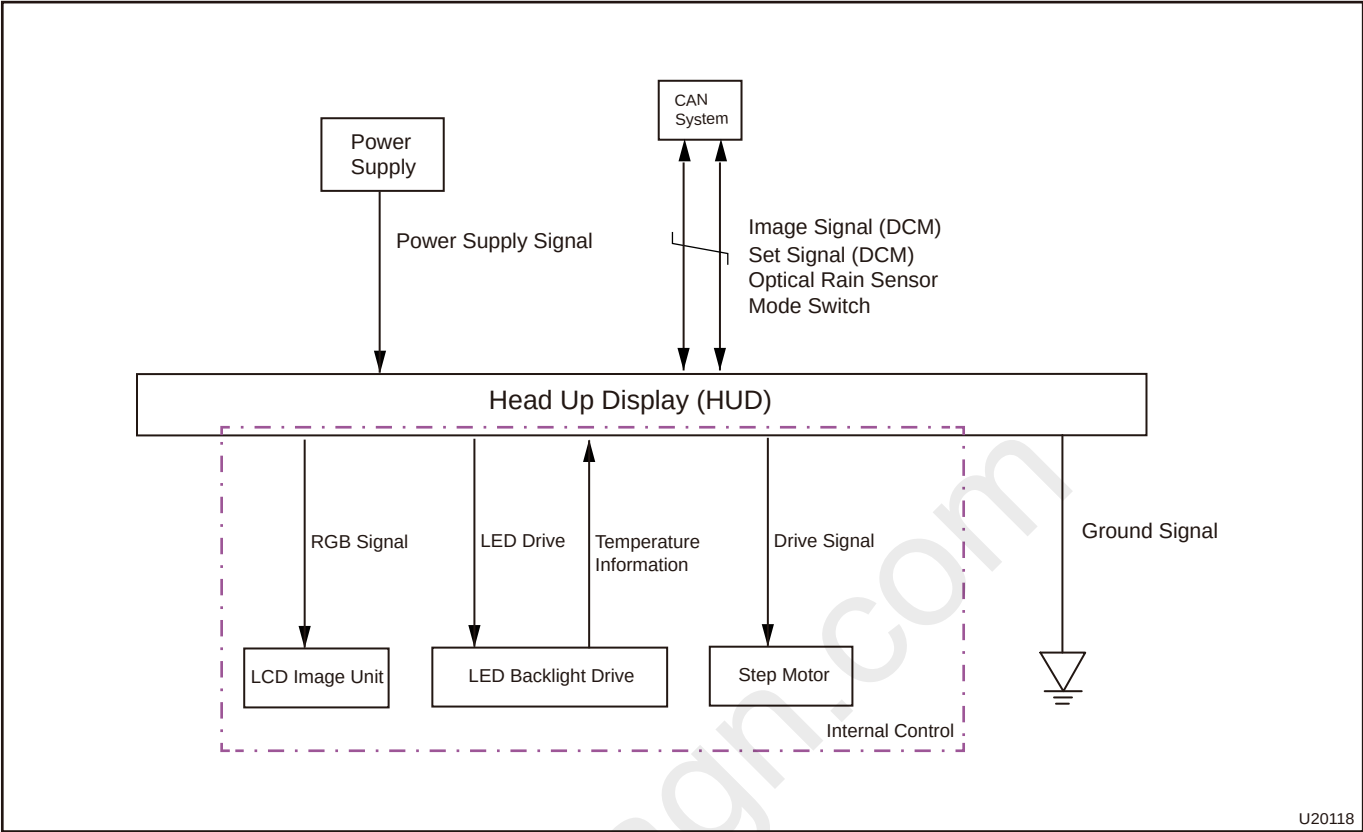


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1

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

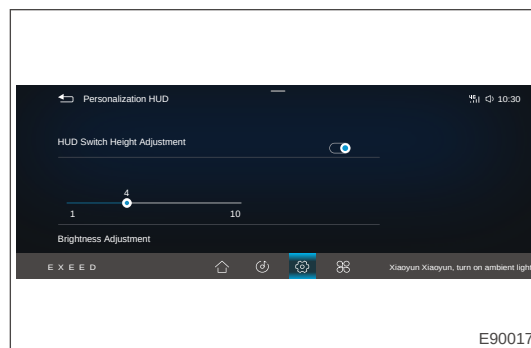
■ HUD display image

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 °C (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 °C, 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:

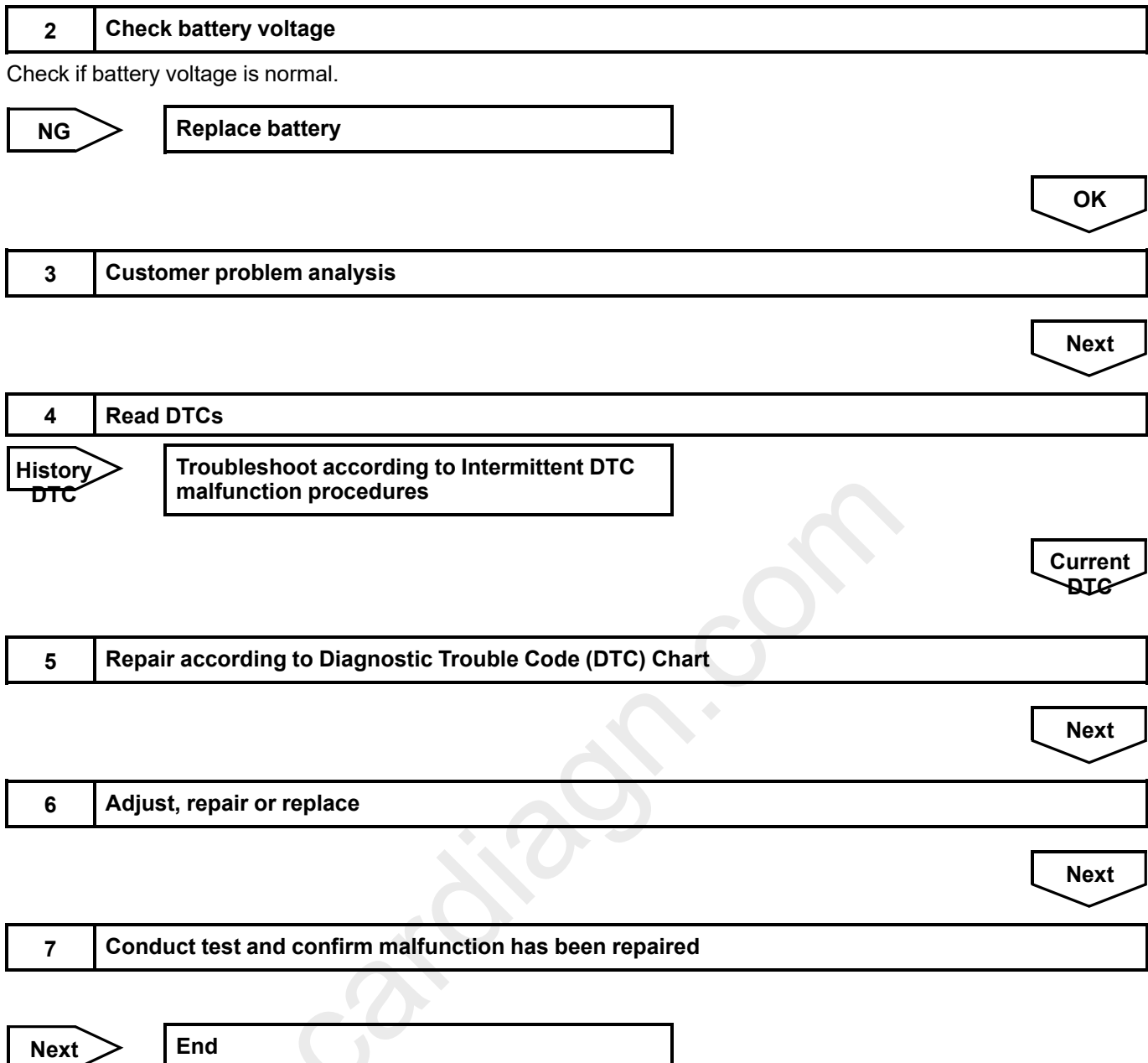
- (1) Remove ground bolt or nut.
- (2) Check all contact surfaces for tarnish, dirt and rust, etc.
- (3) Clean as necessary to ensure that contact is in good condition.
- (4) Reinstall ground bolt or nut securely.
- (5) Check if any additional accessories interfere with ground circuit.
- (6) If several 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



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:

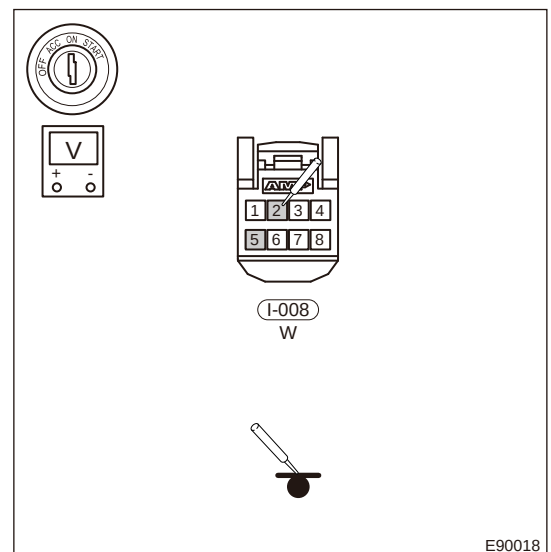
- (a) Turn ENGINE START STOP switch to OFF.
 (b) Disconnect the negative battery cable.
 (c) Check continuity of fuse MF03 (125A), RF16 (5A) and RF08 (5A) in instrument panel fuse and relay box and engine compartment assembly with digital multimeter.

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.

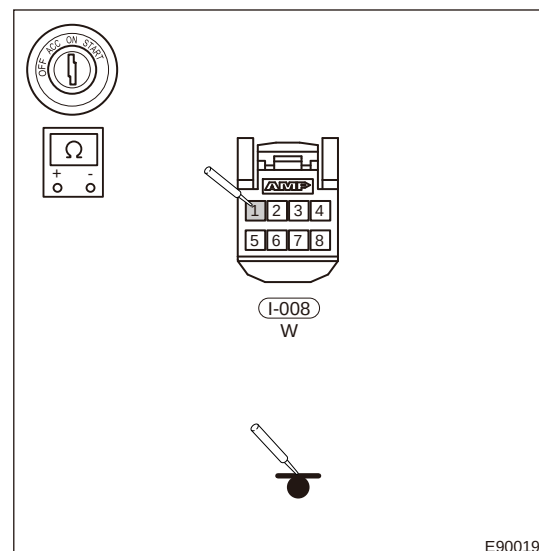
Multimeter Connection	Condition	Specified Condition
I-008 (5) - Body ground	ENGINE START STOP switch "ON"	Not less than 12 V
B-008 (2) - Body ground		Not less than 12 V



E90018

- (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"	∞



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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.

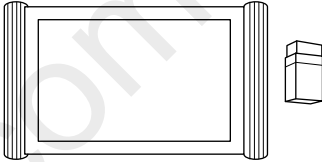
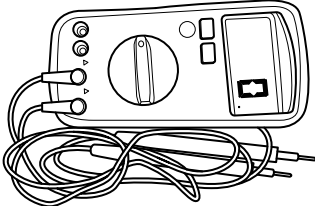
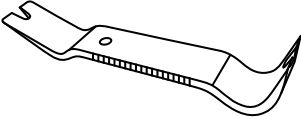
- Turn ENGINE START STOP switch to OFF.
- Connect the diagnostic tester (the latest software).
- Start engine and warm it up, and then read DTC again. If DTC is detected, malfunction is current.
- If DTC is not detected, malfunction is intermittent.

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.
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4 On-vehicle Service

4.1 Tools

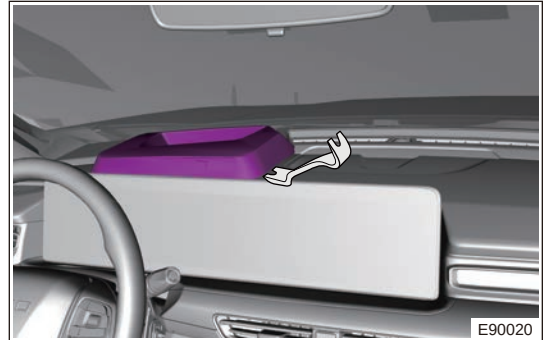
Tool Name	Tool Drawing
Diagnostic Tester	 S00001
Digital Multimeter	 S00002
Interior Crow Plate	 S00020

4.2 Replacement of Head Up Display (HUD)

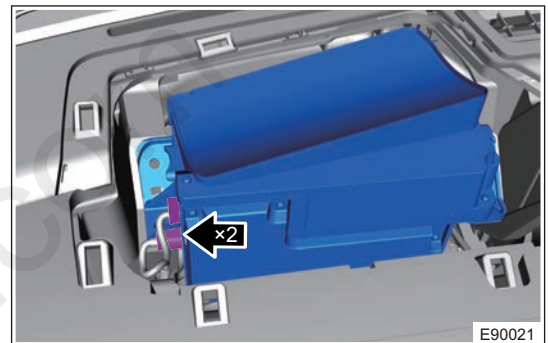
■ Removal

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.

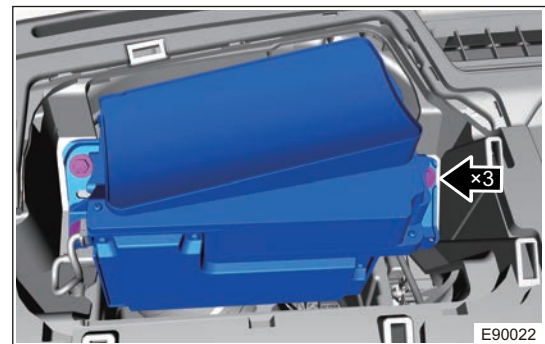
- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.
- (3) Remove head up display cover with interior crow plate.



- (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.

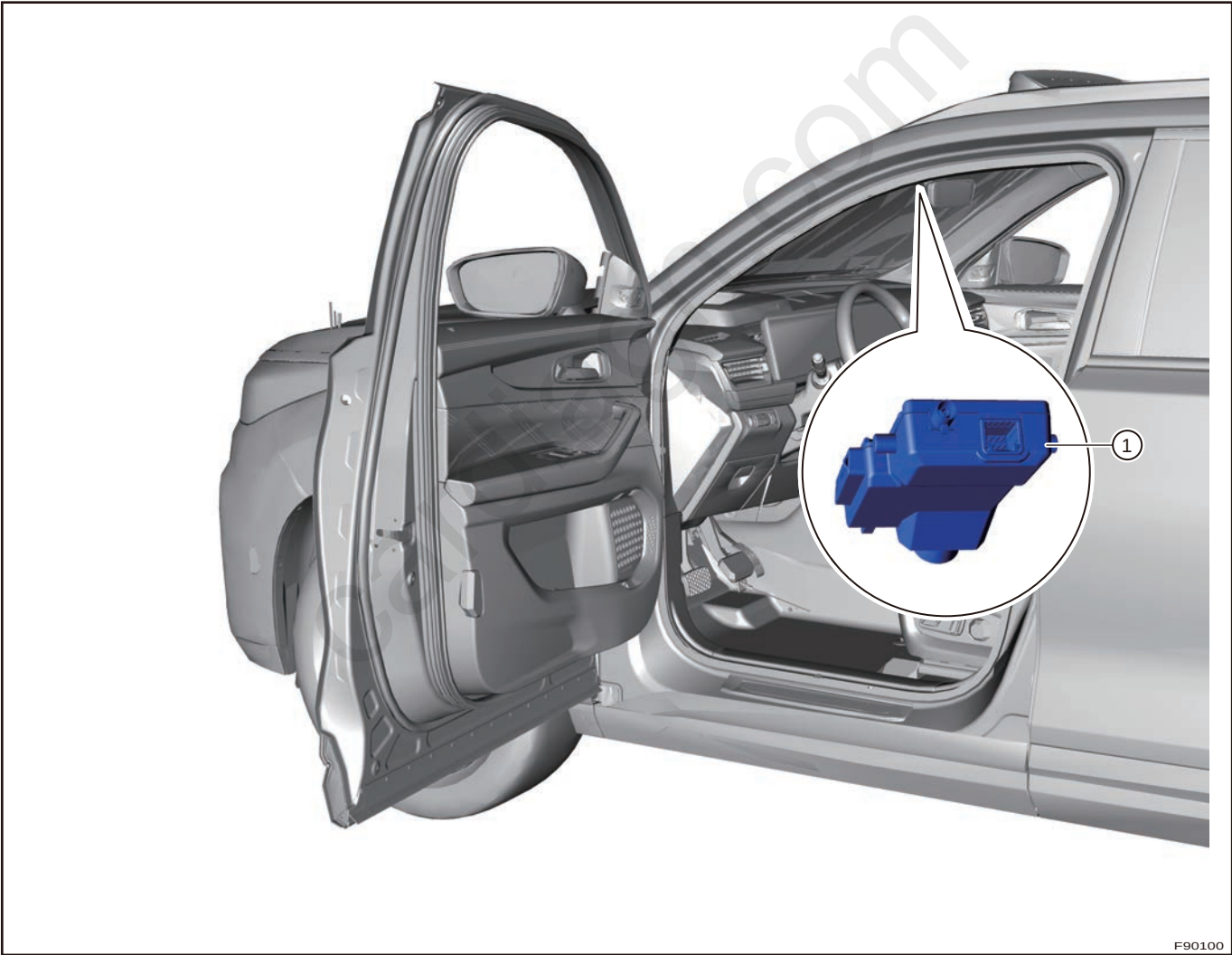
- (1) Prevent camera lens from being scratched during removal and installation of drive recorder.

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.

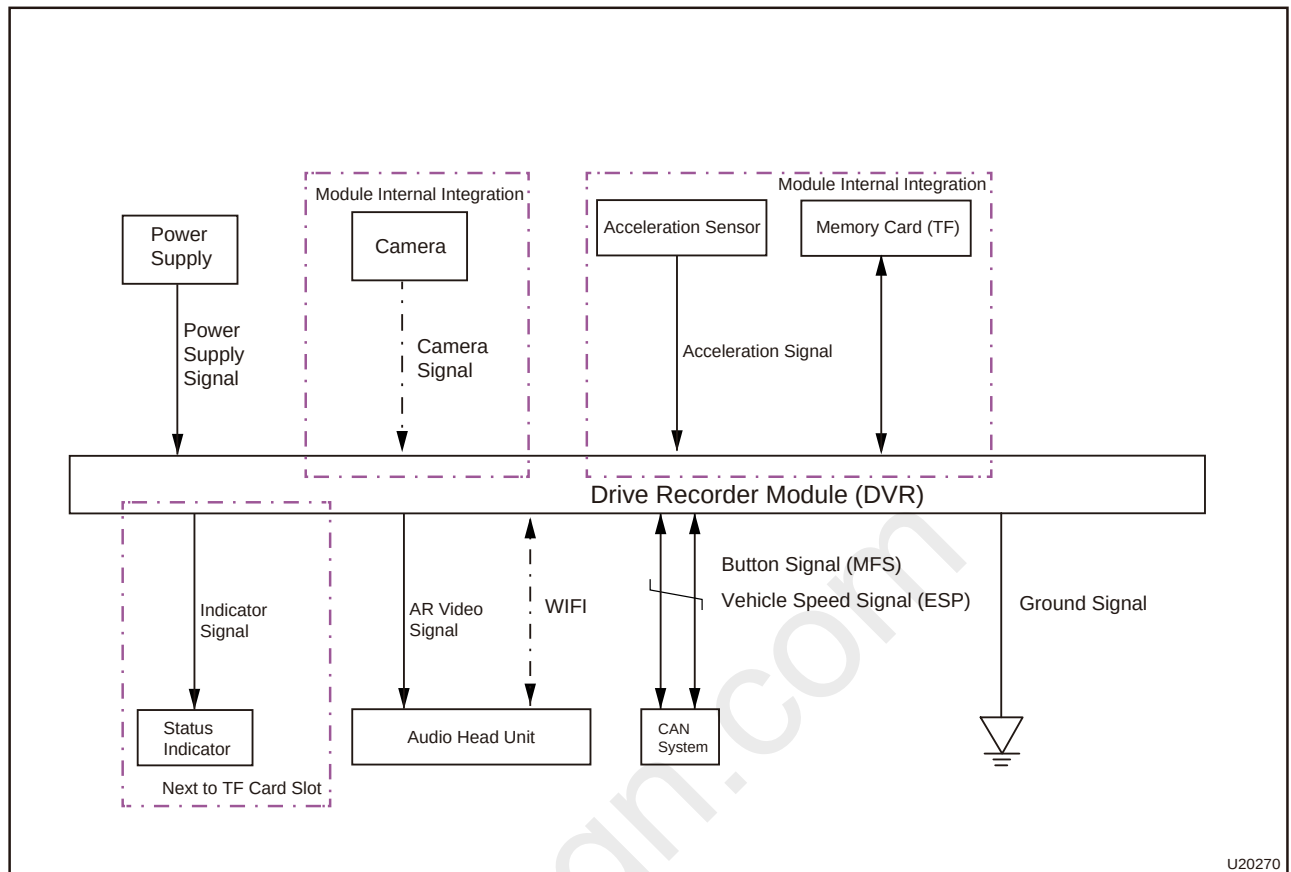
2.2 System Component Diagram



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1	Drive Recorder
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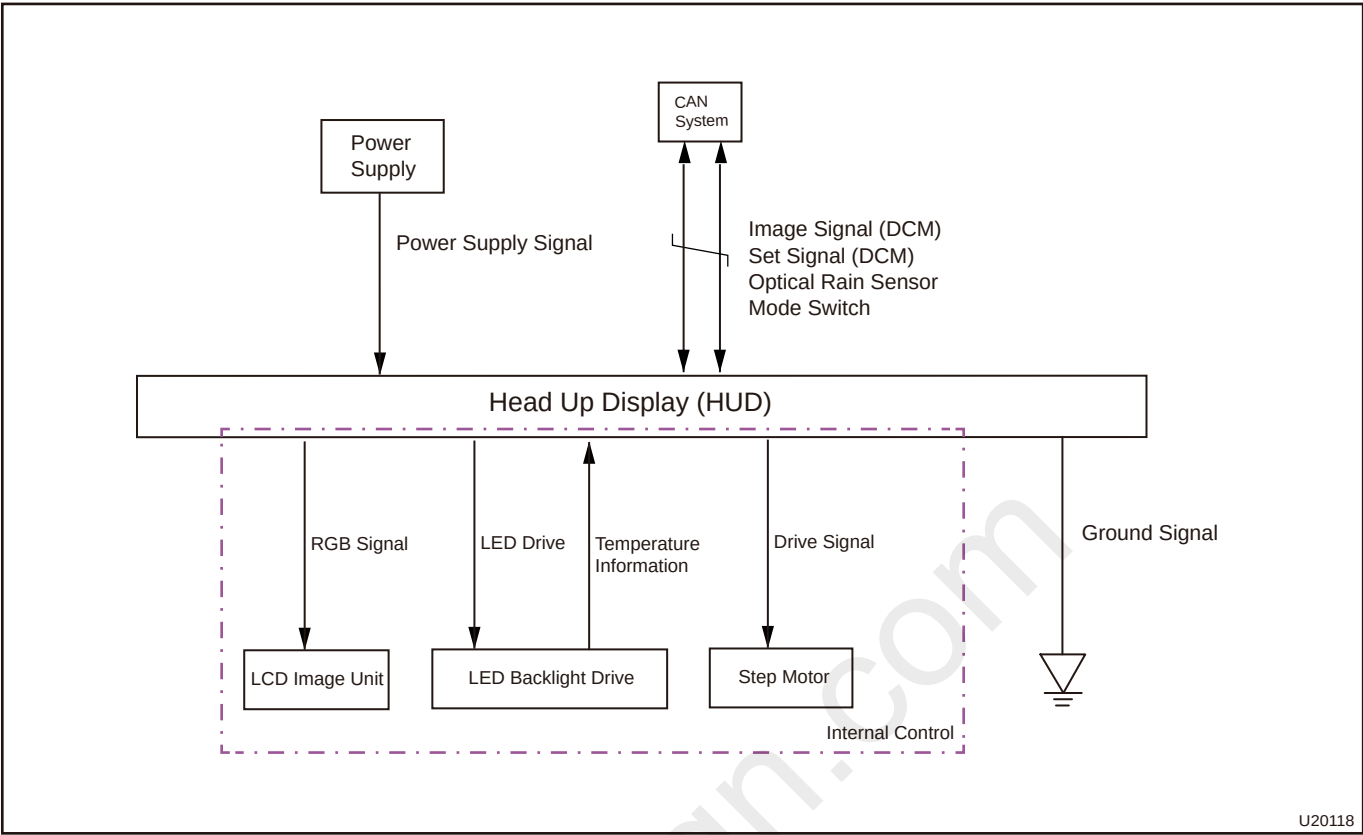
2.3 System Principle



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: ≤ 0.1 mA.

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	$120^\circ \pm 5^\circ$ in horizontal, $140^\circ \pm 5^\circ$ 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	$\geq 1920 \times 1080$	
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 record 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

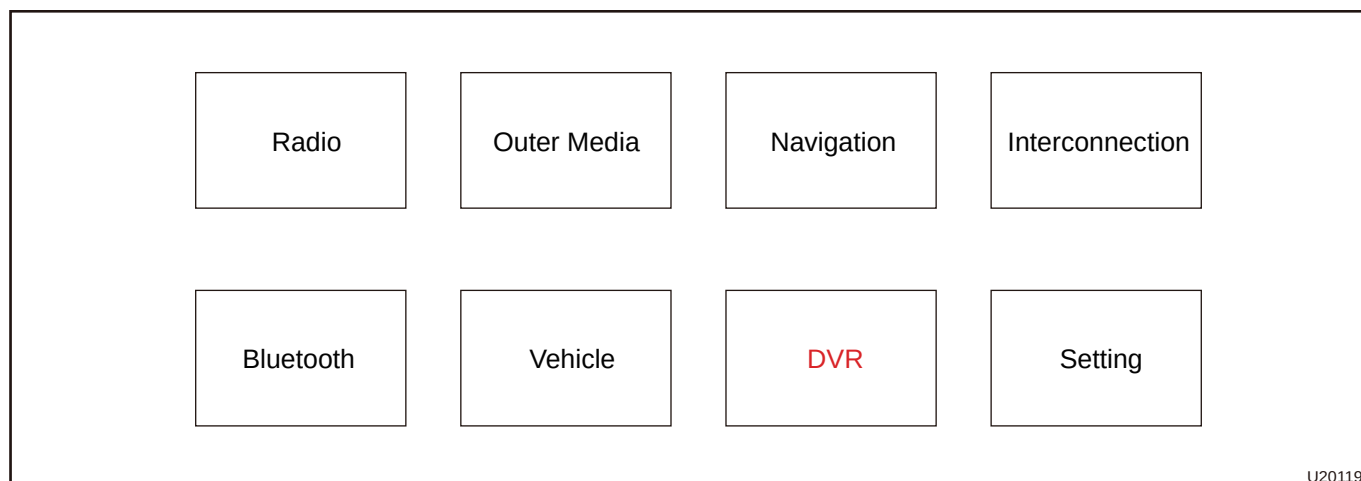
Primary Function	Secondary Function	Description	Note
Power management, CAN network	ON position signal response	When power is turned on in ON position, system turns on and starts recording; When power is turned off in ON position and there is no CAN communication, system turns off and stops recording, 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:



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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.

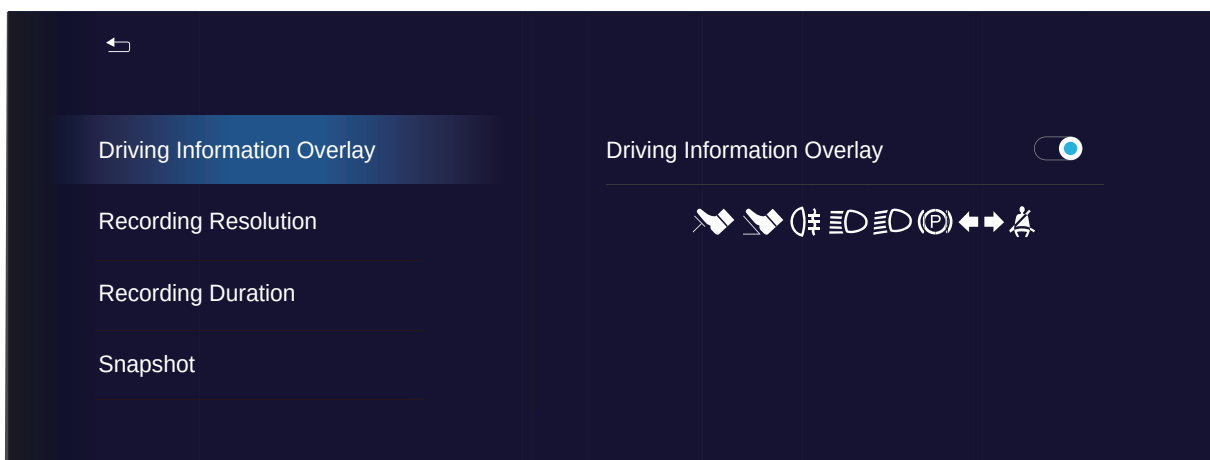
Time watermark and driving information (such as "driving information" setting is on during photo taking) can be displayed on the photo playback interface. Click ICON, the photos will be played automatically at speed of 3 s per photo from the current photo, ICON will change to , click will pause automatic play, ICON returns to .

Click "<" or ">" ICON, it will change to previous or next photo.

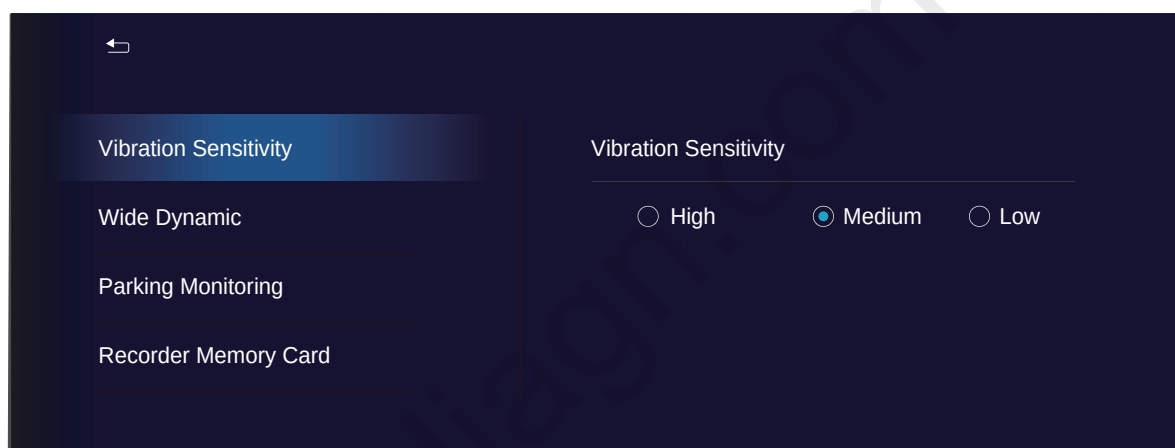
Click "Return" icon to exit photo playback and return to DVR main interface.

11) Setting

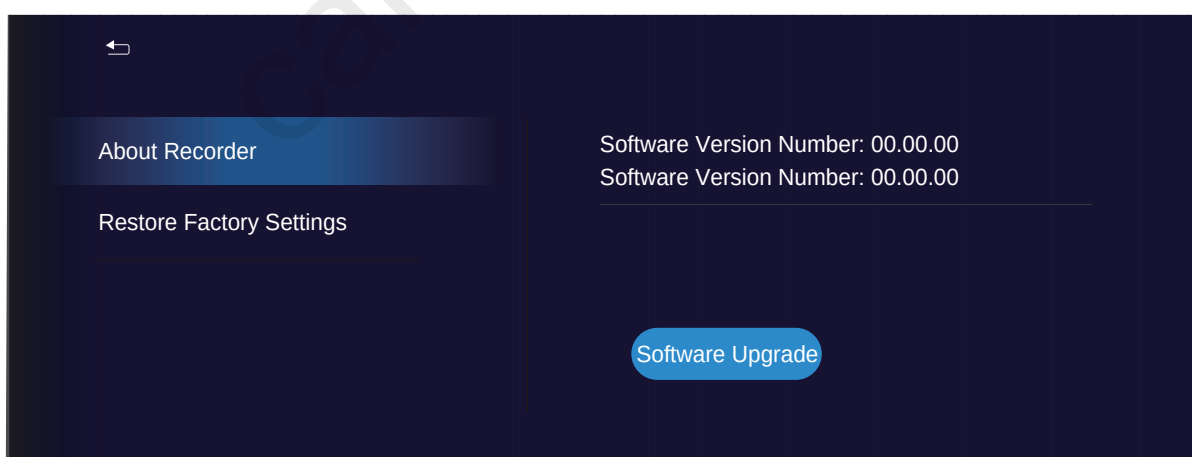
On the real-time preview interface, click setting ICON to enter setting menu interface of drive recorder, setting items of drive recorder contains the following:



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

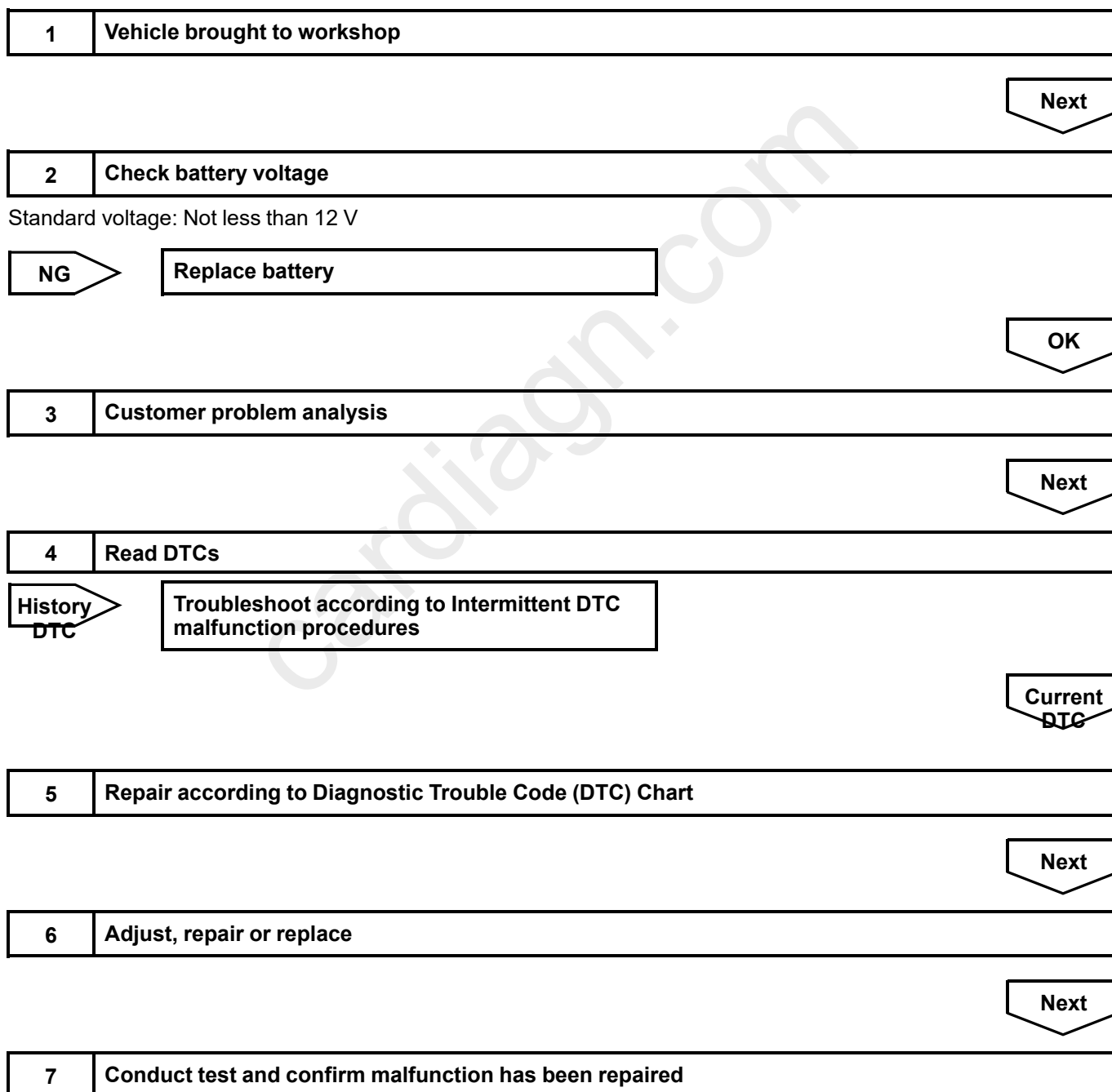
Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation

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.



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:

- Wait for 120 seconds, turn the ignition switch to ON and then to OFF.
- 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

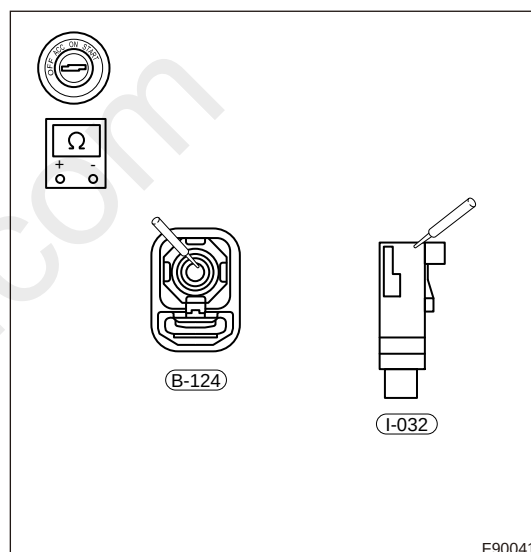
Check, repair and replace module assembly.

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)	$\leq 1 \Omega$
B-124 (1, 2) - I-032 (1, 2)	$\leq 1 \Omega$



F90041

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

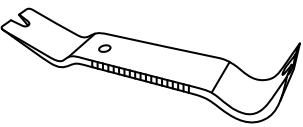
Check and repair or replace controller.

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

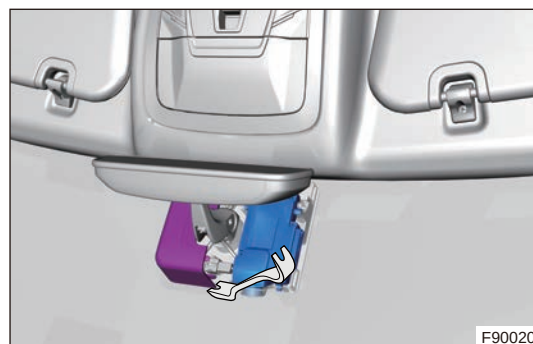
■ Removal

- (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.



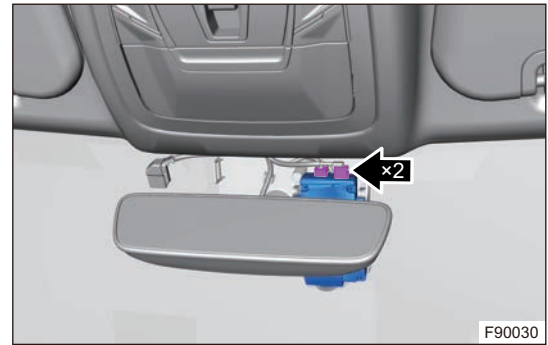
F90010

- (4) Using an interior crow plate, pry off the inside rear view mirror left protective cover.

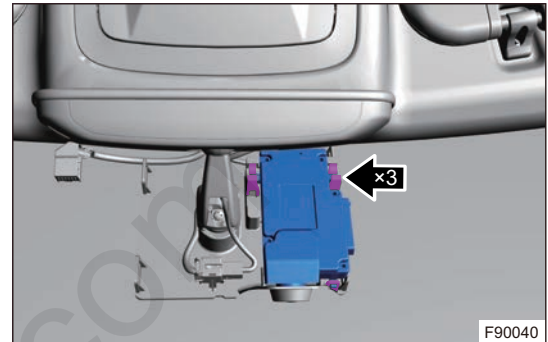


F90020

- (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, even 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



U20010

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

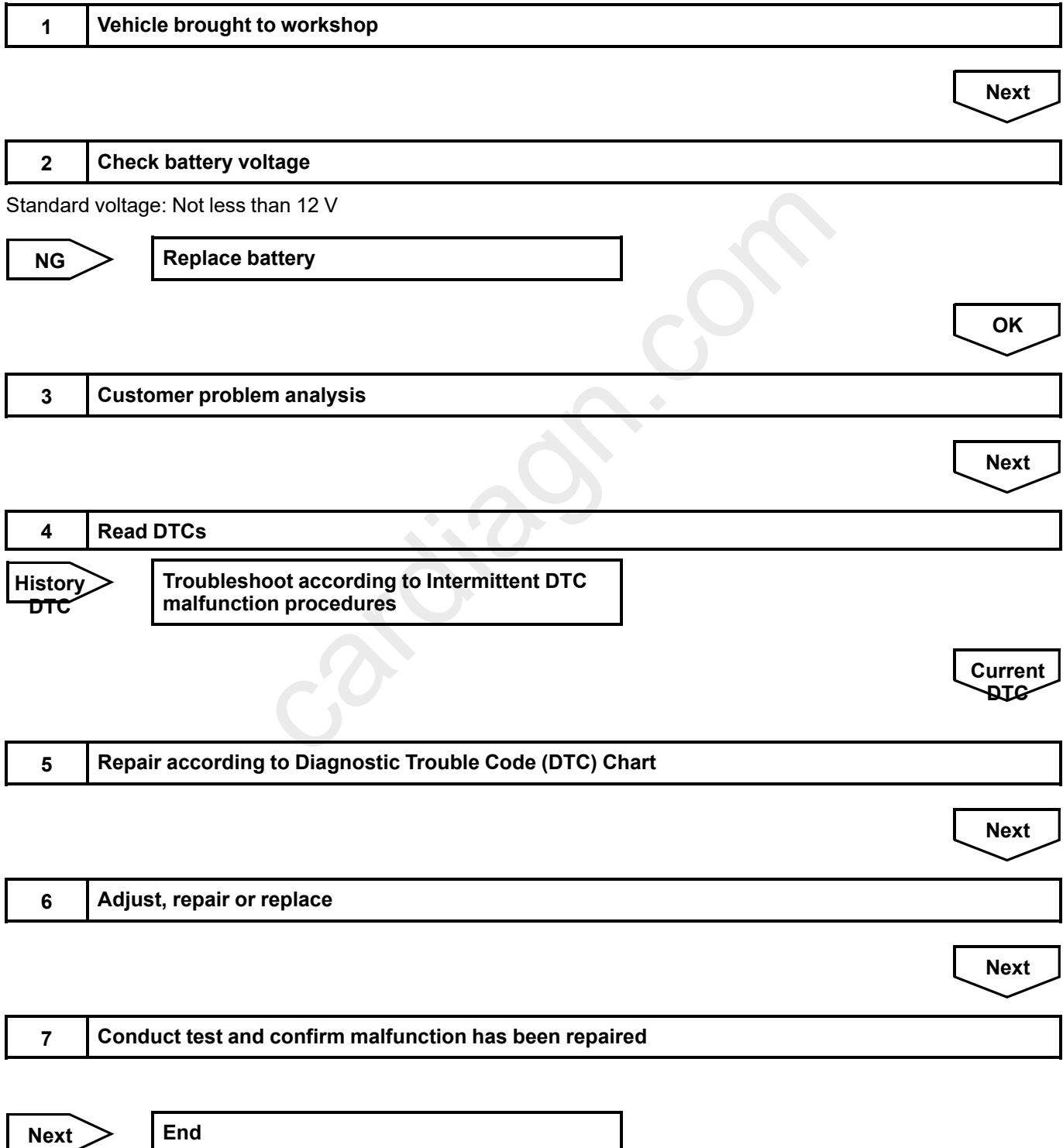
Ground points are very important to the proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) may increase load resistance. This situation may change the way in which a circuit operates. Circuits are very sensitive to proper 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.



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:

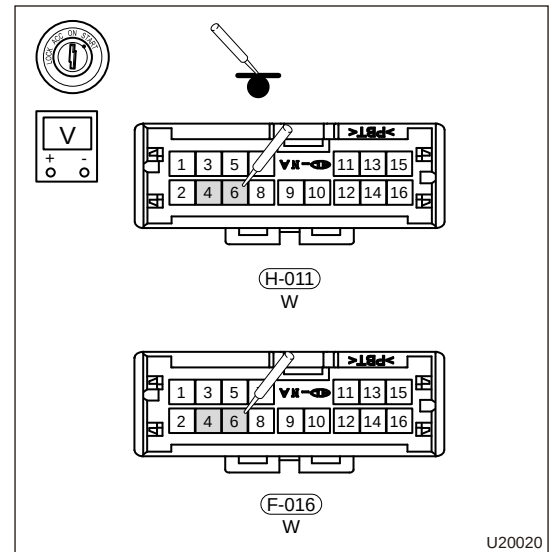
- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect the connectors H-011 and F-016.
- Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
- Using voltage band of digital multimeter, check for voltage between H-011 (4) - ground, H-011 (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

- Connect diagnostic tester and clear DTCs.
- Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
- 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

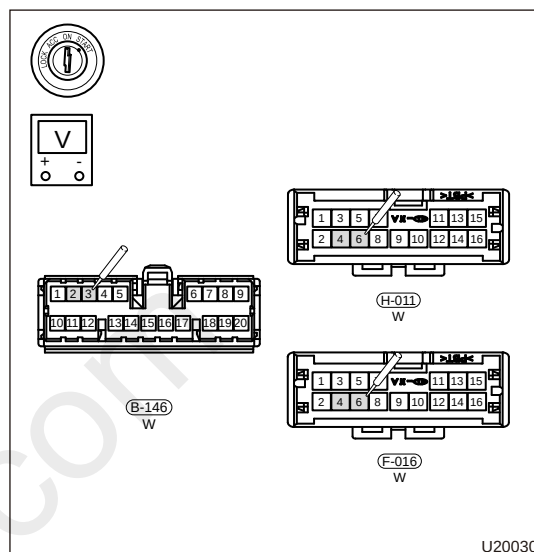
- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect the connectors B-146, H-011 and F-016.
- Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
- Using voltage band of digital multimeter, check for voltage between B-146 (3) - H-011 (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"	$\leq 1 \Omega$
B-146 (3) - F-016 (6)	ENGINE START STOP switch "OFF"	$\leq 1 \Omega$
B-146 (2) - H- 011 (4)	ENGINE START STOP switch "OFF"	$\leq 1 \Omega$
B-146(2) - F-016(4)	ENGINE START STOP switch "OFF"	$\leq 1 \Omega$

NG

Repair or replace faulty wire harness or connector

OK



U20030

2 Reconfirm DTCs

- Connect diagnostic tester and clear DTCs.
- Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
- 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:

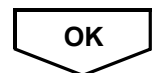
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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#	$\leq 1 \Omega$
5#-3#	When battery voltage is not applied to 1#-2#	∞
5#-3#	When battery voltage is applied to 1#-2#	$\leq 1 \Omega$

NG	Replace relay
----	---------------



2	Check for short to power supply in wire harness and connector
---	---

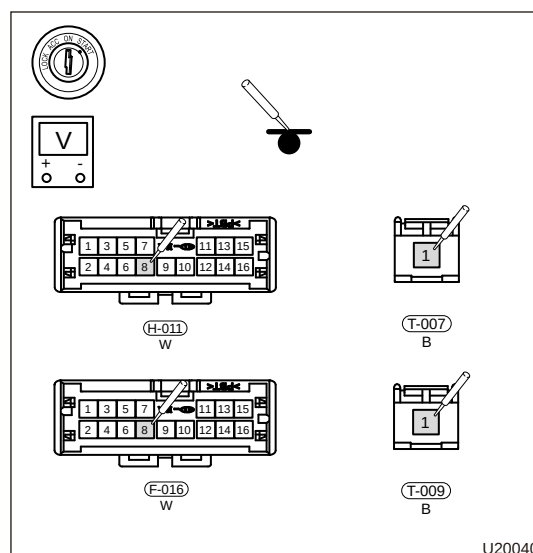
- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect the connectors H-011, F-016, T-007 and T-009.
- Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
- Using voltage band of digital multimeter, check for voltage between H-011 (8) - 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



U20040

3

Reconfirm DTCs

- Connect diagnostic tester and clear DTCs.
- Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
- 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

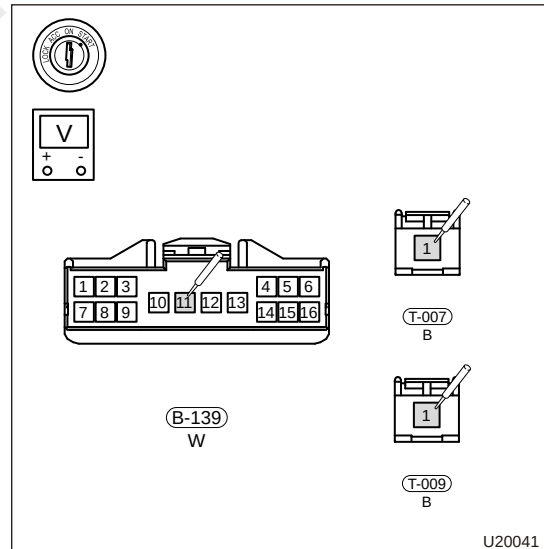
- (a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- (b) Using ohm band of digital multimeter, check relay (RRLY12).

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#	$\leq 1 \Omega$

NG**Replace relay****OK****2 Check wire harness and connector for open**

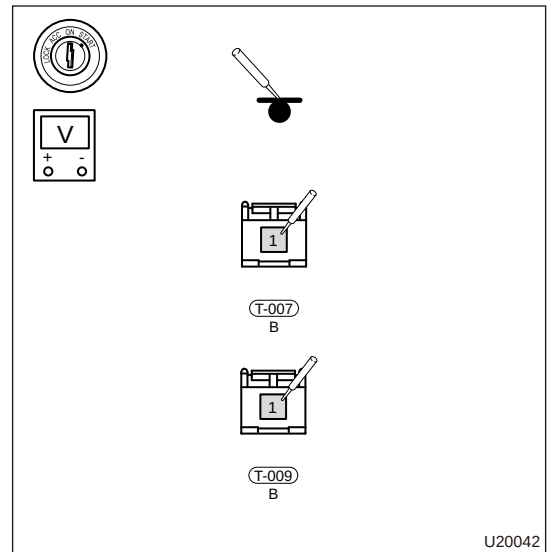
- (a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- (b) Disconnect the connectors B-139, T-007 and T-009.
- (c) Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
- (d) Using voltage band of digital multimeter, check for continuity between 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"	$\leq 1 \Omega$
B-139 (11) - T-009 (1)	ENGINE START STOP switch "OFF"	$\leq 1 \Omega$

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

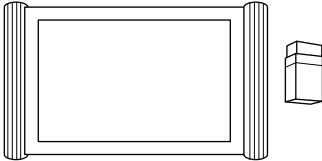
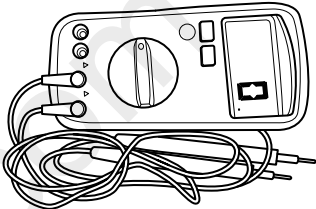
Replace BCM module

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.

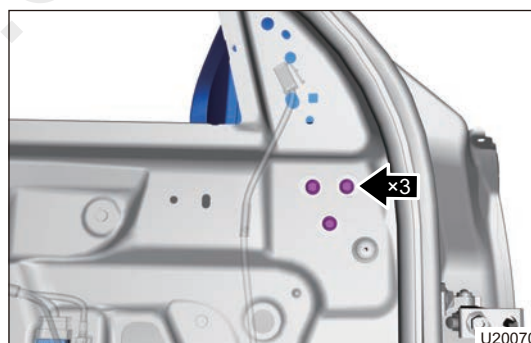
- (4) Disconnect the left outside rear view mirror assembly connector.



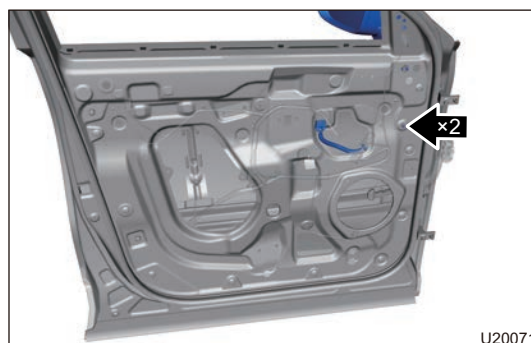
- (5) Remove 3 block covers from left door sheet metal assembly.



- (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.

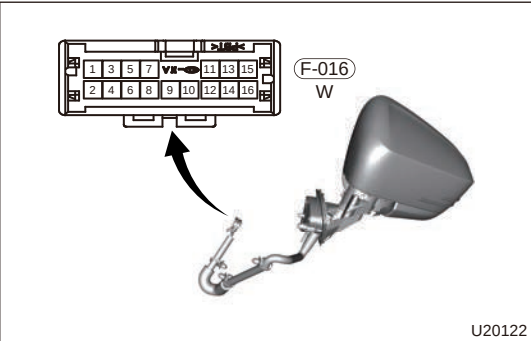
■ Inspection

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

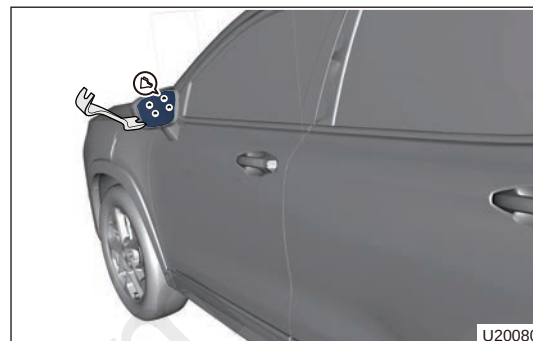
Hint

- Use same procedures for right and left sides.
- Procedures listed below are for left side.

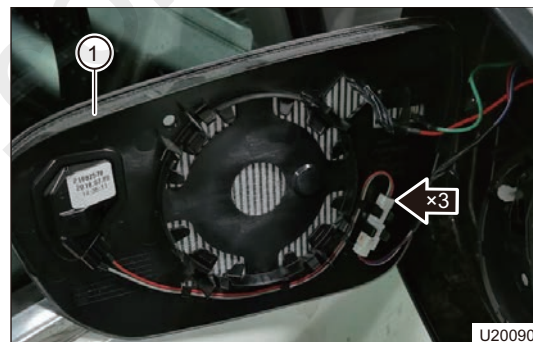
Warnings

- 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

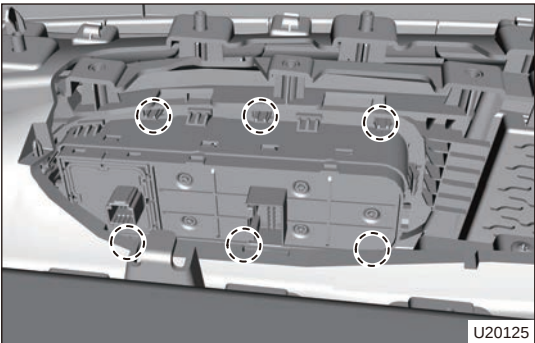
■ Removal

Warnings

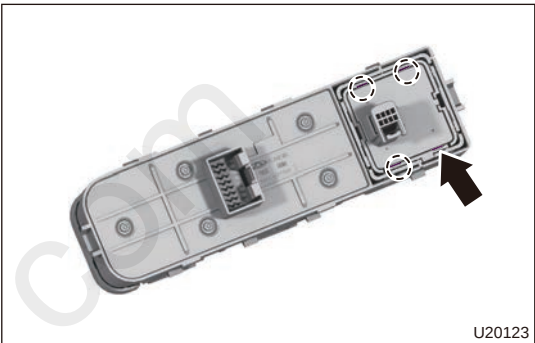
- **Be sure to wear safety equipment to prevent accidents, when removing outside rear view mirror adjustment switch.**
- **DO NOT scratch instrument panel assembly when removing outside rear view mirror adjustment switch.**

- (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

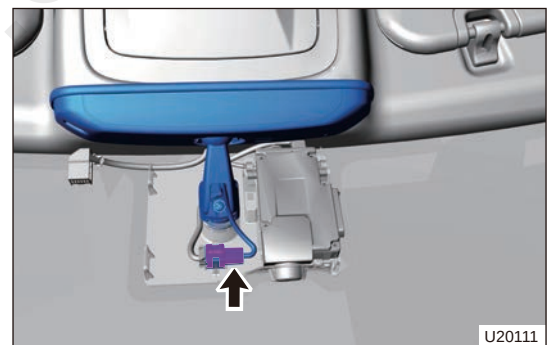
- (3) Using an interior crow plate, pry off and remove the inside rear view mirror right protective cover.



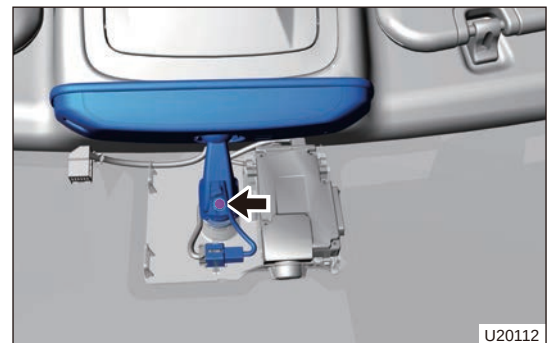
- (4) Using an interior crow plate, pry off the inside rear view mirror left protective cover.



- (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.

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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.

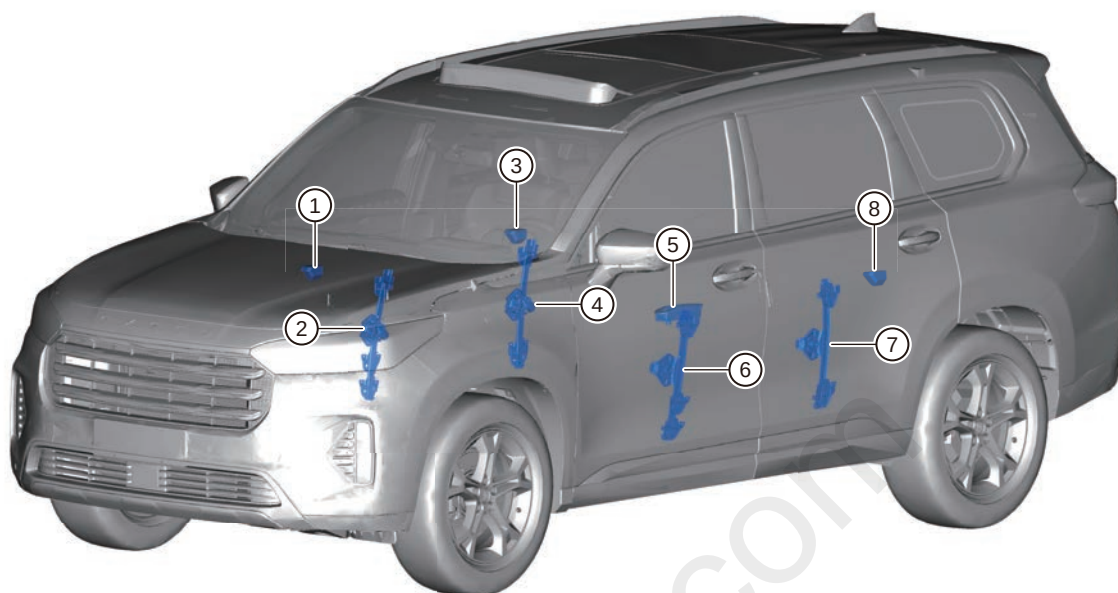
2 System Overview

2.1 System Components Diagram



V20010

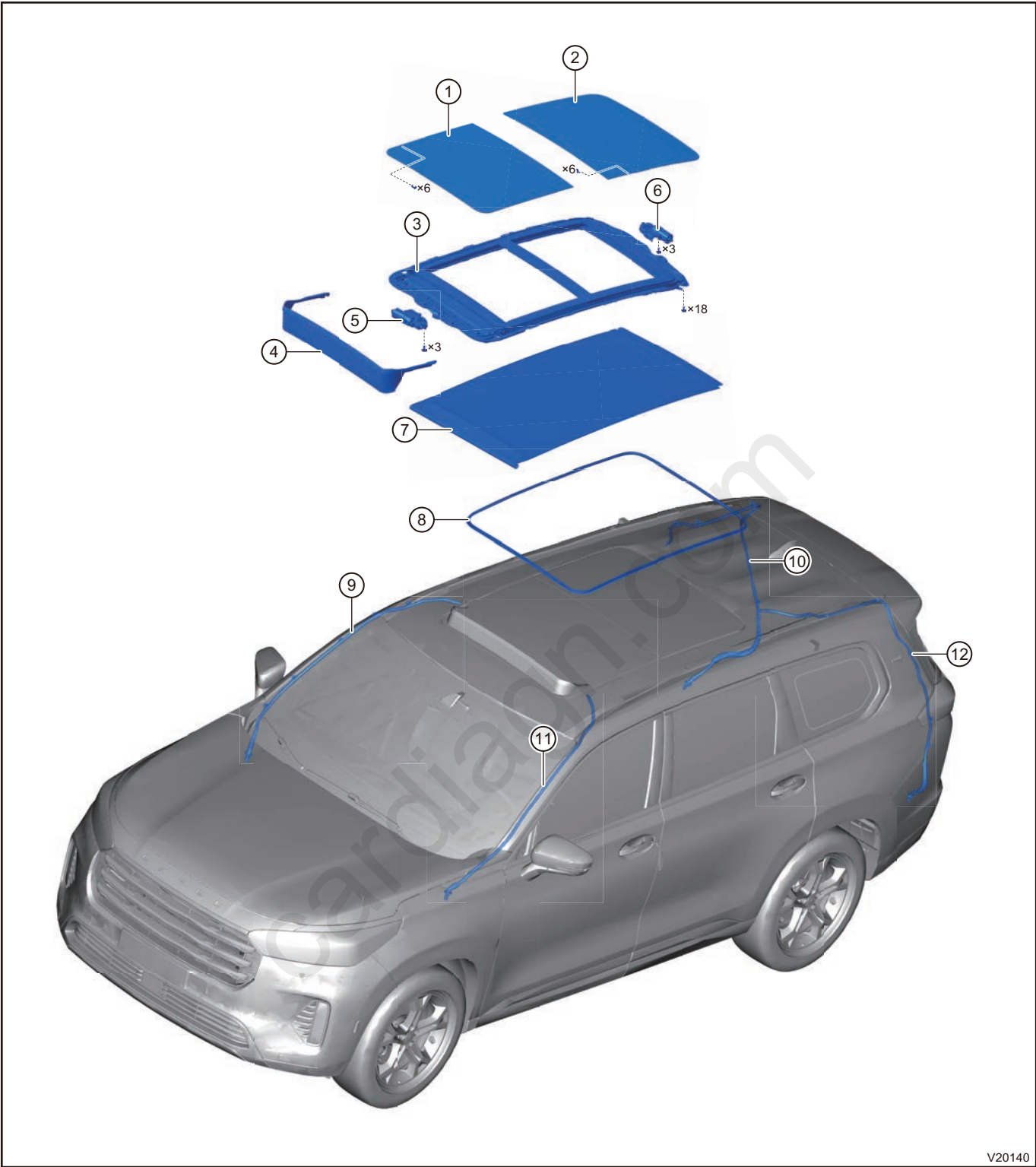
1	Front Windshield Assembly	2	Front Left Door Glass Assembly
3	Rear Left Door Glass Assembly	4	Left Triangular Window Glass Assembly
5	Front Right Door Glass Assembly	6	Rear Right Door Glass Assembly
7	Right Triangular Window Glass Assembly	8	Rear Windshield Assembly



V20011

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.



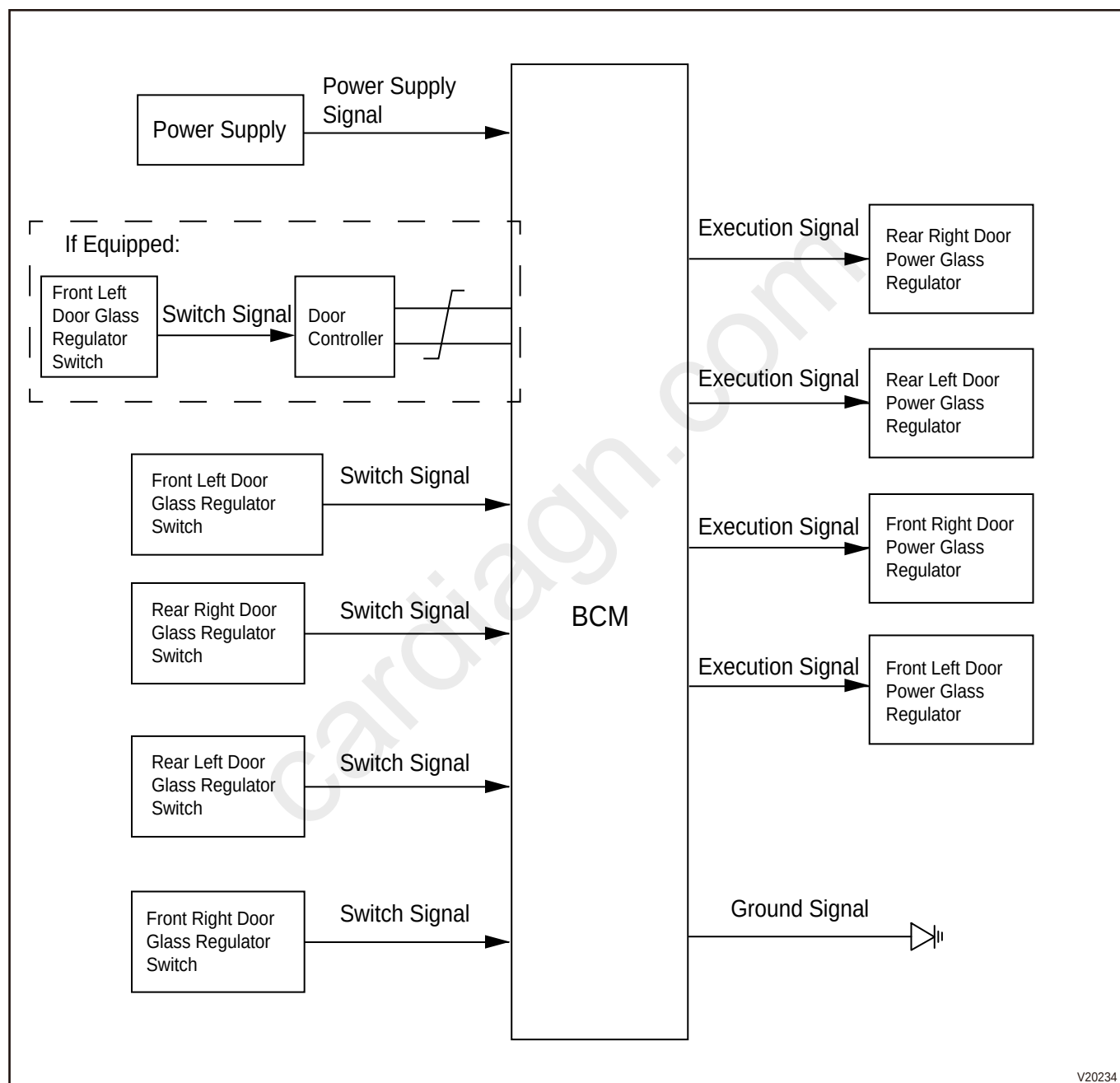
V20140

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

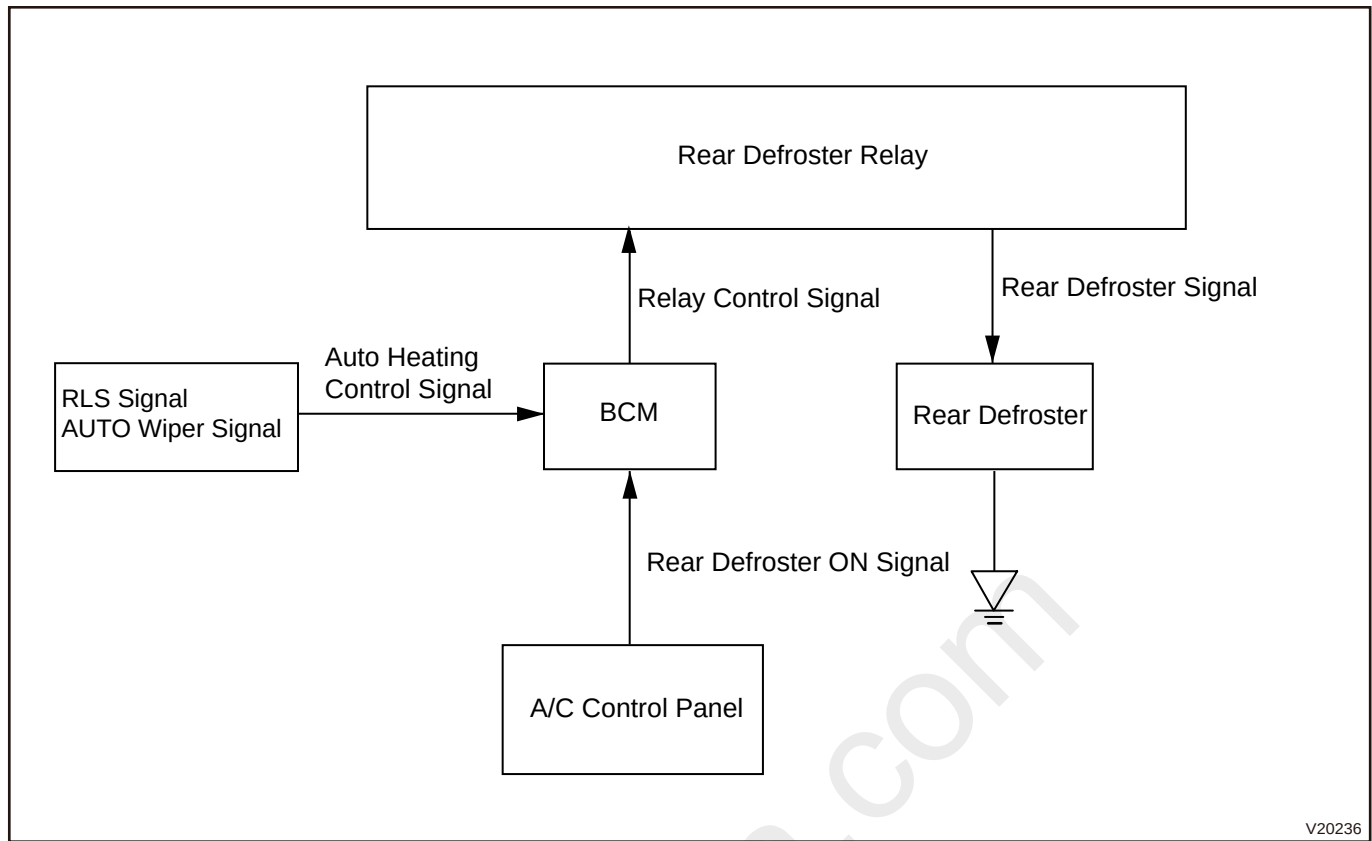
9	Front Right Sliding Roof Drain Hose Assembly	10	Rear Right Sliding Roof Drain Hose Assembly
11	Front Left Sliding Roof Drain Hose Assembly	12	Rear Left Sliding Roof Drain Hose Assembly

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.

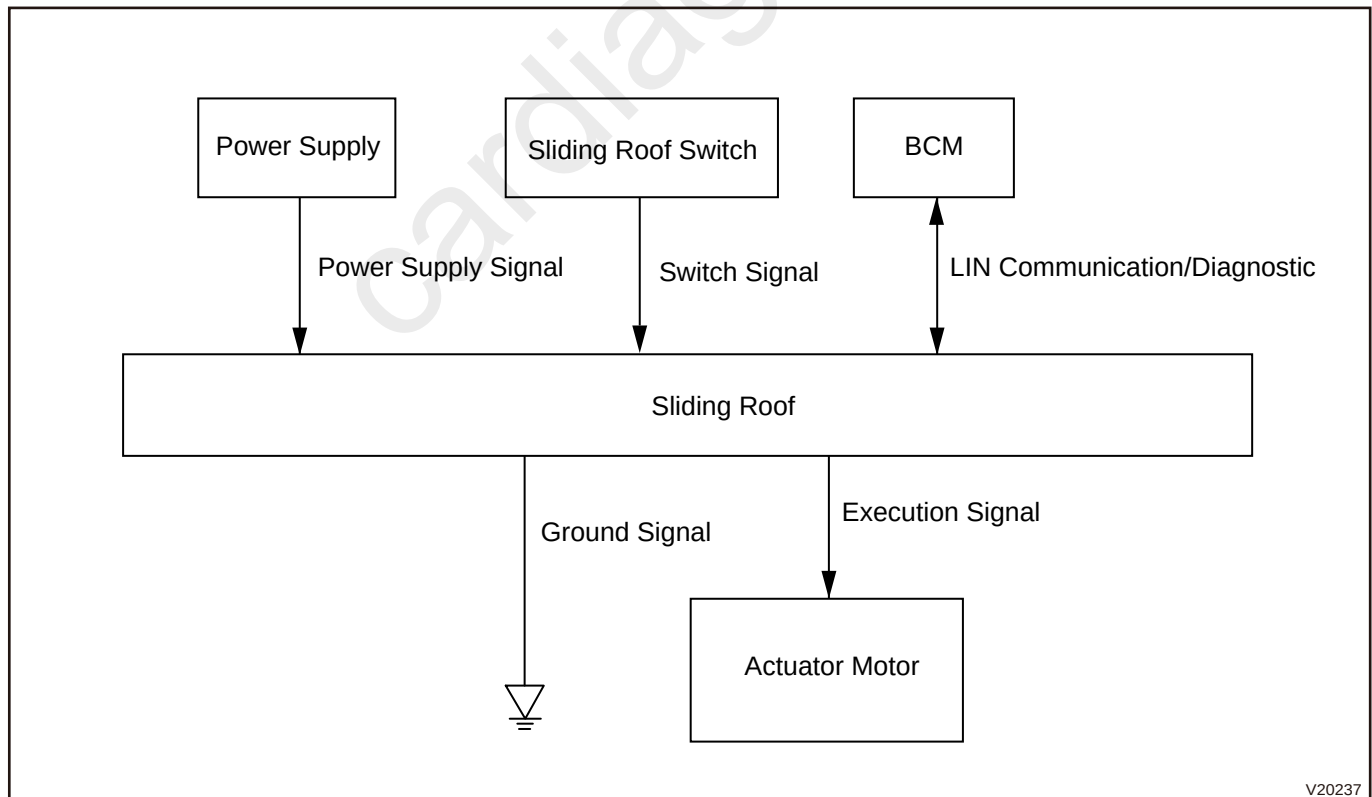
2.2 System Schematic Diagram



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.



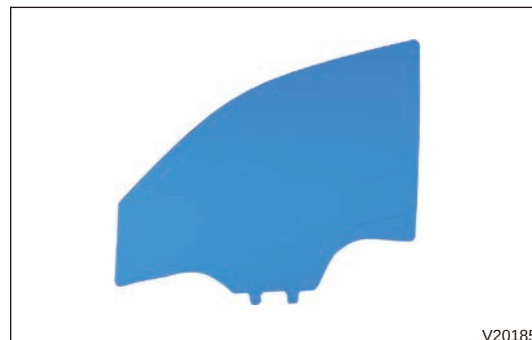
Battery provides 12 V power supply to sliding roof module. When sliding roof module receives switch information, sliding roof module drive motor starts to perform open and close.

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.



V20185

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.



V20186

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

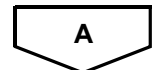
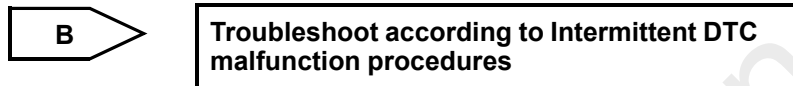
Result	Go to
DTC occurs	A
No DTC	B



5	Read DTCs (current DTC and history DTC)
----------	--

Result

Result	Go to
DTC occurs	A
No DTC	B



6	Repair according to Diagnostic Trouble Code (DTC) Chart
----------	--



7	Adjust, repair or replace
----------	----------------------------------



8	Conduct test and confirm malfunction has been repaired
----------	---

**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
---	--

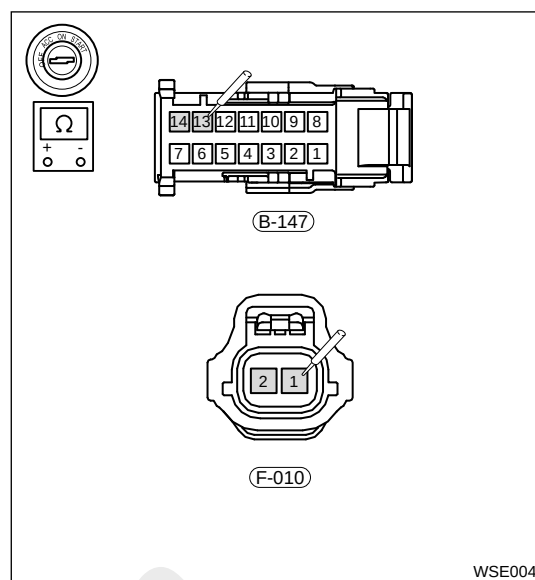
OK	Go to step 5: Check control circuit of front left door glass.
----	---

NG

3	Check execution circuit of front left window system
---	---

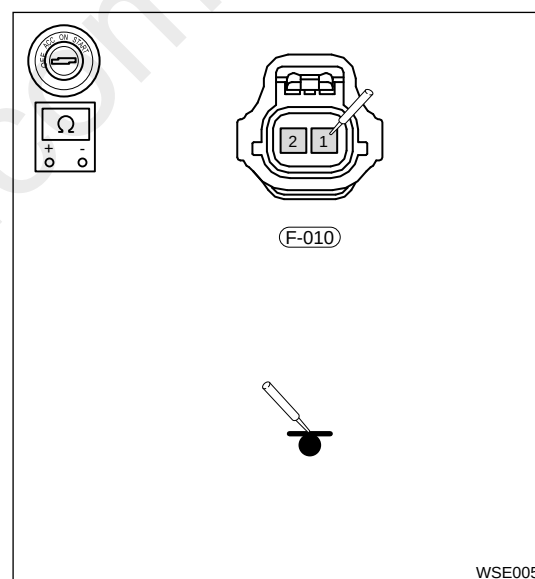
- (a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
- (b) Disconnect front left door glass regulator motor wire harness connector F-010 and BCM connector B-147.
- (c) Using ohm band of multimeter, check for continuity between F-010 (1) - B-147 (13) and F-010 (2) - B-147 (14) separately.

Digital Multimeter	Condition	Specified Condition
F-010 (1) - B-147 (13)	Always	$\leq 1 \Omega$
F-010 (2) - B-147 (14)		$\leq 1 \Omega$



- (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.

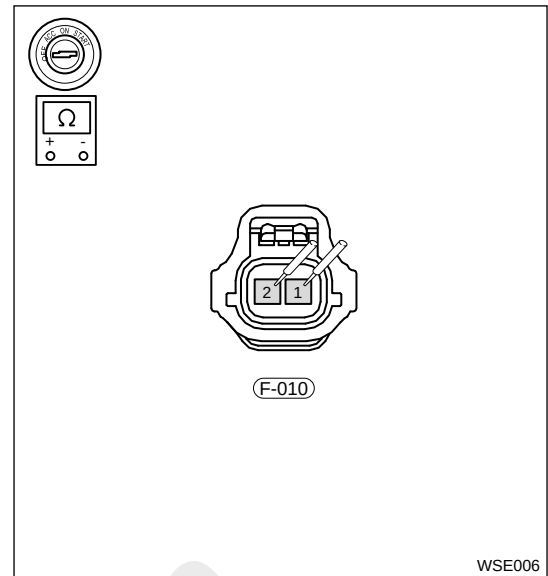
OK

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	$\leq 1 \Omega$



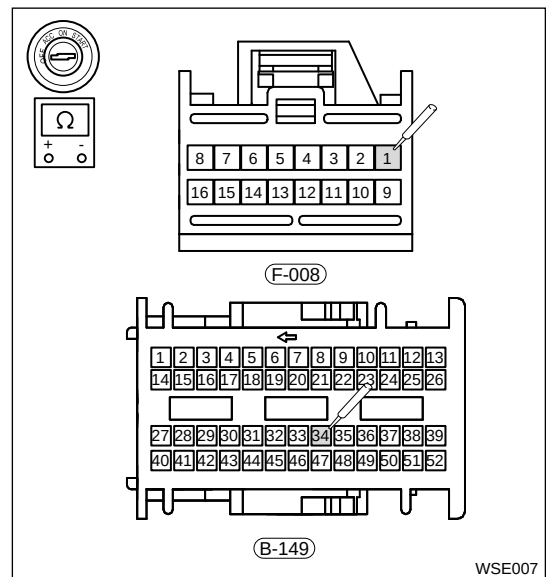
- (d) Apply 12 V voltage to both terminals (1) and (2) of front left window regulator motor connector F-010, and observe if regulator motor operates.

NG	Replace front left window regulator motor.
OK	Replace BCM.

5 Check front left door glass control circuit

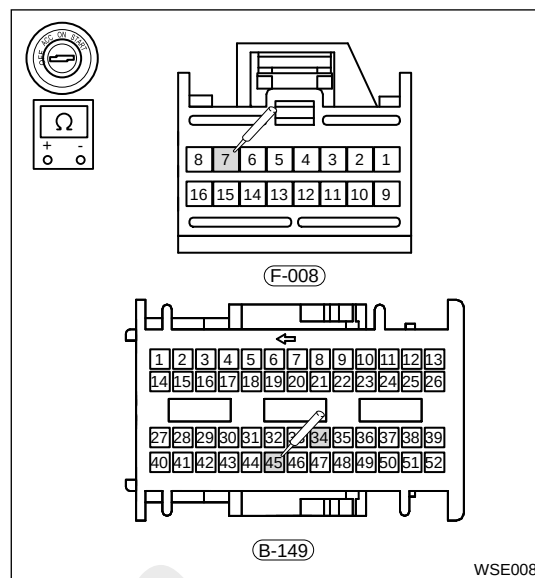
- (a) Turn ENGINE START STOP switch to ON.
- (b) Check if fuse MF03 (125A) of engine compartment main fuse and relay box is blown.
- (c) Check if fuses RF52 (30A), RF51 (30A), RF54 (20A) of instrument panel fuse and relay box are blown.
- (d) Using voltage band of multimeter, measure if the voltage of 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	$\leq 1 \Omega$



- (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	$\leq 1 \Omega$



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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

- (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

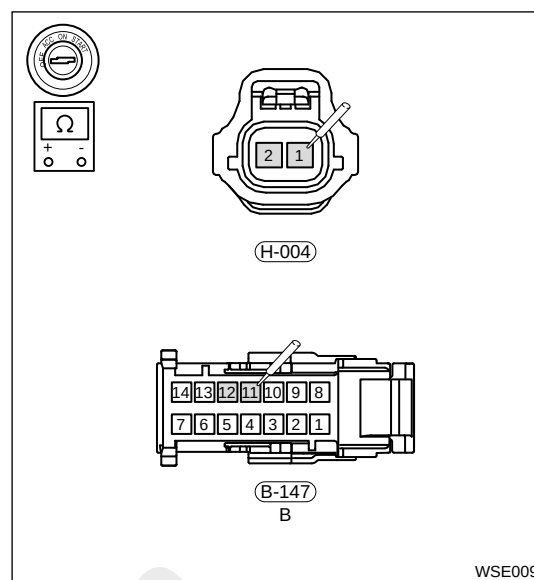
Go to step 5: Check control circuit of front left door glass.

NG

3	Check execution circuit of front left window system
---	---

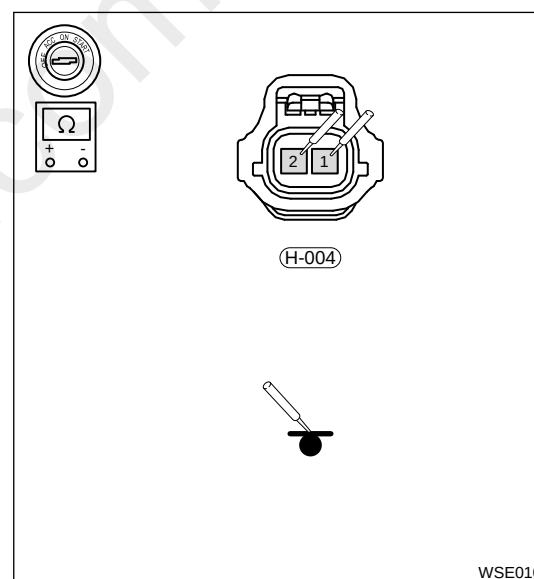
- (a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
- (b) Disconnect front right door glass regulator motor connector H-004 and BCM connector B-147.
- (c) Using ohm band of multimeter, check for continuity between H-004 (1) and B-147 (11), H-004 (2) and B-147 (12) separately.

Multimeter Connection	Condition	Specified Condition
H-004 (1) - B- 147 (11)	Always	$\leq 1 \Omega$
H-004 (2) - B- 147 (12)		$\leq 1 \Omega$



- (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.

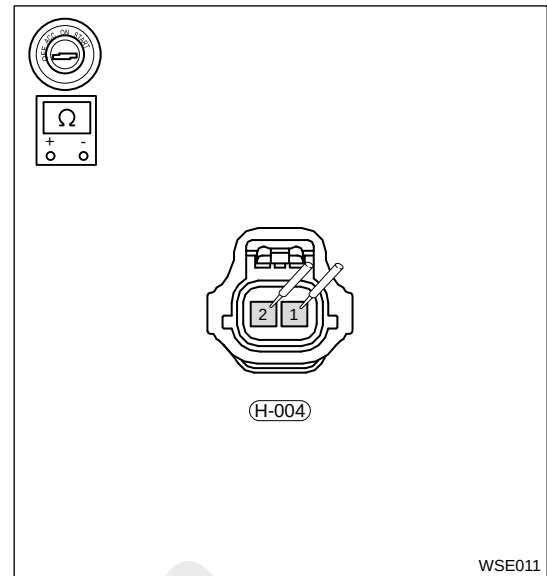
OK

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	$\leq 1 \Omega$



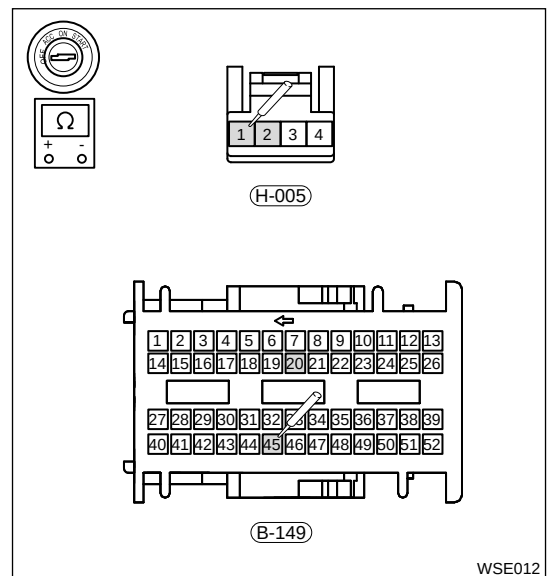
- (d) Apply 12 V voltage to terminals (1) and (2) of front right window regulator motor connector H-004, and observe if the regulator motor moves.

NG	Replace the front right window regulator motor.
OK	Replace BCM.

5 Check control circuit of front right glass regulator

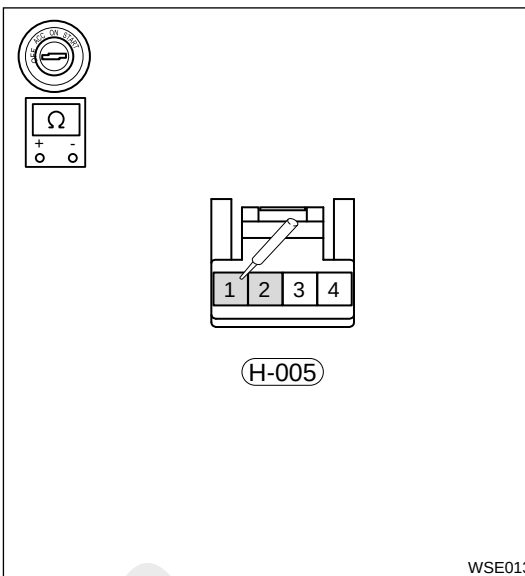
- (a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- (b) Disconnect the front right door regulator switch H-005 and BCM connector B-149.
- (c) Using ohm band of multimeter, check for continuity between H-005 (1) and B-149 (45), H- 005 (2) and B-149 (20) separately.

Multimeter Connection	Condition	Specified Condition
H-005 (1) - B- 149 (45)	Always	$\leq 1 \Omega$
H-005 (2) - B- 149 (20)	Always	$\leq 1 \Omega$



- (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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

- (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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

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.

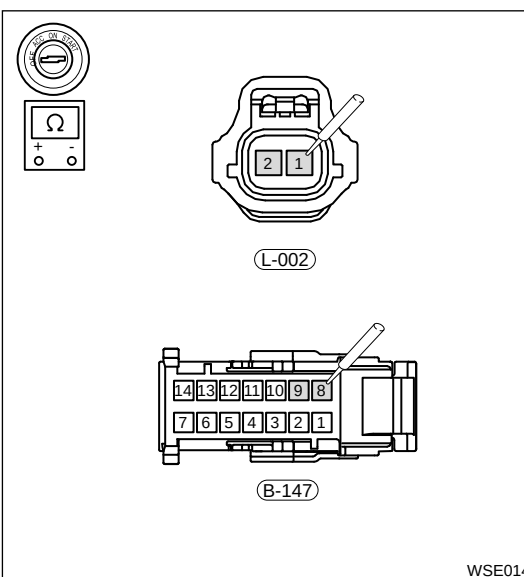
NG
3 Check execution circuit of rear left window system

(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.

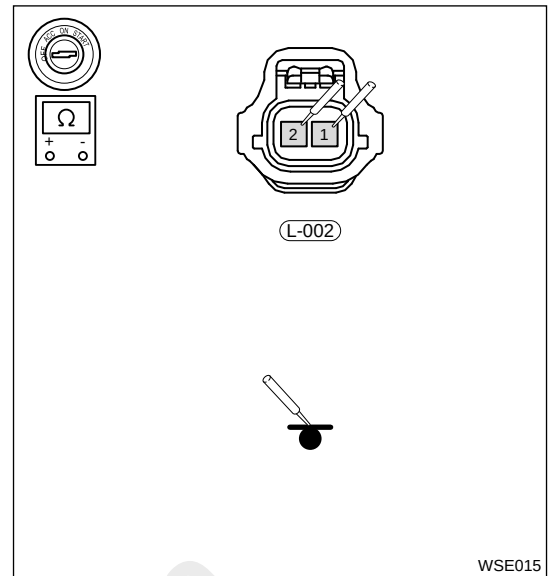
(c) Using ohm band of multimeter, check for continuity between L-002 (1) and B-147 (8), L-002 (2) and B-147 (9) separately.

Multimeter Connection	Condition	Specified Condition
L-002 (1) - B-147 (8)	Always	$\leq 1 \Omega$
L-002 (2) - B-147 (9)		$\leq 1 \Omega$



- (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.

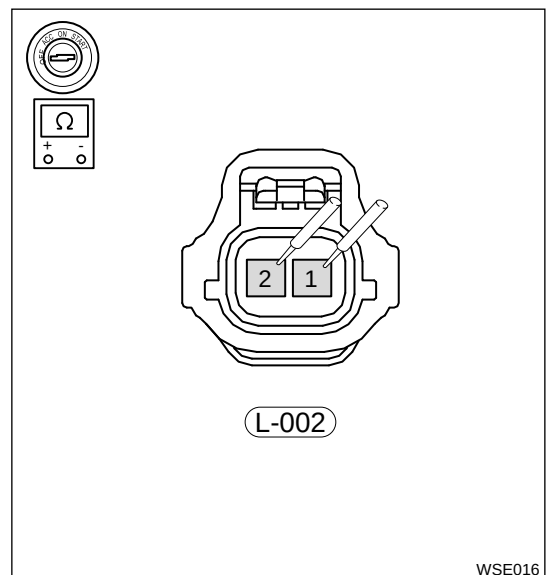
OK

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	$\leq 1 \Omega$



- (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

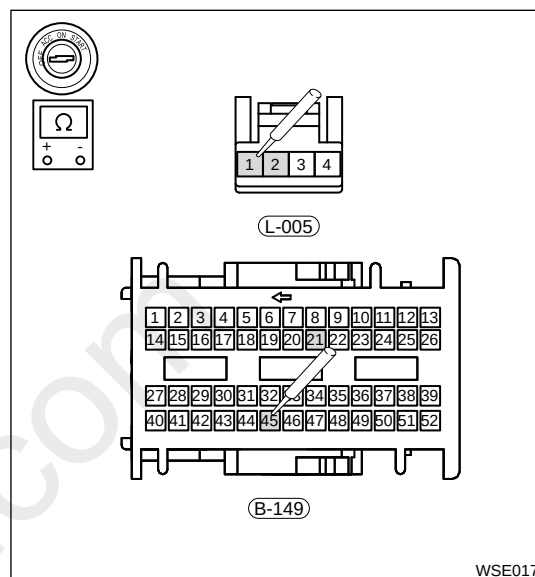
Replace BCM.

5

Check control circuit of rear left glass regulator

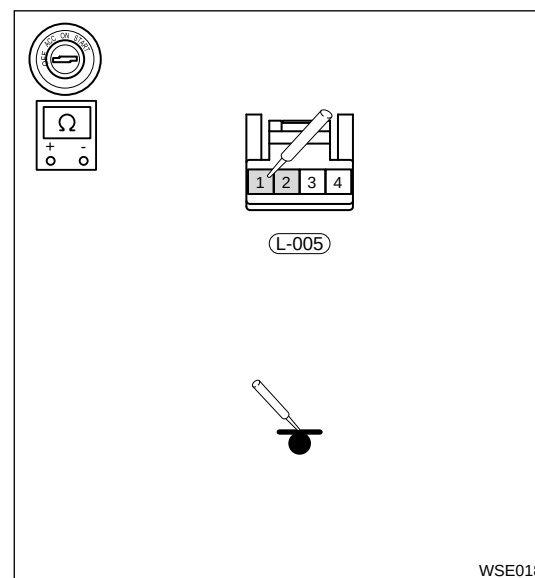
- (a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- (b) Disconnect rear left door glass regulator switch L-005 and BCM connector B-149.
- (c) Using ohm band of multimeter, check for continuity between L-005 (2) and B-149 (21), and L-005 (1) and B-149 (45).

Multimeter Connection	Condition	Specified Condition
L-005 (2) - B-149 (21)	Always	$\leq 1 \Omega$
L-005 (1) - B-149 (45)		$\leq 1 \Omega$



- (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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

- (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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$

Multimeter Connection	Condition	Specified Condition
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

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.

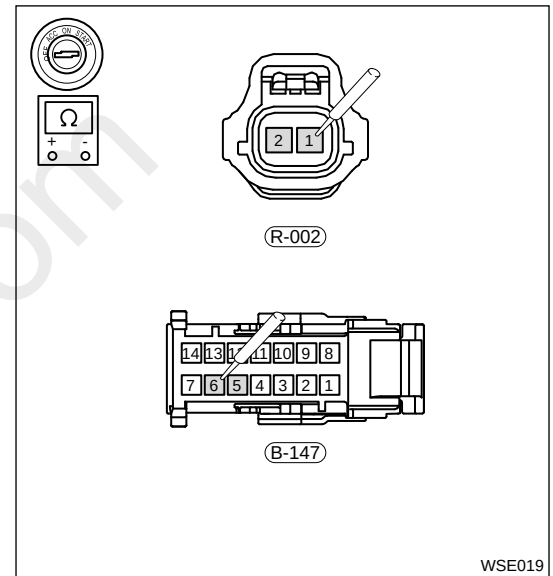
NG

3

Check execution circuit of rear right window system

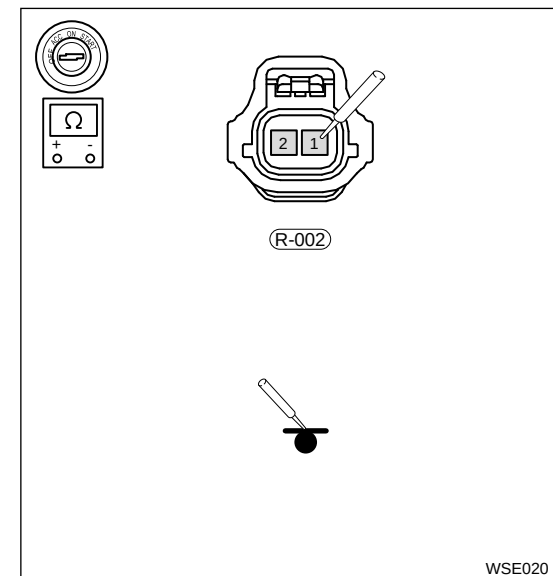
- (a) Disconnect negative battery cable, and turn ENGINE START STOP switch to OFF.
- (b) Disconnect rear right door glass regulator motor connector R-002 and BCM connector B-147.
- (c) Using ohm band of multimeter, check for continuity between R-002 (1) and B-147 (6), R-002 (2) and B-147 (5) separately.

Multimeter Connection	Condition	Specified Condition
R-002 (1) - B- 147 (6)	Always	$\leq 1 \Omega$
R-002 (2) - B- 147 (5)		$\leq 1 \Omega$



- (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.

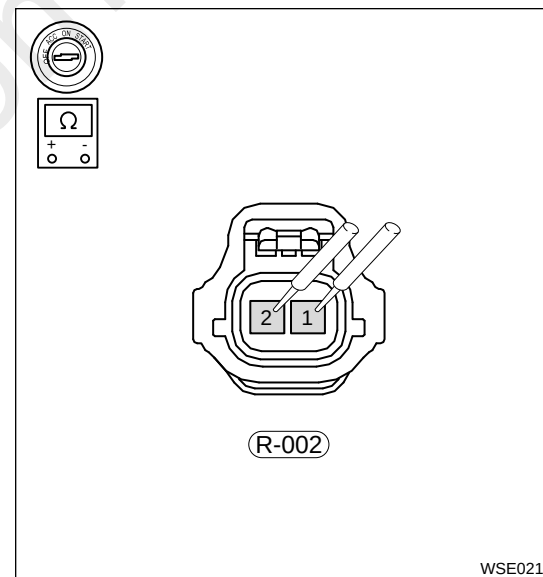
OK

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	$\leq 1 \Omega$



- (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

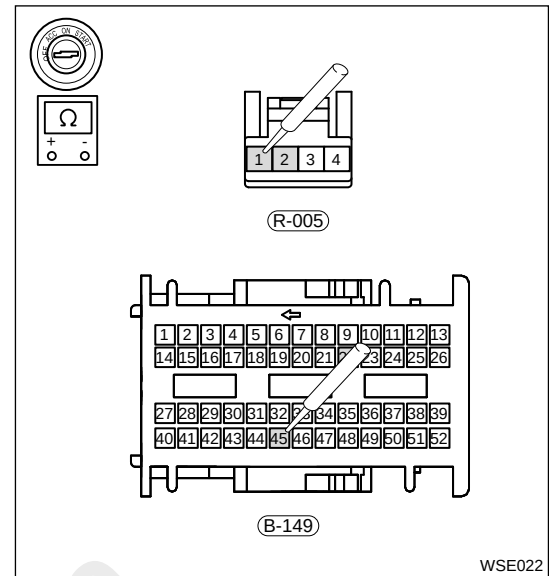
Replace BCM.

5

Check control circuit of rear right door glass regulator

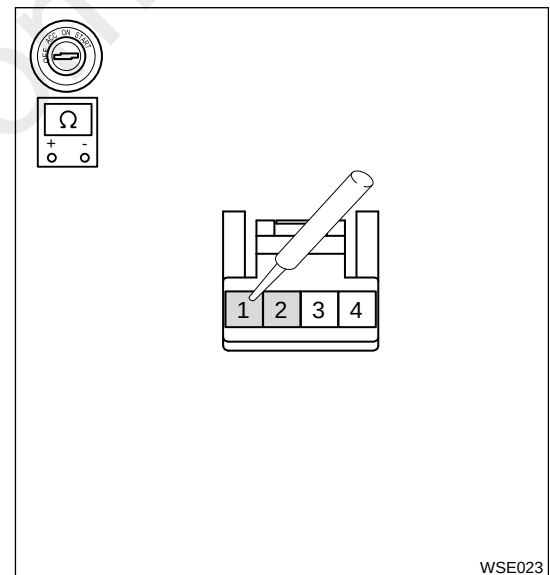
- (a) Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- (b) Disconnect rear right door glass regulator switch R-005 and BCM connector B-149.
- (c) Using ohm band of multimeter, check for continuity between R-005 (1) and B-149 (45), and R-005 (2) and B-149 (22).

Multimeter Connection	Condition	Specified Condition
R-005 (1) - B- 149 (45)	Always	$\leq 1 \Omega$
R-005 (2) - B- 149 (22)		$\leq 1 \Omega$



- (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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

- (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	$\approx 332 \Omega$
	Automatic DOWN	$\approx 0 \Omega$
	Manual UP	$\approx 3000 \Omega$
	Auto UP	$\approx 1500 \Omega$

- (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).

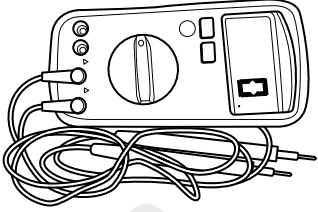
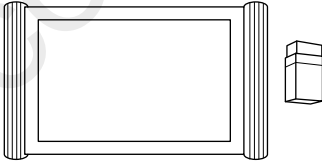
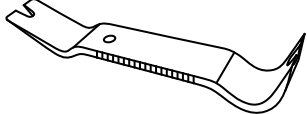
OK

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

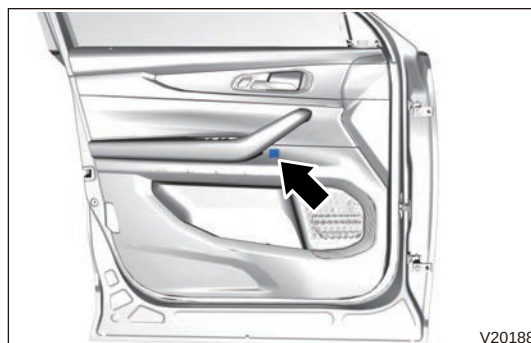
- **Be sure to wear safety equipment to prevent accidents, when removing front left door glass regulator switch.**
- **Appropriate force should be applied when removing front left door glass regulator switch. Be careful not to operate roughly.**
- **Try to prevent front door inner protector assembly 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.



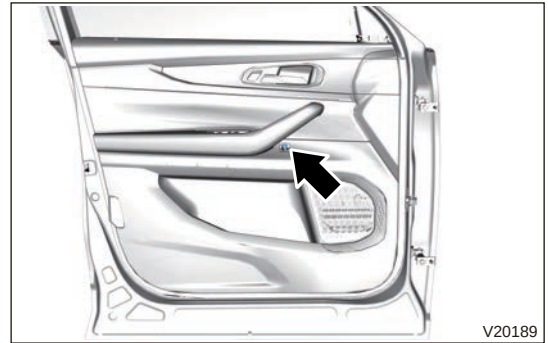
V20187

- (4) Using an interior crow plate, carefully pry off front door protector block cover.

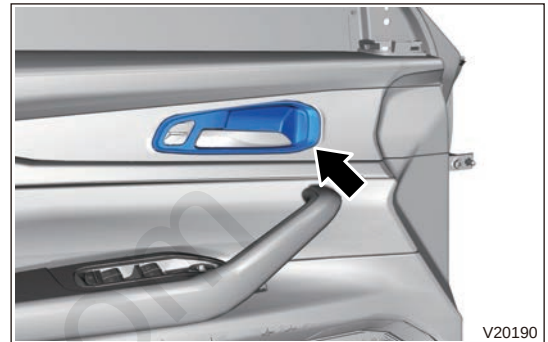


V20188

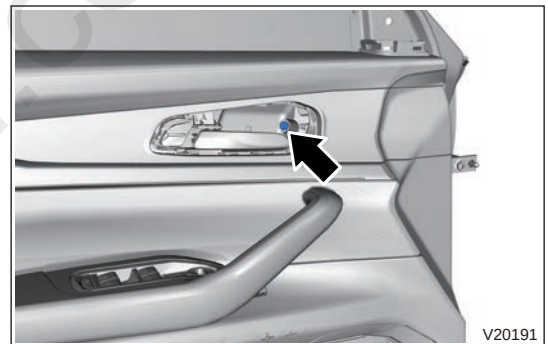
- (5) Remove fixing bolt from the rear side of front door protector block cover.



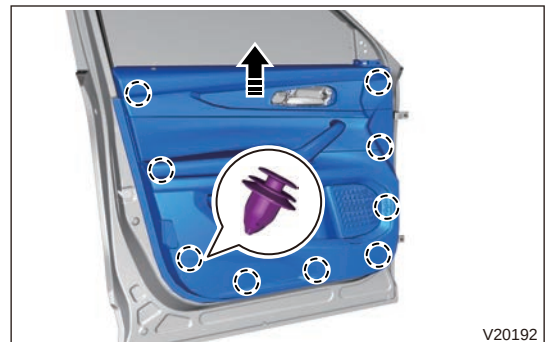
- (6) Remove the front door protector and disconnect the central control switch connector.



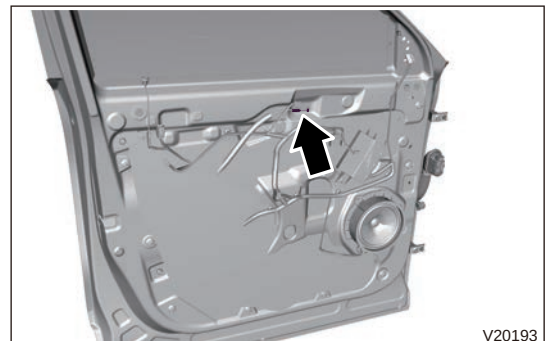
- (7) Remove fixing bolt from the rear side of front door protector.



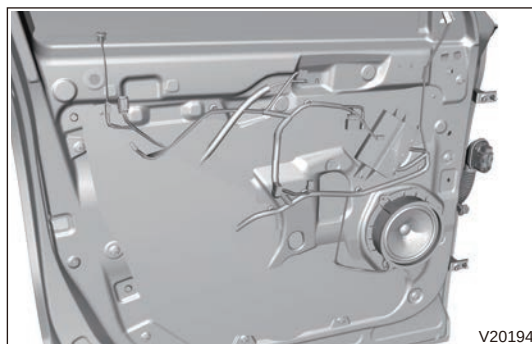
- (8) Using an interior crow plate, carefully pry off clips on front door inner protector assembly, and loosen front door inner protector assembly in direction of arrow as shown in illustration.



- (9) Disengage front door inside handle cable from front door inside handle.



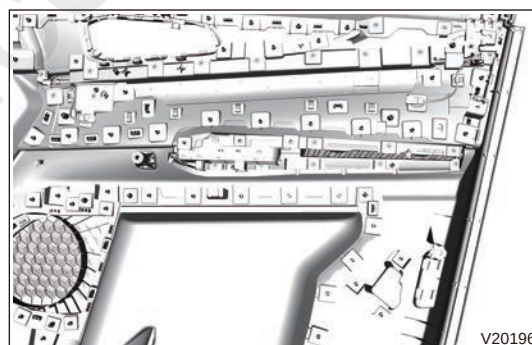
- (10) Disconnect ambient light connector, anti-theft indicator light connector and regulator switch connector.



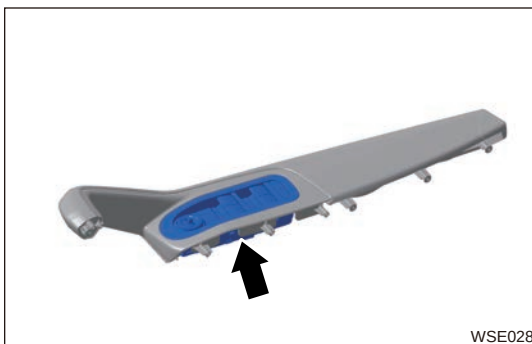
- (11) Remove the front left door protector assembly.



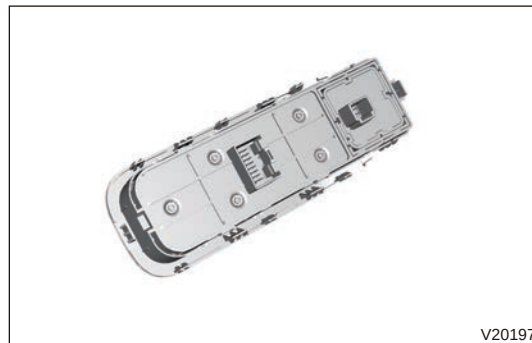
- (12) Remove fixing screw from power glass regulator switch that fixed on door protector assembly.



- (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	$\approx 332 \Omega$
		Automatic DOWN	$\approx 0 \Omega$
	1 - 7	Manual UP	$\approx 3000 \Omega$
		Auto UP	$\approx 1500 \Omega$
Front right door glass regulator switch	2 - 7	Manual DOWN	$\approx 332 \Omega$
		Automatic DOWN	$\approx 0 \Omega$
	2 - 7	Manual UP	$\approx 3000 \Omega$
		Auto UP	$\approx 1500 \Omega$
Rear left door glass regulator switch	3 - 7	Manual DOWN	$\approx 332 \Omega$
		Automatic DOWN	$\approx 0 \Omega$
	3 - 7	Manual UP	$\approx 3000 \Omega$
		Auto UP	$\approx 1500 \Omega$
Rear right door glass regulator switch	4 - 7	Manual DOWN	$\approx 332 \Omega$
		Automatic DOWN	$\approx 0 \Omega$
	4 - 7	Manual UP	$\approx 3000 \Omega$
		Auto UP	$\approx 1500 \Omega$

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.

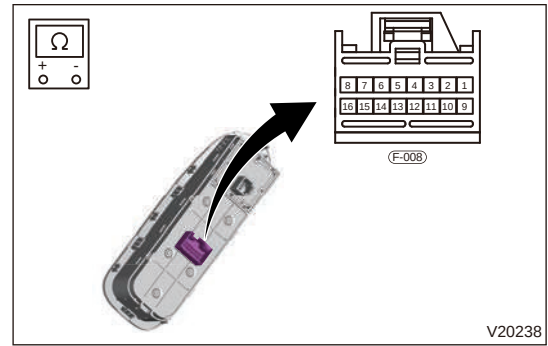
- (1) Install power glass regulator switch to proper position of door protector handle.
- (2) Install fixing screw to door protector handle.

Tightening torque: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (3) Install door protector handle to proper position of door protector, and install fixing bolt.

Tightening torque: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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: $5 \pm 1.0 \text{ N}\cdot\text{m}$

- (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: $5 \pm 1.0 \text{ N}\cdot\text{m}$

- (10) Install the front door protector block cover.
- (11) Install the front door triangular block assembly.
- (12) Connect the negative battery cable.

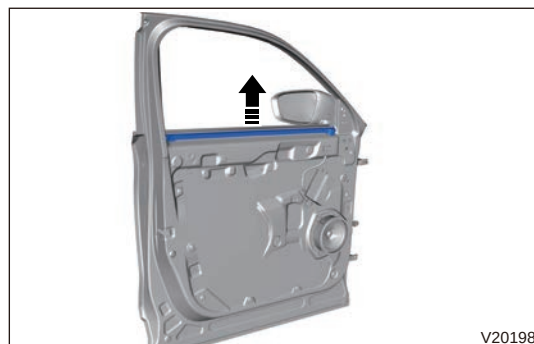
5.4 Replacement of Front Door Inner Weather Bar

■ 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

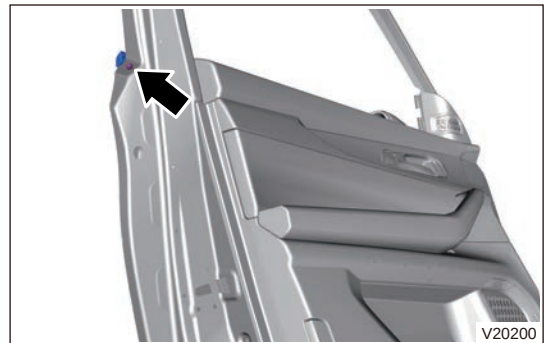
Caution

- 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.



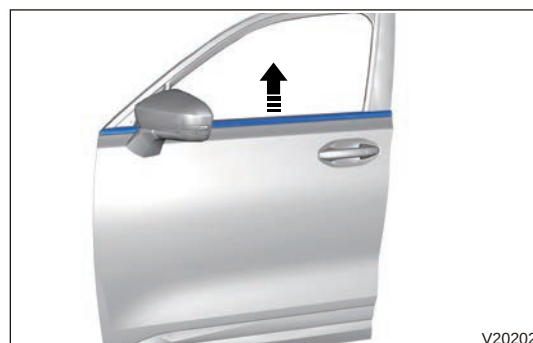
- (4) Remove 1 fixing screw from front left triangular block assembly.
- (5) Using a interior crow plate, carefully pry off front left triangular block assembly.
- (6) Remove 1 fixing screw from left side of front left door outer weather bar.



- (7) Remove 1 fixing screw from right side of front left door outer weather bar.



- (8) Using an interior crow plate, remove front door outer weather bar from slot in direction of arrow.



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■ 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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (3) Install the front left triangular block assembly.
- (4) Install 1 fixing screw to front left triangular block assembly.

Tightening torque: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (5) Install the front door inner triangular block assembly.
- (6) Connect the negative battery cable.

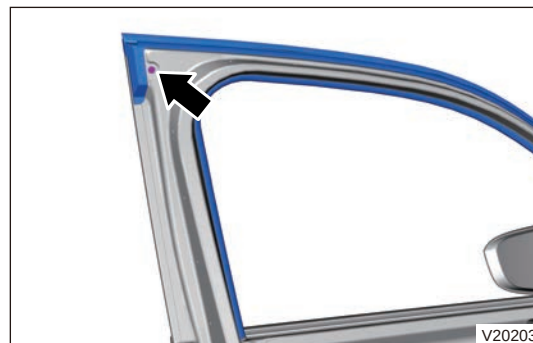
5.6 Replacement of Front Door Upper Glass Run

■ 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.



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- (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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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.

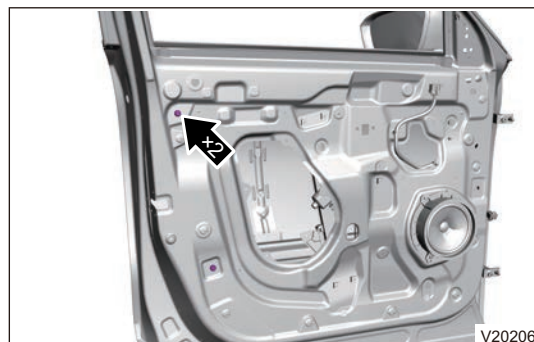
5.8 Replacement of Front Door Glass Rear Lower Guide Rail Assembly

■ 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.

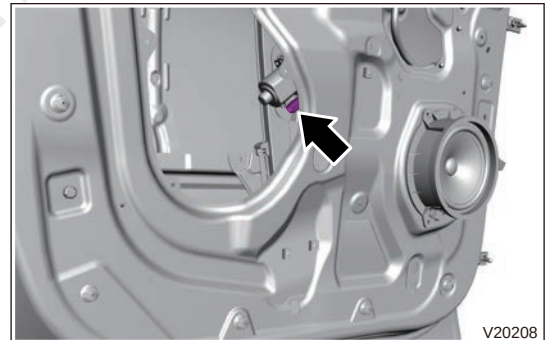
5.9 Replacement of Front Door Power Glass Regulator

■ 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.**

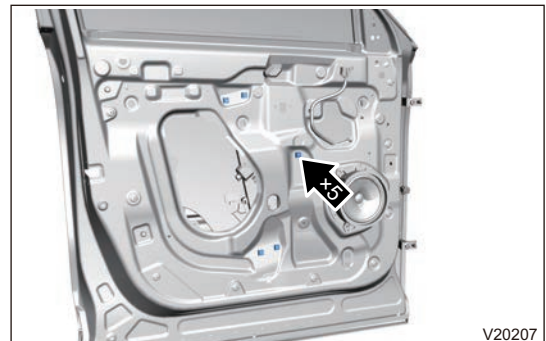
- (1) Turn off all electrical equipment and the ignition switch.
- (2) Disconnect the negative battery cable.
- (3) Remove the front left door inner protector assembly.
- (4) Remove the front left door protective film assembly.
- (5) Remove the front left door weather bar.
- (6) Remove the front left 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.

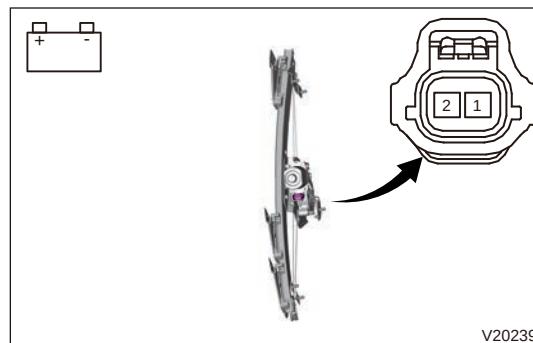


■ Inspection

- (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: $9 \pm 1.5 \text{ N}\cdot\text{m}$

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

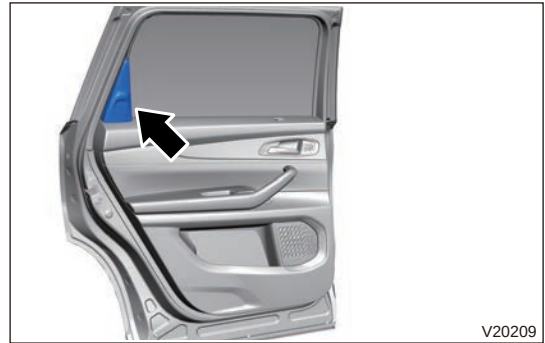
■ Removal

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.



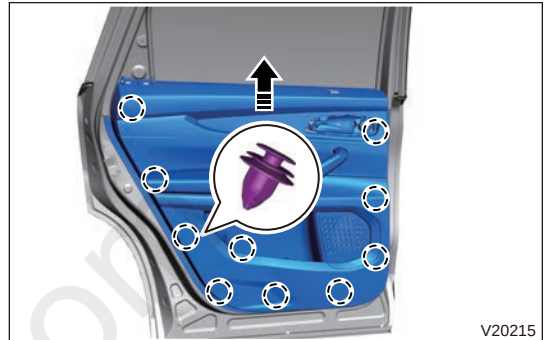
- (7) Remove rear left door front cover and rear left door protector block cover (middle) rear fixing bolt.



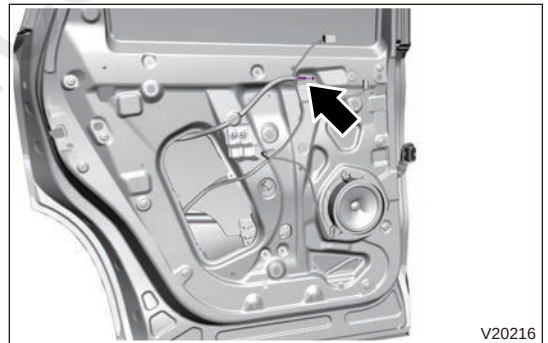
- (8) Remove fixing screw from rear side of rear left door handle box block cover.



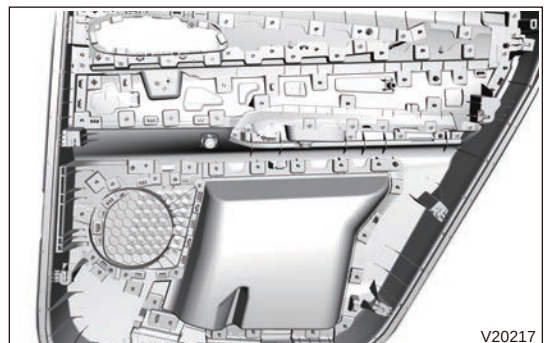
- (9) Using an interior crow plate, pry up clips on rear door inner protector assembly, and remove rear door inner protector assembly in direction of arrow as shown in illustration.



- (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

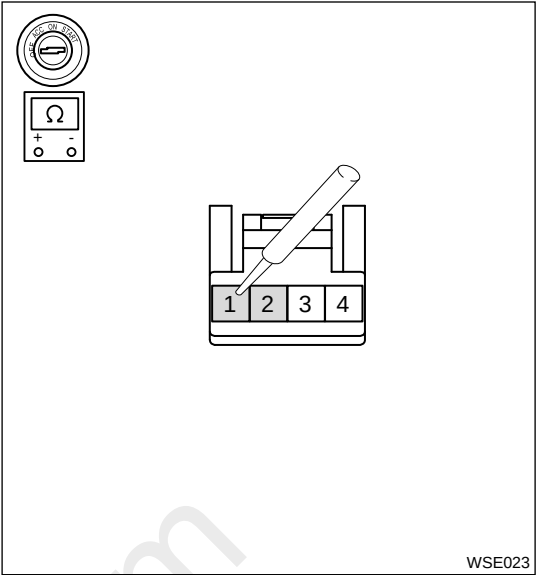
- (1) Using a digital multimeter, measure continuity between terminals of three power glass regulator switches according to table below.

Component	Multimeter Connection	Switch Condition	Specified Condition
Front right door glass regulator switch	2 - 1	Manual DOWN	$\approx 332\ \Omega$
		Automatic DOWN	$\approx 0\ \Omega$
	2 - 1	Manual UP	$\approx 3000\ \Omega$
		Auto UP	$\approx 1500\ \Omega$
Rear left door glass regulator switch	2 - 1	Manual DOWN	$\approx 332\ \Omega$
		Automatic DOWN	$\approx 0\ \Omega$
	2 - 1	Manual UP	$\approx 3000\ \Omega$
		Auto UP	$\approx 1500\ \Omega$
Rear right door glass regulator switch	2 - 1	Manual DOWN	$\approx 332\ \Omega$
		Automatic DOWN	$\approx 0\ \Omega$
	2 - 1	Manual UP	$\approx 3000\ \Omega$
		Auto UP	$\approx 1500\ \Omega$

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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (3) Install door protector handle to proper position of door protector, and install 16 fixing screws.

Tightening torque: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (8) Install rear left door front cover and rear left door protector block cover (middle) rear fixing bolt.

Tightening torque: $5 \pm 1.0 \text{ N}\cdot\text{m}$

- (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.

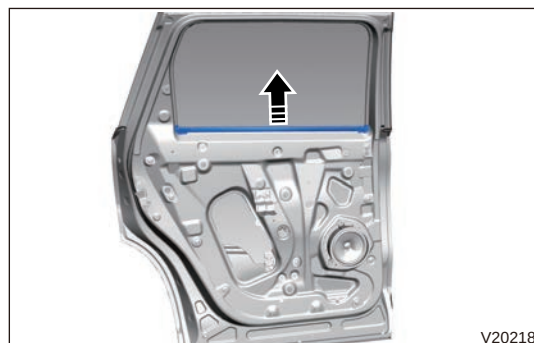
5.11 Replacement of Rear Door Inner Weather Bar

■ 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.



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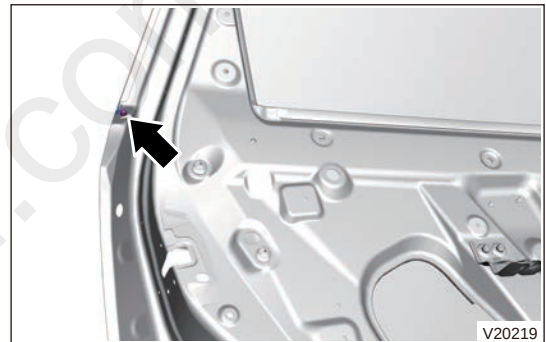
■ Installation

- (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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (3) Installation 1 fixing screw to left side of rear door outer weather bar.

Tightening torque: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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

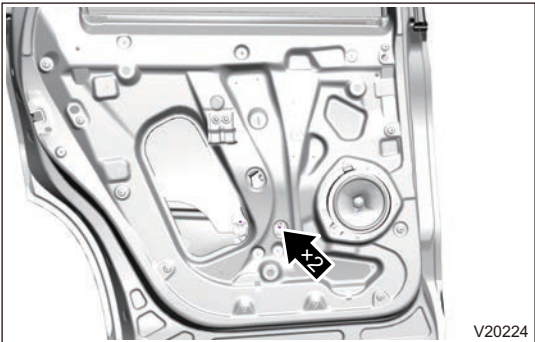
- (3) Install the rear left door glass assembly.
- (4) Install the rear left door frame weatherstrip.
- (5) Install the rear left door inner protector assembly.
- (6) Connect the negative battery cable.

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.

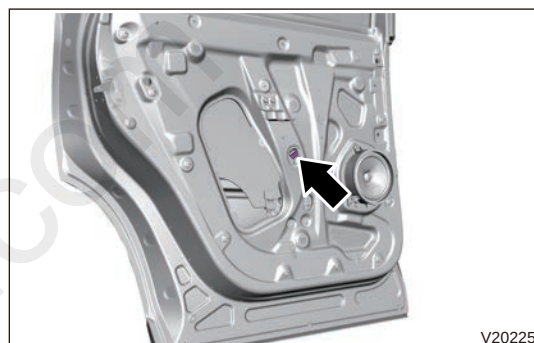
5.15 Replacement of Rear Door Power Glass Regulator

■ 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.



- (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.



- (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: $9 \pm 1.5 \text{ N}\cdot\text{m}$

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.

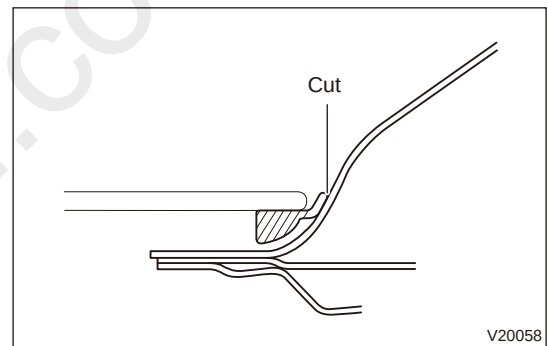
Hint

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.

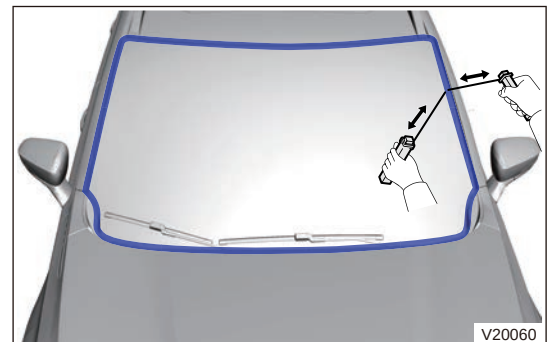
Caution

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

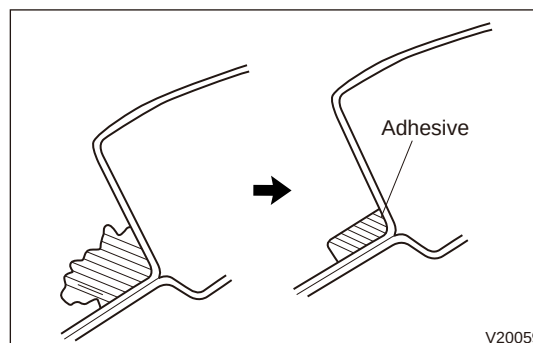
- When removing front windshield assembly, an assistant is needed.
- When removing front windshield assembly, prevent it from dropping.
- Leave as much adhesive on the body as possible when cutting off the adhesive.
- When separating front windshield assembly from vehicle, be careful not to damage body 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.

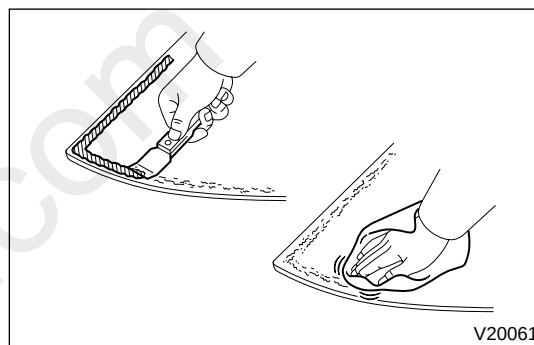
Hint

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 $18 \approx 20$ mm.
- (3) Apply sheet metal primer (A11-4105013A) to installation area and make sure application width is $9 \approx 11$ 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 $14 \approx 16$ mm.
- (5) Apply A11-4105015 windshield primer on the application position around front windshield. Make sure application width is $12 \approx 14$ mm. Apply gum (A11-4105011) along application line, make sure the gum width is 8 ± 1 mm, height is $11.5 \text{ mm} \pm 1 \text{ mm}$, 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 $150 \approx 200$ 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

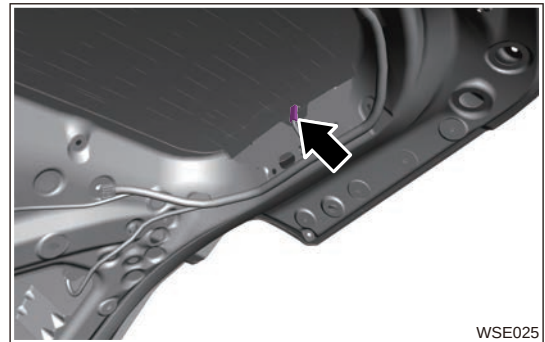
Warnings

- **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.



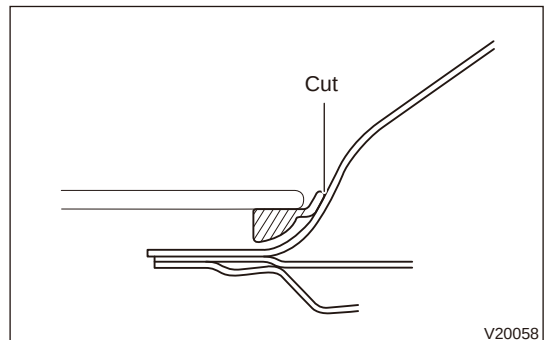
- (9) Remove the right defroster connector.



- (10) Using a knife, cut off the adhesive.

Caution

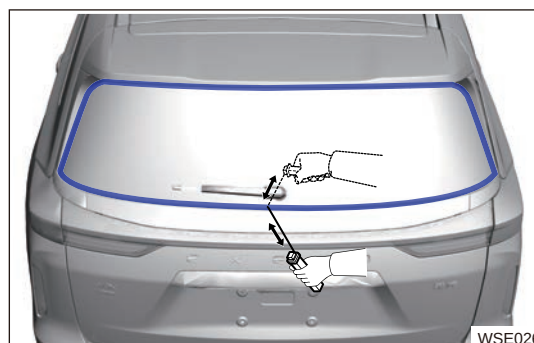
- **Try to prevent body paint surface from being scratched, when cutting off the adhesive.**



- (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

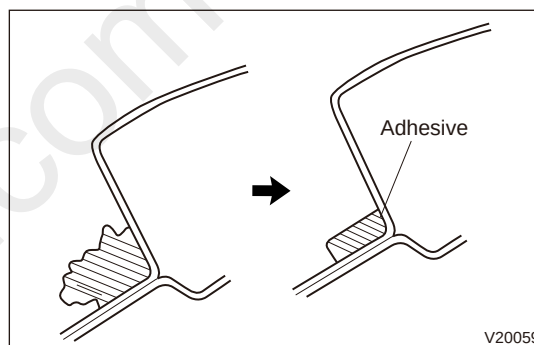
- When removing rear windshield assembly, two persons are required.
- When removing rear windshield assembly, prevent it from dropping.
- Leave as much adhesive on the body as possible when cutting off the adhesive.
- When separating rear windshield assembly from vehicle, be careful not to damage body 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.

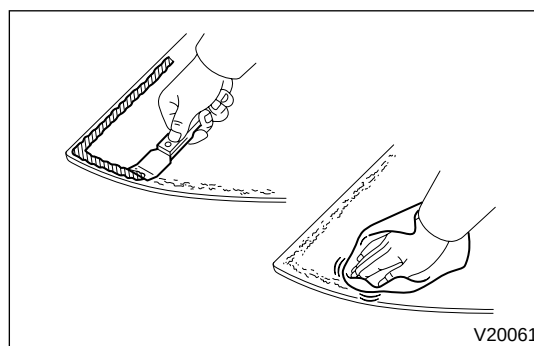
Hint

- 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.



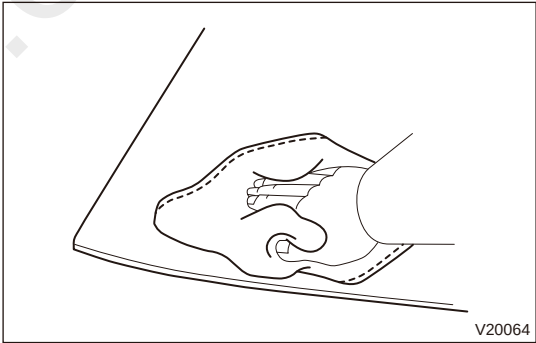
■ Assembly order:

- (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 $11.5 \text{ mm} \pm 1 \text{ mm}$, 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

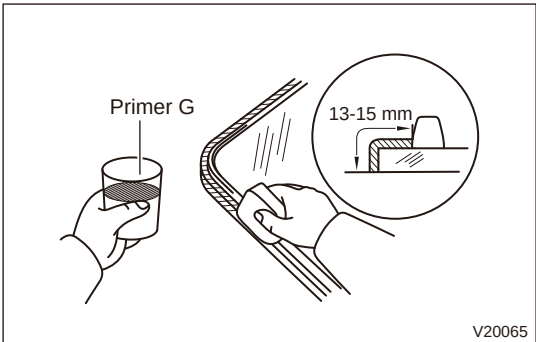
- (1) Clean the contact surface of rear windshield. Remove any residue on the contact surface of rear windshield with a clean, lint-free cloth soaked with cleaner.

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.

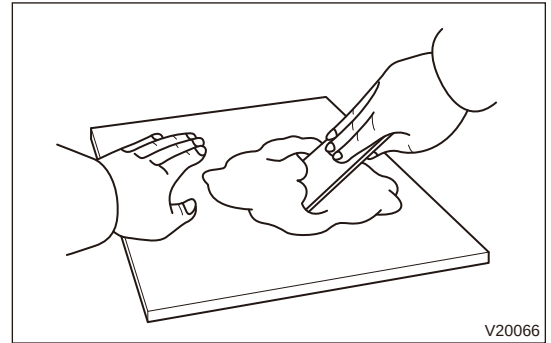
Hint
• Allow primer to dry for at least 3 minutes. • DO NOT apply primer to the adhesive. • DO NOT apply too much primer. • DO NOT keep any opened primer for later use.



- (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

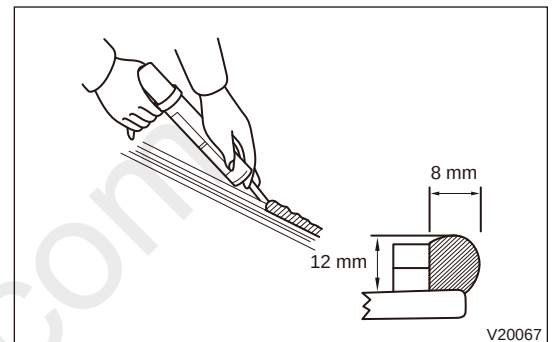
- **Adhesive should be mixed thoroughly within 5 minutes.**



- (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

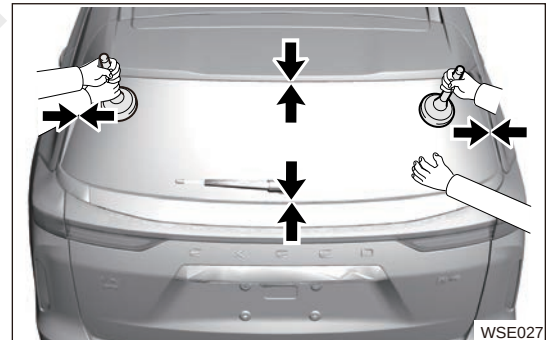
Adhesive height: 12 mm



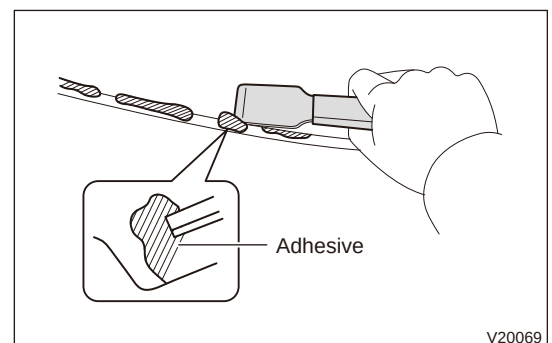
- (6) Install the rear windshield assembly. Align the matchmarks on glass and vehicle body, and gently press in glass along the edge.

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.



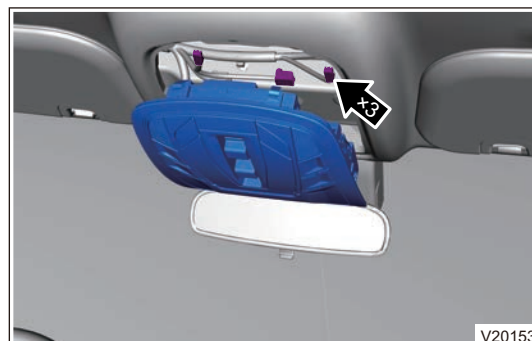
- (4) Remove 2 fixing screws.



- (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: $2.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (4) Close the glasses box.
- (5) Connect the negative battery cable.

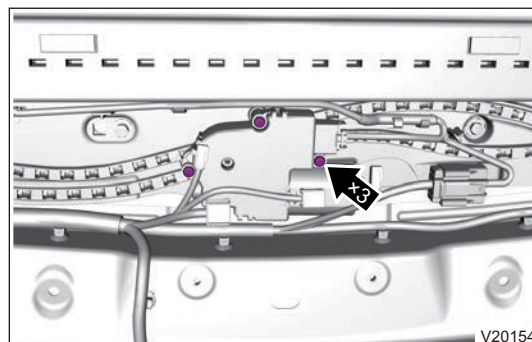
5.19 Replacement of Sliding Roof Glass Motor

■ Removal

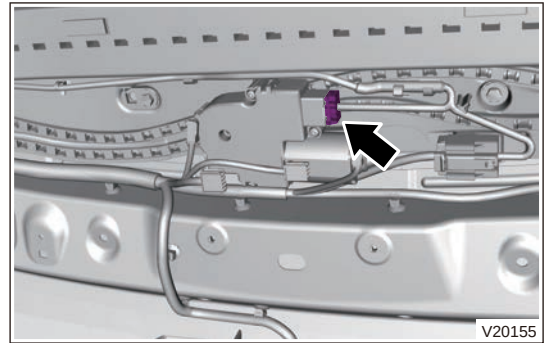
Warnings

- **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.

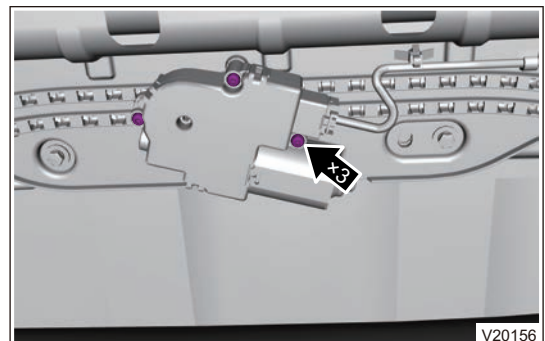
5.20 Replacement of Sun Visor Motor Assembly

■ Removal

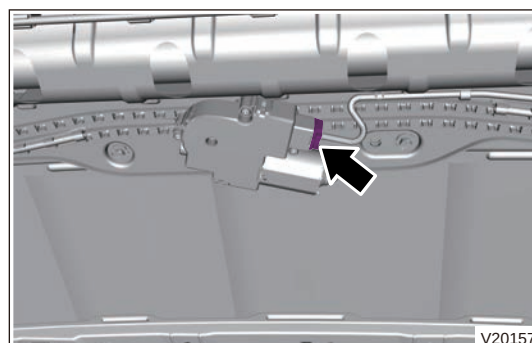
Warnings

- 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: $2.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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.

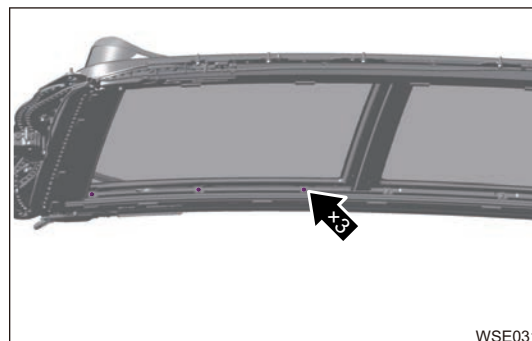
5.22 Replacement of Sliding Roof Rear Glass

■ 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).



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- (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: $4.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (3) Install the sliding roof fixing bracket.
- (4) Install the roof assembly.
- (5) Connect the negative battery cable.

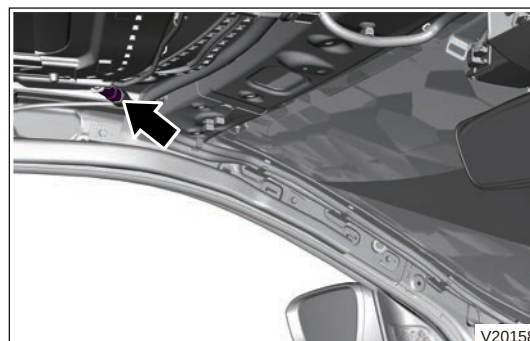
5.23 Replacement of Sliding Roof Front Left Drain Hose

■ 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.

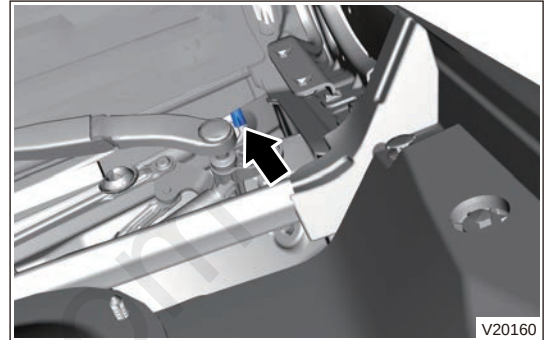


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- (9) Detach front left drain hose from wire harness clip.



- (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.

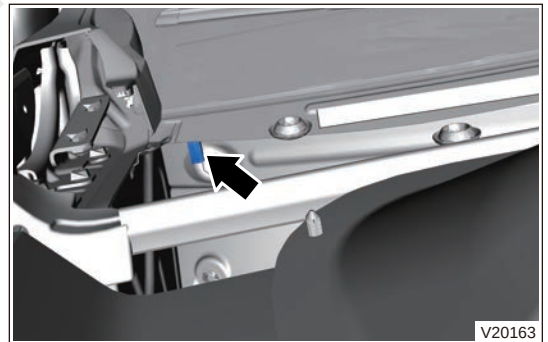
- (6) Remove the left C-pillar upper protector assembly
- (7) Remove the roof assembly.
- (8) Detach front right drain hose joint from drain outlet of sliding roof side.



- (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.

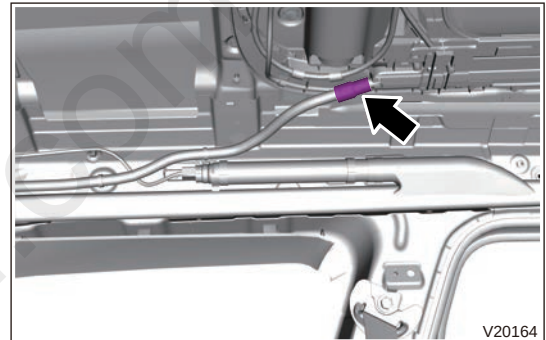
5.25 Replacement of Sliding Roof Rear Drain Hose

■ Removal

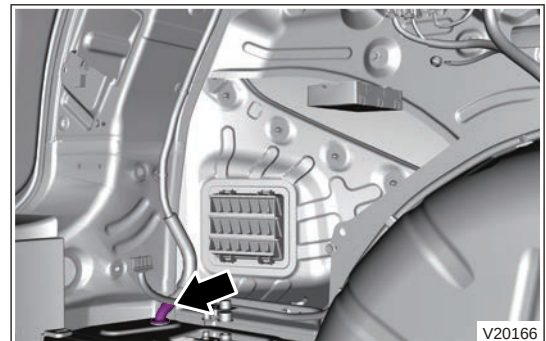
Warnings

- **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.**

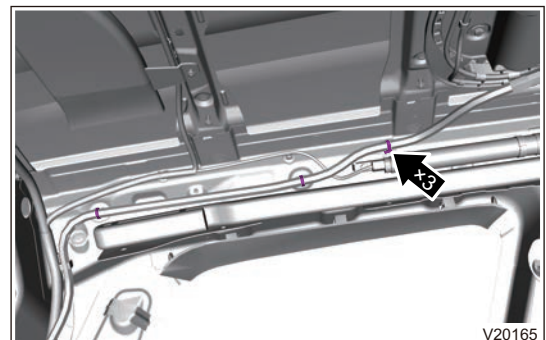
- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.
- (3) Remove the left A-pillar upper protector assembly.
- (4) Remove the left B-pillar upper protector assembly.
- (5) Remove the left C-pillar upper protector assembly
- (6) Remove the roof assembly.
- (7) Detach rear left drain hose joint from drain outlet of sliding roof side.



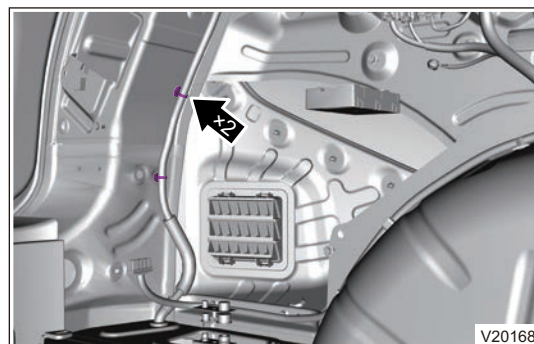
- (8) Detach lower part of rear left drain hose from corresponding mounting hole on vehicle body.



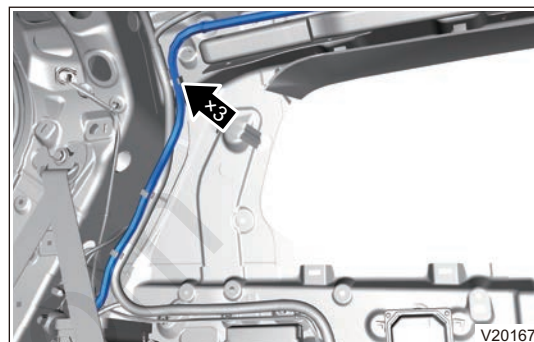
- (9) Using an interior crow plate, carefully pry off rear left drain hose clip.



- (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

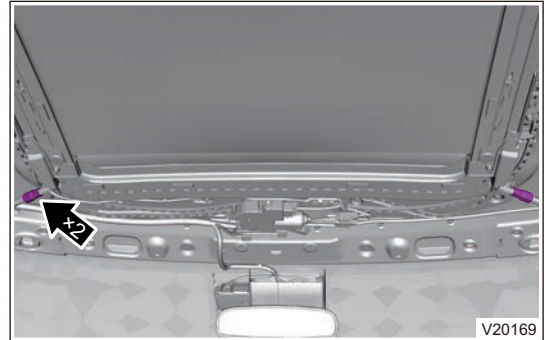
■ Removal

Warnings

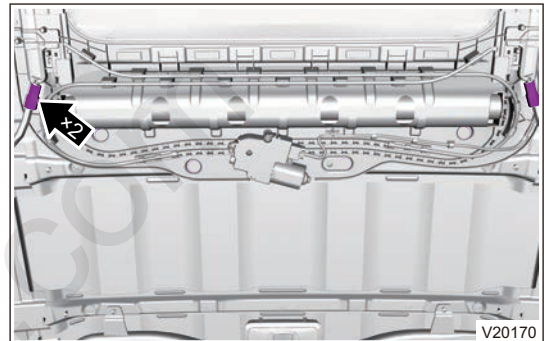
- Be sure to wear safety equipment to prevent accidents, when removing sliding roof assembly.
- Try to prevent interior from being scratched during operation, when removing sliding roof assembly.
- When removing sliding roof assembly, an assistant is needed to hold sliding roof fixing bracket. During 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.

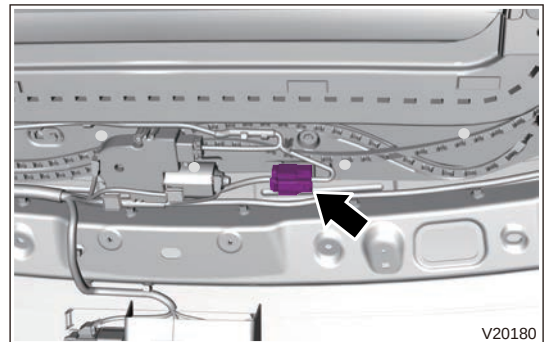
- (2) Disconnect the negative battery cable.
- (3) Remove the interior front dome light assembly.
- (4) Remove the roof assembly.
- (5) Detach joints of front left drain hose and front right drain hose from drain outlet of sliding roof side.



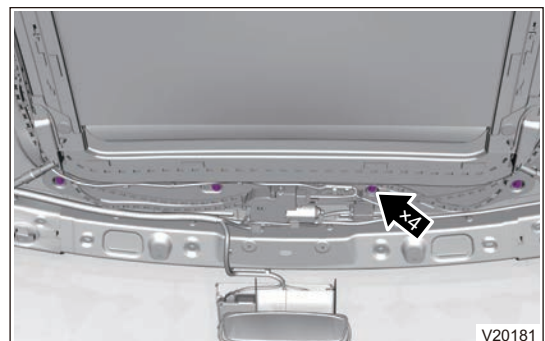
- (6) Detach joints of rear left drain hose and rear right drain hose from drain outlet of sliding roof side.



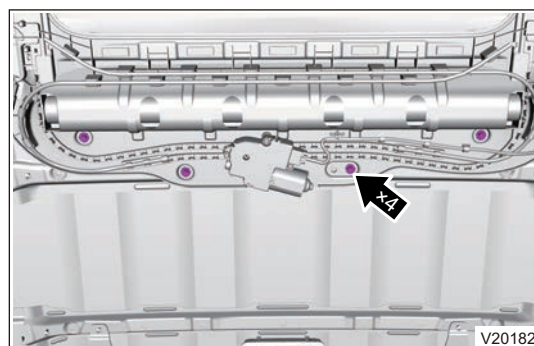
- (7) Disconnect the sliding roof wire harness connector.



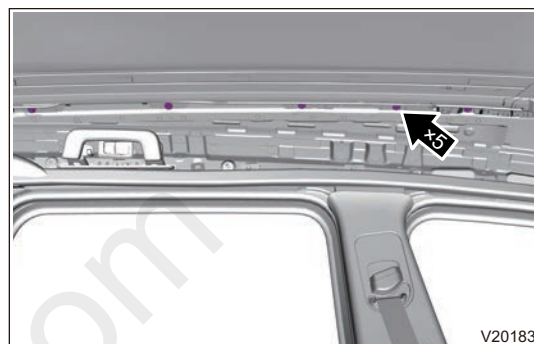
- (8) Remove 4 fixing bolts between sliding roof assembly front side and roof.



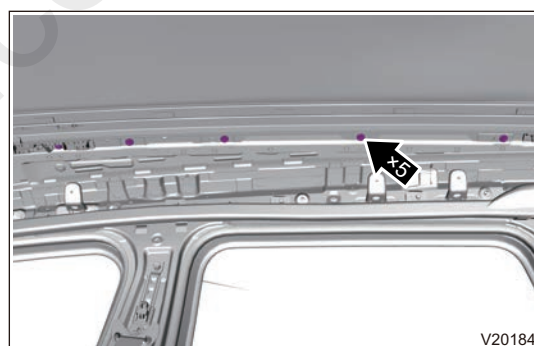
- (9) Remove 4 fixing bolts between sliding roof assembly rear side and roof.



- (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: $9 \pm 1.5 \text{ N}\cdot\text{m}$

- (5) Loosen and remove the auxiliary tool.
- (6) Install remaining 14 fixing bolts.

Tightening torque: $9 \pm 1.5 \text{ N}\cdot\text{m}$

- (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.

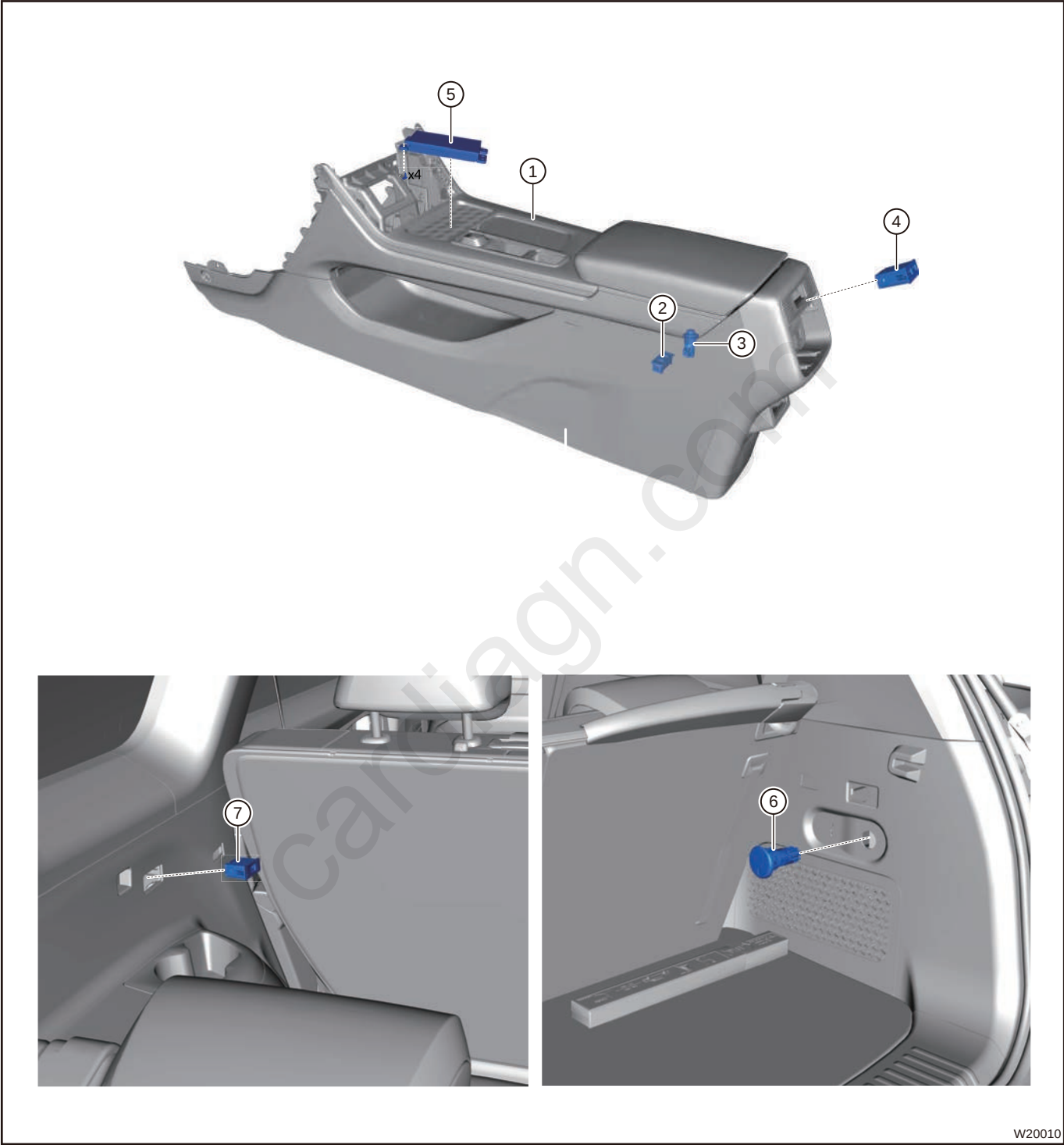
1.2 Precautions

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



W20010

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.

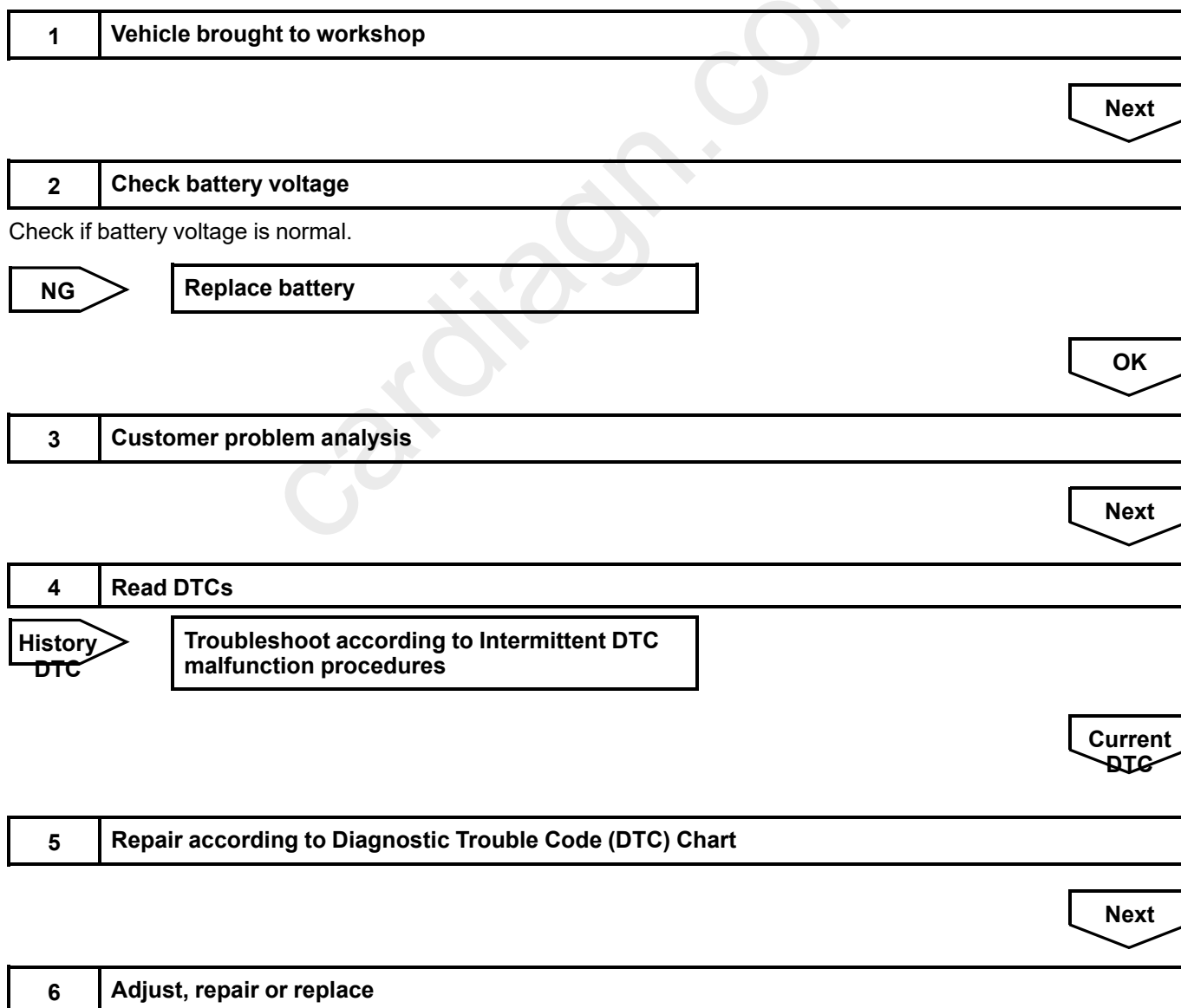
3.3 Ground Inspection

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.



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

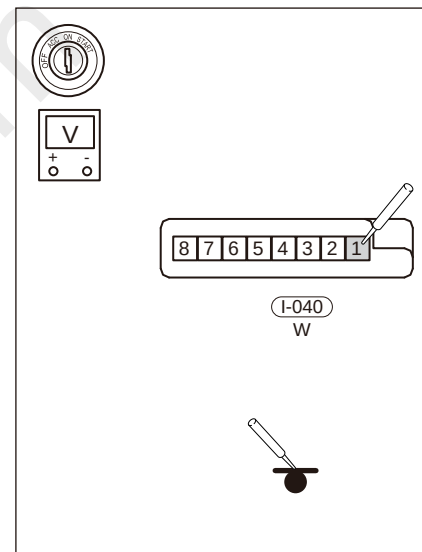
NG

Check if instrument panel fuse is burnt.

OK

3

Using a 21 W test lamp, test power supply voltage



W200

Use circuit diagram as a guide to perform the following inspection procedures:

- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect the instrument panel wire harness connector I-040.
- Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
- 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:

- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect the instrument panel wire harness connector I-040.
- 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"	$\leq 1 \Omega$

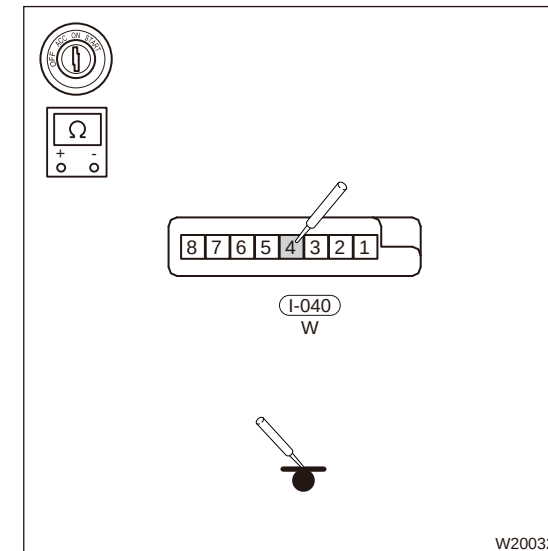
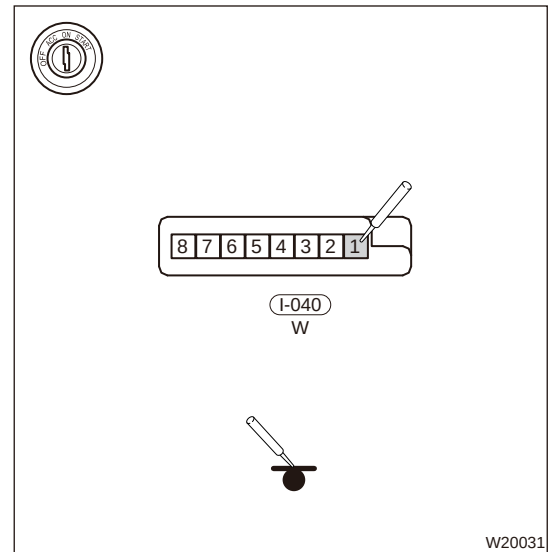
NG

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 charging time. - Wireless charging pasteur 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:

- Turn ENGINE START STOP switch to OFF, and disconnect the negative battery cable.
- Disconnect the instrument panel wire harness connector I-040.
- 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:

- Connect the negative battery cable.
- Use diagnostic tester to clear DTCs.
- Start the engine.
- 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:

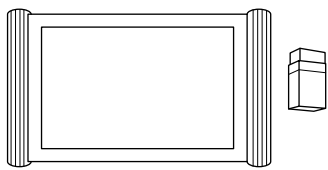
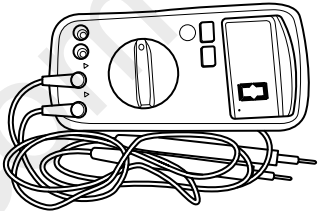
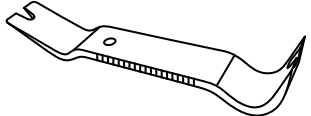
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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

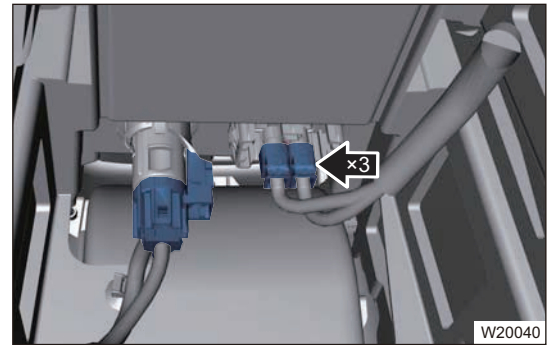
■ Removal

Warnings

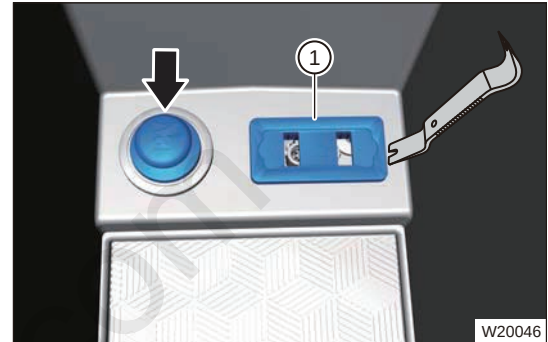
- Be sure to wear safety equipment to prevent accidents, when removing front backup power supply.
- Appropriate force should be applied, when removing front backup power supply. Be careful not to operate roughly.

- (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.

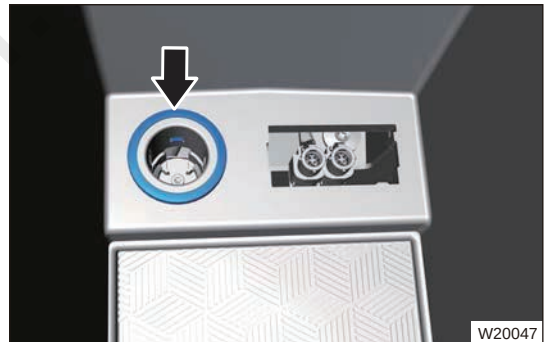
- (4) Disconnect USB connector, backup power supply connector.



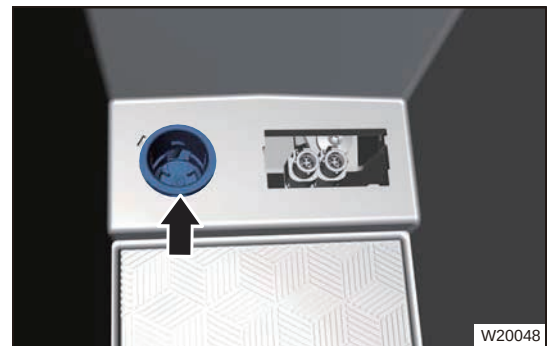
- (5) Remove cigarette lighter block cover, and use interior crow plate to pry off multi-function interface (1).



- (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.**

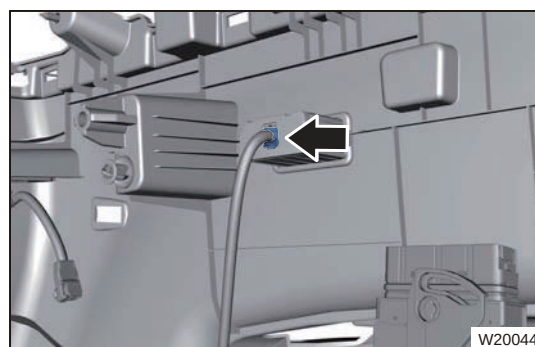
(1) Turn off all electrical equipment and ENGINE START STOP switch.

(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.

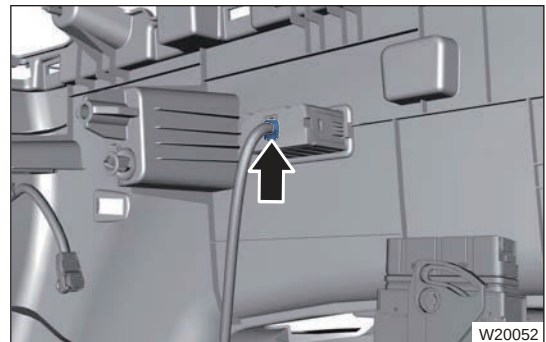
4.4 Replacement of Rear USB Charging Module

■ Removal

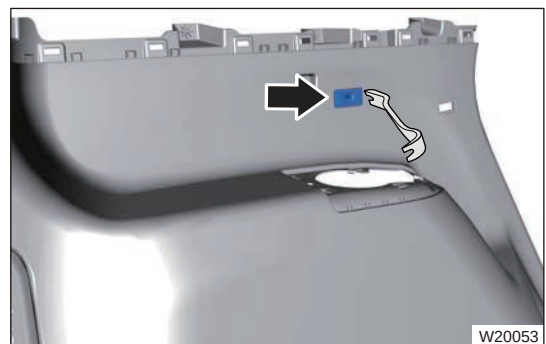
Warnings

- 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.

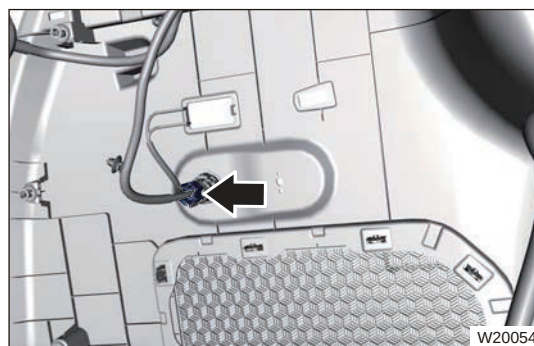
4.5 Replacement of Rear Backup Power Supply

■ 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.



W20054

- (5) Remove the luggage compartment right power supply block cover.



W20055

- (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.

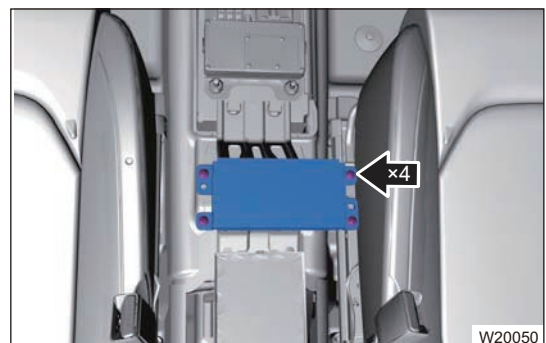
4.6 Replacement of Wireless Charging Module

■ Removal

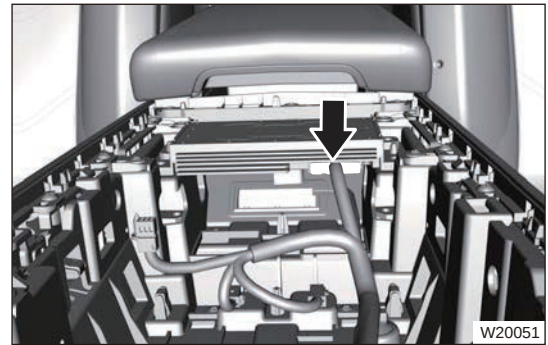
Warnings

- **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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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.

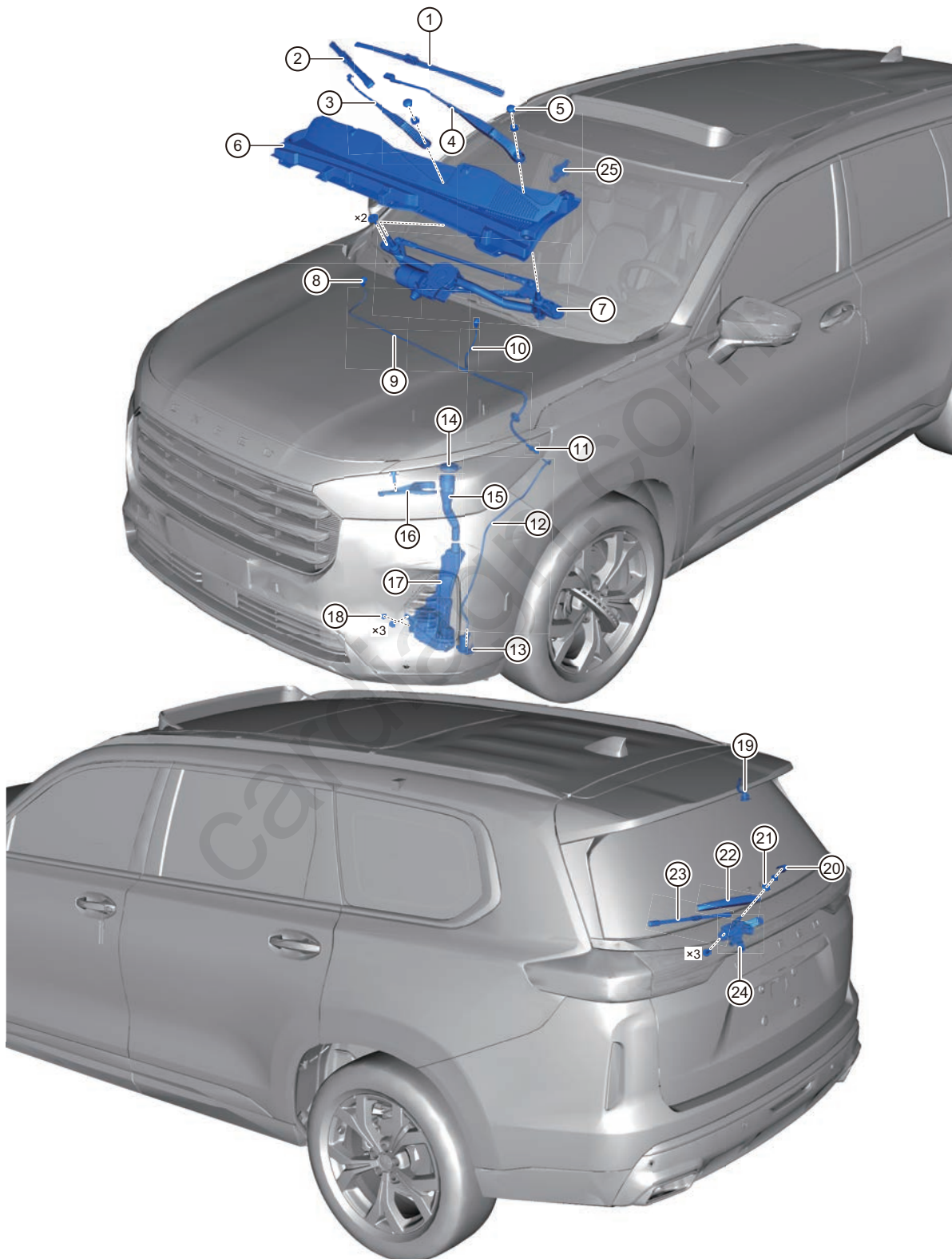
2 System Overview

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

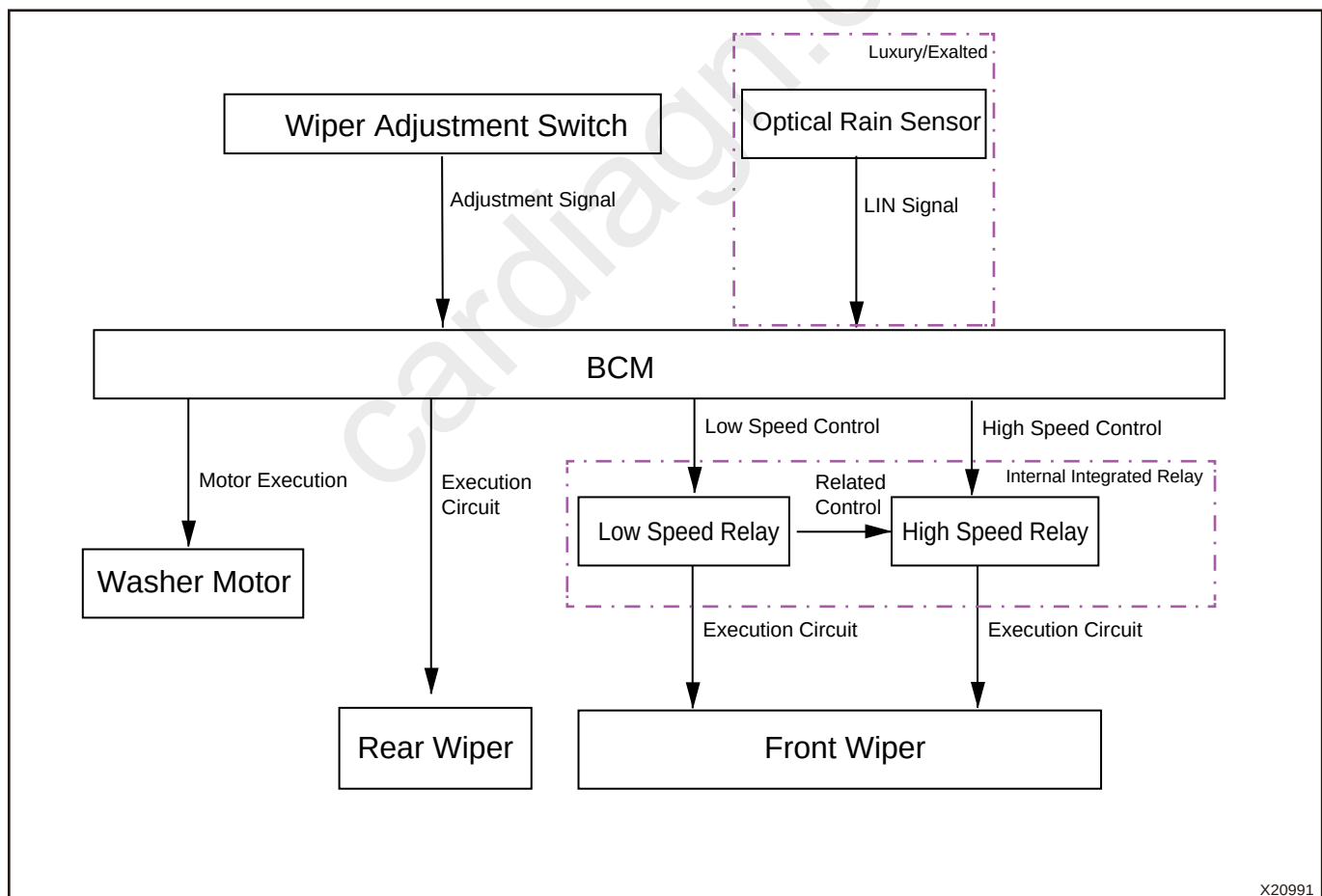
■ Front Wiper Assembly



X20010

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



X20991

- 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

A

Troubleshoot according to Intermittent DTC malfunction procedures

B

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

3.4 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 least 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			
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

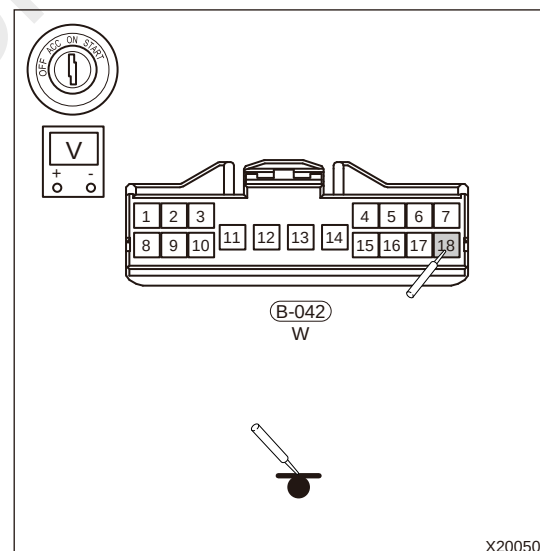
Replace the relay.

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

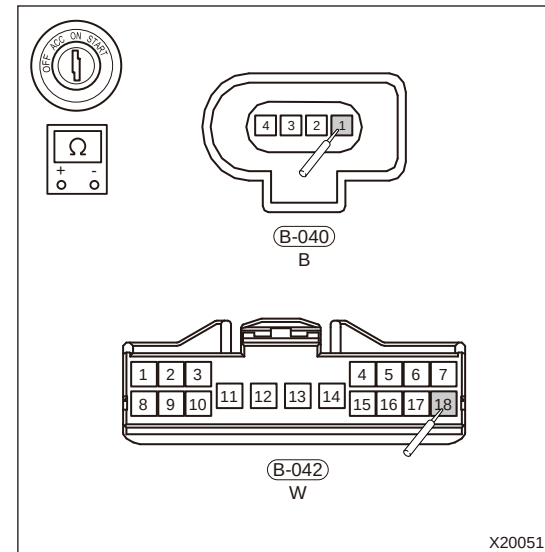
Repair or replace related wire harness.

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	$\leq 1 \Omega$



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:

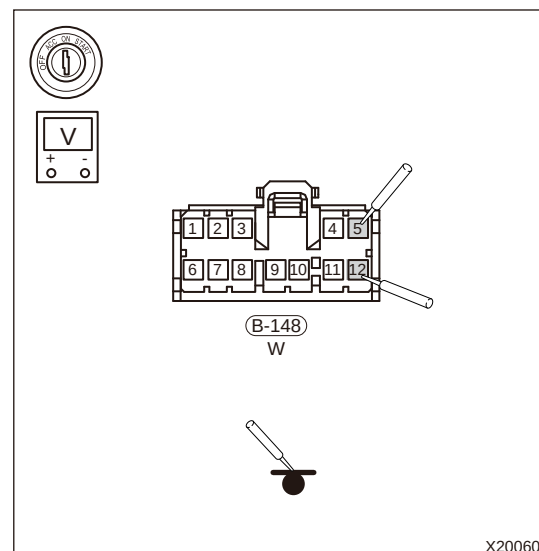
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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:

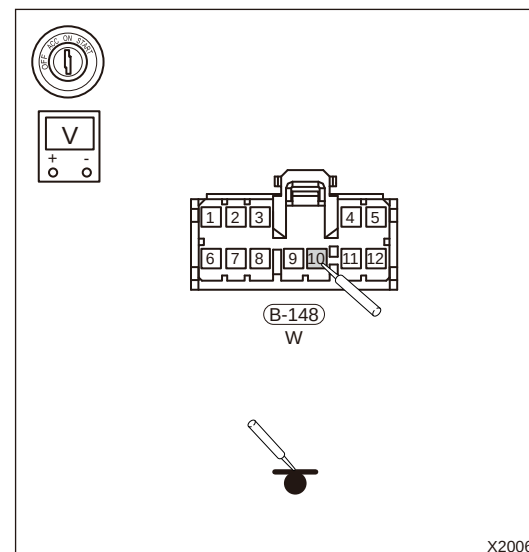
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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

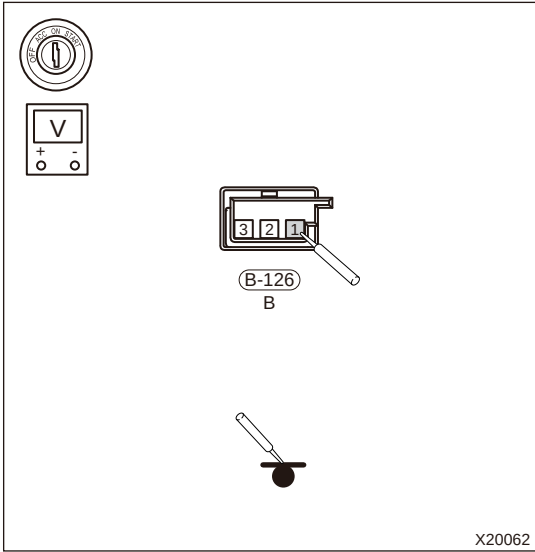
Check the rear wiper motor and wire harness.

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

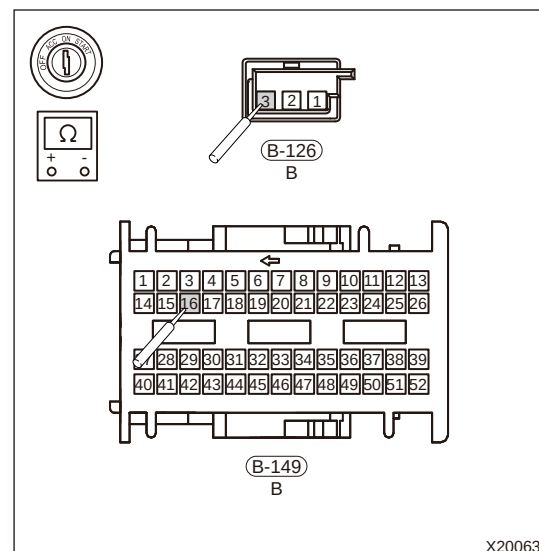
Check wire harness between B-126 (1) and instrument panel fuse and relay box.

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	$\leq 1 \Omega$



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.

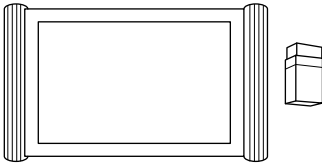
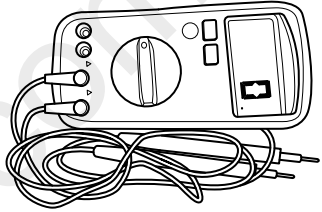
OK

System is normal

4 On-Vehicle Service

4.1 Tools

■ General Tools

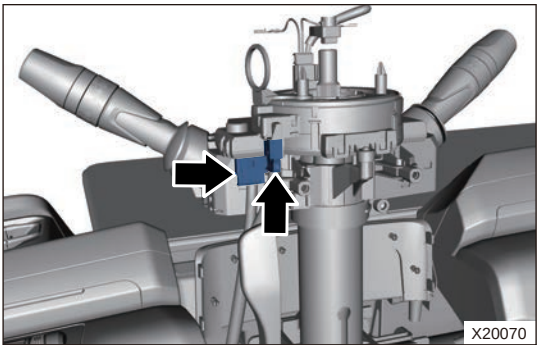
Tool Name	Tool Drawing
Digital Multimeter	 RCH0001006
X-431 PAD Diagnostic Tester	 RCH0002006

4.2 Replacement of Wiper Switch Assembly

■ Removal

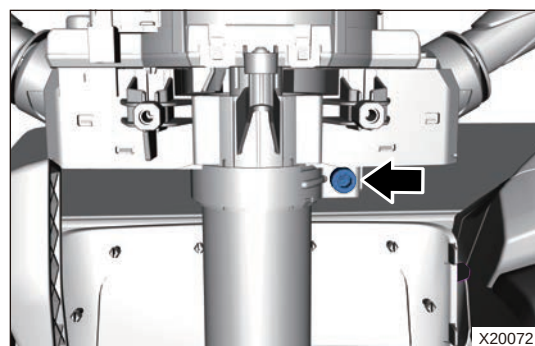
Hint
• Be sure to wear safety equipment to prevent accidents, when removing wiper switch assembly. • Appropriate force should be applied, when removing wiper switch assembly. Be careful not to operate roughly. • Try to prevent interior and body paint surface from being scratched, when removing wiper 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.

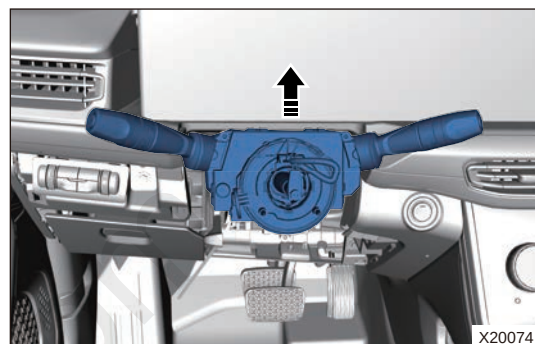


X20070

- (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: $6 \pm 0.5 \text{ N} \cdot \text{m}$

- (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

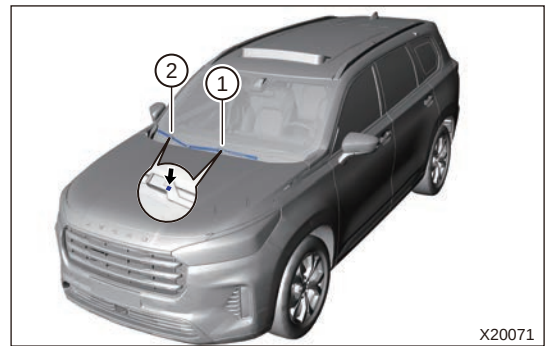
■ Removal

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).



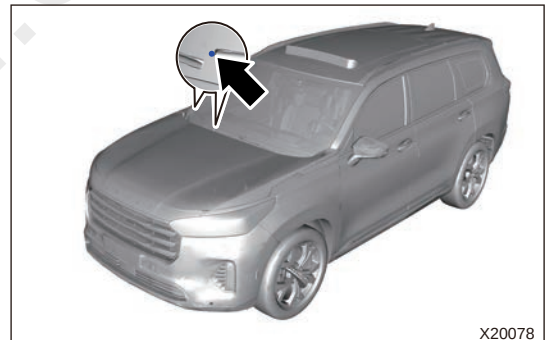
X20071

■ 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.



X20078

4.4 Replacement of Front Wiper Arm Assembly

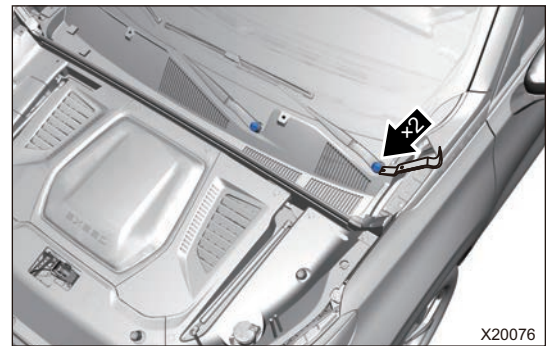
■ Removal

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.

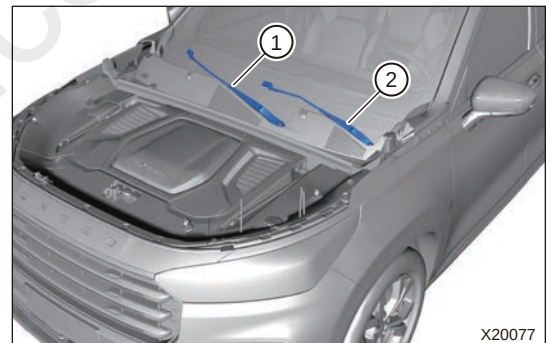
- (4) Using an interior crow plate, remove the front wiper arm trim cap.



- (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

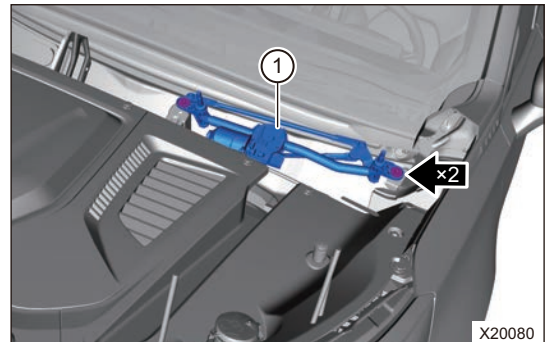
Caution

- **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).



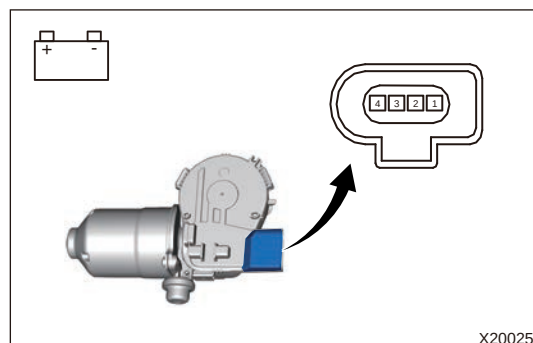
■ Inspection

- (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.

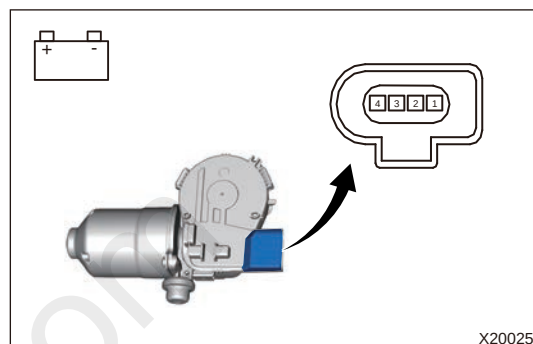
Measurement Condition	Specified Condition
Battery negative (-) → Terminal 4	Motor running at low speed (LO)
Battery positive (+) → Terminal 2	

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.

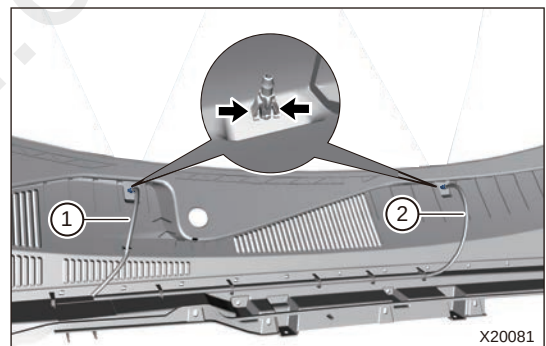
4.6 Replacement of Front Nozzle Assembly

■ Removal

Warnings

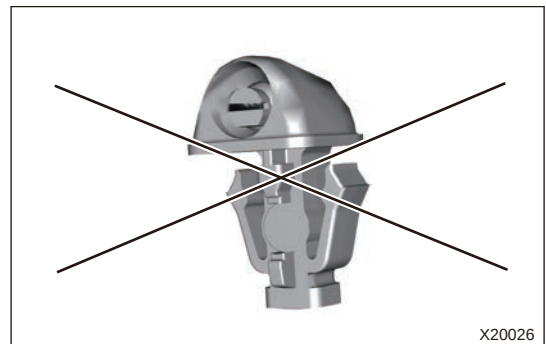
- **Be sure to wear safety equipment to prevent accidents, when removing front nozzle assembly.**
- **Appropriate force should be applied, when removing front nozzle assembly. Be careful not to operate roughly.**

- (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

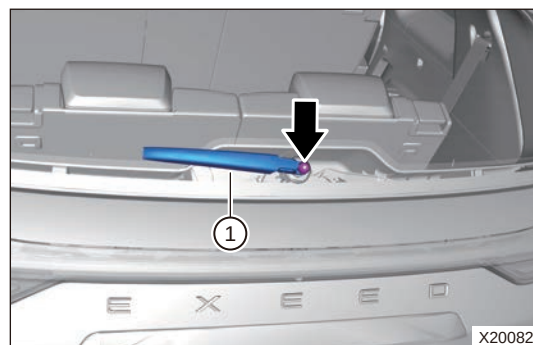
- Be sure to wear safety equipment to prevent accidents, when removing rear wiper arm blade assembly.
- Appropriate force should be applied, when removing rear wiper arm blade assembly. Be careful not to operate roughly.
- Try to prevent rear windshield assembly from being scratched, when removing rear 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.



X20085

- (4) Remove fixing nut and rear wiper arm blade assembly (1).



X20082

■ Installation

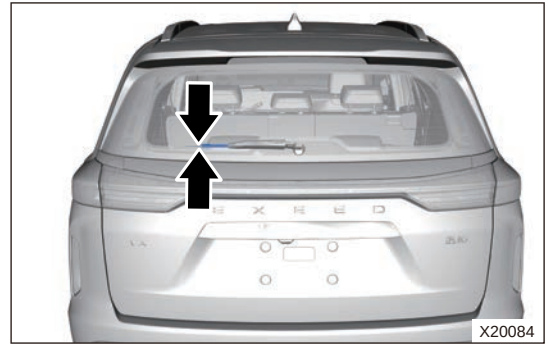
Warnings

- 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: $10 \pm 1.5 \text{ N}\cdot\text{m}$

- (3) Install the rear wiper arm trim cap.

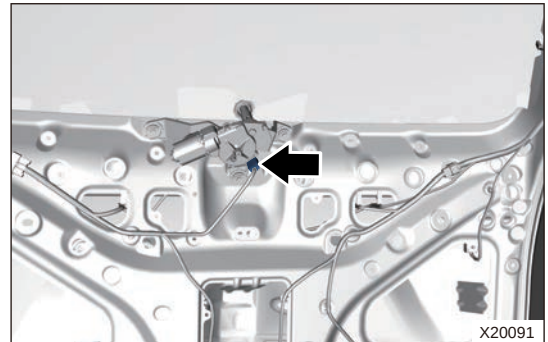
4.8 Replacement of Rear Wiper Motor Assembly

■ Removal

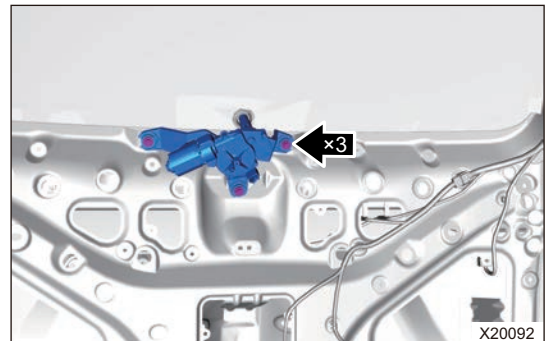
Caution

- 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.



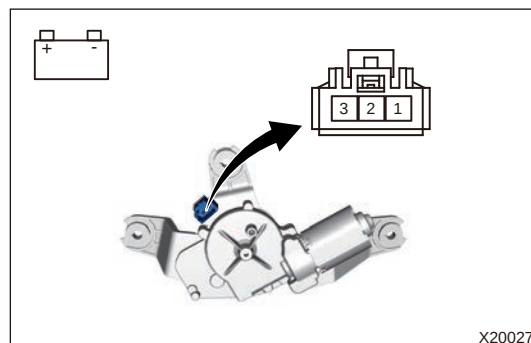
- (7) Remove the rear wiper motor assembly.

■ 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

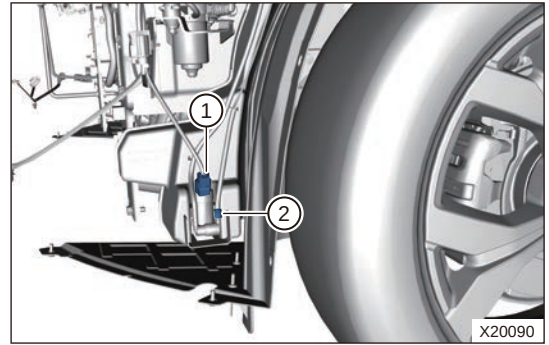
■ Removal

Caution

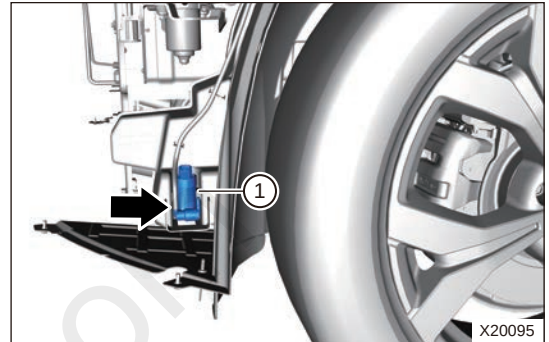
- **Be sure to wear safety equipment to prevent accidents, when removing washer pump assembly.**
- **Appropriate force should be applied, when removing washer pump assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing washer pump assembly.**

- (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.

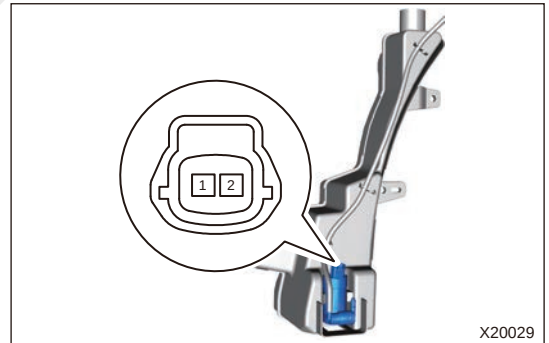


- (5) Disconnect joint between front washer line and washer pump, and remove washer pump assembly (1).

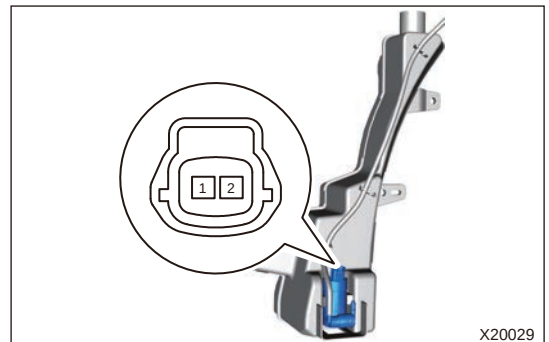


■ Inspection

- (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.

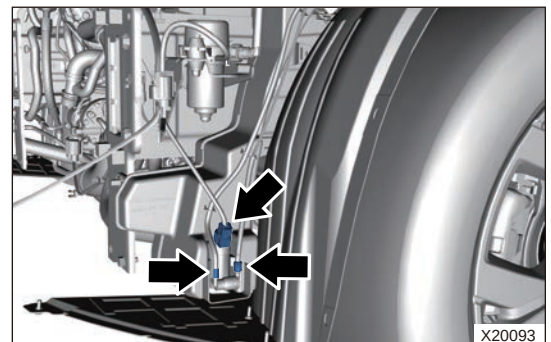
4.10 Replacement of Washer Fluid Reservoir Assembly

■ Removal

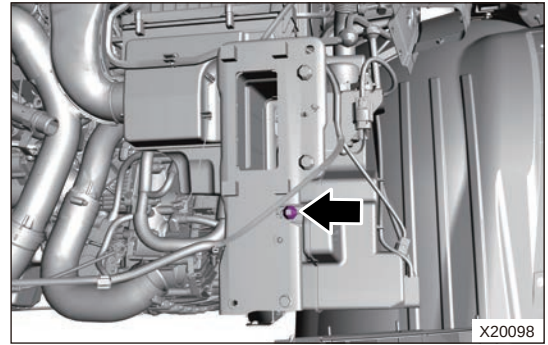
Caution

- **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.**

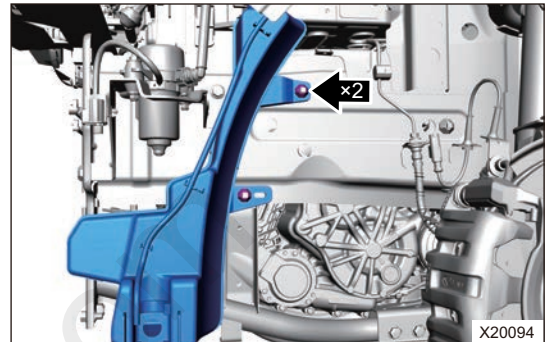
- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.
- (3) Remove the engine compartment trim cover assembly.
- (4) Remove the front bumper assembly.
- (5) Remove the front left wheel assembly.
- (6) Remove the front left wheel house protector assembly.
- (7) Disconnect washer pump front/rear spraying pipe and connector, and remove spraying pipe from washer fluid reservoir.



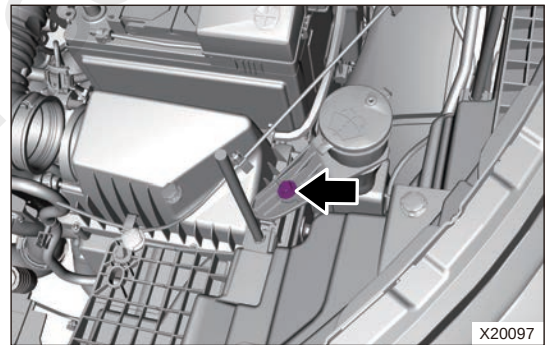
- (8) Remove the washer reservoir fixing bolt.



- (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.

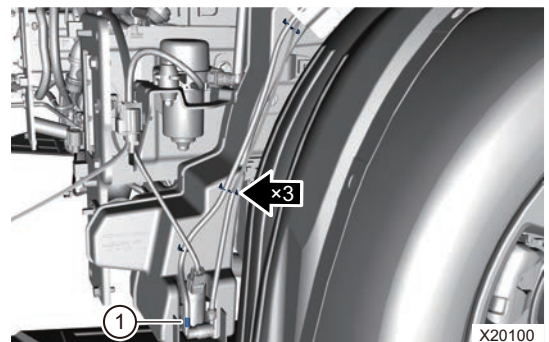
4.11 Replacement of Front Washer Line Assembly

■ Removal

Caution

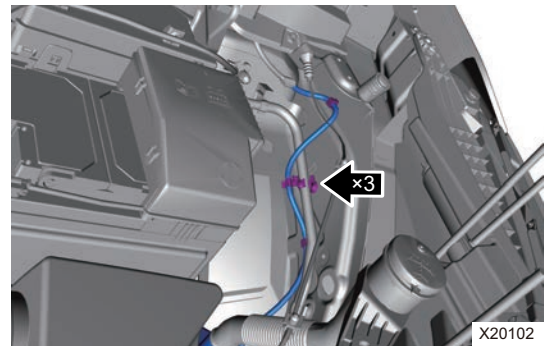
- **Be sure to wear safety equipment to prevent accidents, when removing washer line assembly.**
- **Appropriate force should be applied, when removing washer line assembly. Be careful not to operate roughly.**
- **Try to prevent body paint surface from being scratched, when removing washer line assembly.**

- (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.

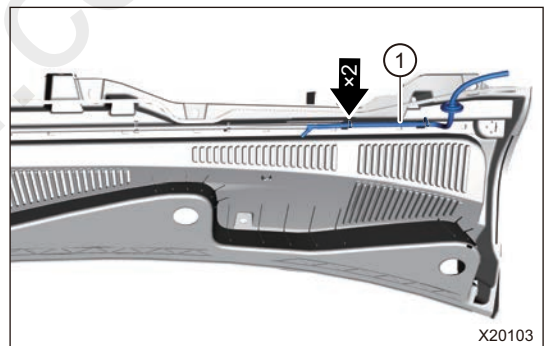
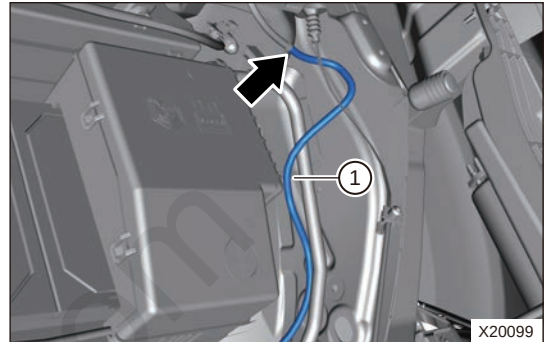


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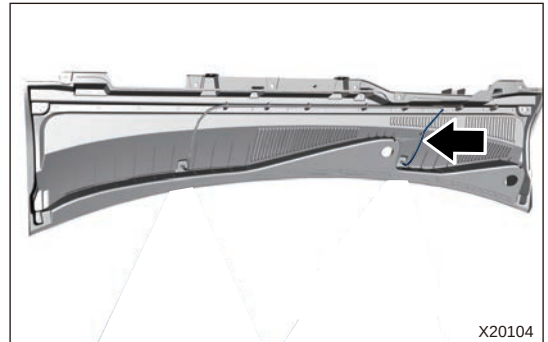
- (9) Remove 3 fixing clips from washer line on the inner side of wing, and remove washer line 2.



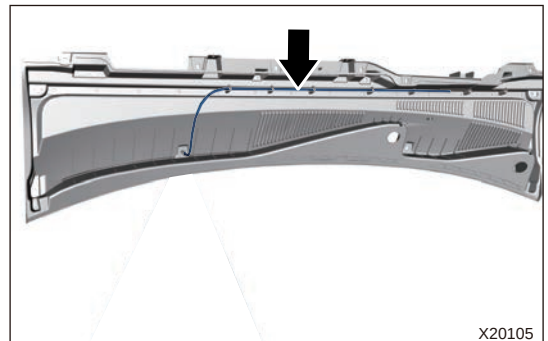
- (10) Disconnect connection between washer line 2 and washer line 1, and remove washer line 1.



- (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.

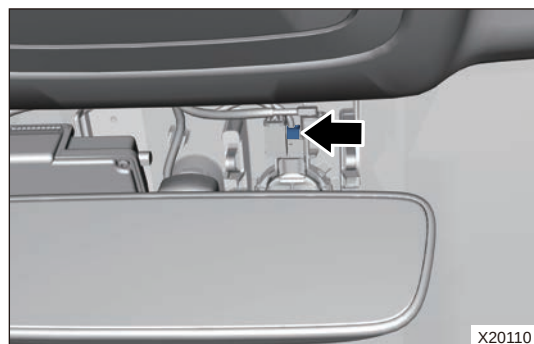
4.12 Replacement of Optical Rain Sensor Assembly

■ Removal

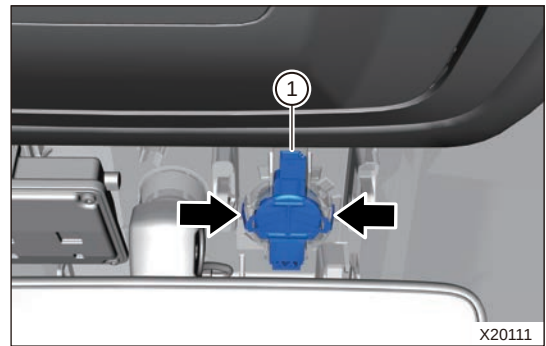
Caution

- **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

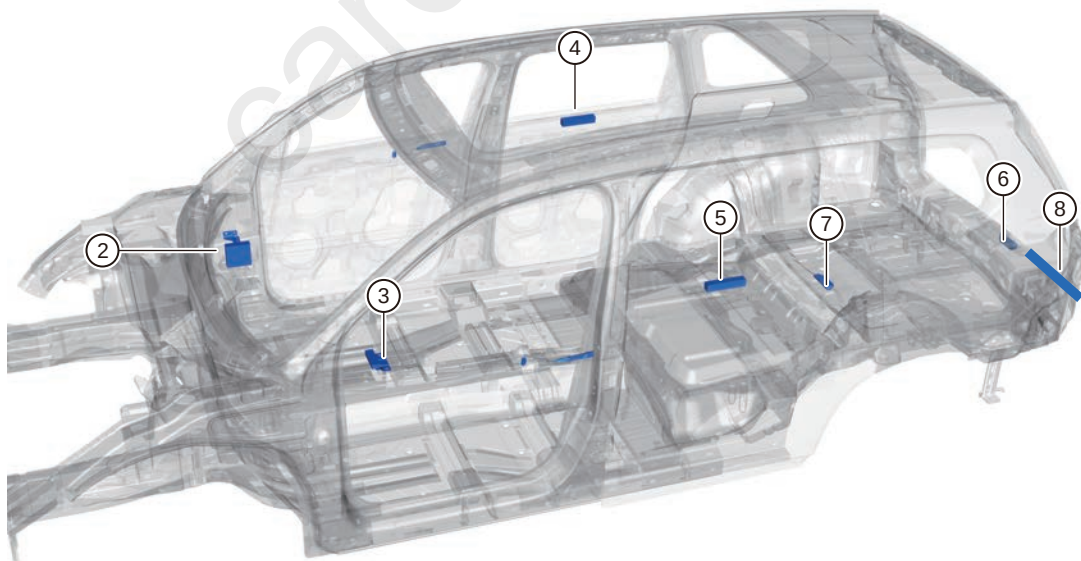
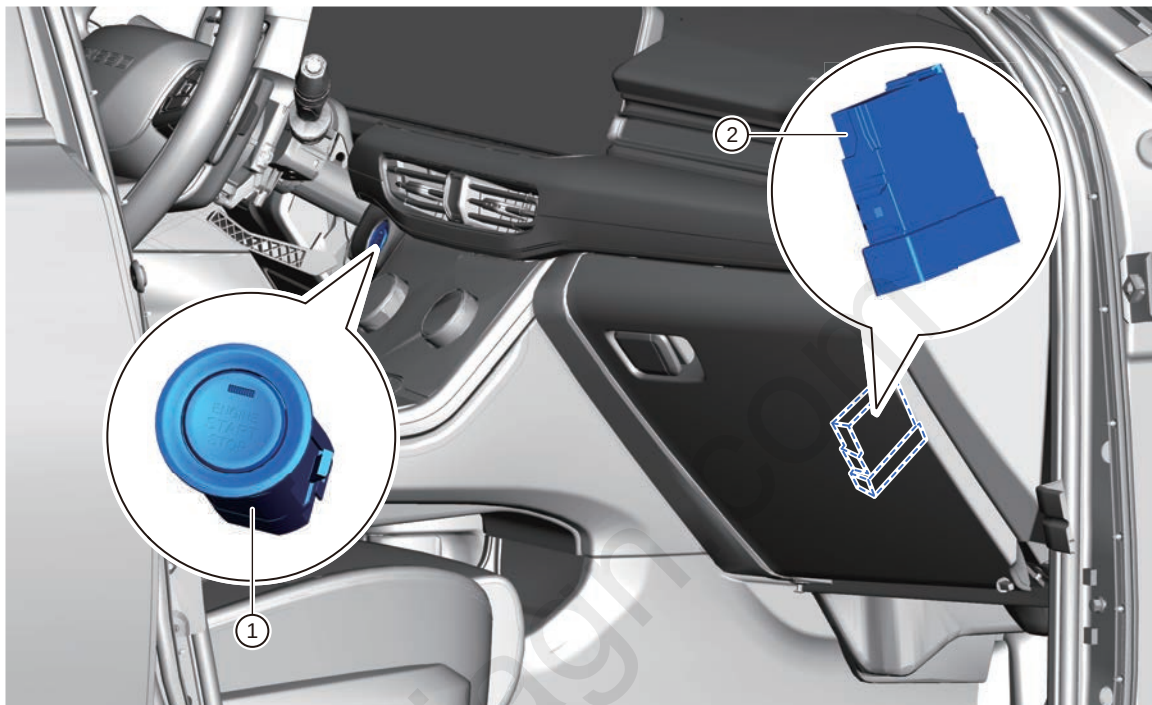
- Always operate carefully to prevent other components from being damaged, when installing optical rain sensor assembly.
- Install the sensor in place when installing optical rain sensor assembly.

- (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

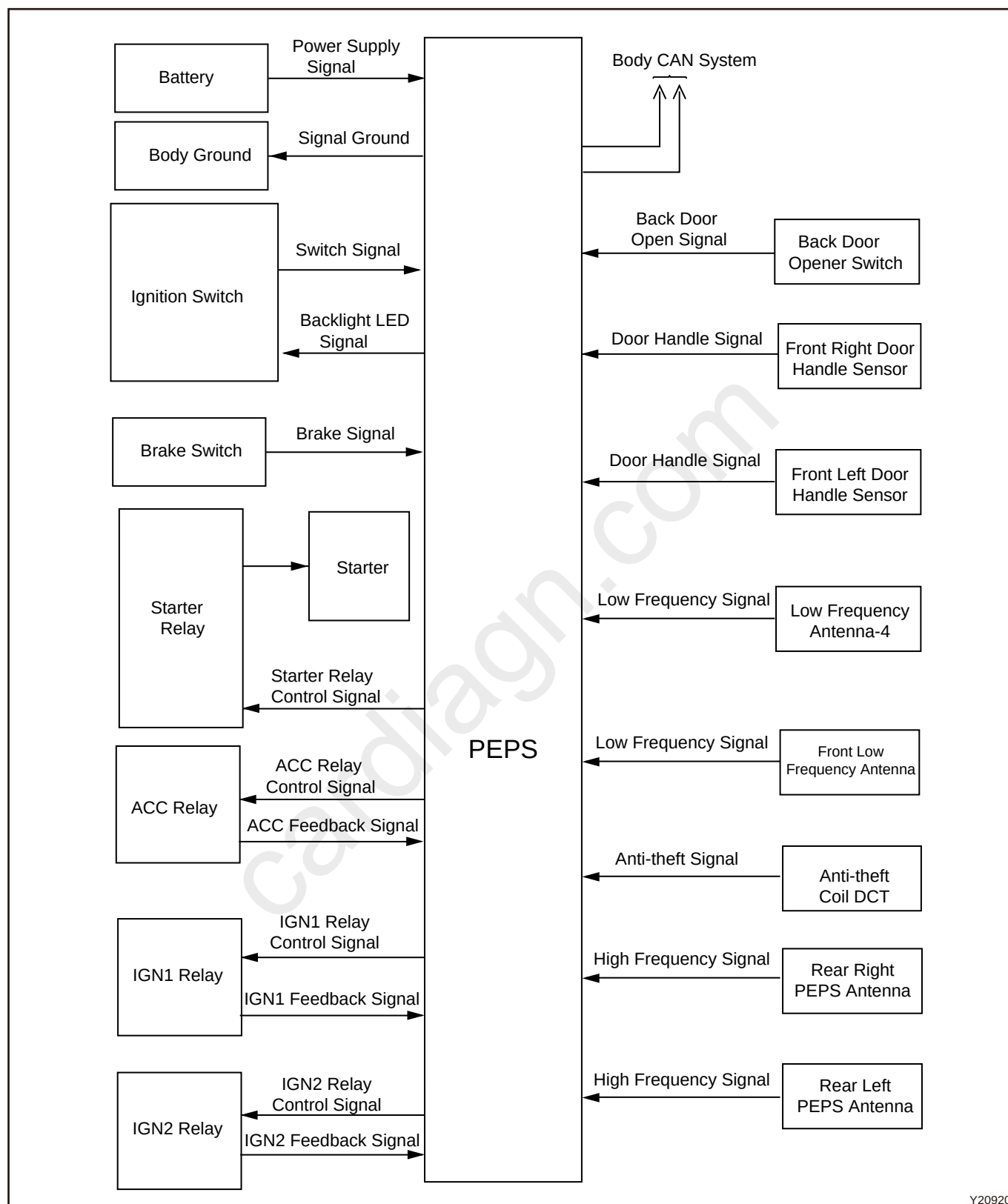


Y20010

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

- When learning a key, PEPS reads the key ID through IMMO, and ensure that the key and the front antenna are within 5 cm.
- The process of learning a key is as follows:

Step	Start learning for 1 key		
1	Is the number of keys learned less than 4?	No	End, the diagnostic tester feedback key learning number exceeds the maximum number or battery voltage is not in the learning range.
		Yes	Next
2	Place the key close to the key icon on the lower part of the instrument cluster (- within 5cm from the IMMO antenna).	No	Place the key near the antenna.
		Yes	Next
3	Click the diagnostic tester to learn how to operate a key. PEPS stores key information and feedback the success of key learning.	No	Trying time is more than 2 times; End, diagnostic tester reports no key found or invalid key.
		Yes	Next
4	PEPS stores key related information and feedback on key learning success.		

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 polling time starts to be counted after powering off.
FR.POLL.004	PEPS static current consumes when Polling is working.

(1) FR.POLL.001

1) Polling 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 locking area 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 Polling 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 Polling 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 Polling 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: APURReq=0x01 (-unlocked). Then it sends three frames of information, (0x404) APURReq=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:
- PEPS enters SATO Wait Approach polling state;
 - 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:
 - 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.
 - 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:
 - Power gear position is switched to non-OFF (Non-remote mode);
 - Any door is open;
 - 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 request), 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 Terminal 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 = 0x06 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 parking 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_Requeset = 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_BTKeySecurityValid=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_BTKeySecurityValid=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, PEPS 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 tolerance 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_BTKeyWrning = 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_BTKeyWarning = 0x8 BluetoothKey deactivated (sending for 3 seconds).
- 4) When Bluetooth key and smart key are disabled at the same time, PEPS sends 0x42B PEPS_BTKeyWarning = 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(Unwanted 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(Unwanted 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 to tocfgT-boxOption=0x00, feedback of PEPS is 0x40A: STAT_BTKeyPassiveEntry=0x00(Disable) - When configuration item FD00 in PEPS is set to 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_PEPSAuthentication: 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:

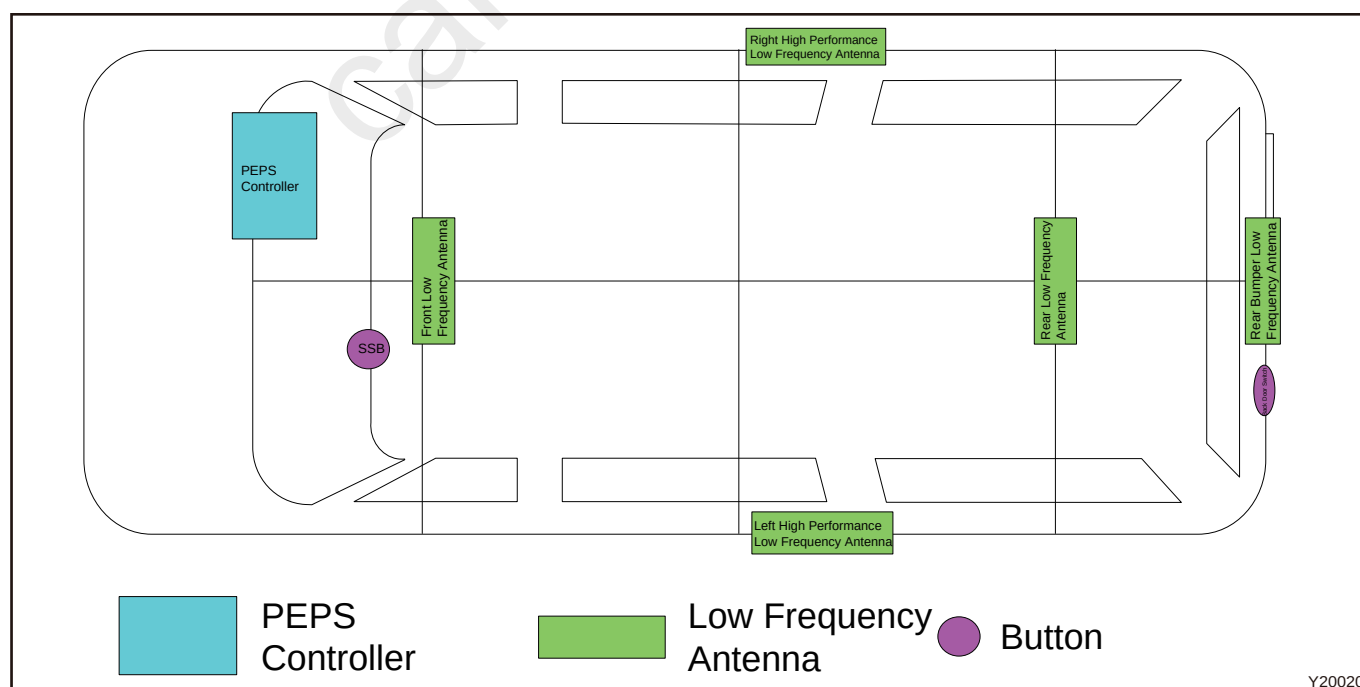
Function	Button ID	Note
Remote locking	0x02	\
Remote unlocking	0x04	\
Remote back door	0x01	\
Remote car location	0x08	Operate the lock button twice within 1.5 seconds

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

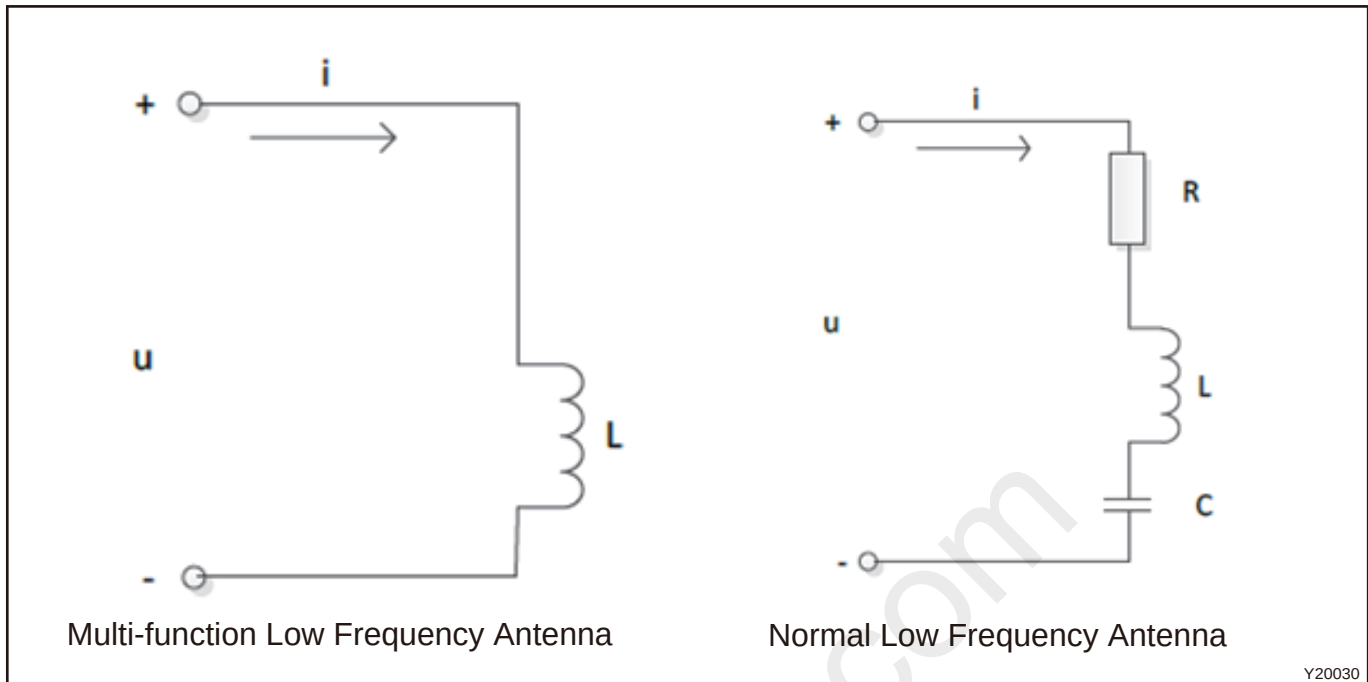
■ Overview

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:



Y20020

- Low frequency antenna is a winding inductor. For both the multifunction 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

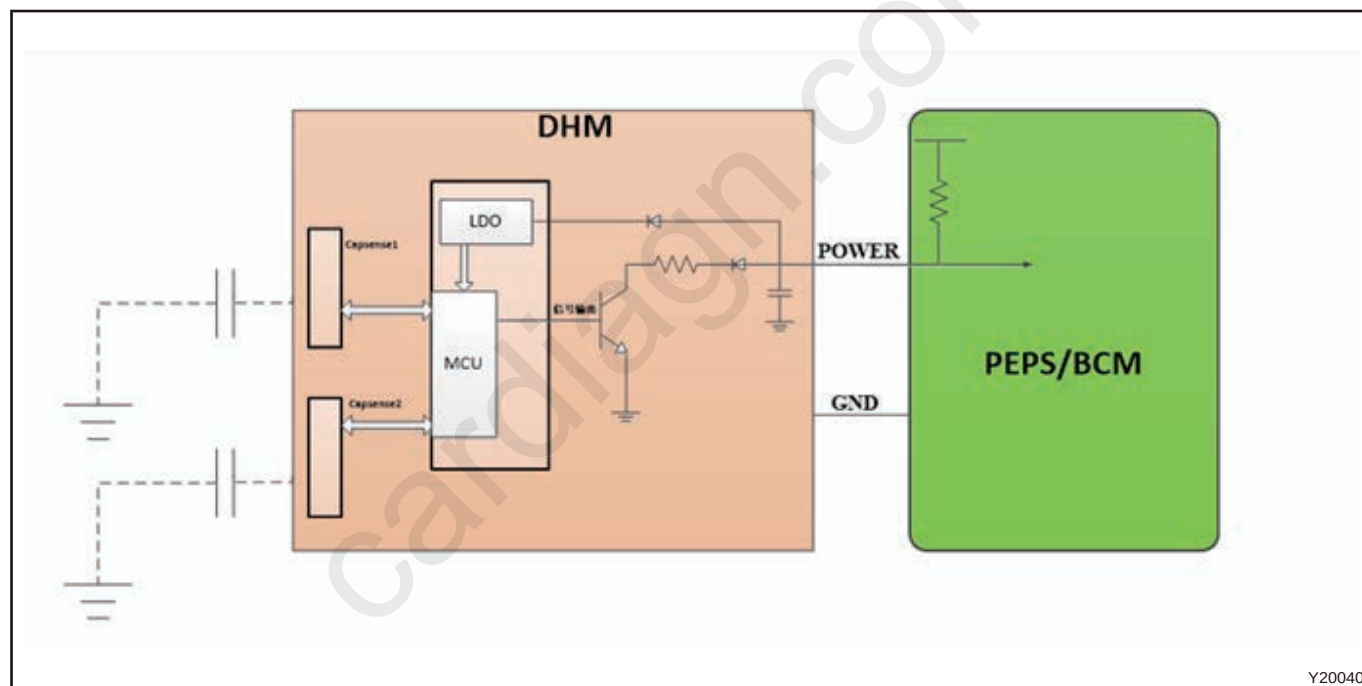
The gear signal is provided by TCU and is only allowed to start when the P or N gear is available.

■ 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:

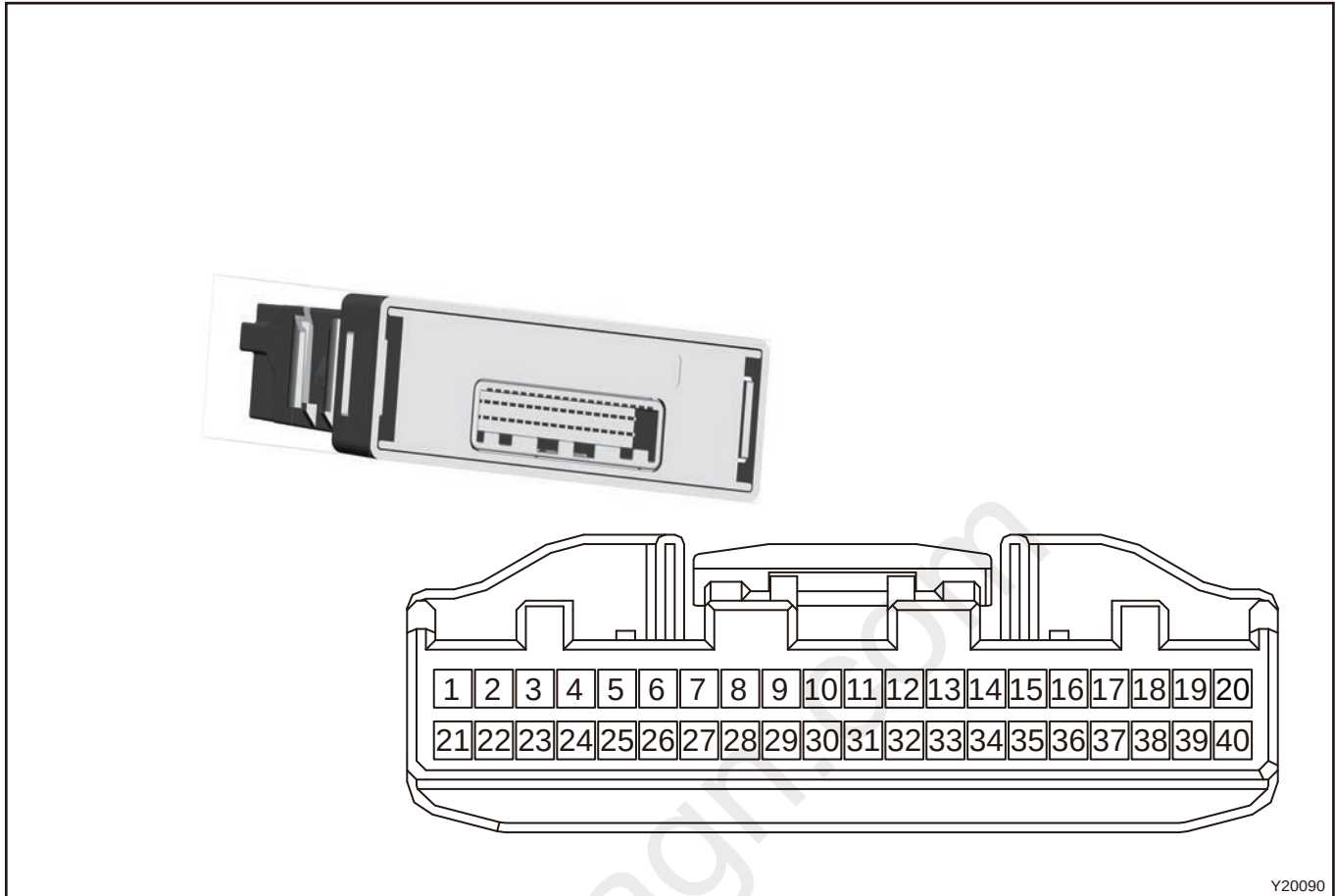
- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
-
- Monitor diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if signal is interrupt in related circuit.
- If possible, 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



Y20090

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:

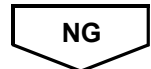
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1	Check for DTCs
---	----------------

(a) Using diagnostic tester, clear DTC and read DTC again.

(b) Check if DTC occurs again.

OK	System is normal
----	------------------



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

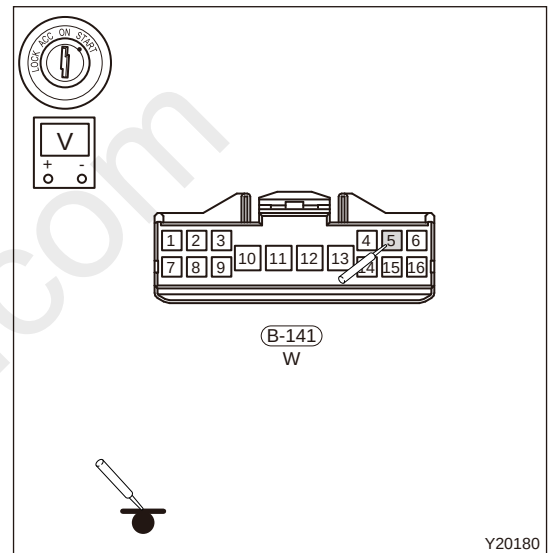
(a) Check if fuse RF01 (5A) is blown.

NG**Replace fuse****OK****2 Check engine compartment fuse and relay box output voltage**

(a) Turn ENGINE START STOP switch to ON.

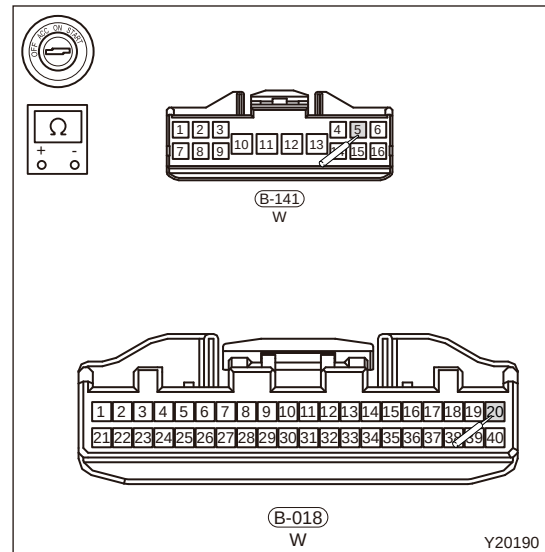
(b) Check the voltage between terminal 5 of engine compartment fuse and relay box B-141 and ground. (When using digital multimeter)

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**

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Disconnect PEPS module connector B-018, engine compartment fuse and relay box connector B-141.
- 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	$\leq 1 \Omega$



NG

Handle and repair related wire harness

OK

4

Reconfirm DTCs

Use circuit diagram as a guide to perform the following inspection procedures:

- Connect diagnostic tester and clear DTCs.
- Run the vehicle as specified procedure. The operating way should meet the conditions for corresponding fault diagnosis.
- 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	$\approx 10 \text{ K}\Omega$

NG

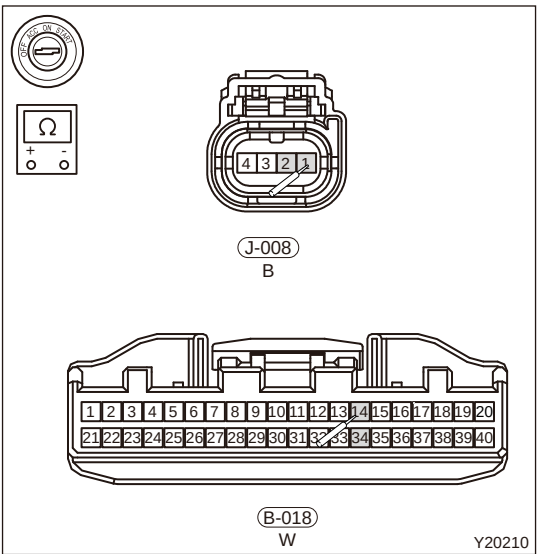
Replace bumper low frequency antenna

OK

3 Check interior wire harness for open or short

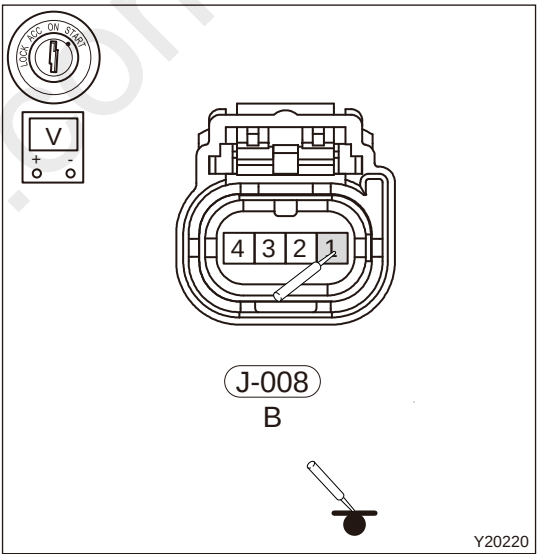
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect rear bumper antenna connector J-008 and PEPS module connector B-018.
- (d) Check if wire harnesses are worn, pierced, pinched or partially broken.
- (e) Check for broken, bent, protruded or corroded 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	$\leq 1 \Omega$
J-008(2)-B- 018(34)		



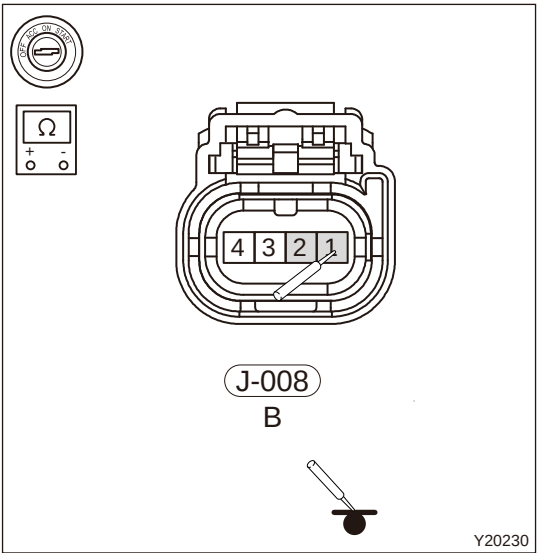
- (h) Using a digital multimeter, check for voltage between terminal (1) of rear bumper antenna connector J-008 and body ground, to check whether the PEPS module has power output.

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

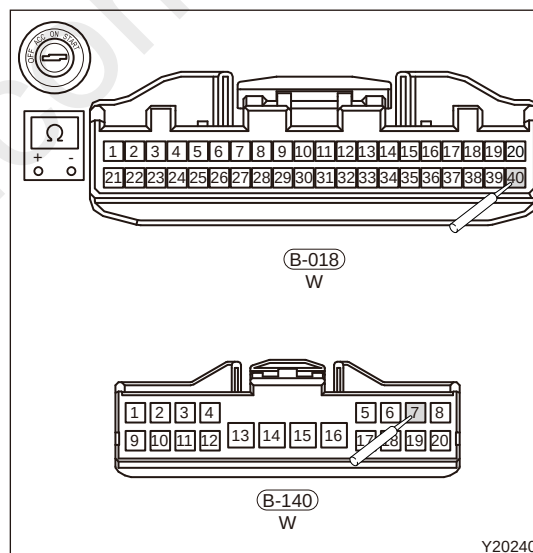
OK

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	$\leq 1 \Omega$



Y20240

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 one, 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:

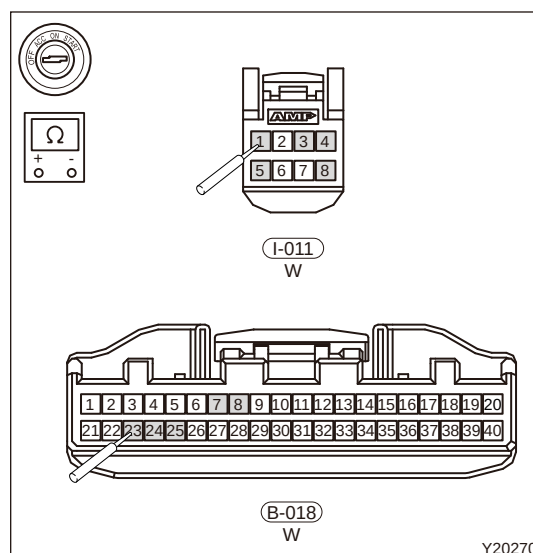
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect ENGINE START STOP switch connector I-011 and PEPS module connector B-018.
- (d) Check if wire harnesses are worn, pierced, pinched or partially broken.
- (e) Check for broken, bent, protruded or 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	$\leq 1 \Omega$
I-011(8) - B- 018 (24)	Always	$\leq 1 \Omega$
I-011(4) - B- 018 (25)	Always	$\leq 1 \Omega$
I-011(3) - B- 018(7)	Always	$\leq 1 \Omega$
I-011(1) - B- 018(8)	Always	$\leq 1 \Omega$

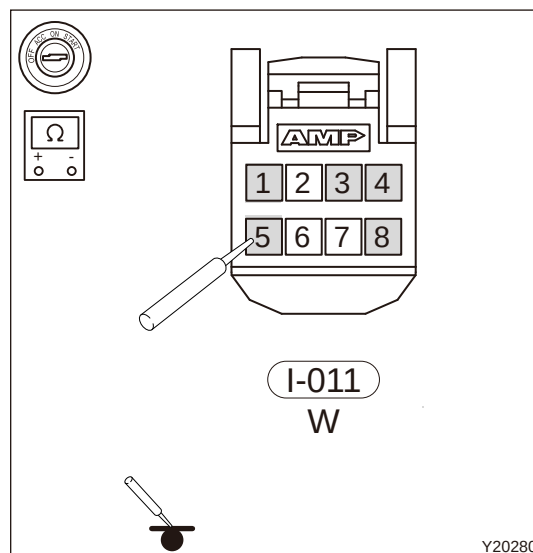
Use circuit diagram as a guide to perform the following inspection procedures:

- (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



Y20270

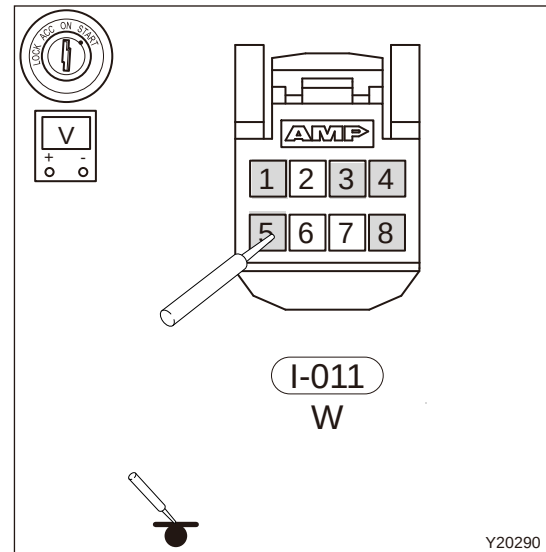


Y20280

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

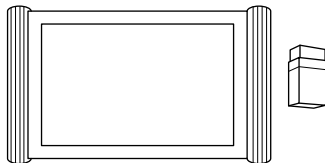
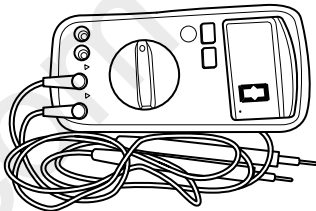
Replace PEPS module

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

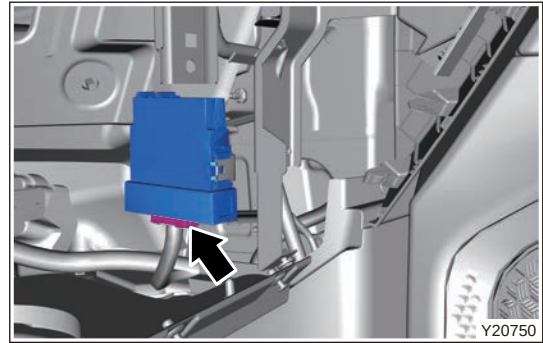
■ Removal

CAUTION

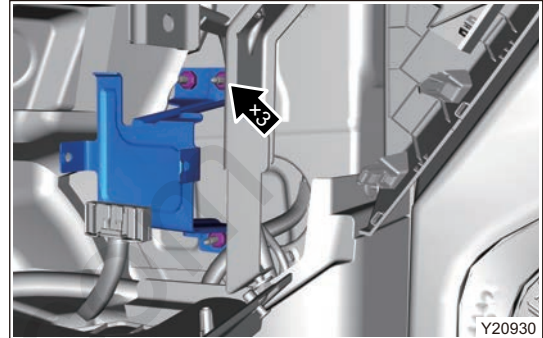
- **DO NOT** separate PEPS controller and fixing bracket at will, or clamping structure of controller will be damaged, unless controller malfunction is confirmed by troubleshooting result, it can be removed and cannot be reused.
- **DO NOT** replace PCB board of PEPS controller at will, or it cannot 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 not 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.

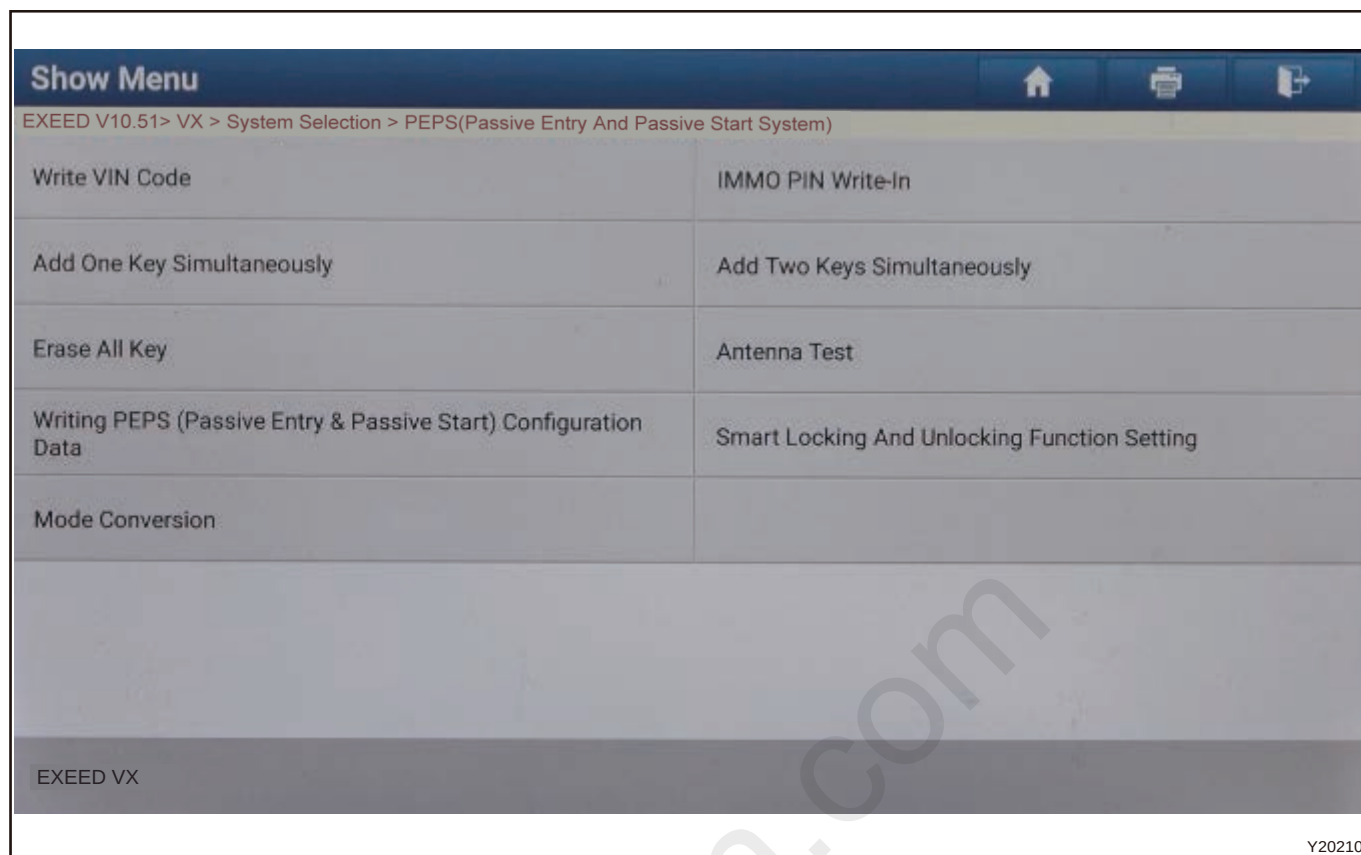
Torque: $7 \pm 1 \text{ N}\cdot\text{m}$

- (2) Install the PEPS module connector.
 (3) Install the glove box assembly.
 (4) Connect the negative battery cable.

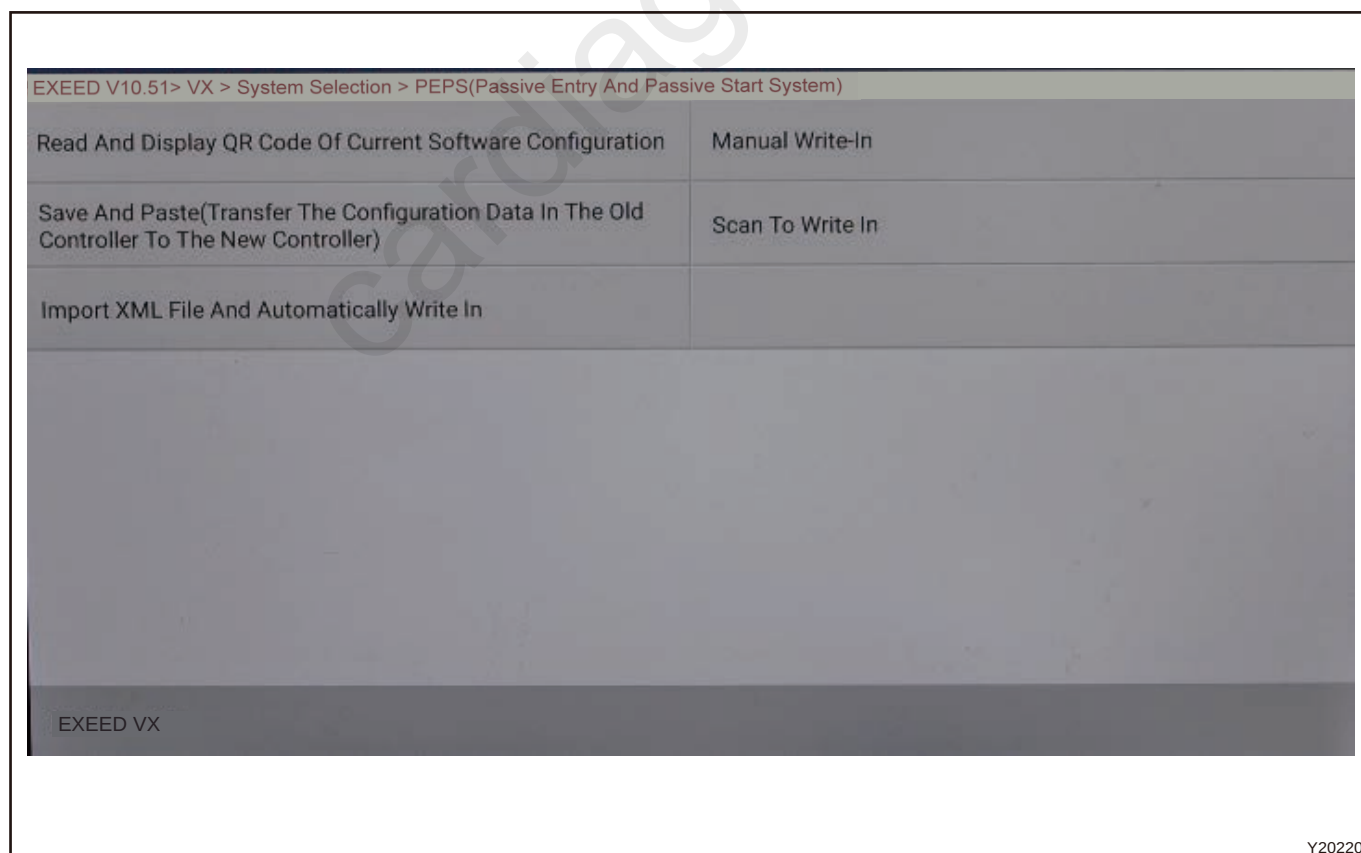
■ Anti-theft Matching

■ 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” .



- (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” .

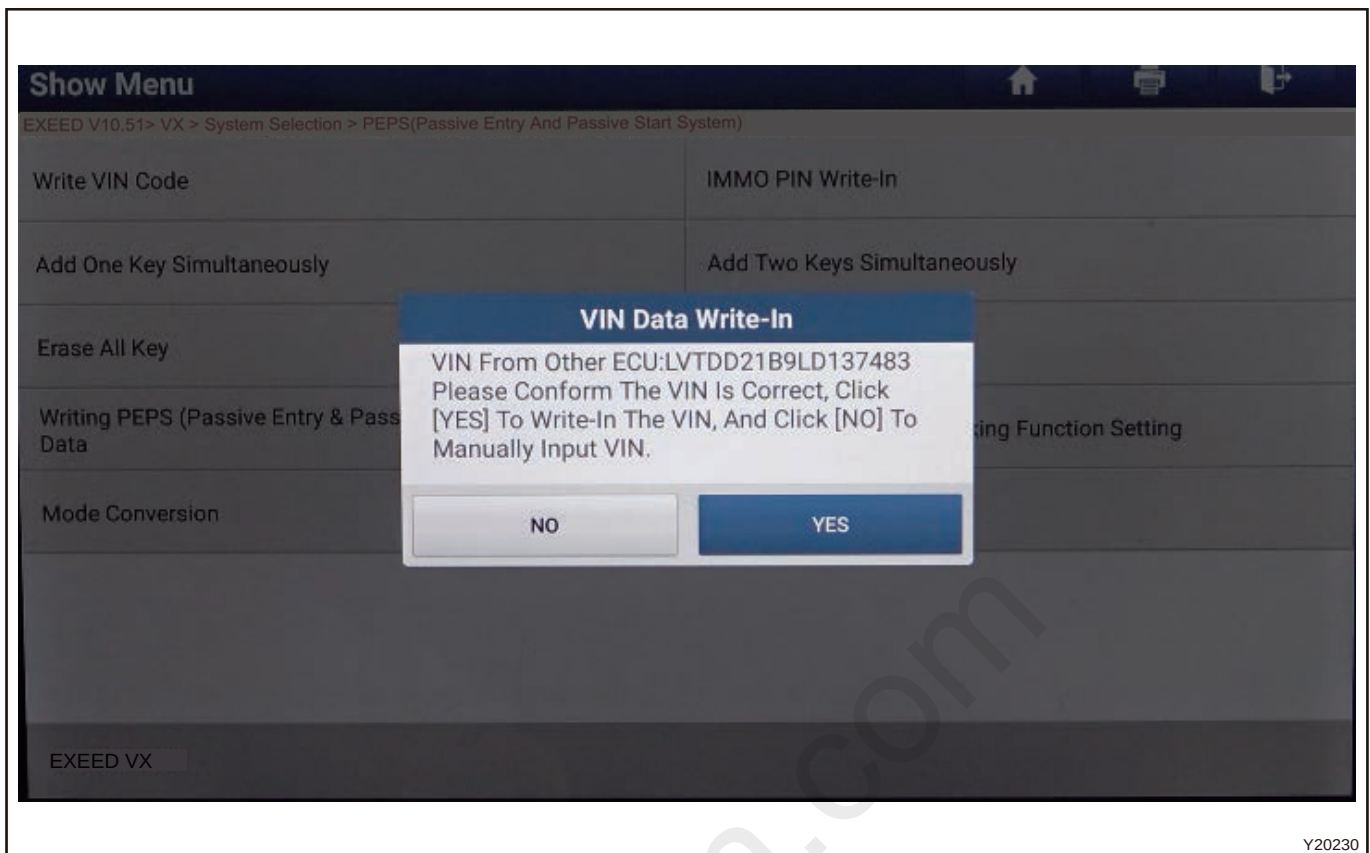
(6) The diagnostic tester interface shows “Read and Save Vehicle Configuration Code Successfully” .

■ 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.

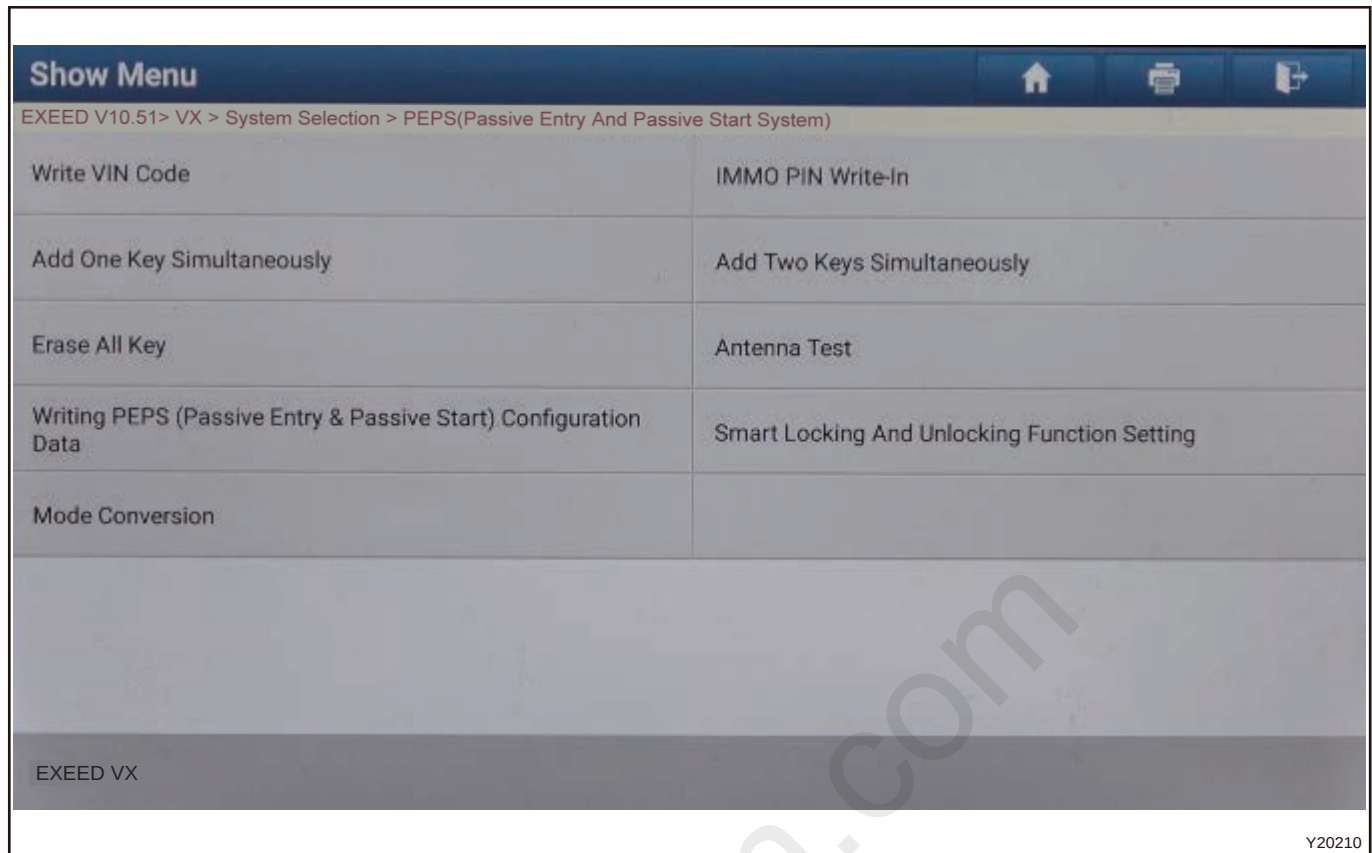


■ Writing PEPS (Passive Entry & Passive Start) Configuration Data

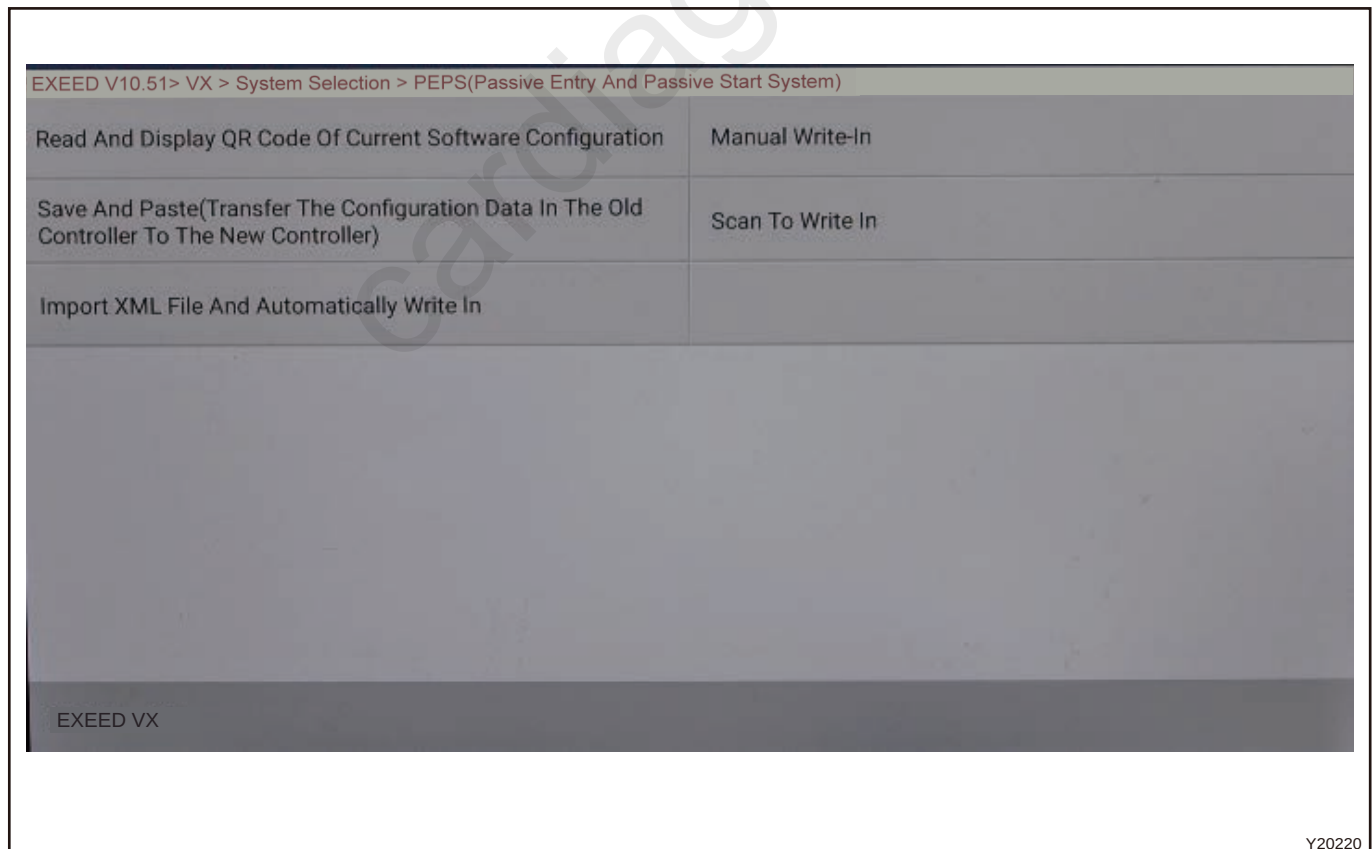
Caution

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” .

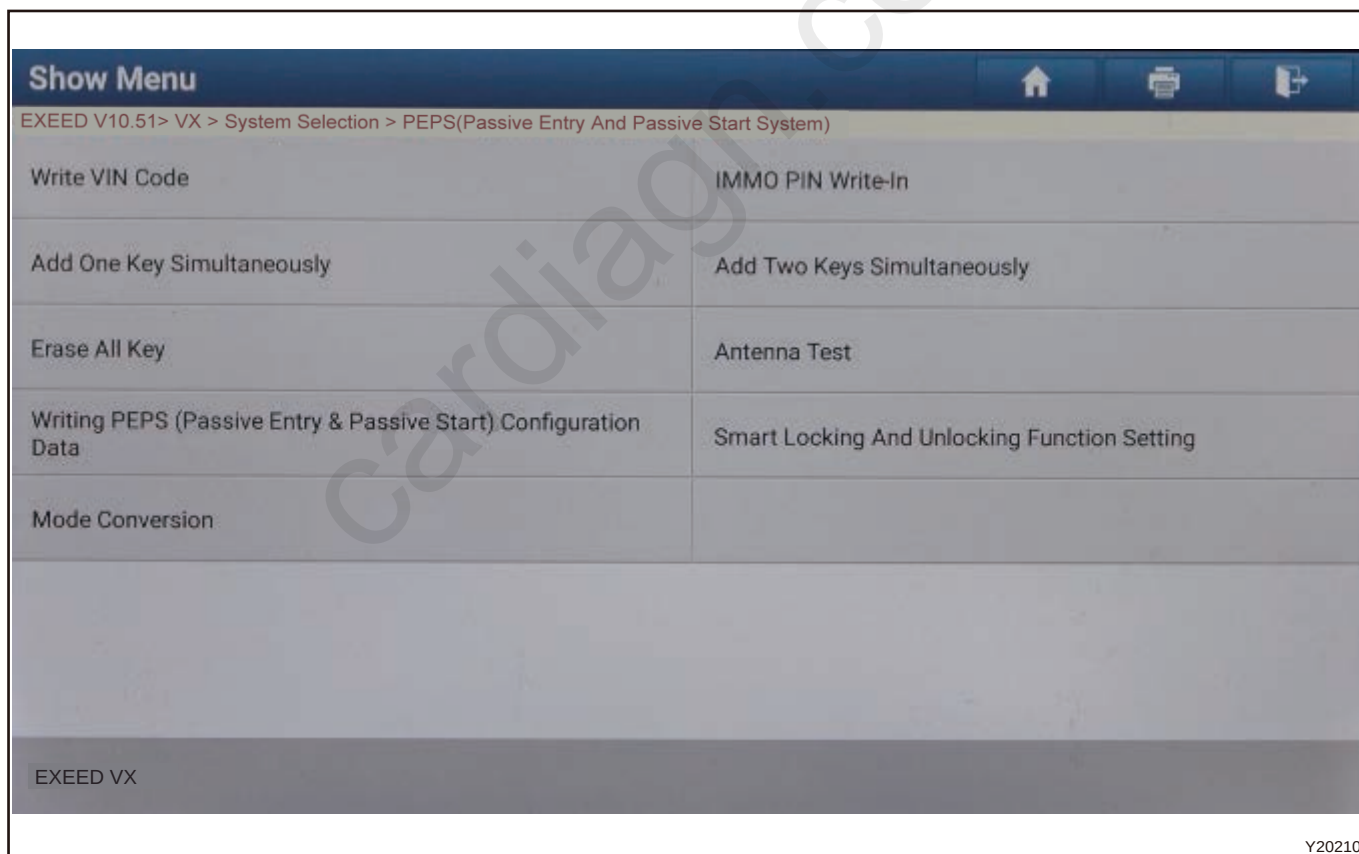
- (4) The diagnostic tester interface shows "Enter 12-digit Repair Shop Code" .
- (5) Click "OK" after input is completed.
- (6) Click "YES" after confirming that repair shop code is correct again.
- (7) The diagnostic tester interface shows "Saved Vehicle Configuration Code Last Time" . Click "Yes" 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

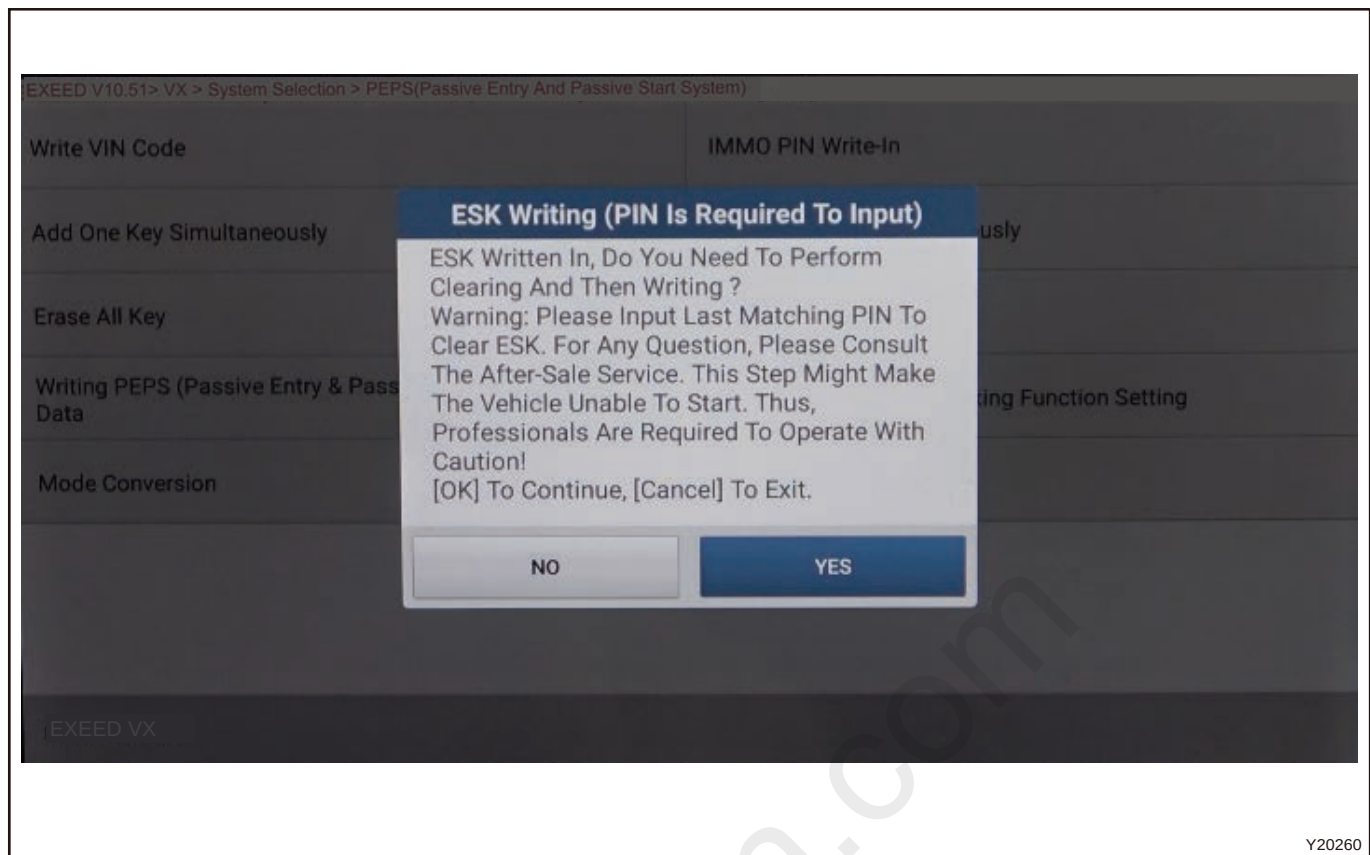
- The first 5 digits of the 12-digit repair shop code are the dealer code (ERP), and the last 7 digits can be entered at will.
- The correct vehicle configuration code must be entered, otherwise the normal functions of the vehicle will be affected, so please check again after entering it.

■ ESK Writing (PIN Is Required To Input)

- (1) Click "ESK Writing (PIN Is Required To Input)" .



- (2) Read the prompts and click "YES" .



Y20260

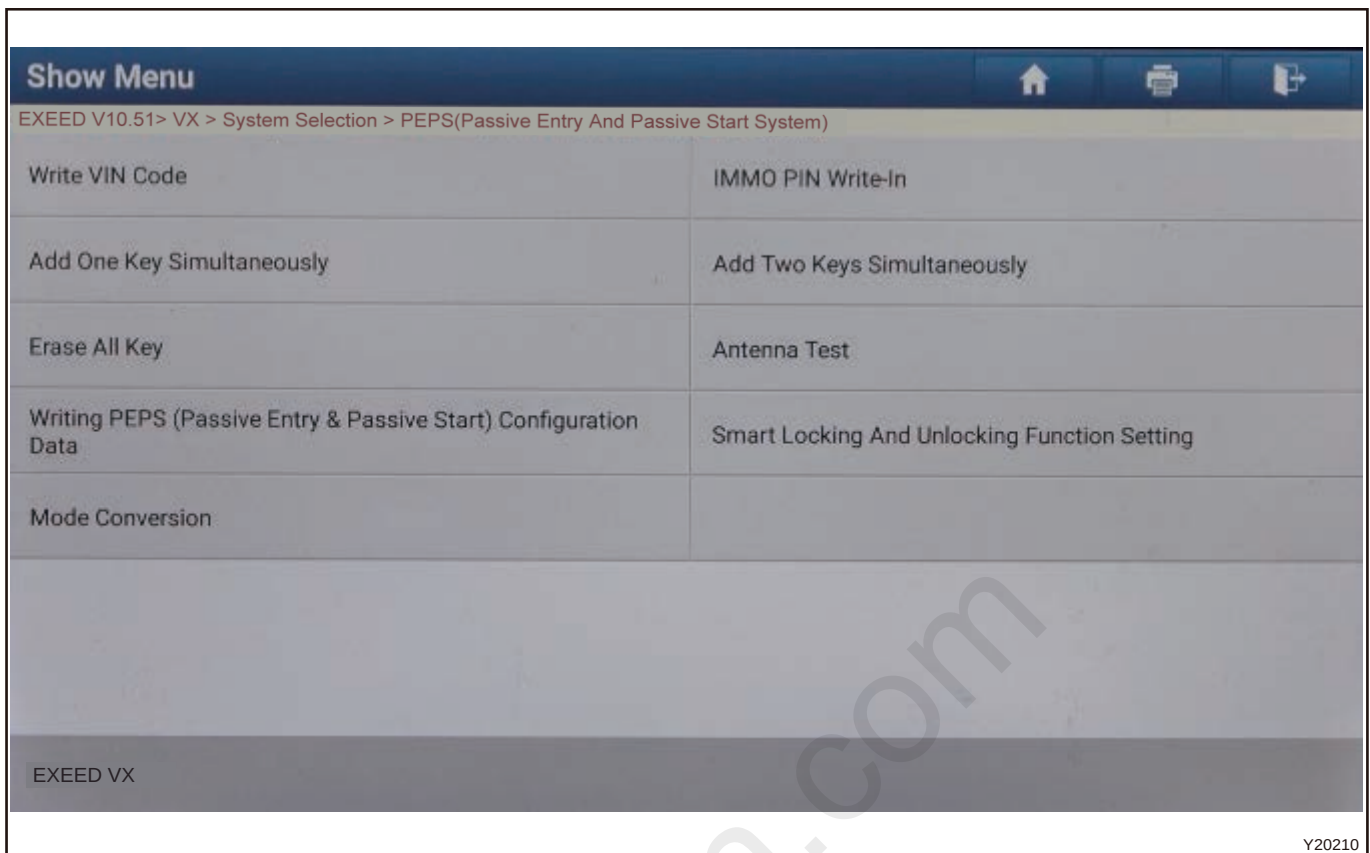
- (3) The diagnostic tester interface prompts "Please Enter 8-Digit New Anti-theft Security Code (PIN)".
- (4) Click "OK" to enter next screen after entering.
- (5) Verify if the entered PIN code is correct and click "OK".
- (6) The diagnostic tester interface prompts "ESK Writing Successfully". Click "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!

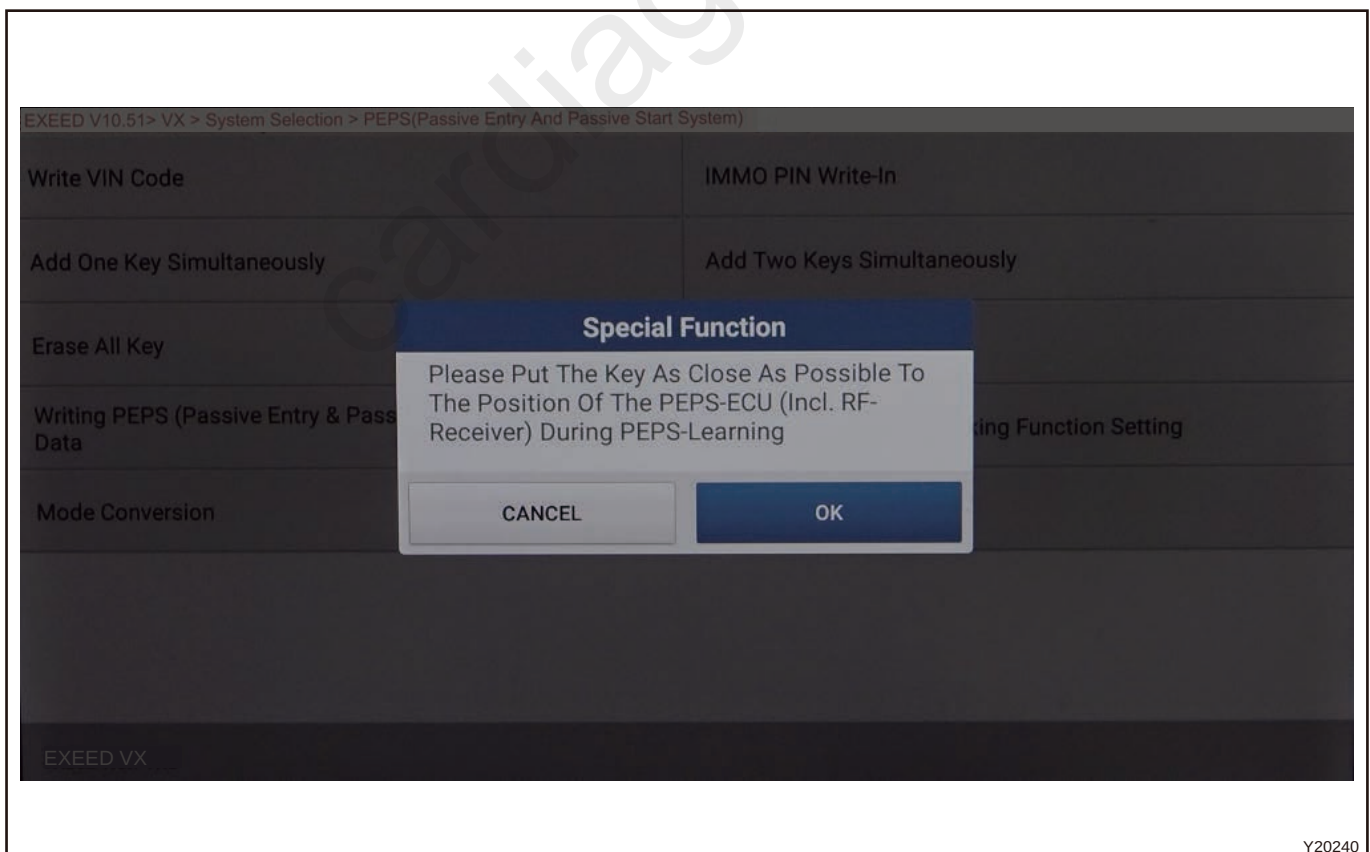
■ Add a key

- (1) Click "Add One Key Simultaneously".



Y20210

- (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” .



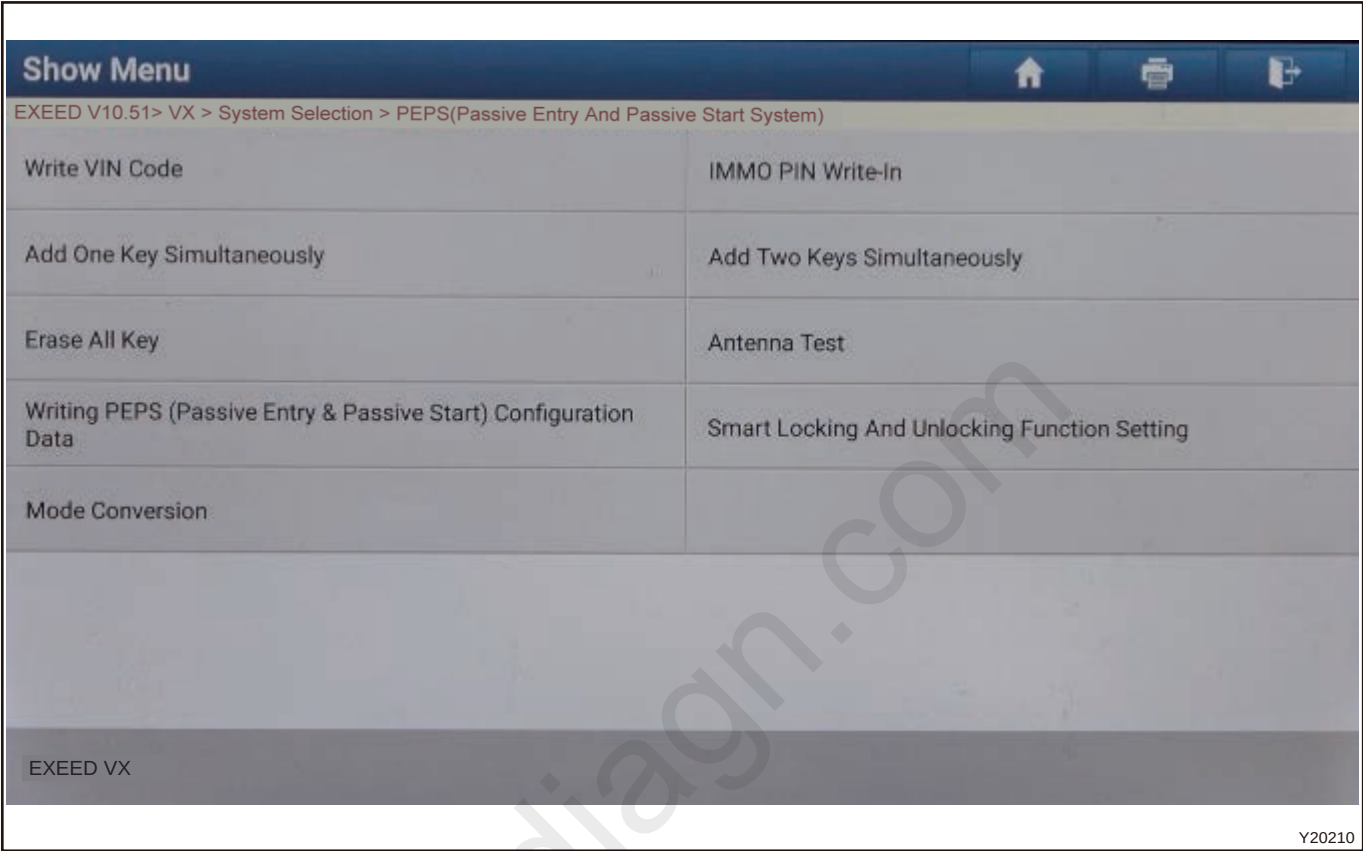
Y20240

- (3) Click “OK” when putting the key in position.

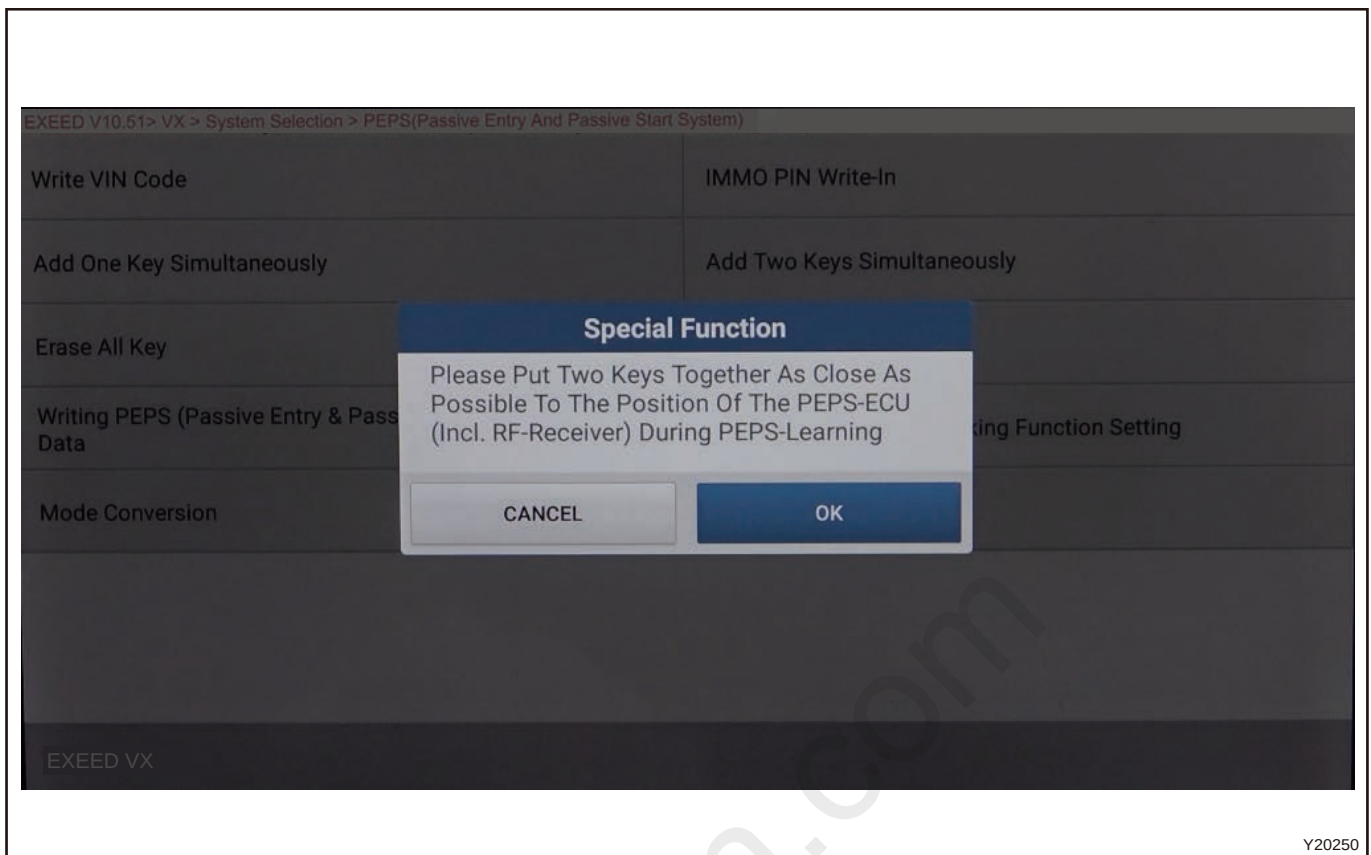
- (4) The diagnostic tester interface prompts “Key Learning Successfully!” .
- (5) Click “OK” to return.

■ 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” .

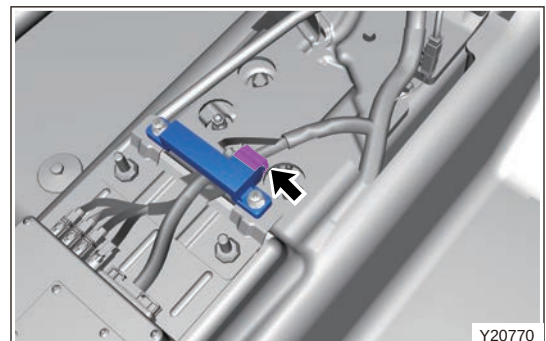


- (3) Click “OK” when putting the key in position.
- (4) The diagnostic tester interface prompts “Key Learning Successfully!” .
- (5) Click “OK” to return.

4.3 Front Low Frequency Antenna

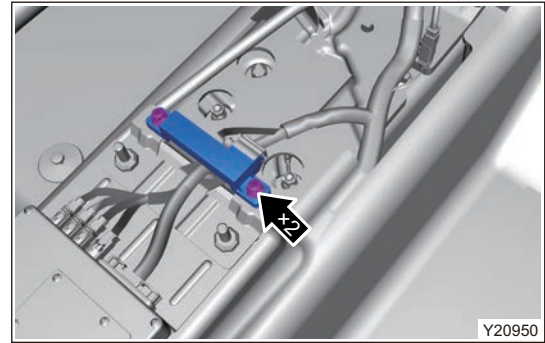
■ Removal

- (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.



Y20770

- (6) Removal 2 fixing clips and front low frequency antenna.



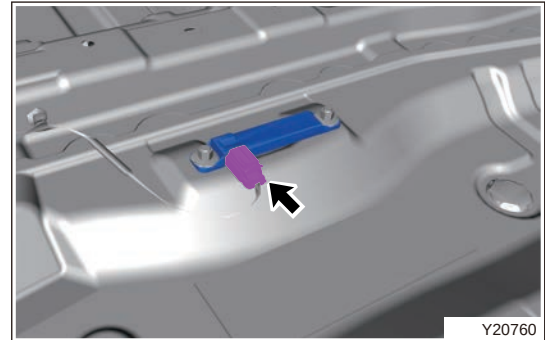
■ Installation

- (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.

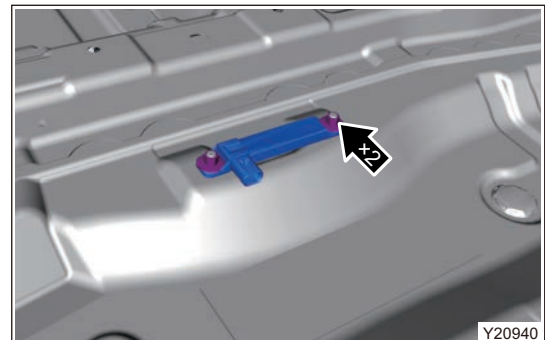
4.4 Rear Bumper Low Frequency Antenna

■ 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

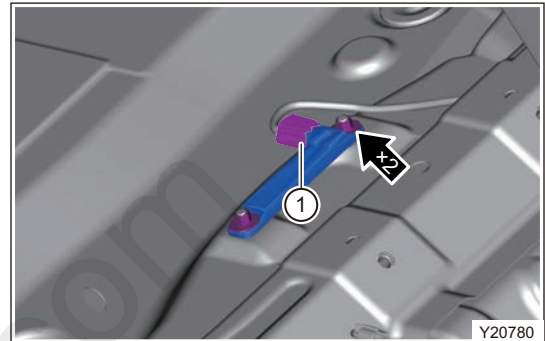
- (1) Install 2 fixing plastic nuts of rear low frequency antenna.
Torque: 1.5 N·m.

- (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.

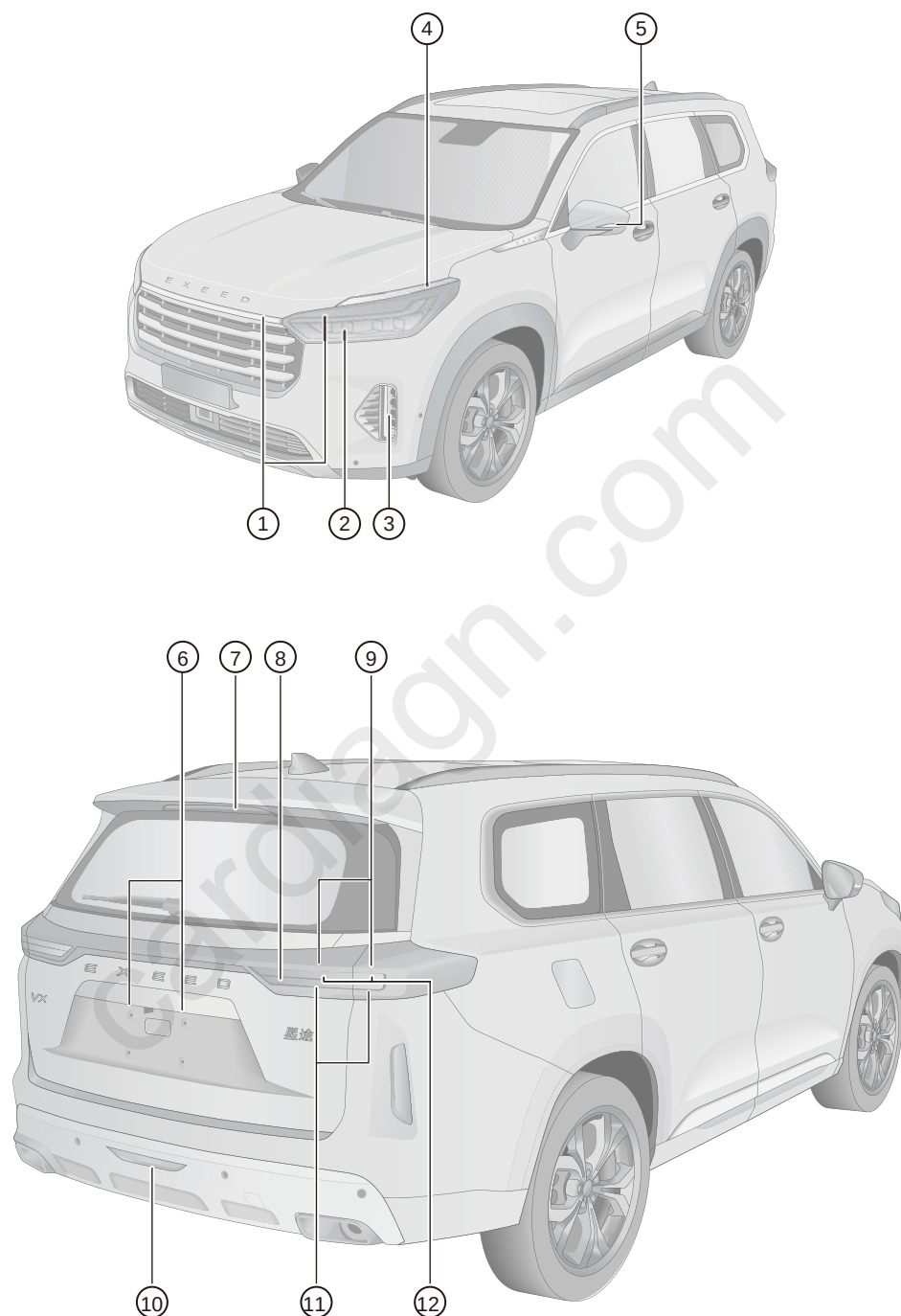
- (1) Be sure to wear safety equipment to prevent accidents, when removing exterior lighting appliance.
- (2) Appropriate force should be applied when removing exterior lighting appliance. Be careful not to operate roughly.
- (3) Try to prevent interior and body paint surface from being scratched, when 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



Z20010

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		
B102312	Short to Power supply in High Beam Light Relay Circuit	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.		
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

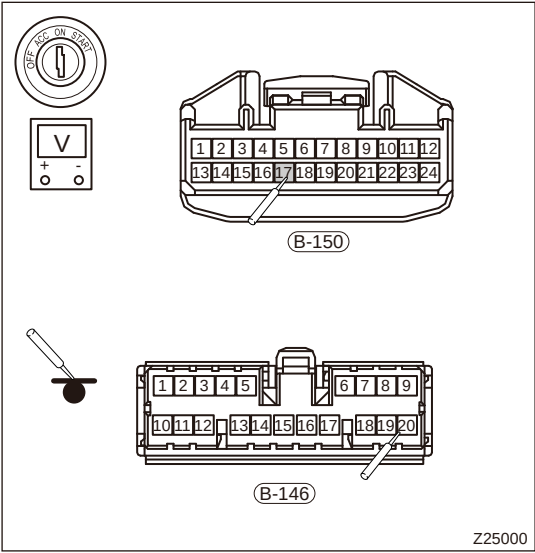
Replace fuse.

OK

3	Check interior power supply wire harness
---	---

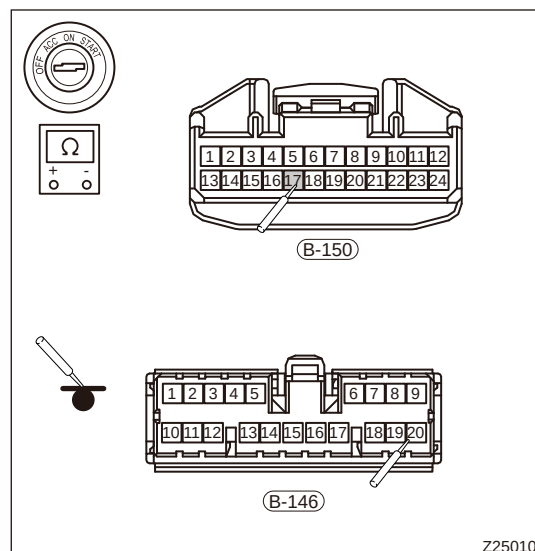
- (a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Disconnect the interior wire harness connectors B-146 and B-150.
(d) Connect the negative battery cable.
(e) Turn ENGINE START STOP switch to ON.
(f) Using a digital multimeter, measure voltage between interior 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

- First, confirm the operating status of left turn signal light.
- If only left turn signal light does not turn on, check the output circuit of left turn signal light only.
- If either front left or rear left light does not come on, check node line and turn signal light.
- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- 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.
- Connect the negative battery cable, turn ignition switch to ON, and turn on left turn signal light switch.
- 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

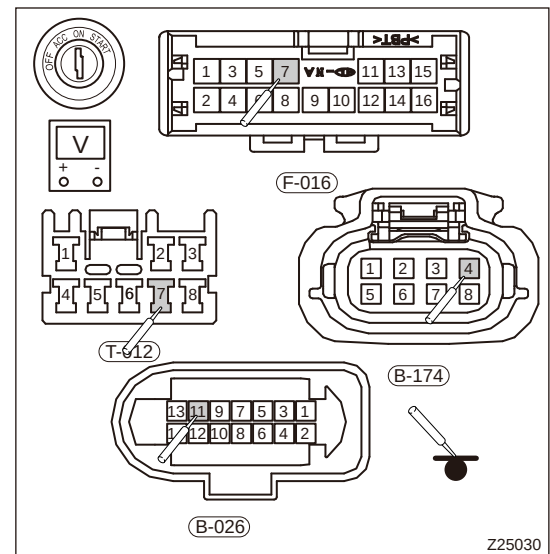
Replace turn signal light

NG

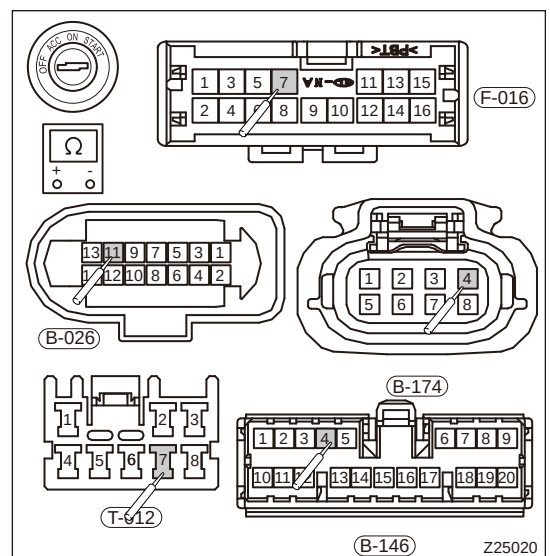
2 Check circuit

- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the body controller connector B-146.
- 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.
- 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"	$\leq 1 \Omega$
B-146 (04) - B-174 (4)		
B-146 (04) - T-012 (6)		
B-146 (04) - F-016 (07)		



Z25030



Z25020

NG

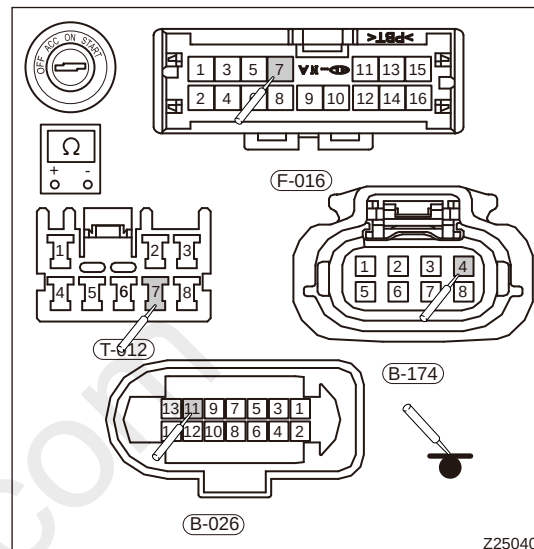
Replace or repair wire harness.

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"	$\leq 1 \Omega$
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.

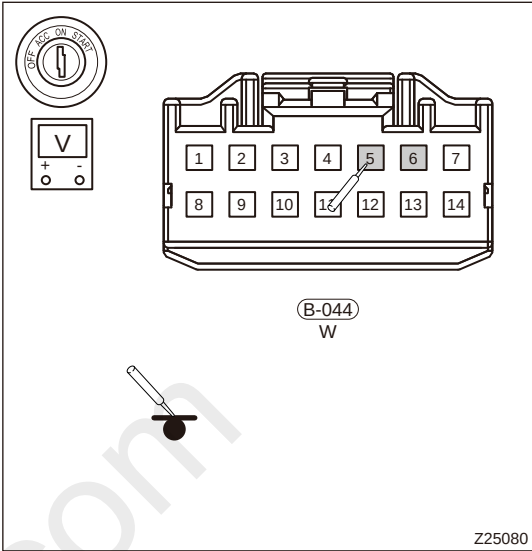
Hint:
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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

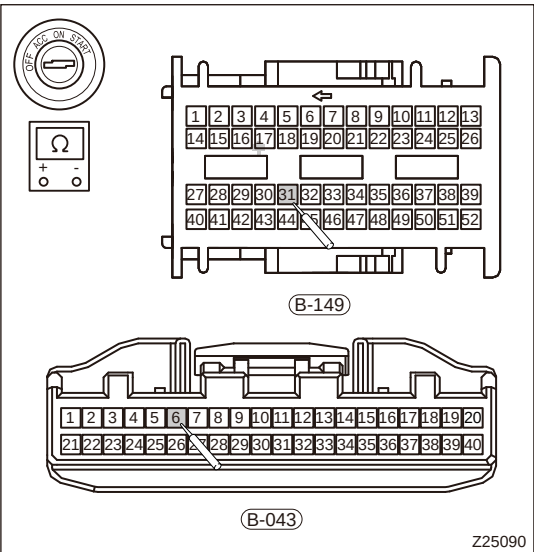
OK

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"	$\leq 1 \Omega$

NG

Replace or repair wire harness and position light relay

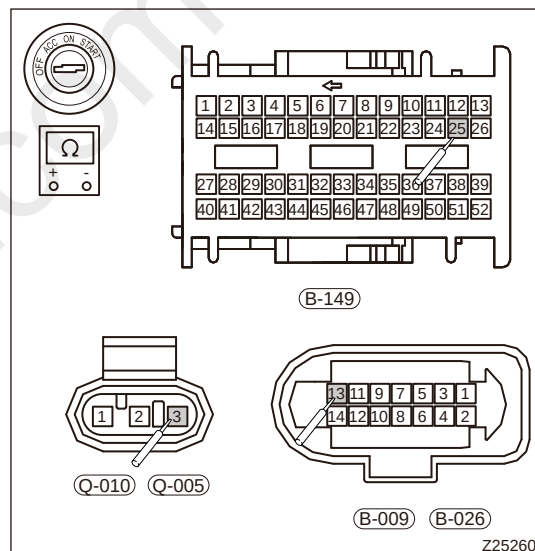
OK

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"	$\leq 1 \Omega$
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.

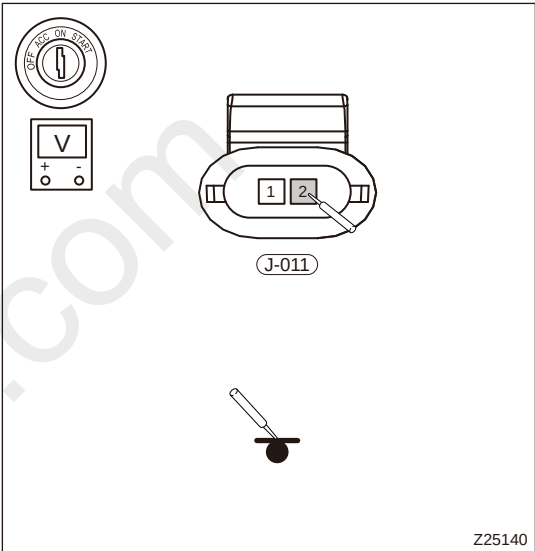
Hint:

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

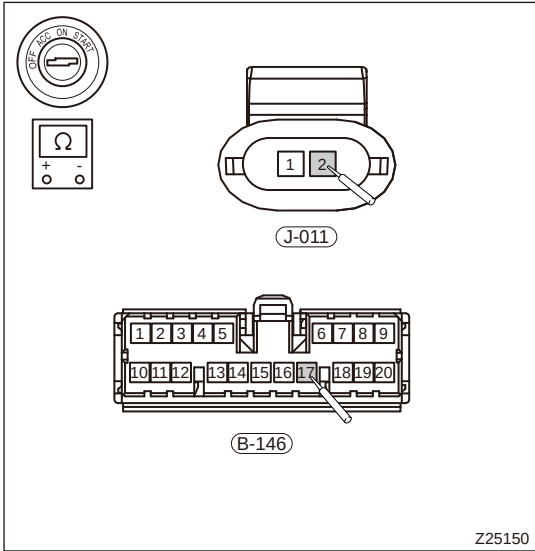
Check power supply wire harness

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"	$\leq 1 \Omega$



NG

Replace or repair wire harness.

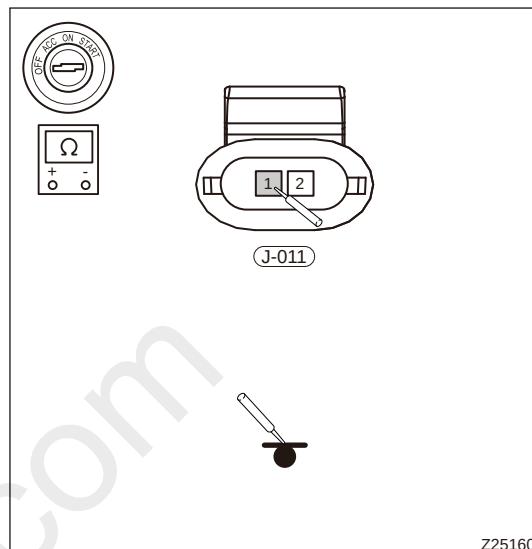
OK

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"	$\leq 1 \Omega$



Z25160

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.

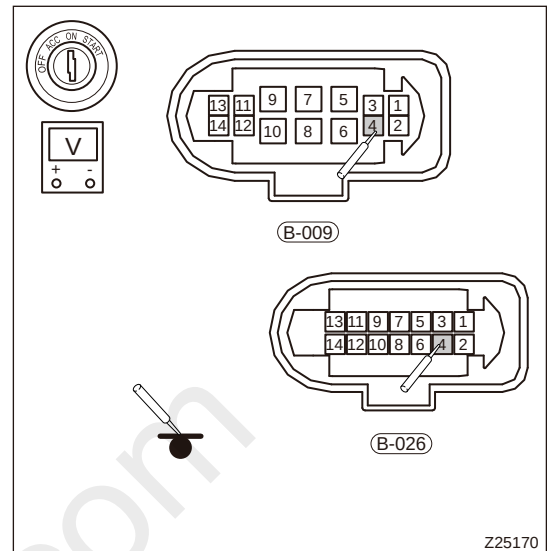
Hint:

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

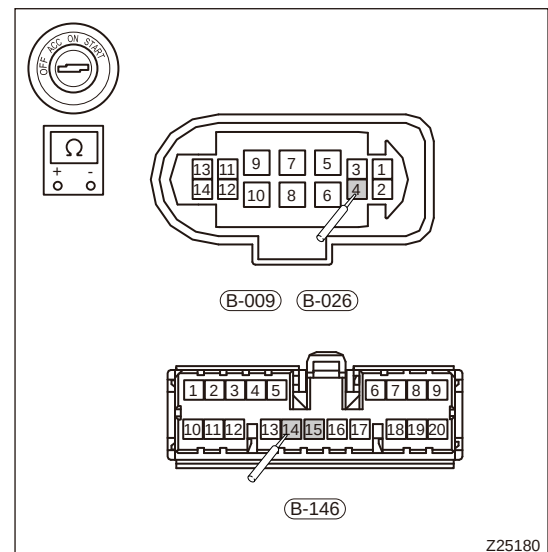
- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the left daytime running light connector B-026 and right daytime running light connector B-009.
- Connect the negative battery cable, turn ignition switch to ON and start engine.
- Using a multimeter, check 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**

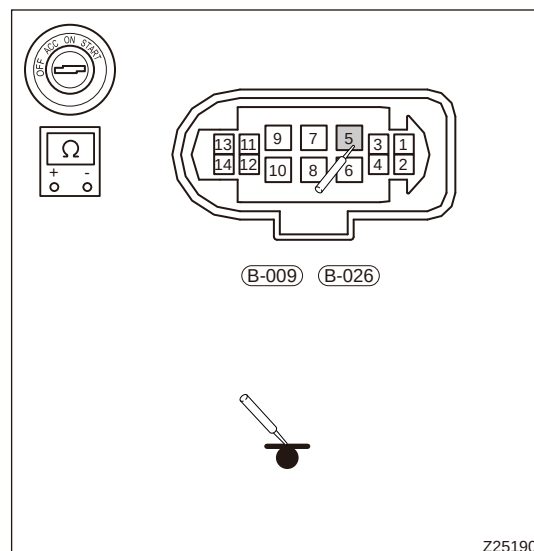
- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the body controller connector B-076.
- Disconnect the left daytime running light connector B-026 and right daytime running light connector B-009.
- Using a digital multimeter, check for normal continuity between connector terminals according to table below.

Multimeter Connection	Condition	Specified Condition
B-026 (4) - B- 076 (14)	ENGINE START STOP switch "OFF"	$\leq 1 \Omega$
B-009 (4) - B- 076 (15)		$\leq 1 \Omega$

**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"	$\leq 1 \Omega$
B-009 (5) - Body ground		$\leq 1 \Omega$



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:

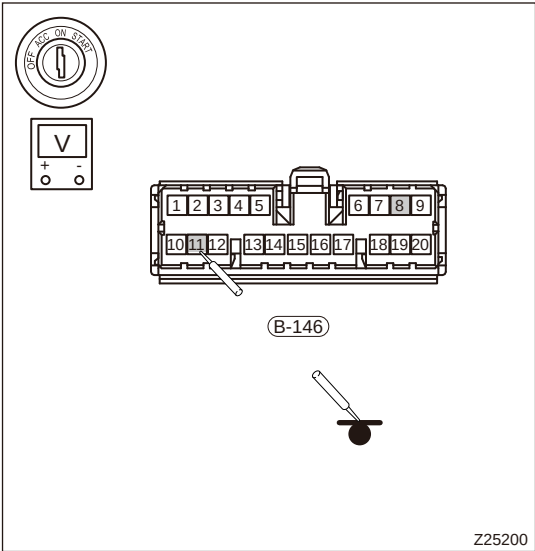
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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



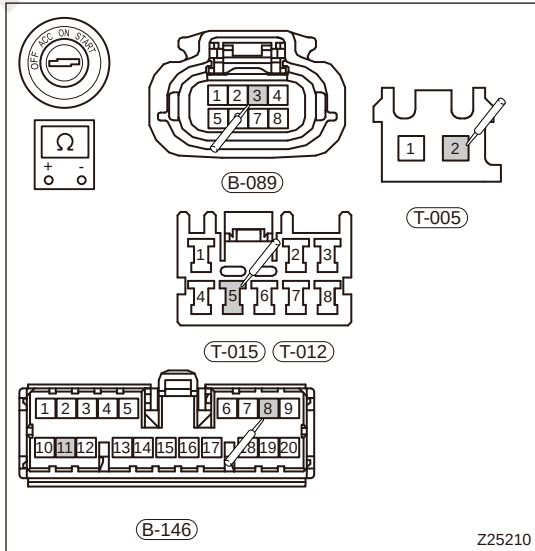
NG Check BCM module

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"	$\leq 1 \Omega$
B-146 (8) - B-174 (3)		
B-146 (8) - B-089 (3)		
B-146 (8) - T-012 (5)		
B-146 (8) - T-015 (5)		



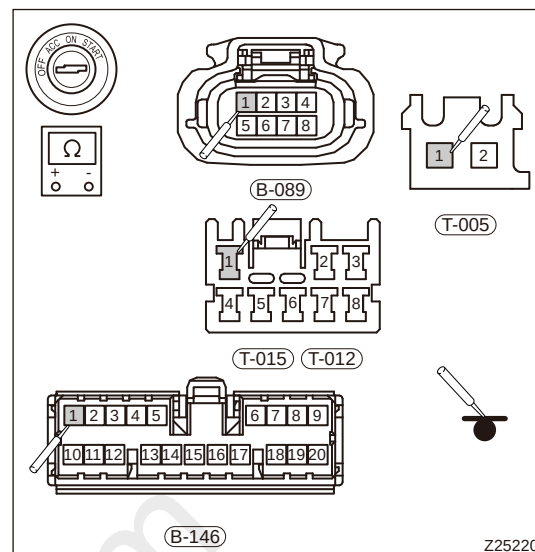
NG Replace or repair wire harness.

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"	$\leq 1 \Omega$
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.

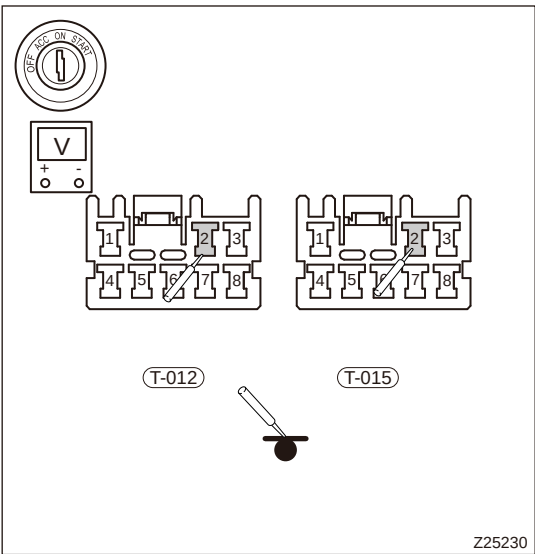
Hint:

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

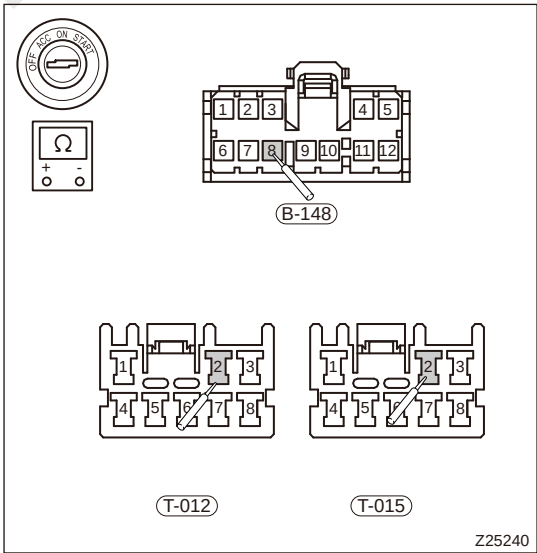
OK

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"	$\leq 1 \Omega$
T-009 (2) - B- 148 (8)		



NG

Replace or repair wire harness.

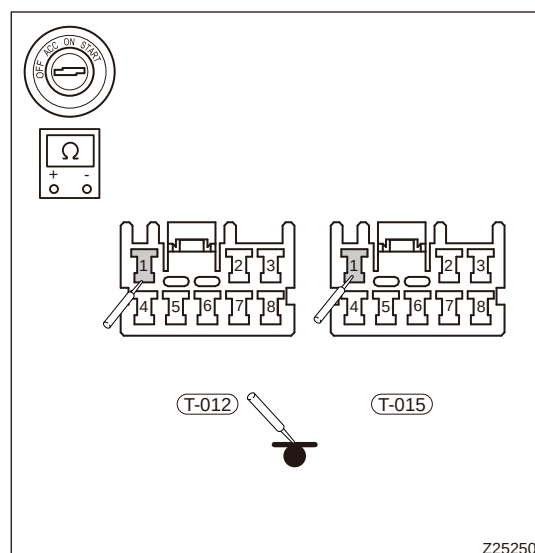
OK

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"	$\leq 1 \Omega$
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:

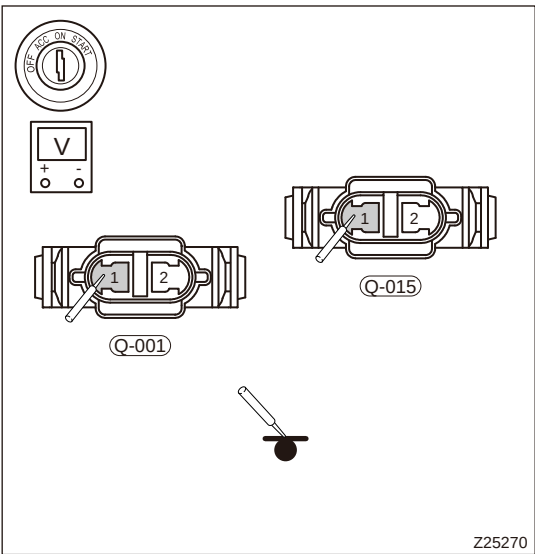
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1

Check output voltage of front fog light control circuit

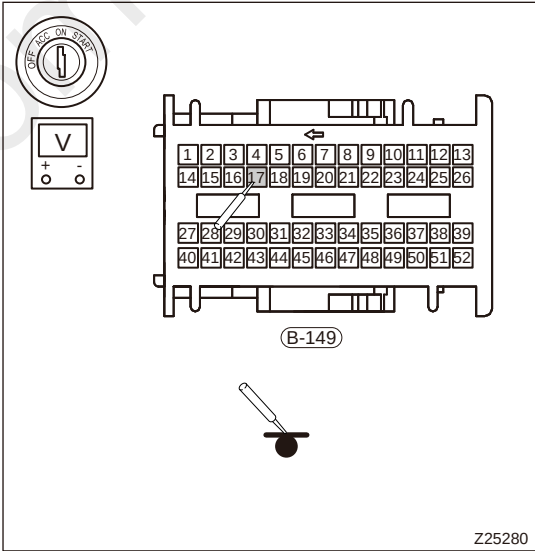
- (a) Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- (b) Disconnect front left fog light connector Q-001 and front right fog light connector Q-005.
- (c) Connect the negative battery cable, turn ignition switch to ON, and turn on front fog light switch.
- (d) Using 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

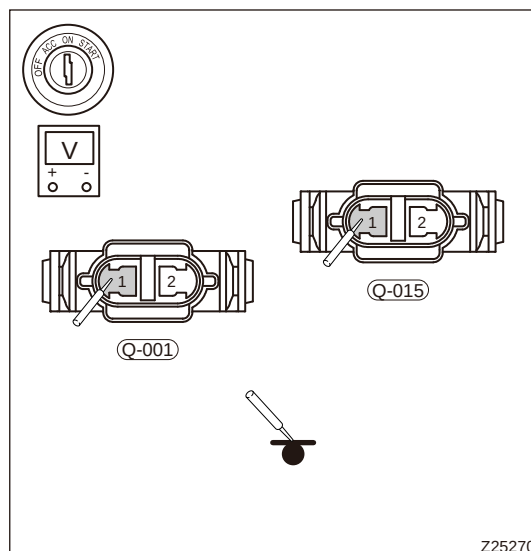
Check power supply wire harness and relay

OK

2	Check circuit
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- (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

- First confirm the working state of right turn signal light.
- If only right turn signal light does not turn on, check the output circuit of right turn signal light only.
- If either front right or rear right light does not come on, check node line and turn signal light.
- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- 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.
- Connect the negative battery cable, turn ignition switch to ON, and turn on right turn signal light switch.
- 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

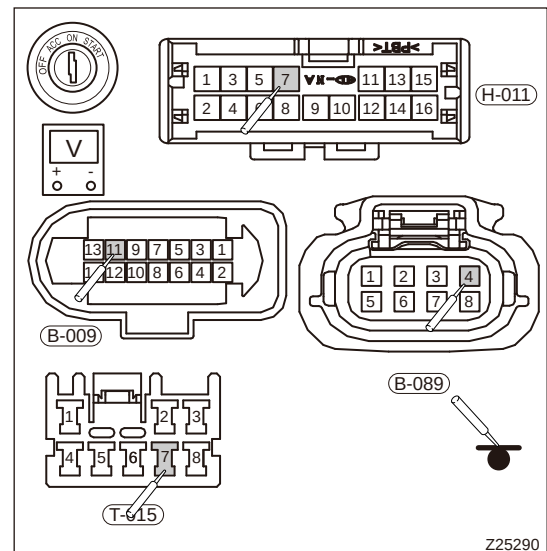
Replace turn signal light

NG

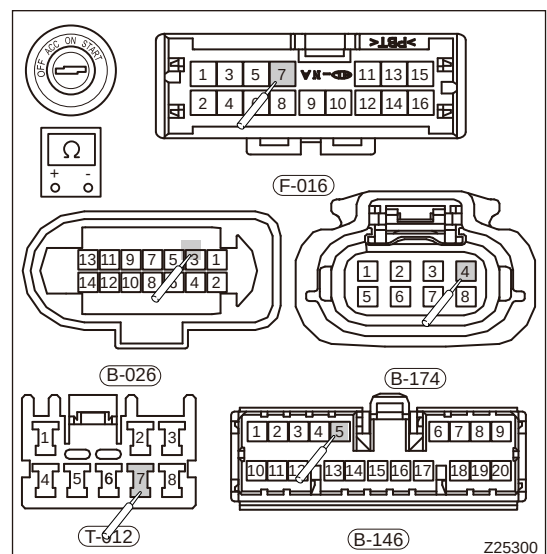
2 Check circuit

- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the body controller connector B-146.
- 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.
- 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"	$\leq 1 \Omega$
B-146 (05) - B-089 (4)		
B-146 (05) - T-015 (6)		
B-146 (05) - H-011 (07)		



Z25290



Z25300

NG

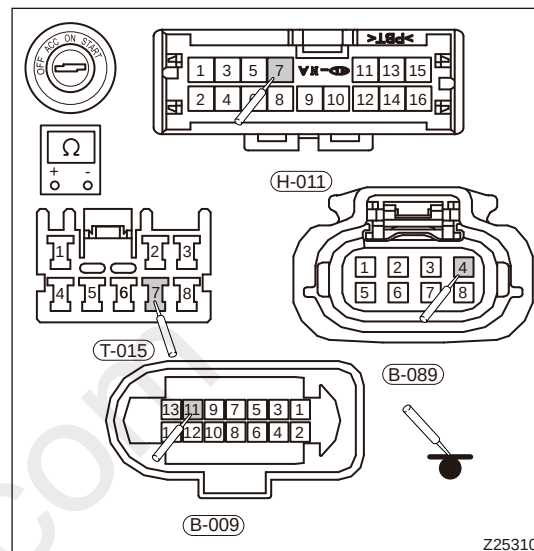
Replace or repair wire harness.

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"	$\leq 1 \Omega$
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

Z25320

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.

Z25330

OK

3

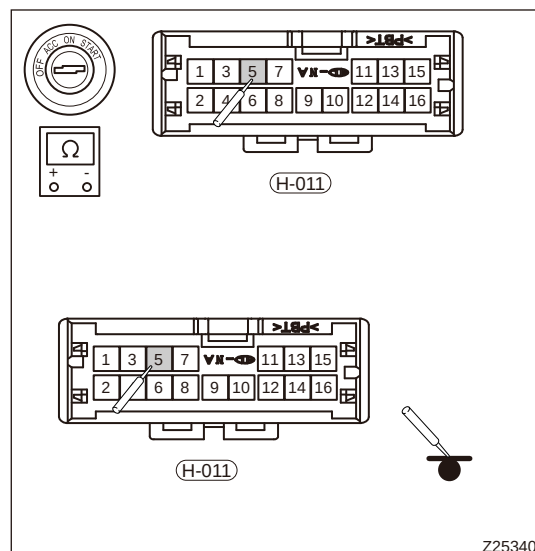
Check ground circuit of rear view mirror foot light

1971

Main Book Title

- (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"	$\leq 1 \Omega$
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

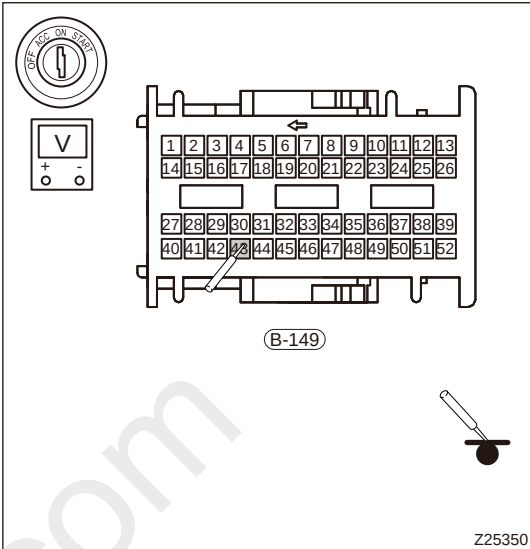
Check and replace fuse

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

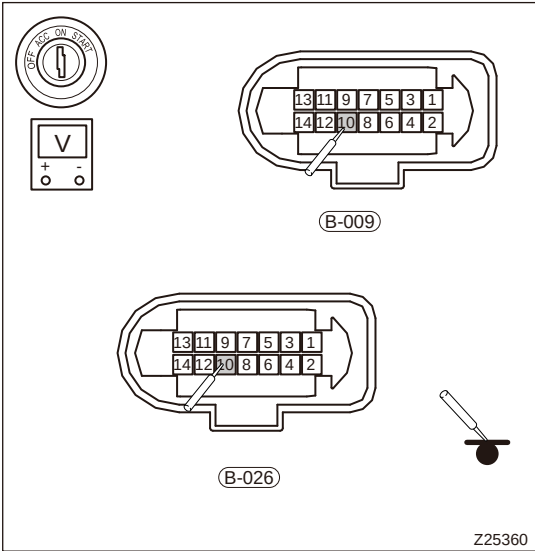
Check module, power supply wire harness and relay

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"	$\leq 1 \Omega$
B-009 (10) - Body ground		



NG

Replace or repair wire harness and relay

OK

4 Reconfirm DTCs

- Connect the negative battery cable.
- Use diagnostic tester to clear DTCs.
- Start the engine.
- 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

- Check if fuses EF05 (10A) and EF06 (7.5A) in engine compartment fuse and relay box are normal.

NG

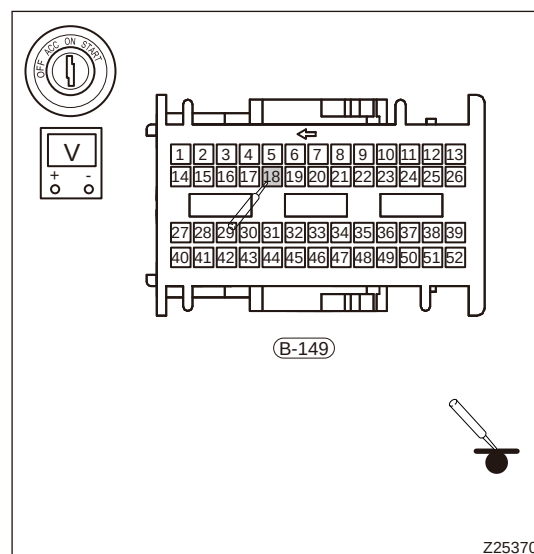
Check and replace fuse

OK

2 Check circuit of primary coil for low beam light relay

- Turn on low beam light switch and check if there is engaging sound from low beam light relay.
- If not, turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the BCM connector B-149.
- Connect the negative battery cable, and turn ENGINE START STOP switch to ON.
- 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

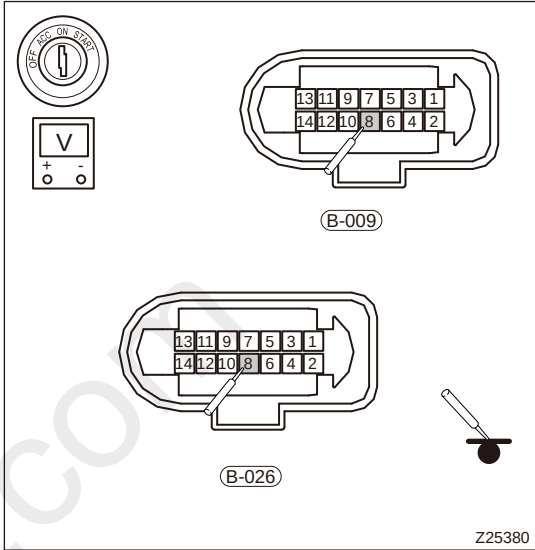
Check module, power supply wire harness and relay

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"	$\leq 1 \Omega$
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

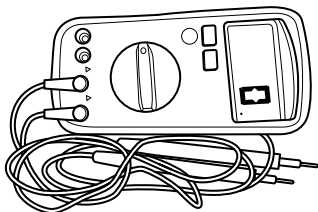
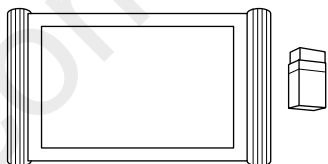
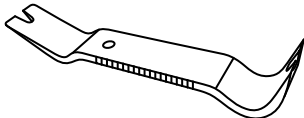
OK

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

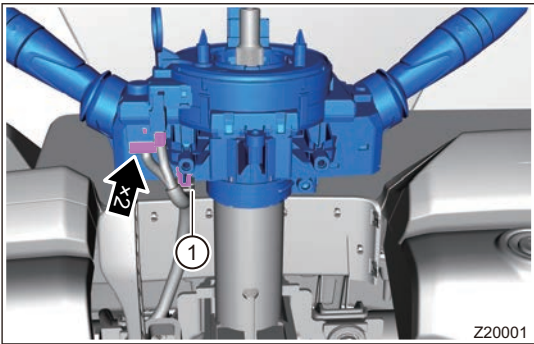
■ Removal

CAUTION

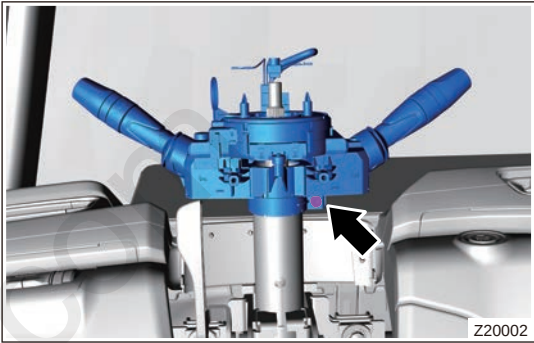
- Be sure to wear necessary safety equipment to prevent accidents, when removing steering column module.
- Appropriate force should be applied when removing steering column module. Be careful not to operate roughly.
- Try to prevent interior and body paint surface from being scratched when removing steering 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

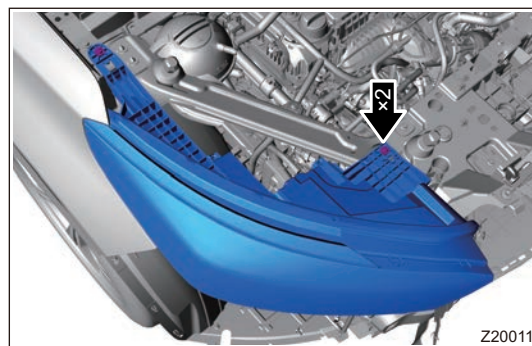
■ Removal

HINT
• Use same procedures for right headlight assembly and left headlight assembly. • Removal and installation procedures listed below are for right headlight assembly.

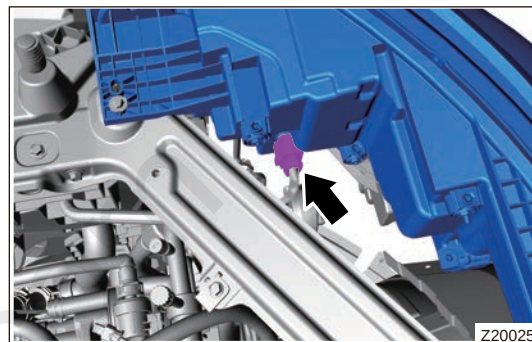
CAUTION
• Be sure to wear safety equipment to prevent accidents, when removing headlight assembly. • Try to prevent body paint surface from being scratched, when removing headlight assembly.

- (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.



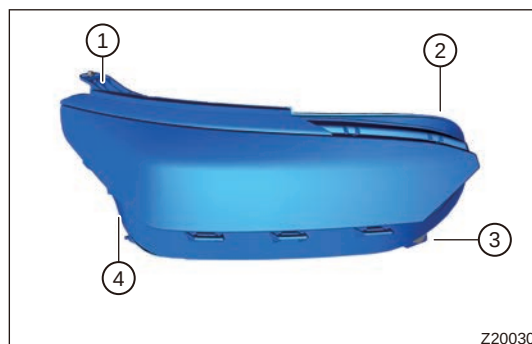
■ Installation

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: $3.5 \pm 0.5 \text{ N}\cdot\text{m}$



- (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:

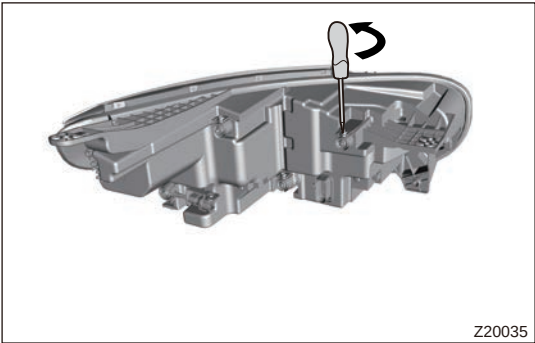
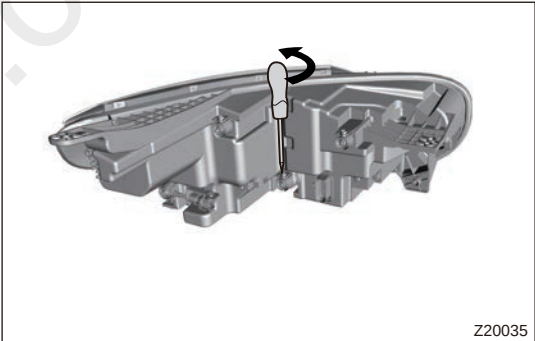
Occupant and Luggage Loading Condition		Knob Position
Occupant	Luggage Loading	
Driver	None	0
Driver + Front Passenger	None	1
Full Occupied	None	2
Full Occupied	Full-loaded Luggage	3
Driver	Full-loaded Luggage	2

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.

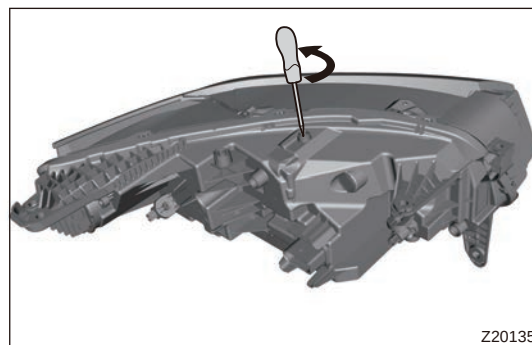
Manual headlight leveling: The headlight leveling can be changed by adjusting the following areas manually as shown in illustration. Take left headlight beam adjustment as an example.

- (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;
- (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;



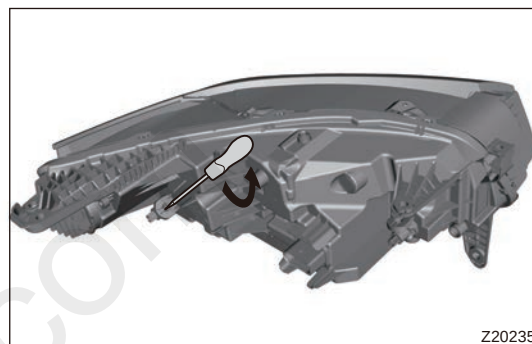
- (3) Low beam light up/down adjustment:

- 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 $\leq$ 150 mm, right $\leq$ 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 $\leq$ 150 mm, right $\leq$ 300 mm Offset for right high beam: Left $\leq$ 300 mm, right $\leq$ 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

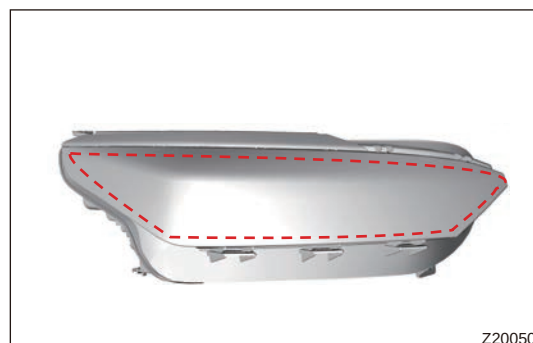
■ Headlight fogging judgment area:

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.

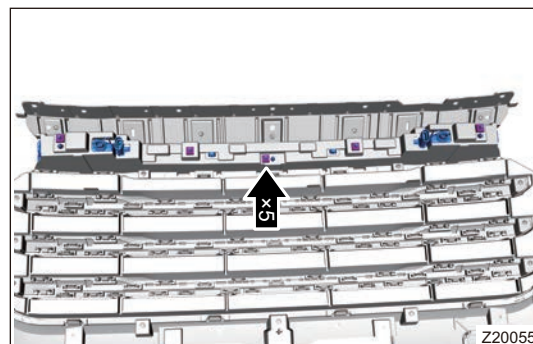
HINT

- 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

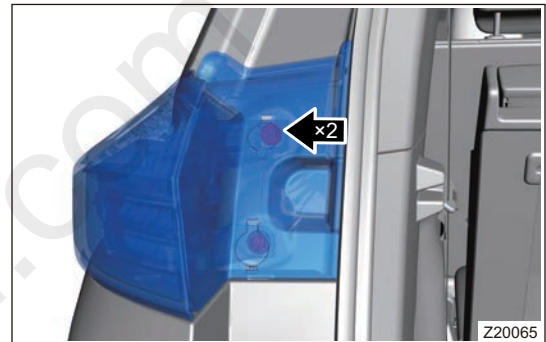
Hint:

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: $2.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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)

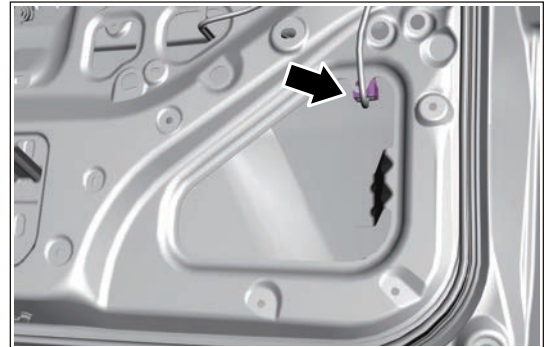
■ Removal

CAUTION

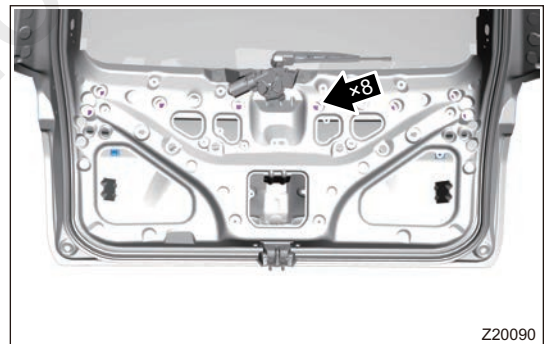
- **Be sure to wear necessary safety equipment to prevent accidents, when removing rear combination light assembly (back door part).**
- **Try to prevent body paint surface from being scratched, when removing rear combination light assembly (back door part).**

- (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: $3.5 \pm 0.5 \text{ N}\cdot\text{m}$
- (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.

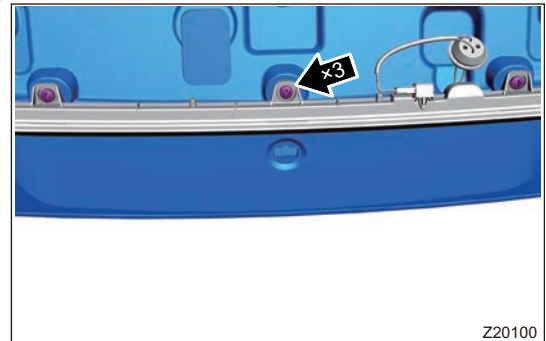
- (1) Fogging judgment for outside light after raining:
 - Vehicle is idling (ambient temperature is not lower than 23 °C), all functions are on for 15 minutes, then fog in the functional area dissipates, or if fog in the functional area dissipates or fog in the non-functional area is less than 1/3 of 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.

**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.



- (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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (2) Install the rear spoiler assembly.
- (3) Connect the negative battery cable.

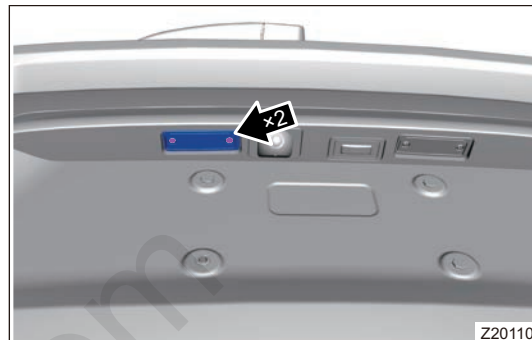
4.8 Replacement of License Plate Light Assembly**■ Removal****HINT**

- Operation steps of right license plate light are same as that of left license plate light.
- Procedures listed below are for left side.

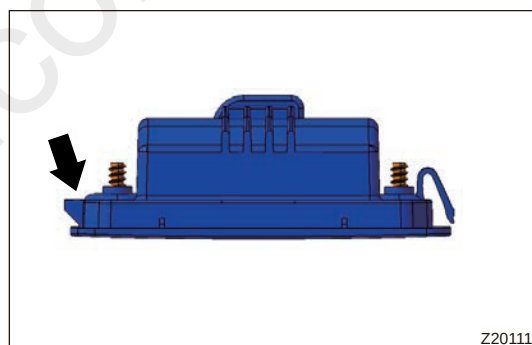
CAUTION

- 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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

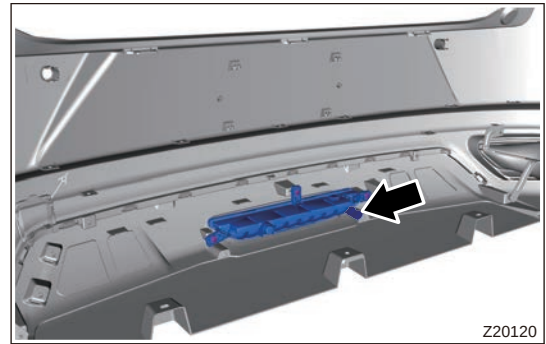
- (3) Connect the negative battery cable.

4.9 Replacement of Rear Fog Light Assembly**■ Removal****CAUTION**

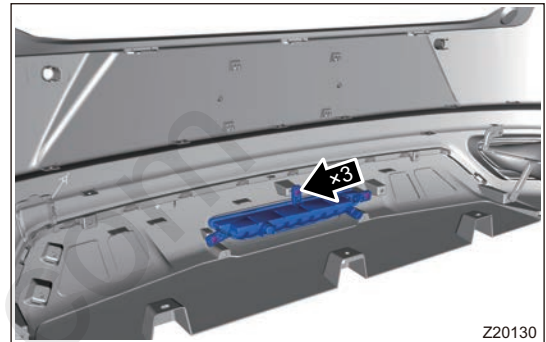
- Be sure to wear safety equipment to prevent accidents, when removing rear fog light assembly.
- Try to prevent interior and body paint surface from being scratched, when removing rear fog light assembly.

- (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: $1.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (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.

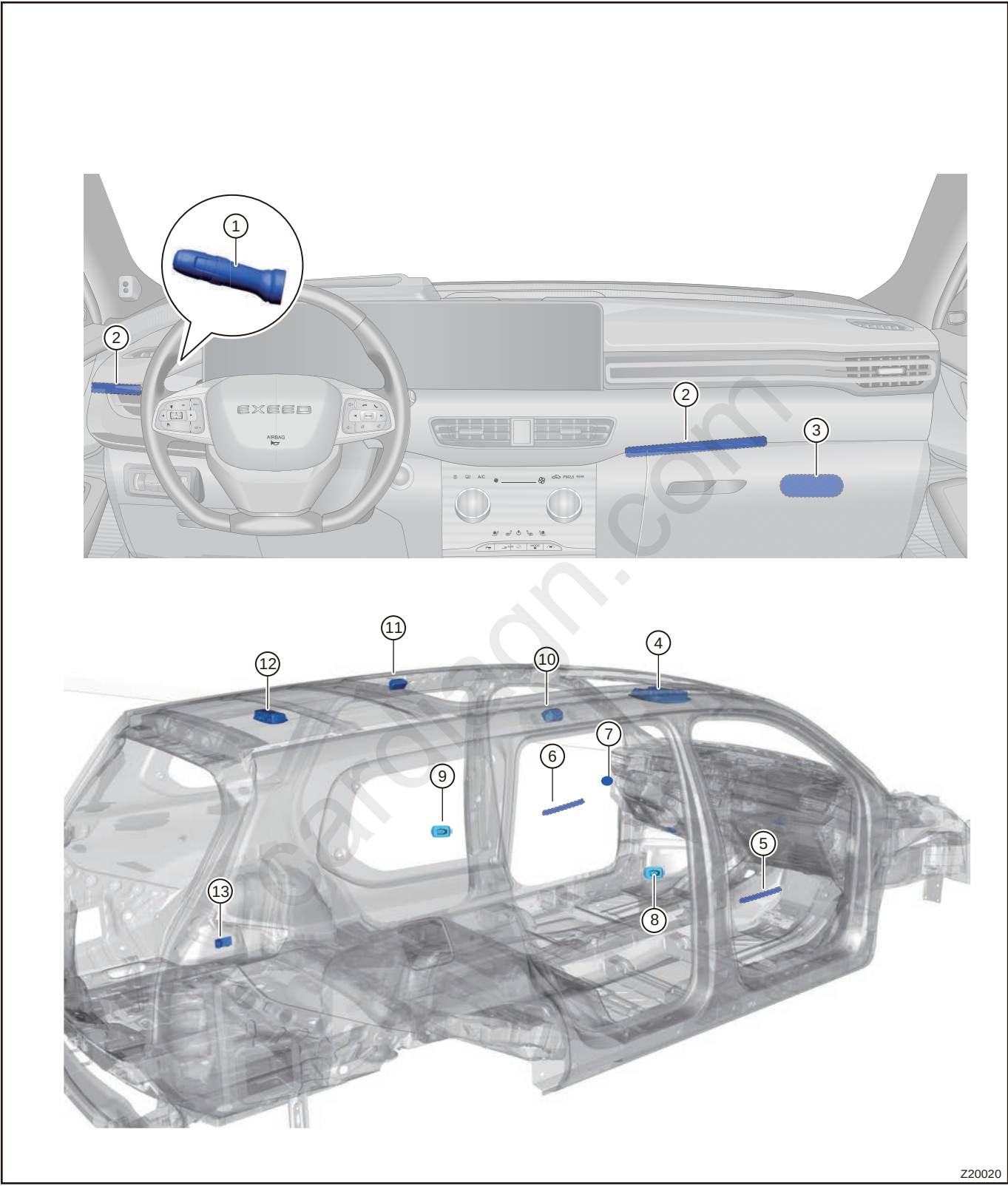
- (1) Be sure to wear safety equipment to prevent accidents, when removing interior lighting appliance.
- (2) Appropriate force should be applied when removing interior lighting appliance. Be careful not to operate roughly.
- (3) Try to prevent interior and body paint surface from being scratched, when 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



Z20020

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			
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.

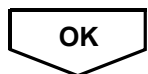
Hint:

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

1	Check fuse
---	------------

- Turn ENGINE START STOP switch to OFF.
- Disconnect the negative battery cable.
- Check for continuity of fuse in instrument panel fuse with a digital multimeter.

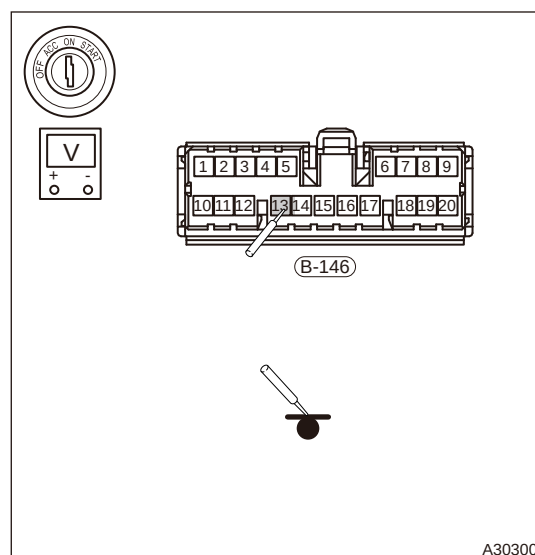
NG	Replace fuse.
----	---------------



2	Check ambient light power supply wire harness
---	---

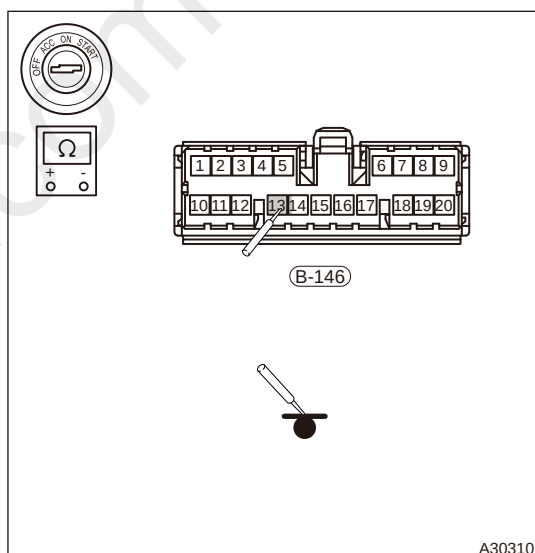
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the interior wire harness connector B-146.
- (d) Connect the negative battery cable.
- (e) Turn ENGINE START STOP switch to ON.
- (f) Using a digital multimeter, measure voltage between interior 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

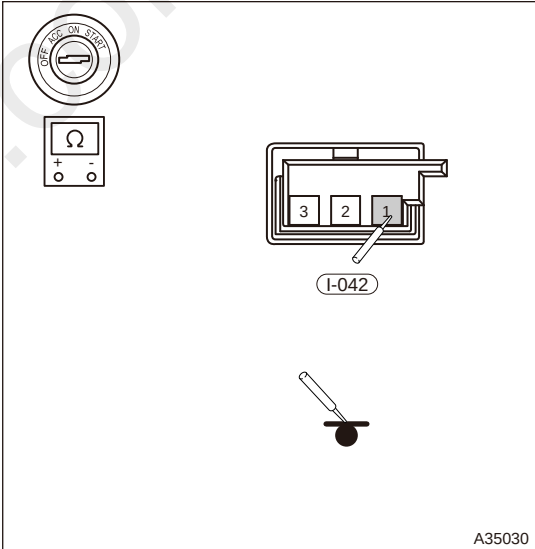
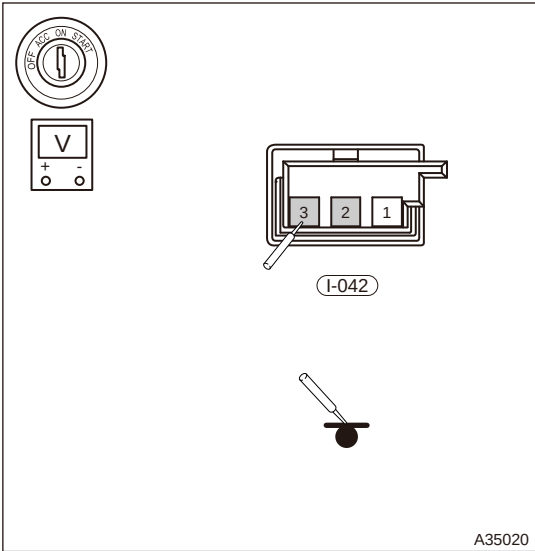
Check dual color ambient light output control circuit

- (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"	$\leq 1 \Omega$



OK

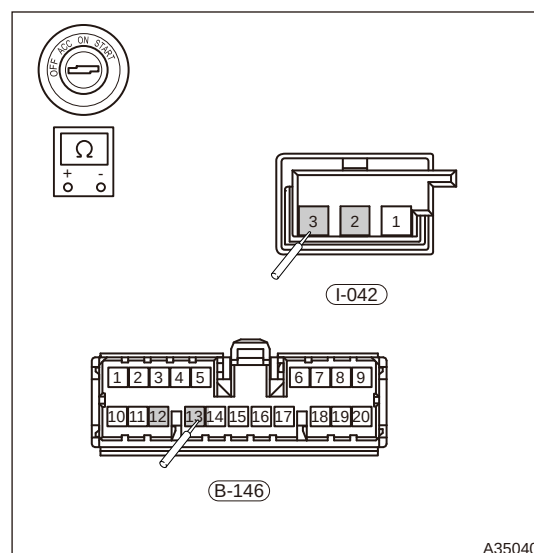
Replace instrument panel left dual color ambient light

NG

4	Check circuit
---	---------------

- Turn ENGINE START STOP switch to OFF and disconnect the negative battery cable.
- Disconnect the body controller connector B-146.
- Disconnect the instrument panel left dual color ambient light connector I-042.
- 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"	$\leq 1 \Omega$
B-146 (12) - I-042 (2)		



NG

Replace or repair wire harness.

OK

5

Reconfirm DTCs

- Connect the negative battery cable.
- Use diagnostic tester to clear DTCs.
- Start the engine.
- 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:

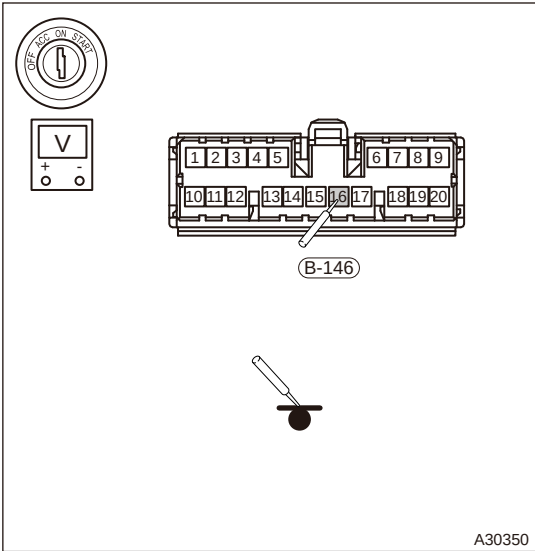
When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

1

Check power supply wire harness of interior light

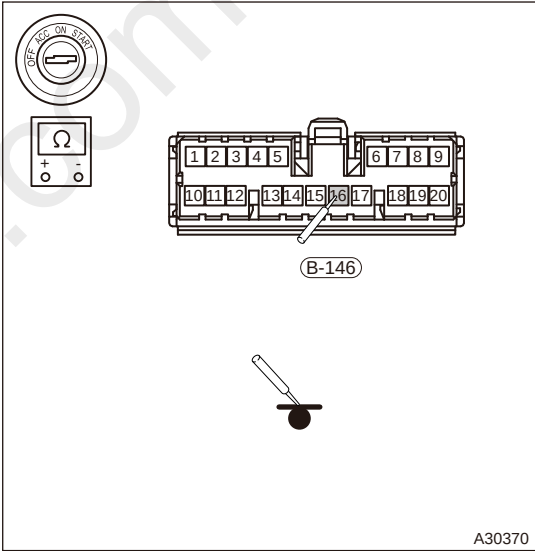
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the interior wire harness connector B-146.
- (d) Connect the negative battery cable.
- (e) Turn ENGINE START STOP switch to ON.
- (f) Using a digital multimeter, measure voltage between interior 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.

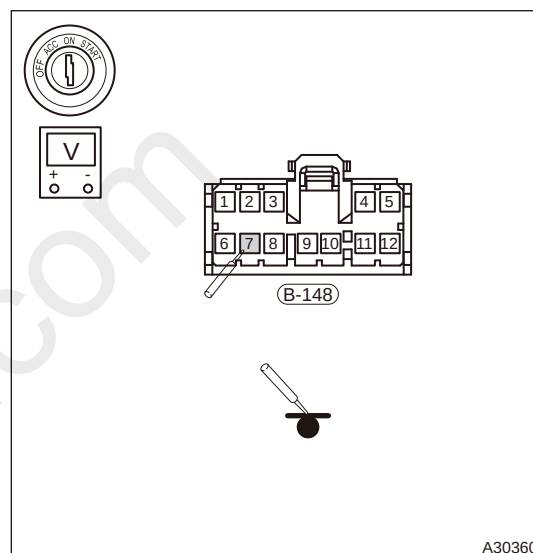
Hint:

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

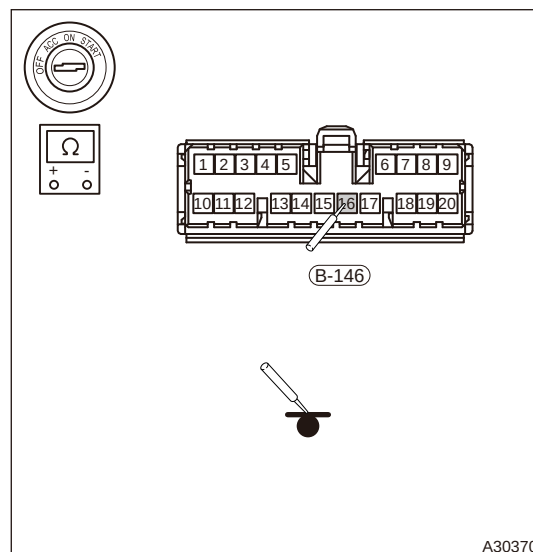
- (a) Turn ENGINE START STOP switch to OFF.
- (b) Disconnect the negative battery cable.
- (c) Disconnect the interior wire harness connector B-148.
- (d) Connect the negative battery cable.
- (e) Turn ENGINE START STOP switch to ON.
- (f) Using a digital multimeter, measure voltage between interior 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

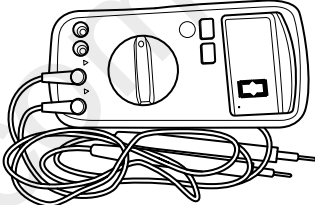
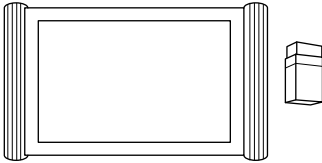
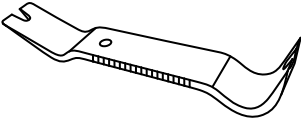
OK

System operates normally.

4 ON-VEHICLE SERVICE

4.1 Tools

■ General tools

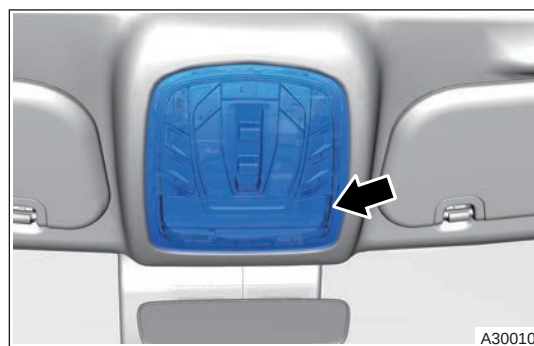
Tool Name	Tool Drawing
Digital Multimeter	 S00002
Diagnostic Tester	 S00001
Interior Crow Plate	 S00020

4.2 Replacement of Front Dome Light Assembly

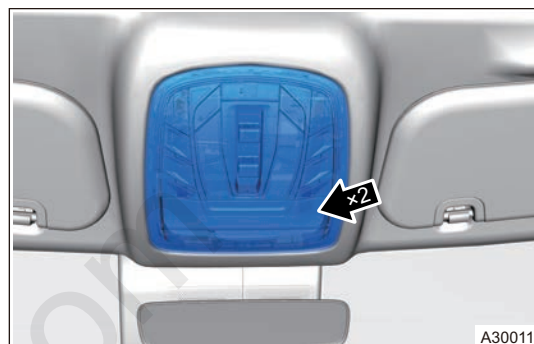
■ Removal

- (1) Turn off all electrical equipment and ENGINE START STOP switch.
- (2) Disconnect the negative battery cable.

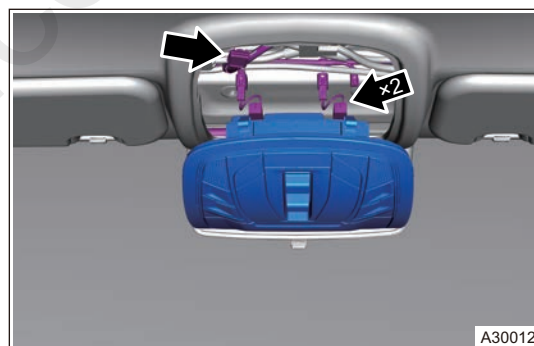
- (3) Open the glasses box on front dome light as shown in illustration.



- (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: $2.5 \pm 0.5 \text{ N}\cdot\text{m}$

- (3) Close the glasses box.
- (4) Connect the negative battery cable.

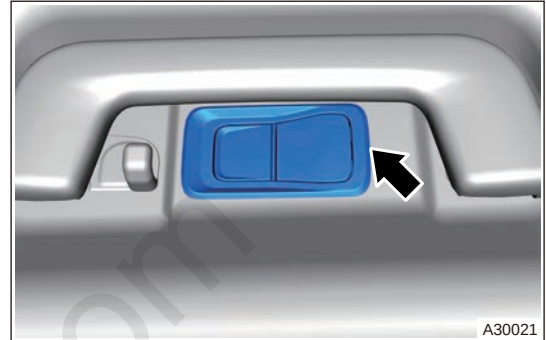
4.3 Replacement of Rear Left Interior Dome Light Assembly

■ 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.



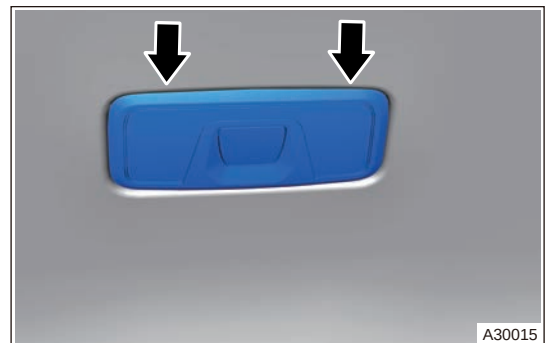
■ Installation

- (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.

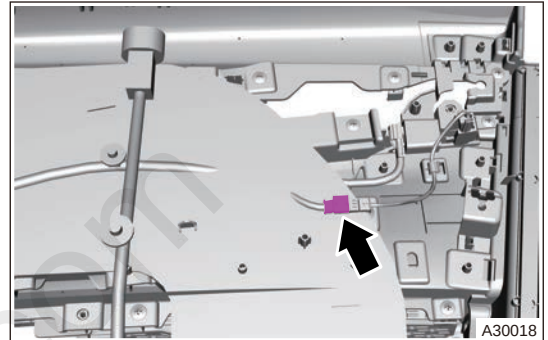
4.5 Replacement of Front Left Door Ambient Light

■ 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

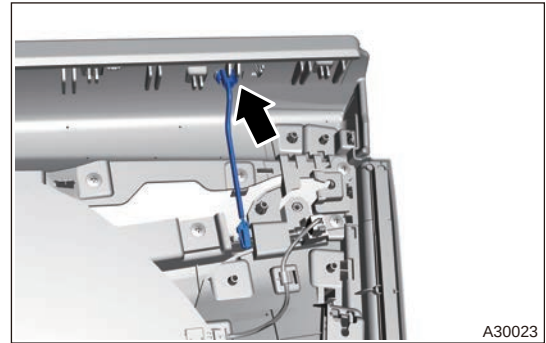
- (1) Install front left door ambient light, and connect 2 connectors of front left door ambient light.
- (2) Install the front left door protector assembly.
- (3) Connect the negative battery cable.

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.

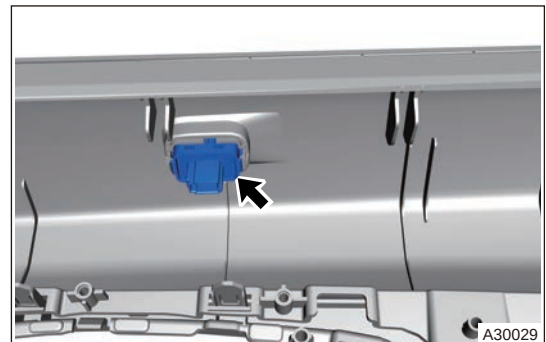
4.7 Replacement of Rear Door Opening Warning Light

■ 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.

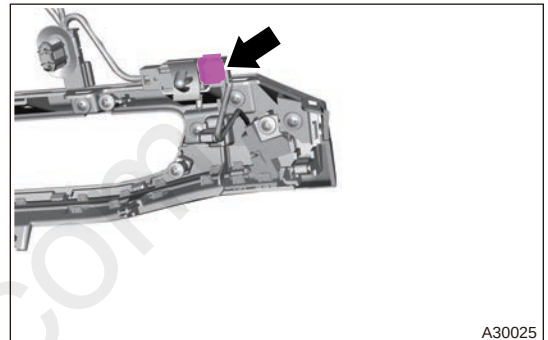
4.8 Replacement of Instrument Panel Ambient Light

■ Removal

WARNING

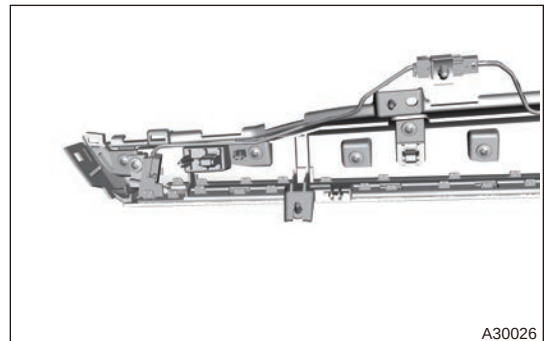
- Be sure to wear safety equipment to prevent accidents, when removing auxiliary fascia console ambient light.
- Appropriate force should be applied, when removing auxiliary fascia console ambient light. Be careful not to operate roughly.

- (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.



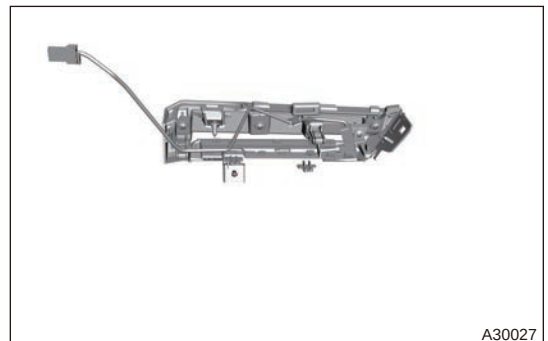
A30025

- (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

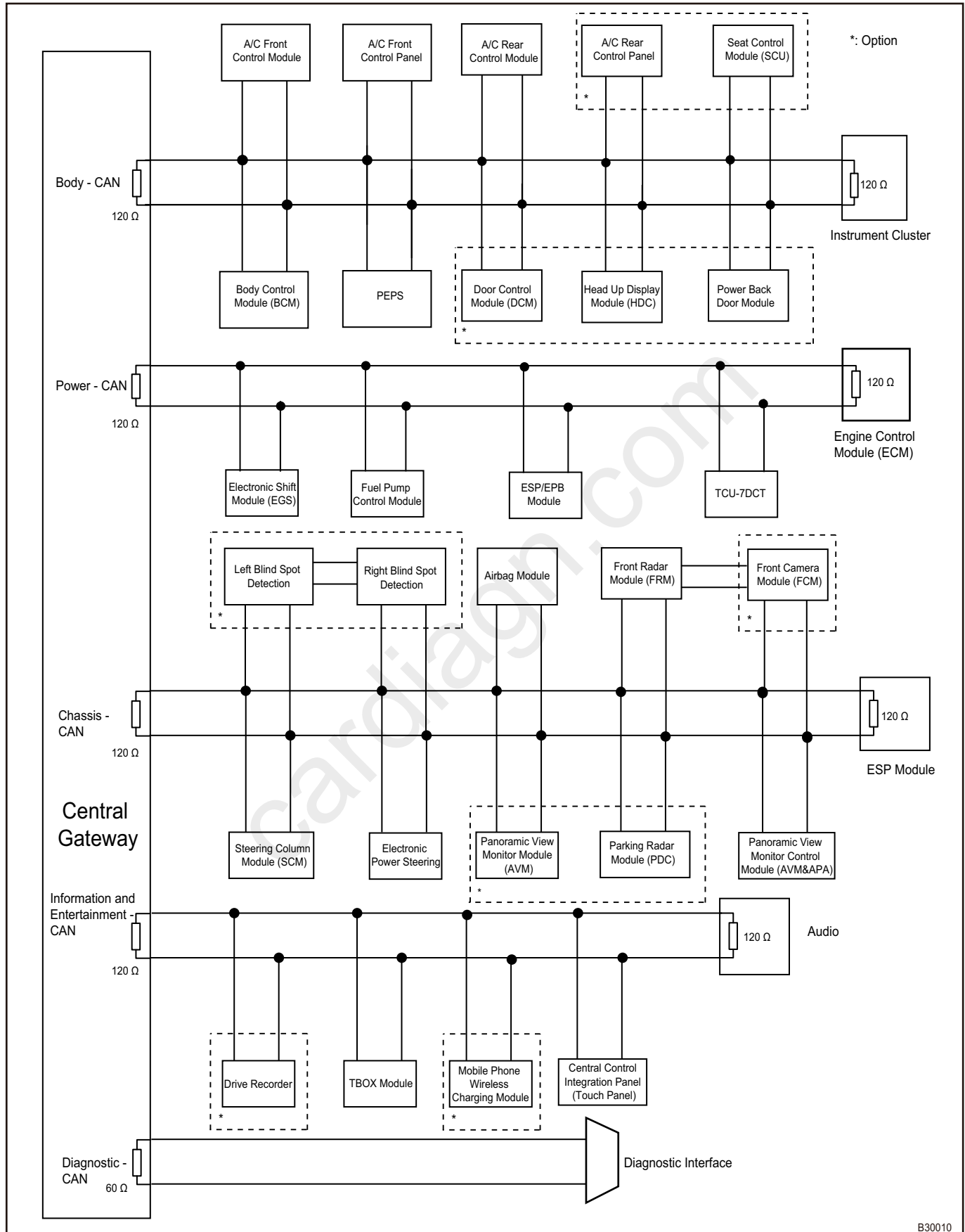
1.1 Precautions

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.

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2 System Principle



B30010

- 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: $9\text{ V} \leq U \leq 16\text{ V}$. CAN network communication voltage range: $6\text{ V} \leq U \leq 16\text{ V}$. 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.

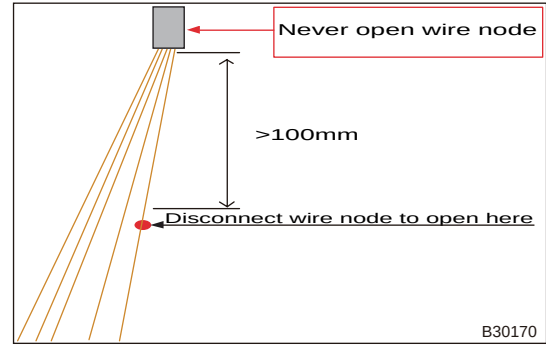
Link refers to a communication connection line between nodes. Link malfunction refers to malfunction of data communication lines, such as short circuit, open circuit and communication signal attenuation or distortion caused by changes in physical properties of the lines. These factors often cause multiple 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.

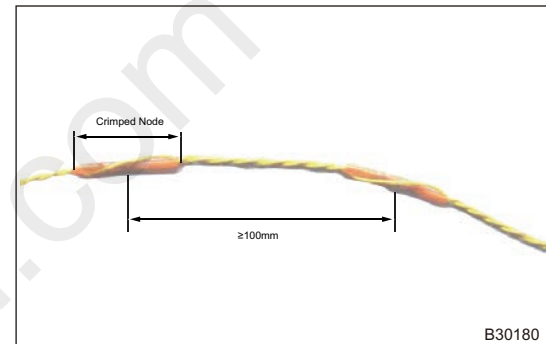
1) Maintenance instructions for CAN line.

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.



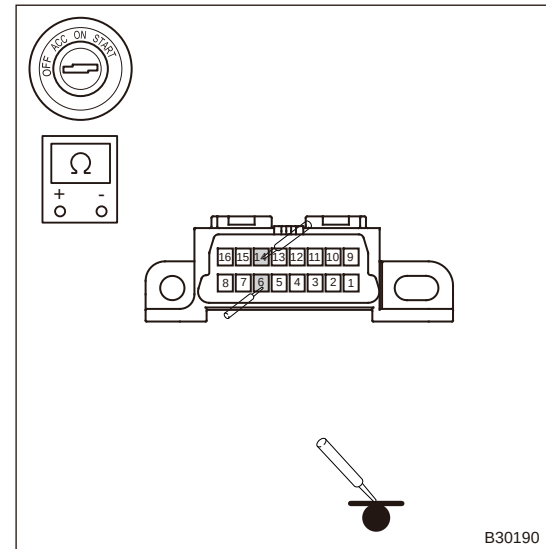
B30170



B30180

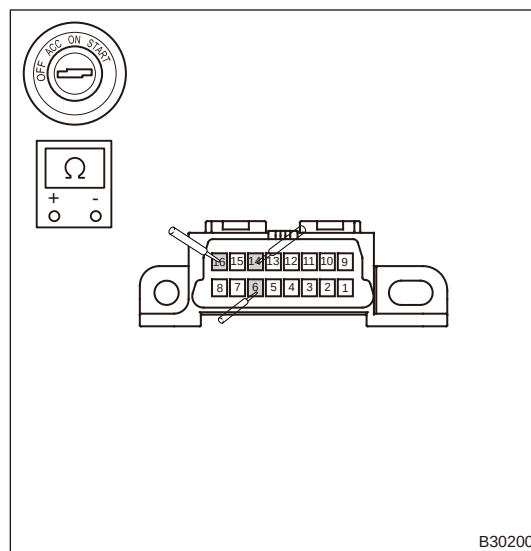
2) Use a multimeter to measure the resistance to ground and power supply of CAN-H and CAN-L.

- 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.



B30190

- 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 M Ω .



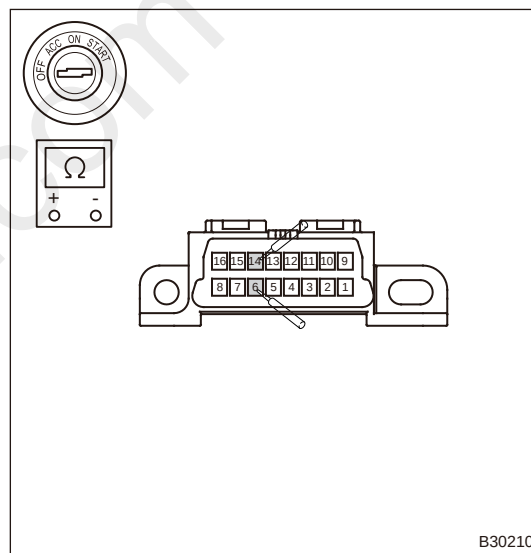
3) Termination resistor.

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:

- Turn ENGINE START STOP switch to OFF, disconnect the negative battery cable;
- Wait about 5 minutes until all capacitors are fully discharged;
- 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 58.7 Ω (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 ∞ .

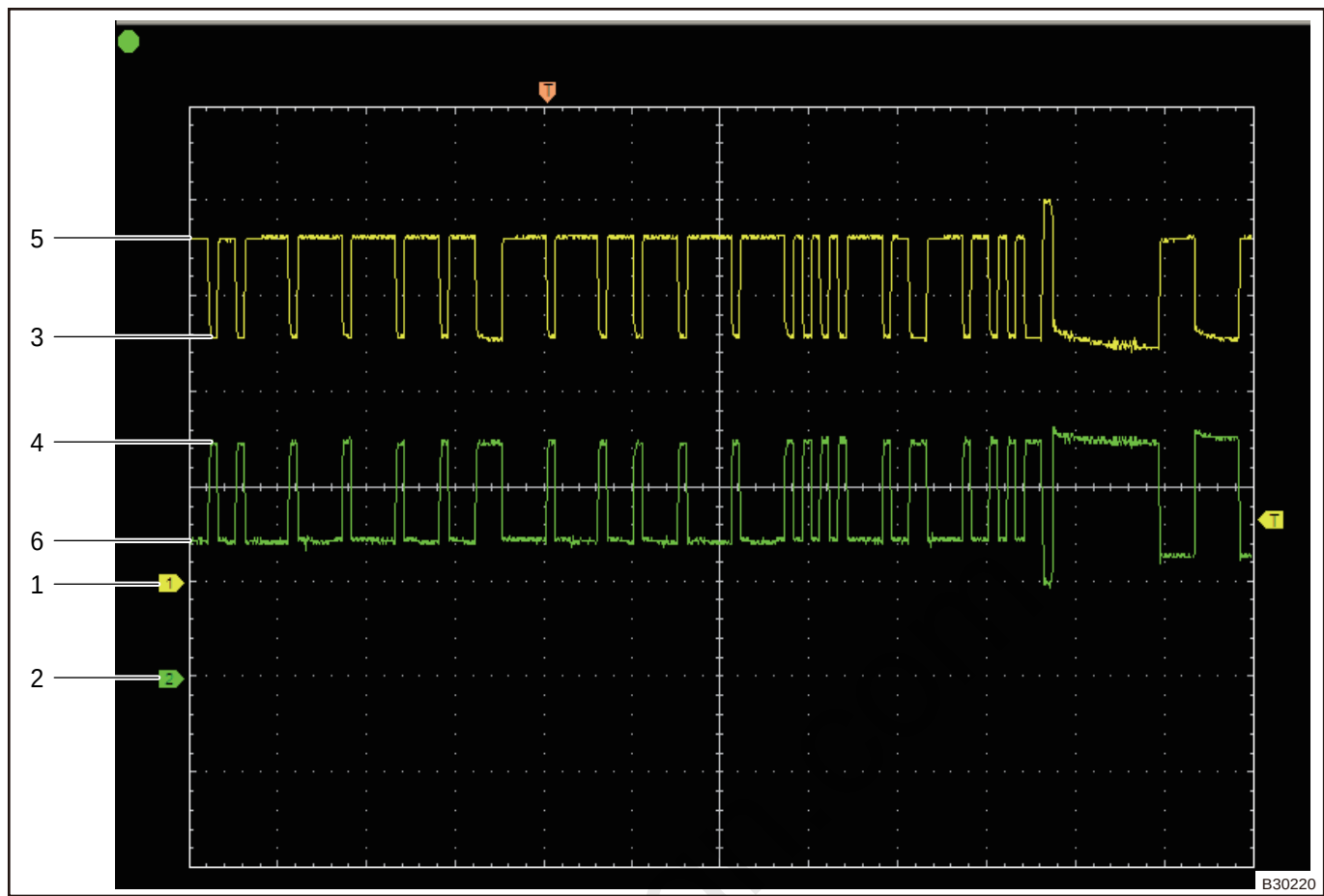


3.8 Oscilloscope Analysis

(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



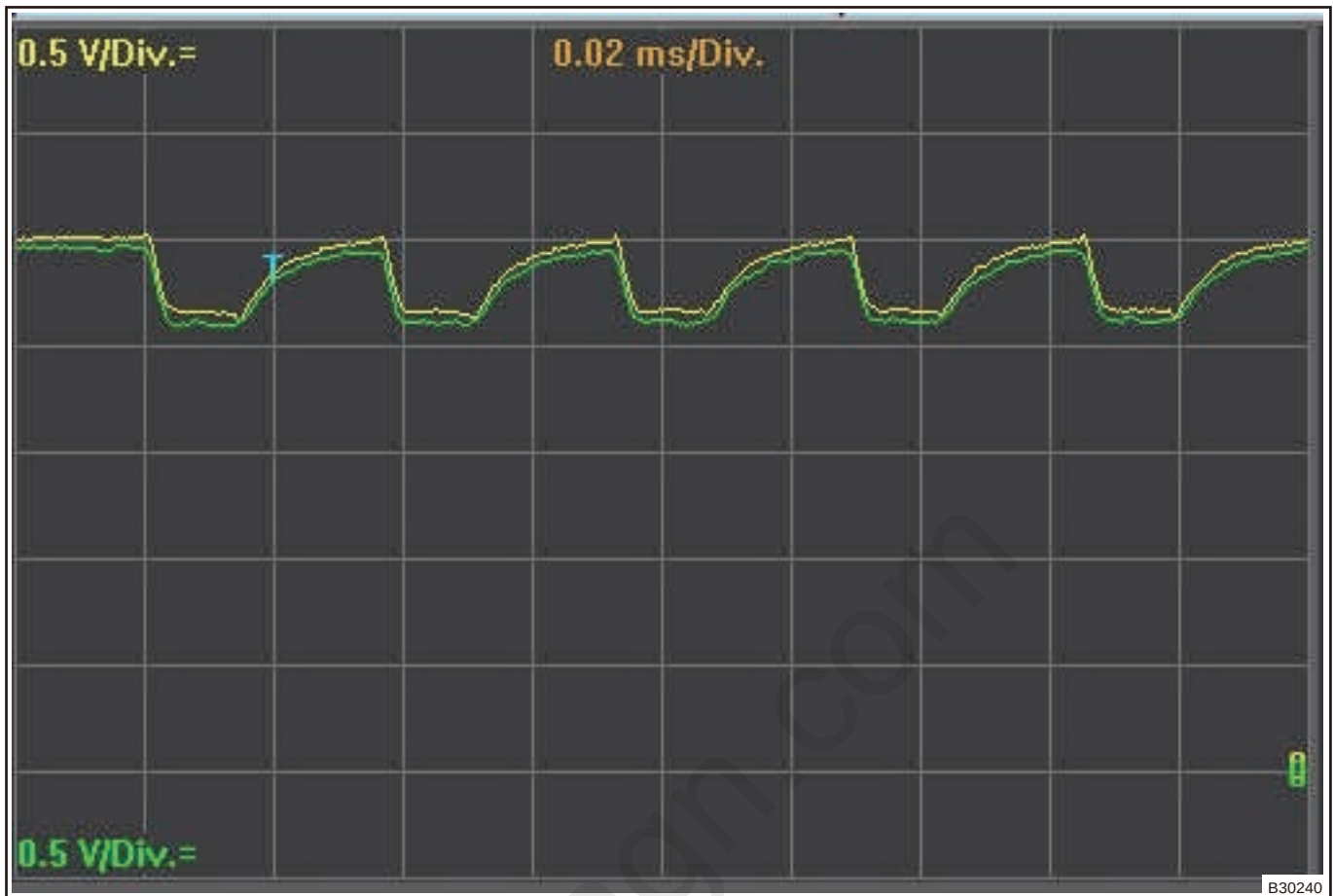
1	Zero potential of CAN-H	4	The recessive voltage potential of CAN-L is approximately 2.5 V (logic value 1)
2	Zero potential of CAN-L	5	The dominant voltage potential of CAN-H is approximately 3.6 V (logic value 0)
3	The recessive voltage potential of CAN-H is approximately 2.6 V (logic value 1)	6	The dominant voltage potential of CAN-L is approximately 1.4 V (logic value 0)

Poten- tial	CAN-H - Ground	CAN-L - Ground	Voltage Difference
Domin- ant	3.6 V (3.5 V)	1.4 V (1.5 V)	2.2 V (2.0 V)
Reces- sive	2.6 V (2.5 V)	2.5 V (2.5 V)	0.1 V (0 V)

Hint:

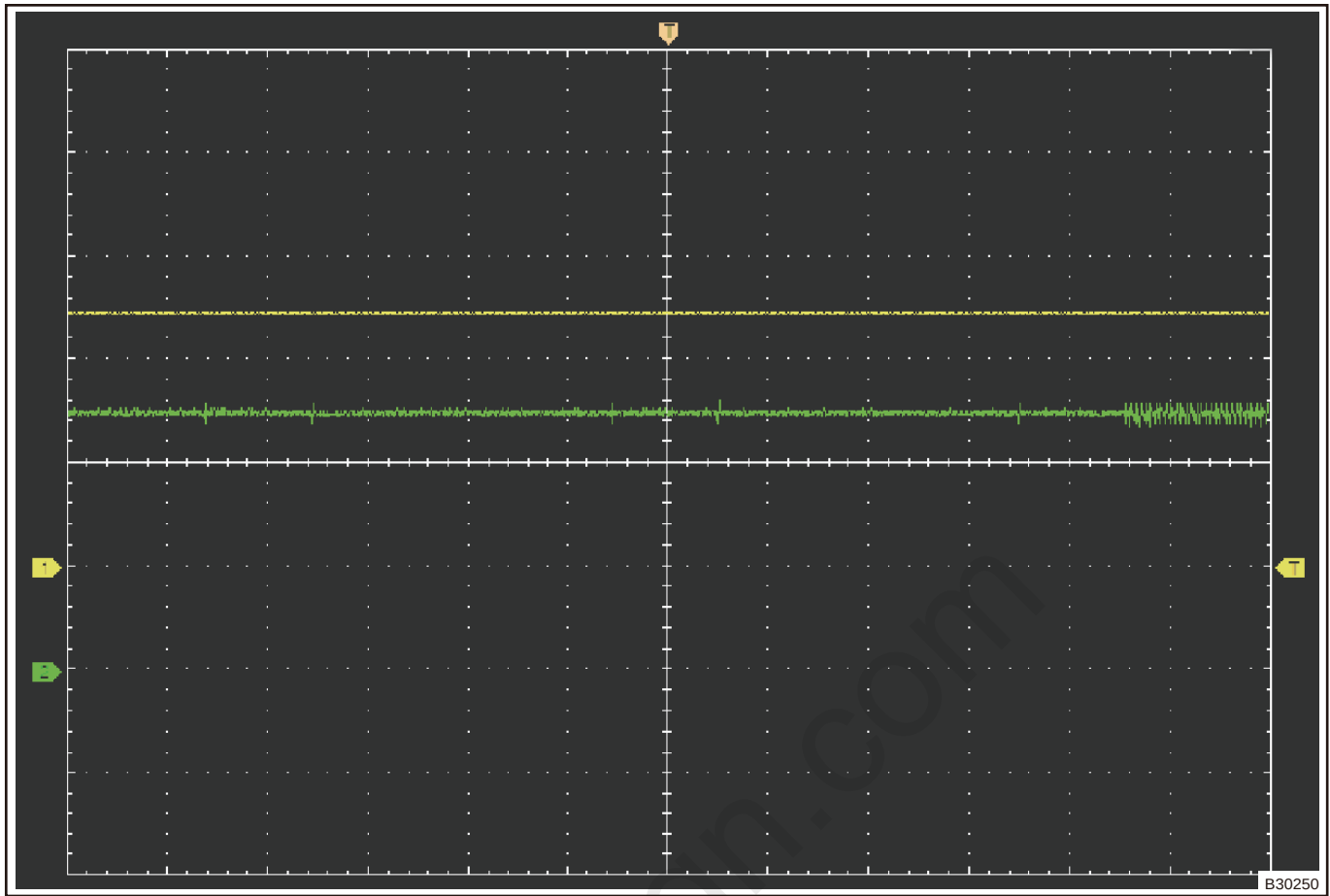
- 1) Always use voltage difference between two lines to confirm data. When voltage of CAN-H rises, the voltage of CAN-L decreases accordingly. The waveform is rectangular and symmetrical.
- 2) As the oscilloscope shows, CAN-Bus has only two operating states. At the recessive voltage potential, the two 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

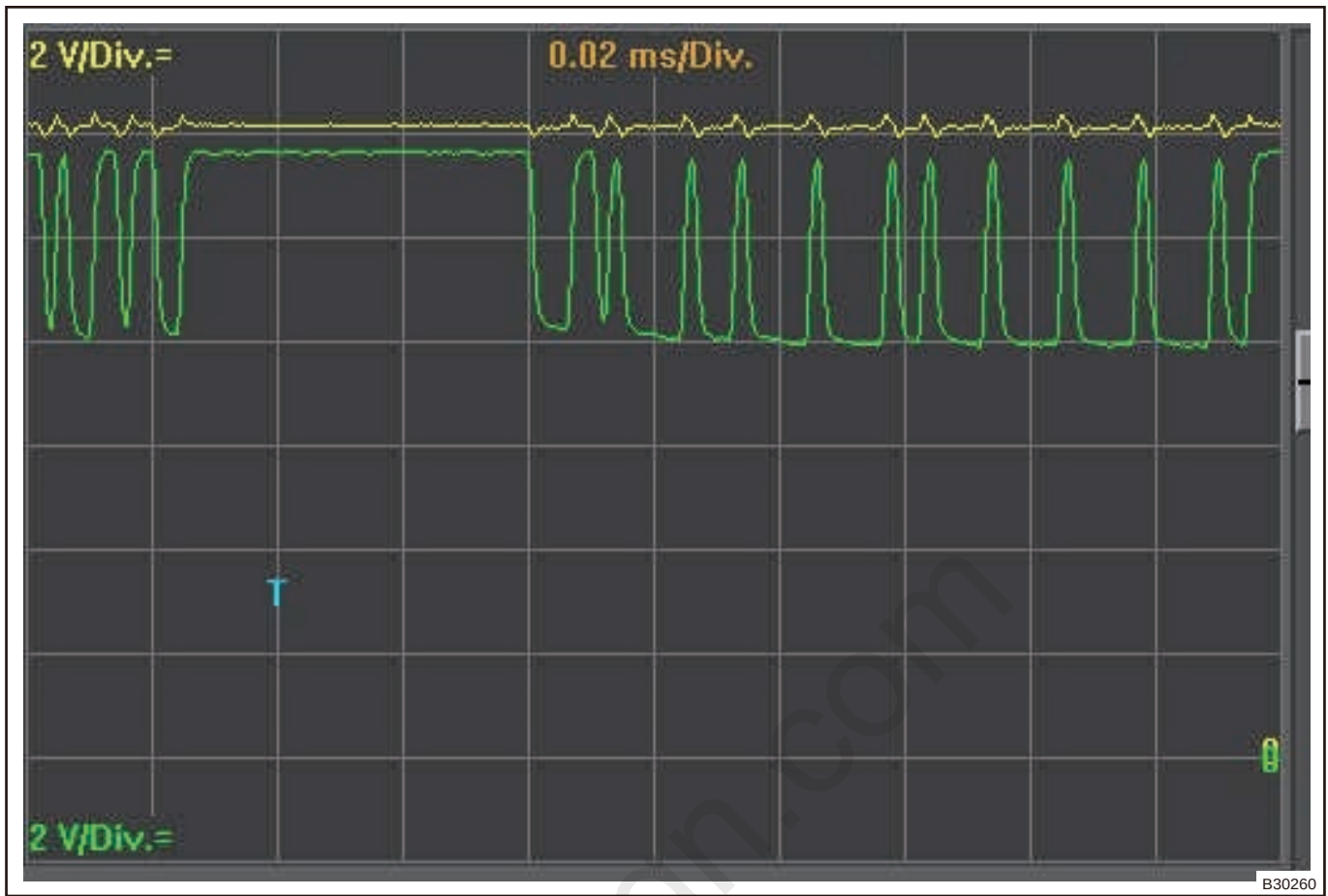
- Observe with an oscilloscope, the voltage potential is at recessive voltage value (approximately 2.5 V). By moving the position of zero potential on two oscilloscope channels to make the zero potential of two channels be coincident. It can be seen that waveforms of the CAN-H and CAN-L change consistently 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

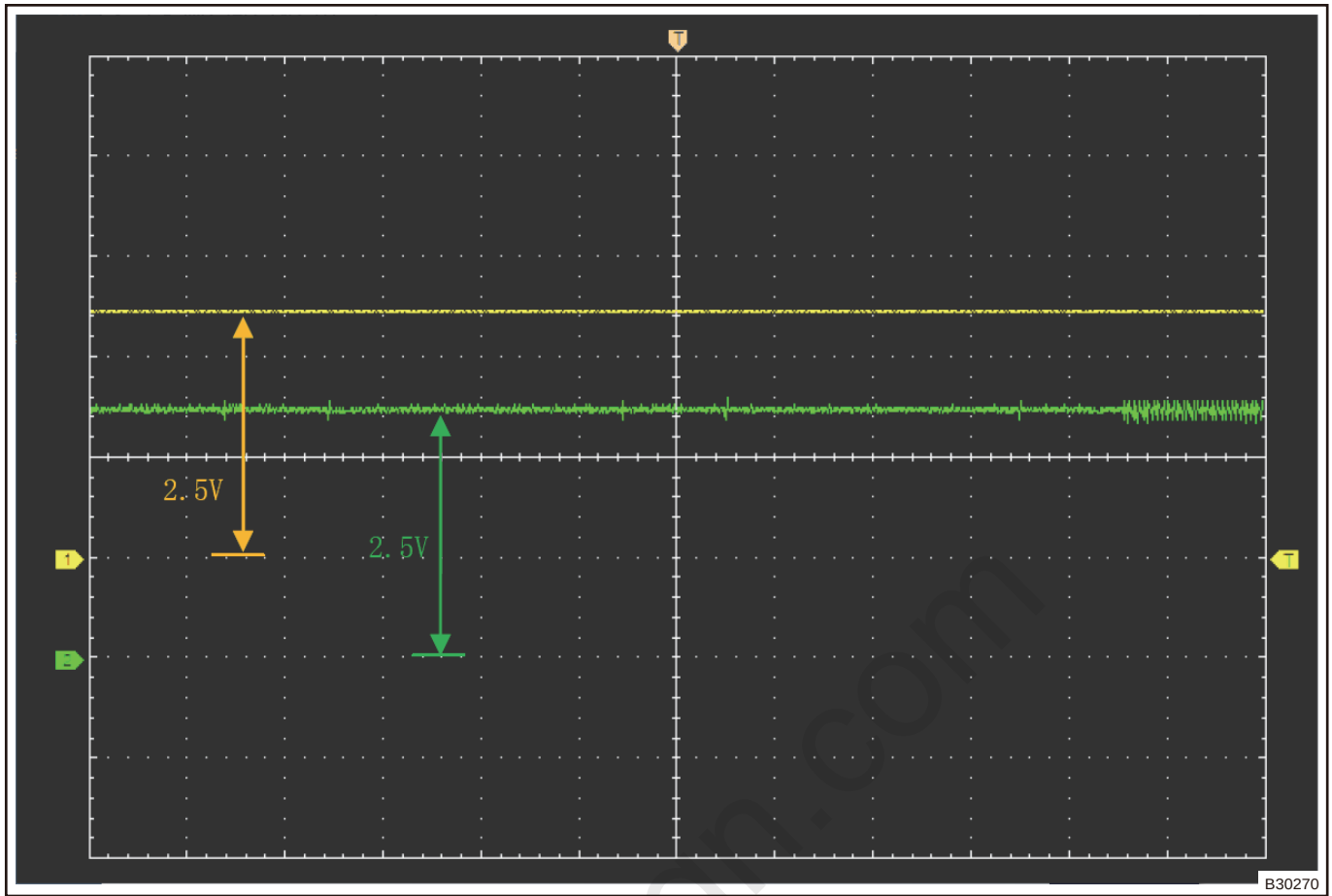


Malfunction symptoms:

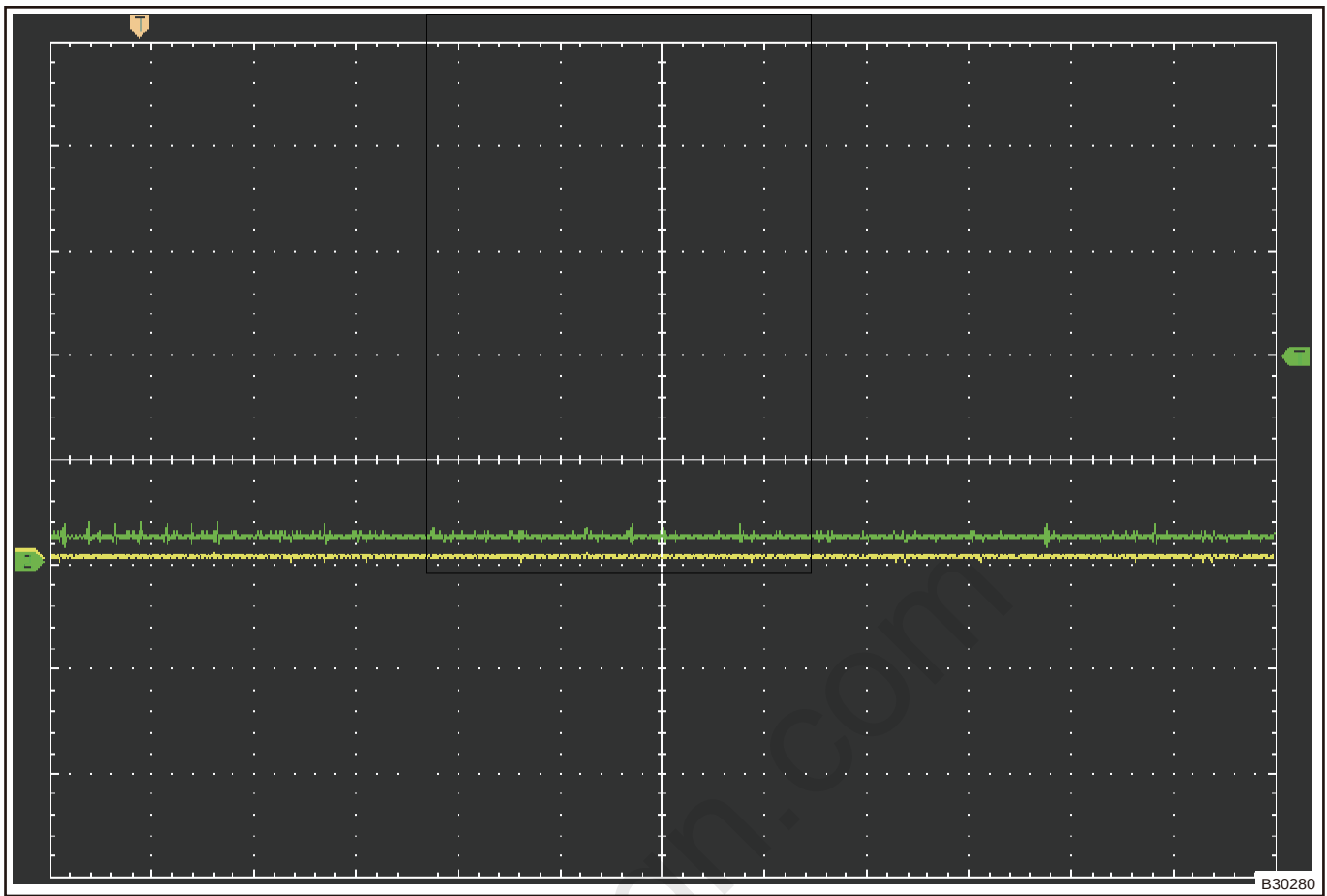
- Observe with an oscilloscope: the voltage potential of CAN-H line is placed at 12 V, the recessive voltage of CAN-L line is placed at approximately 12 V, and amplitude becomes larger due to internal connection of CAN-H and CAN-L in transceiver of control unit.

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.

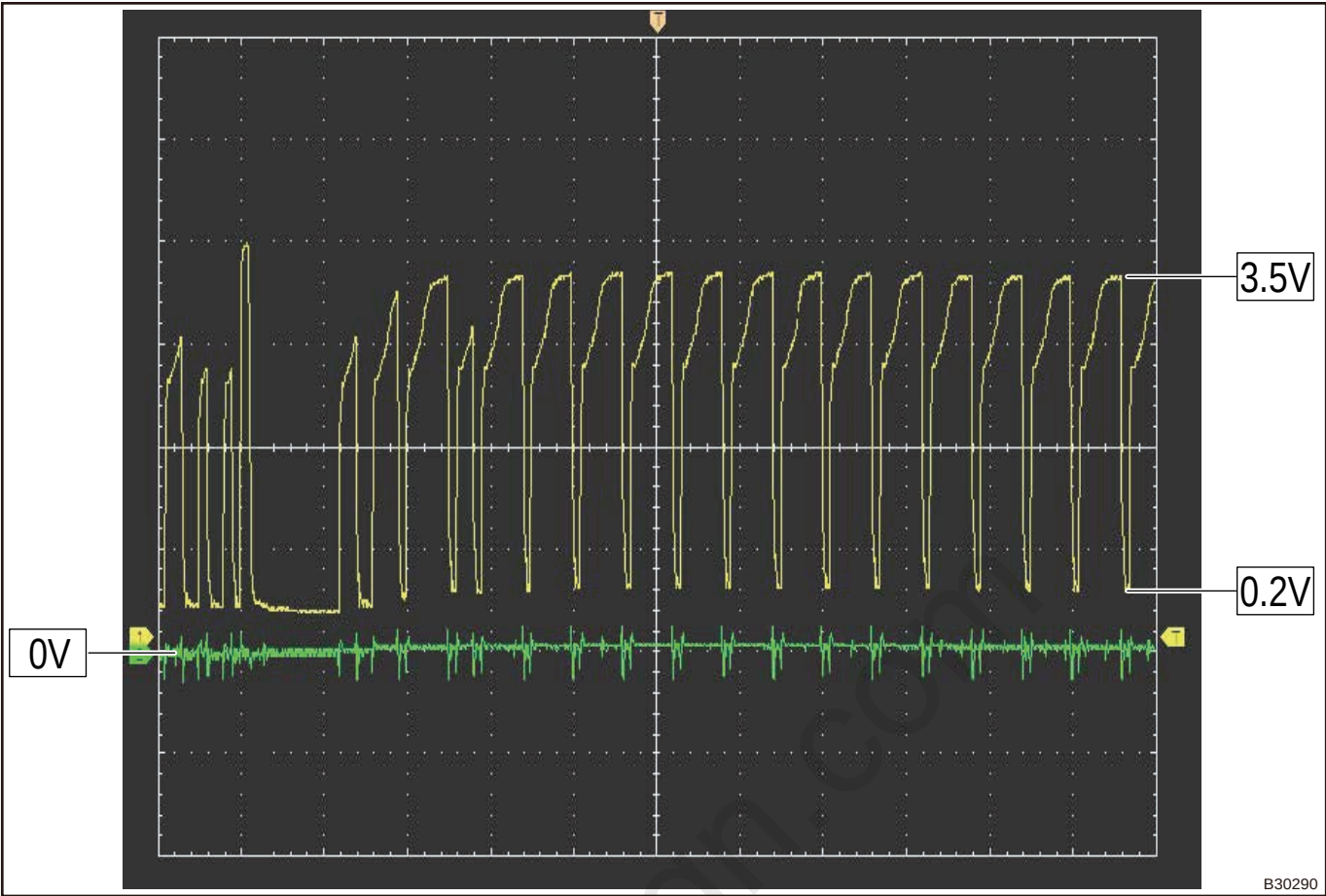
Troubleshooting procedures:

- 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.

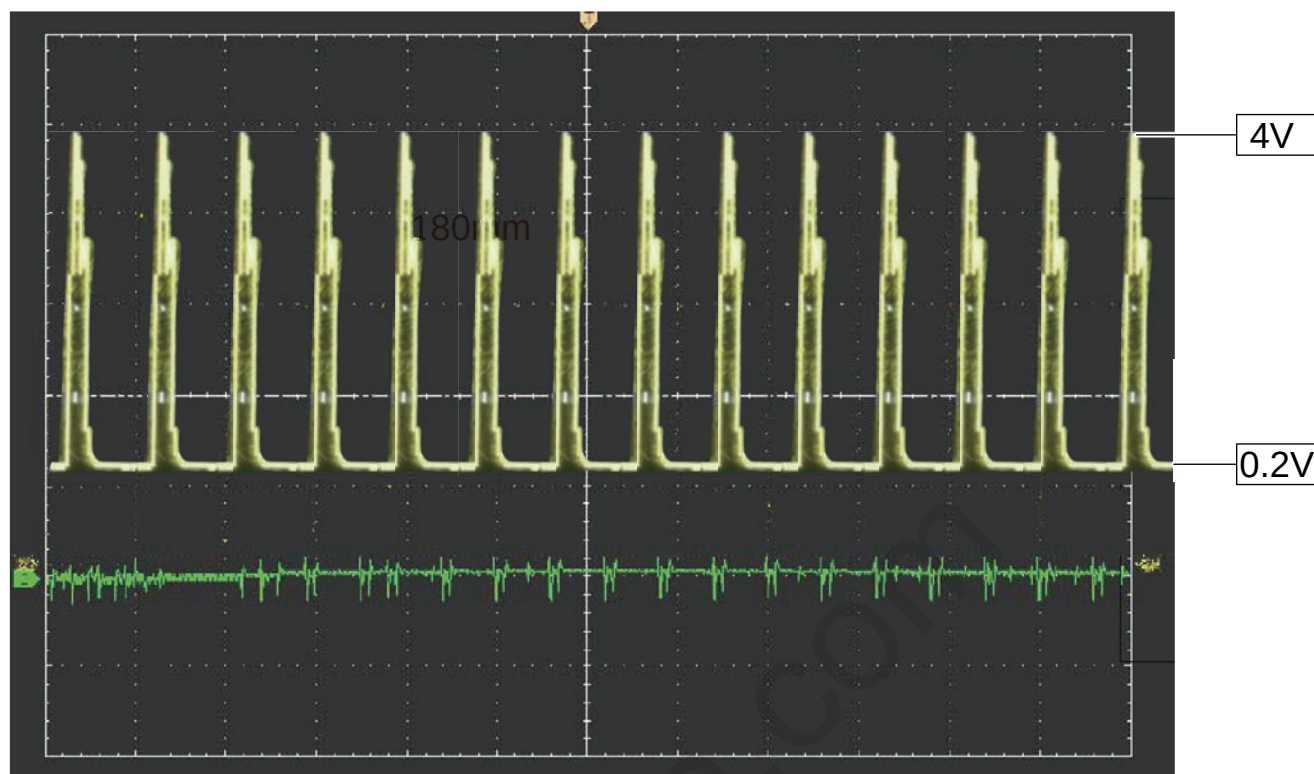
In the short circuit waveform to ground in CAN-H during actual vehicle test, the voltage potential of CAN-H line is placed at 0 V, and the recessive voltage of CAN-L line is placed at approximately 0.2 V. Power CAN and body CAN, CAN-H short to ground, vehicles can not start.

- (5) Short to ground in CAN-L

Malfunction waveform



CAN malfunction waveform



B30300

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.

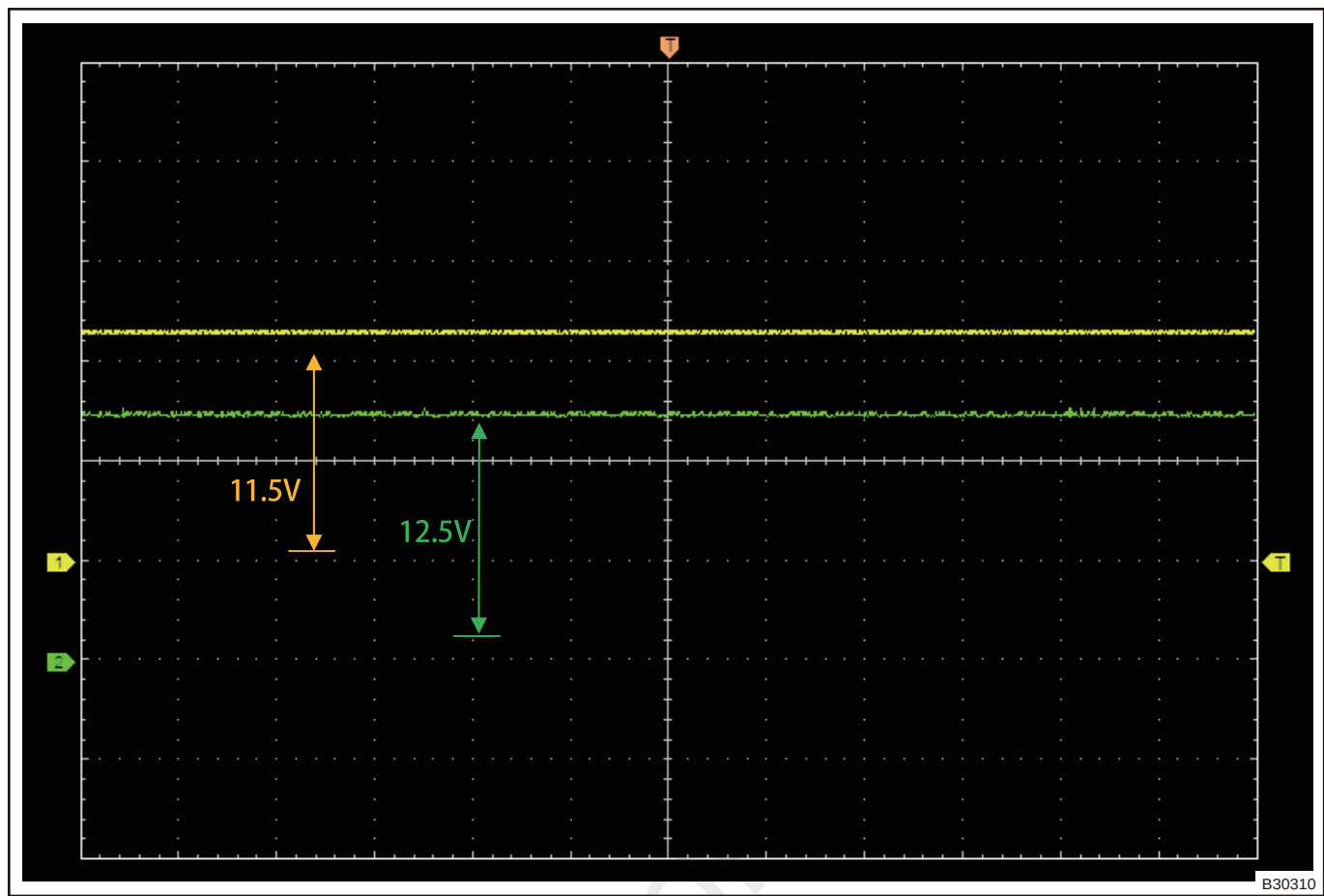
Troubleshooting procedures:

- 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:

- 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;
- If the waveform returns to normal when unplugging the connector of a module, this module is malfunctioning;
- 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	$\leq 1 \Omega$
RF39 - Instrument panel fuse box C4-4	Always	$\leq 1 \Omega$

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	$\leq 1 \Omega$
B-145(19) - Instrument panel fuse box C3-17	Always	$\leq 1 \Omega$

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	$\leq 1 \Omega$

- (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:

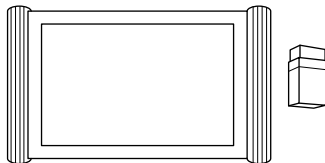
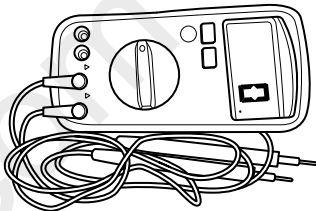
- The following detection takes rear bumper antenna as an example.
- When performing circuit diagnosis and test, always refer to the circuit diagram for specific circuit and component information.

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)

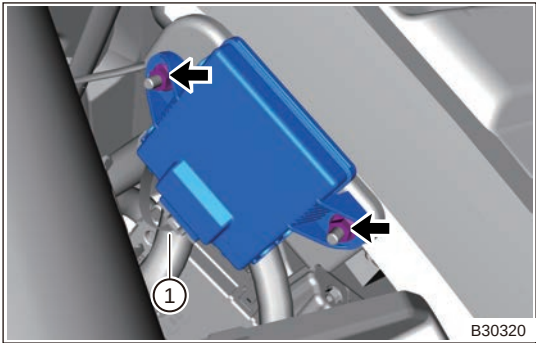
■ Removal

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

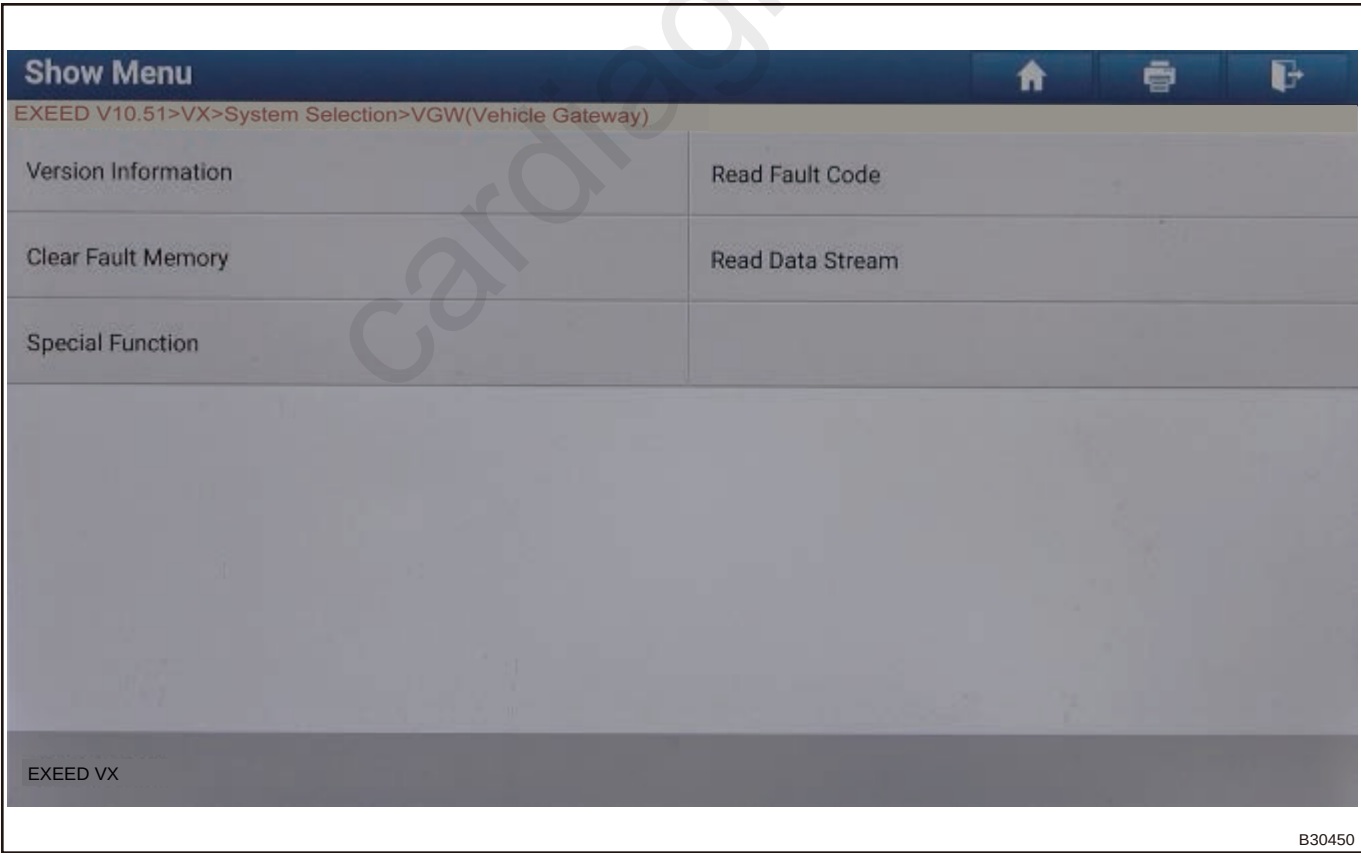
- (1) Install network module and connect connector.
Torque: 4 + 1 N·m

- (2) Install the instrument panel assembly.
- (3) Connect the negative battery cable.

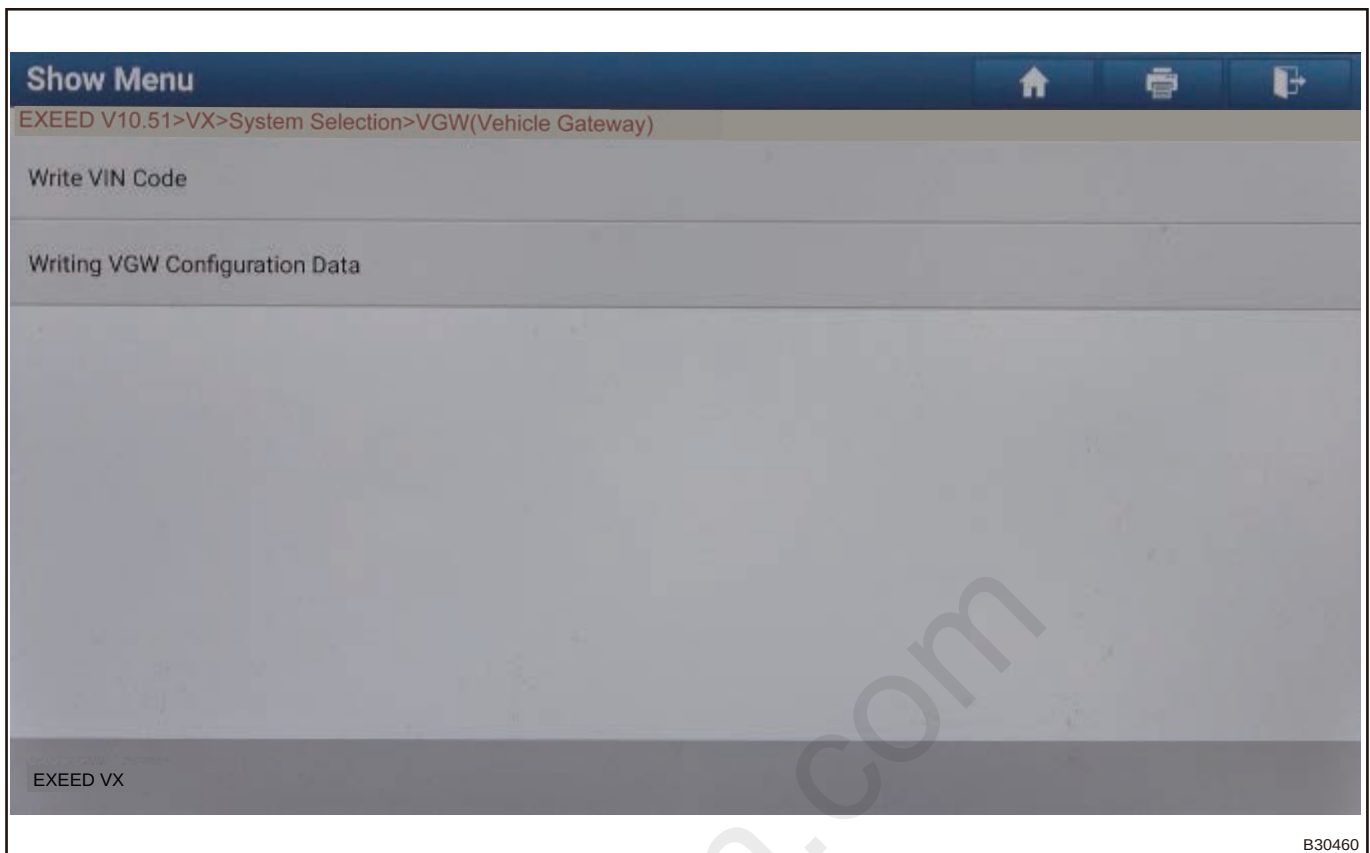
■ Matching Learning

■ Writing VIN code

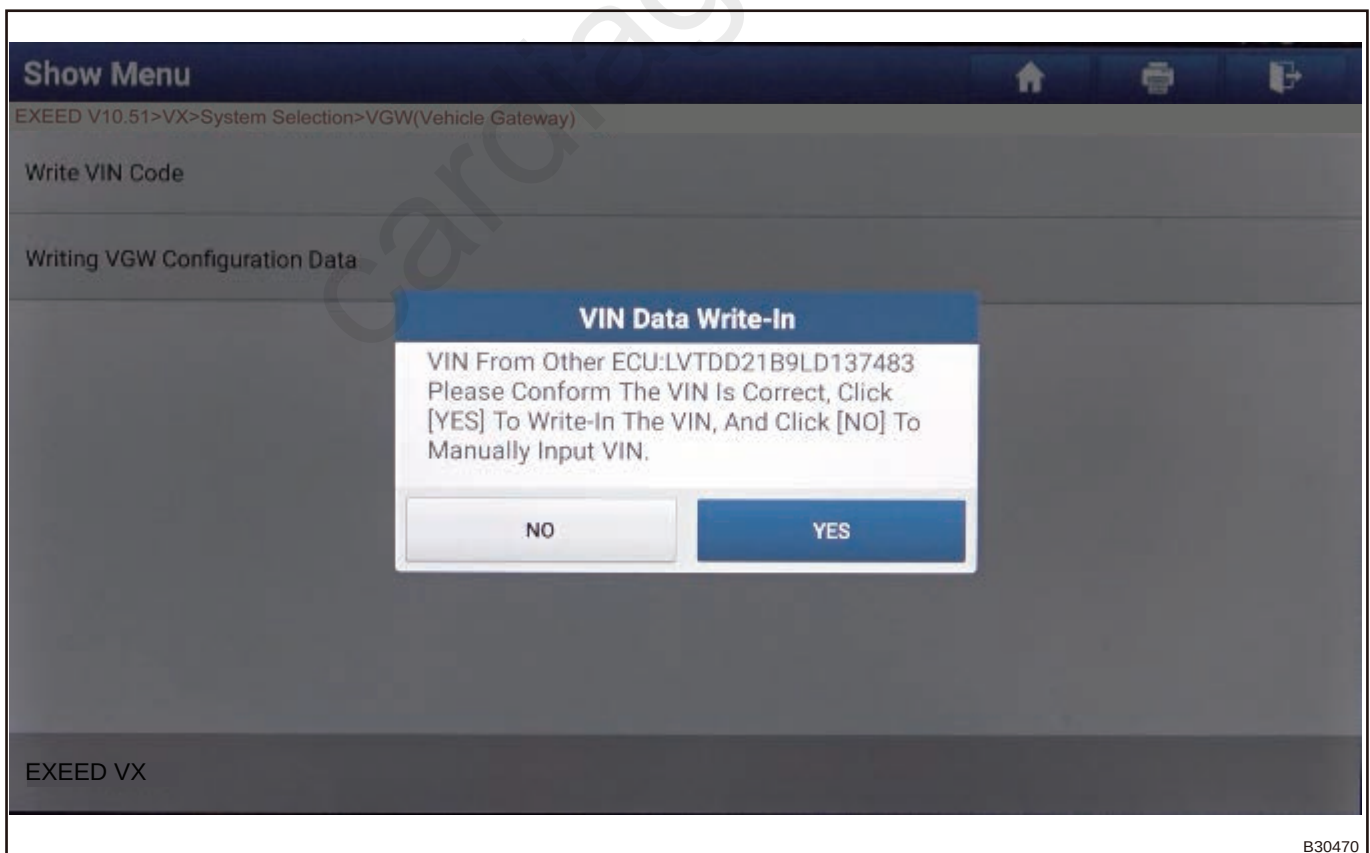
- (1) Connect the diagnostic tester, turn ENGINE START STOP switch to ON and select model, then enter “CGW” .
- (2) Click “Special Function” .



- (3) Select Special Function and click “Write VIN Code” .

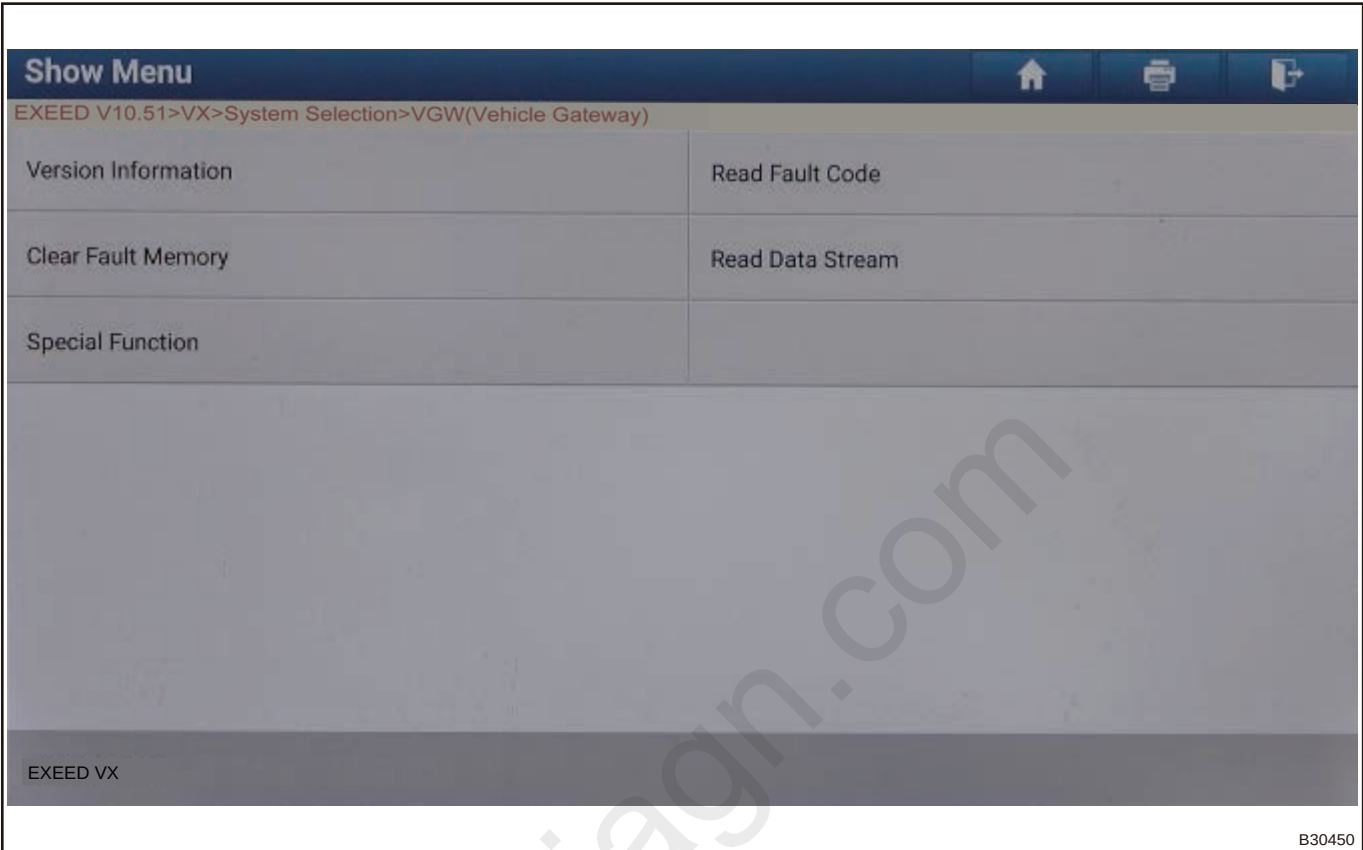


- (4) Enter next screen, determine if VIN code is correct, if correct, click “OK” , if not, click “NO” to input manually.

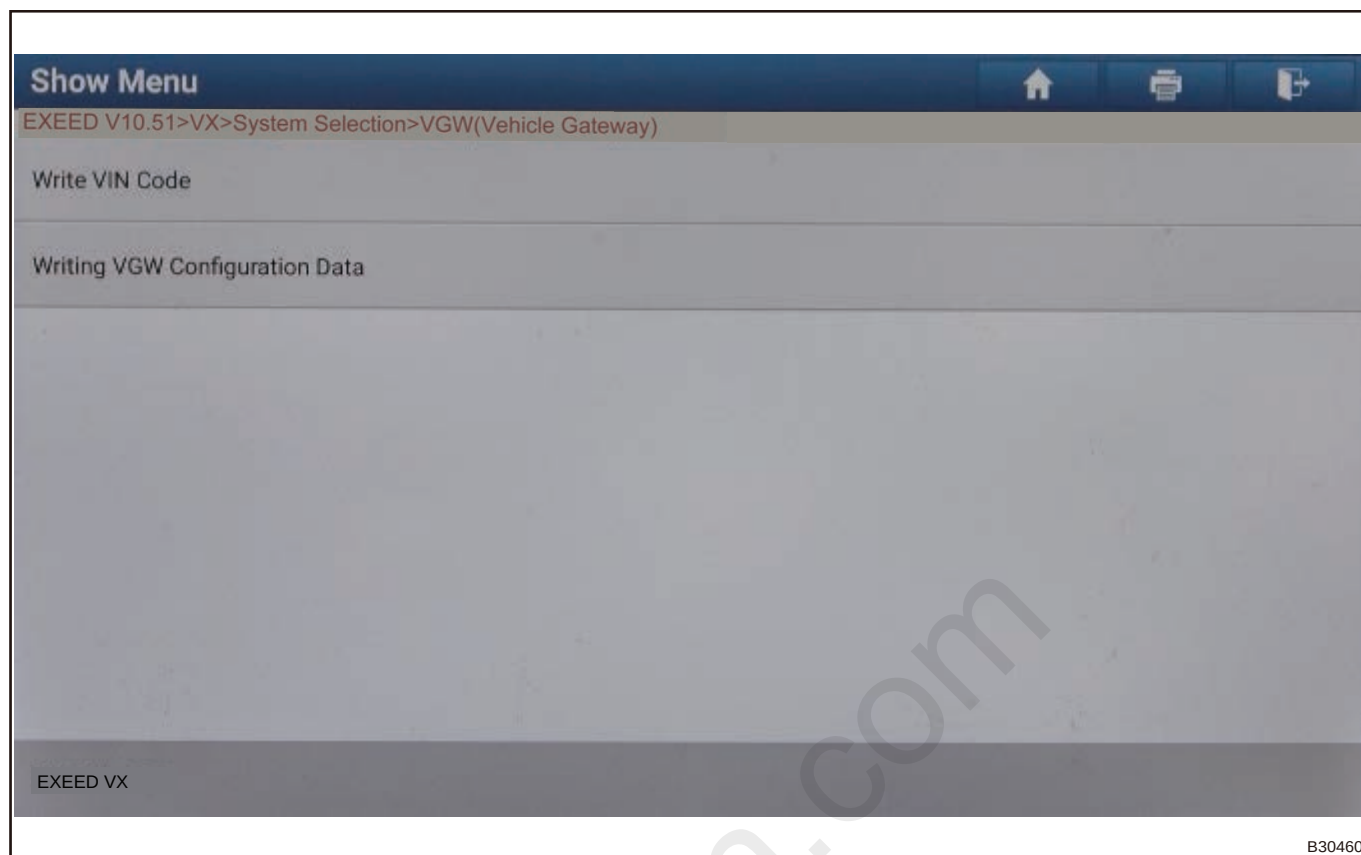


■ Saving configuration data

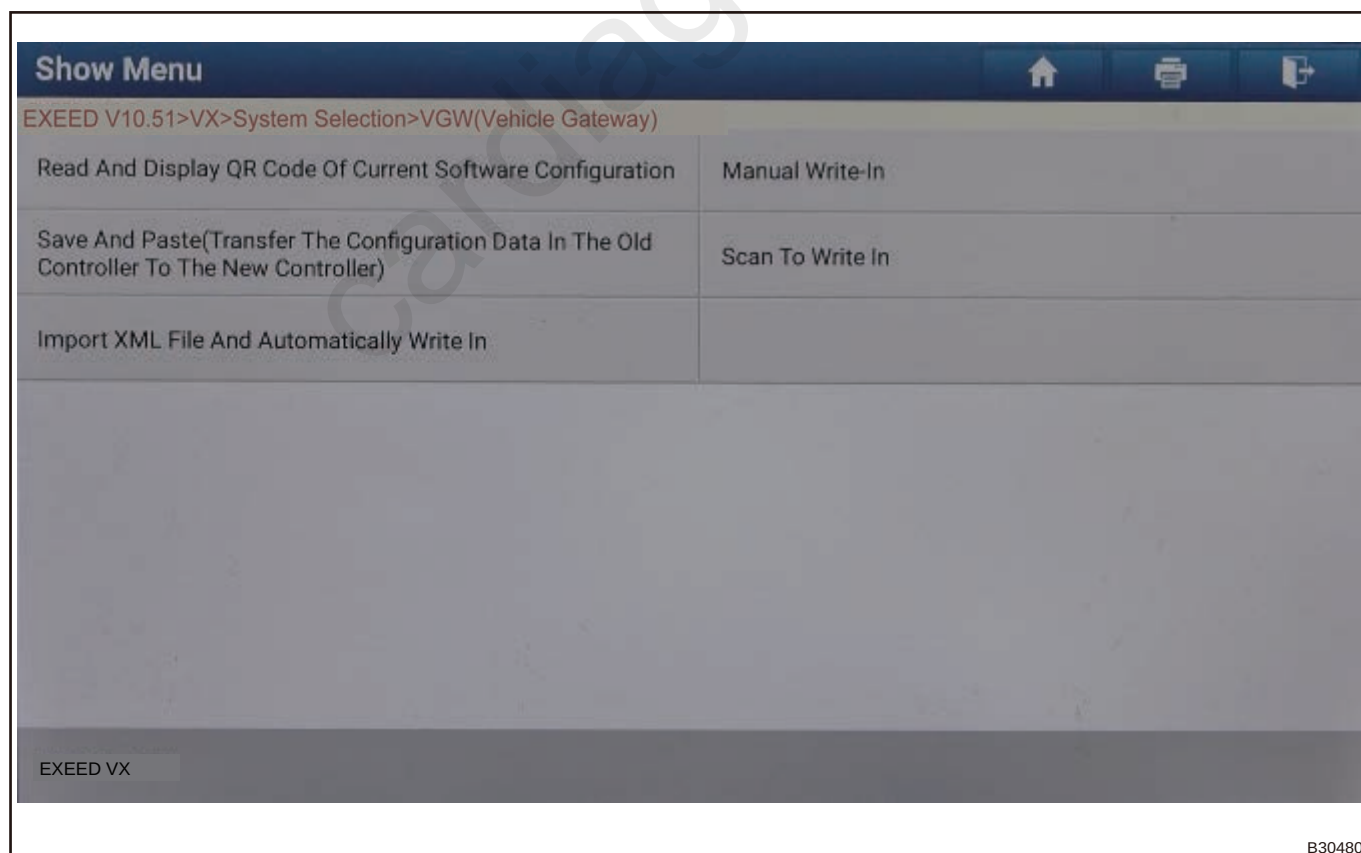
- (1) Click “VGW (Vehicle Gateway Module)” .
- (2) Click “Special Function” .



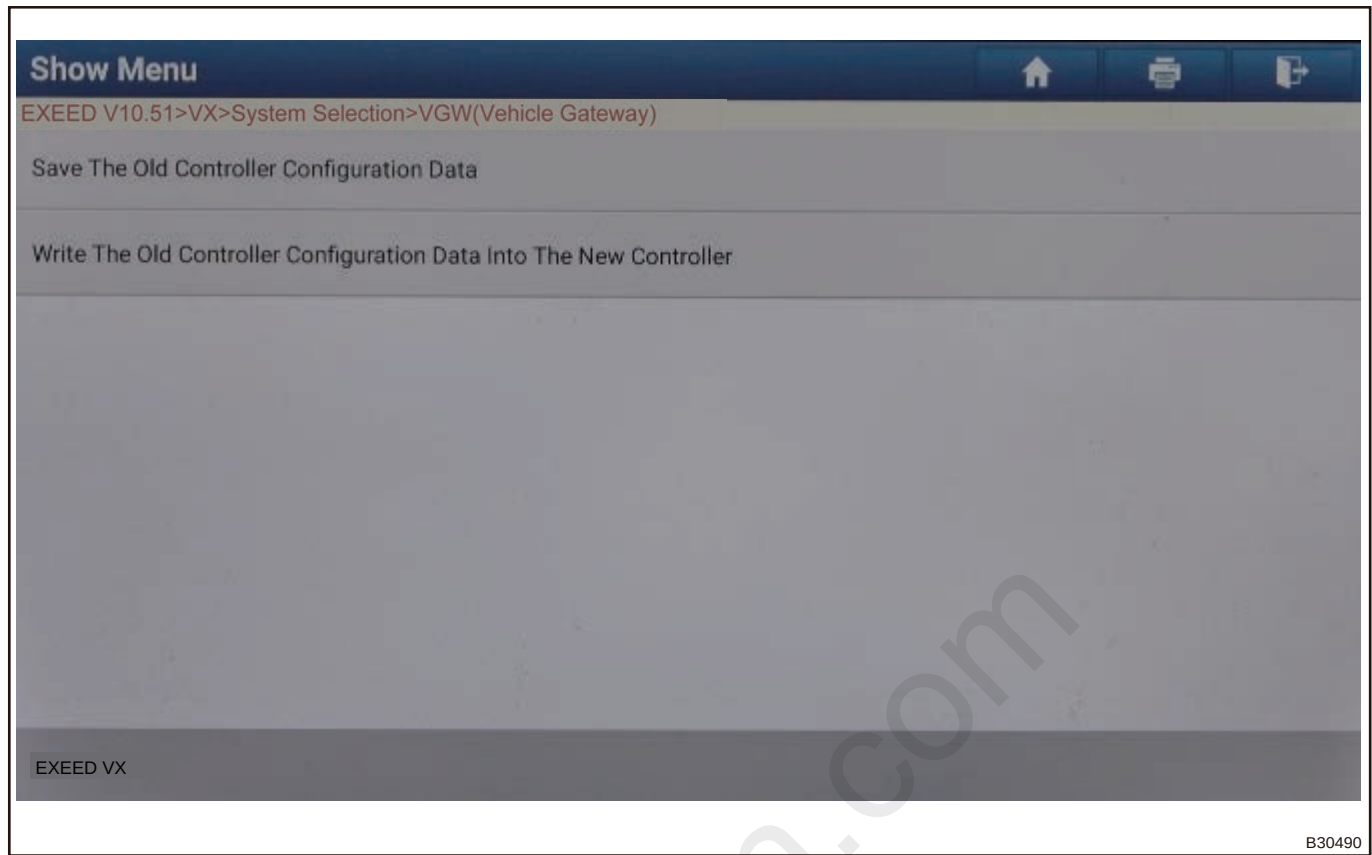
- (3) Click “Writing VGW Configuration Data” .



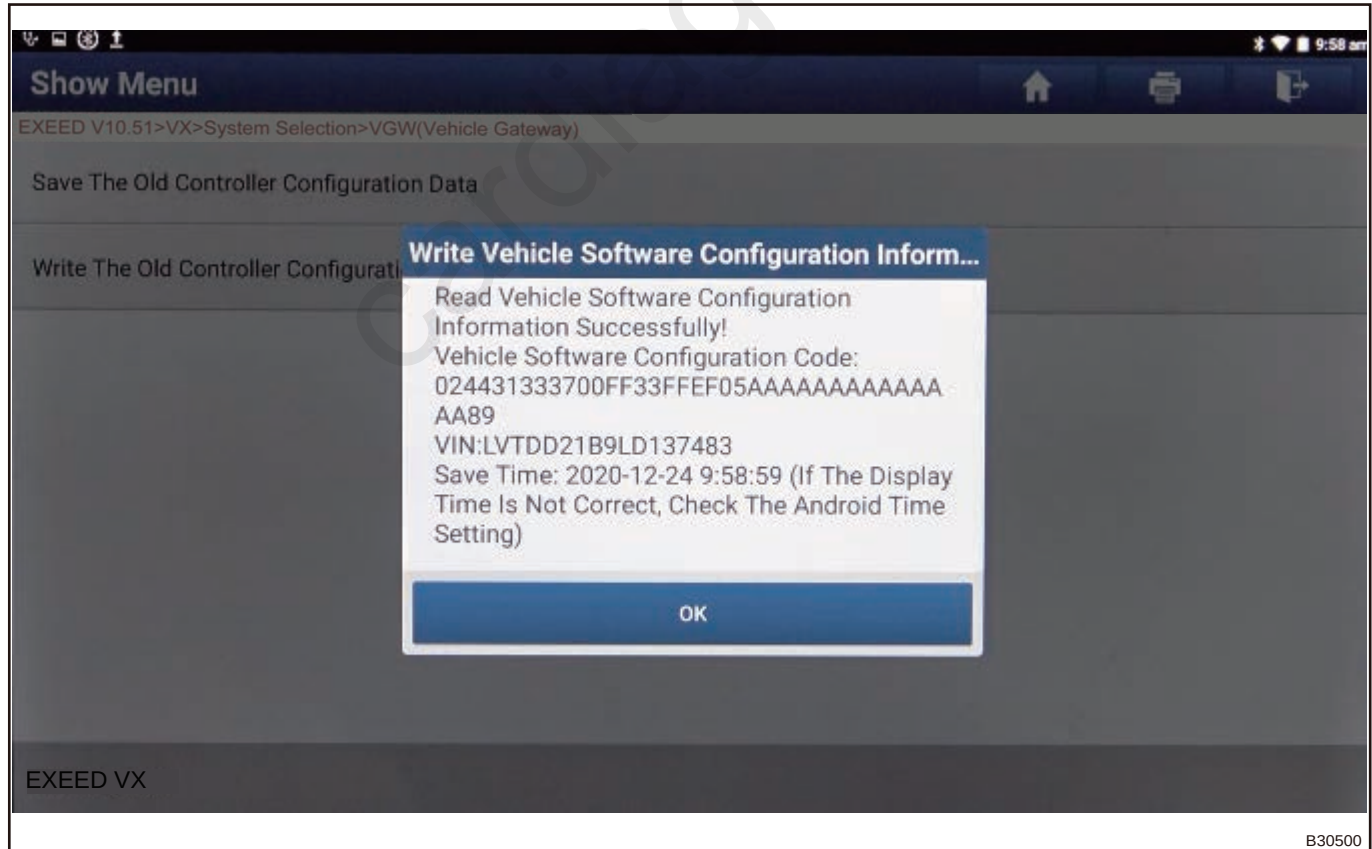
- (4) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller)” .



- (5) Click “Save The Old Controller Configuration Data” .

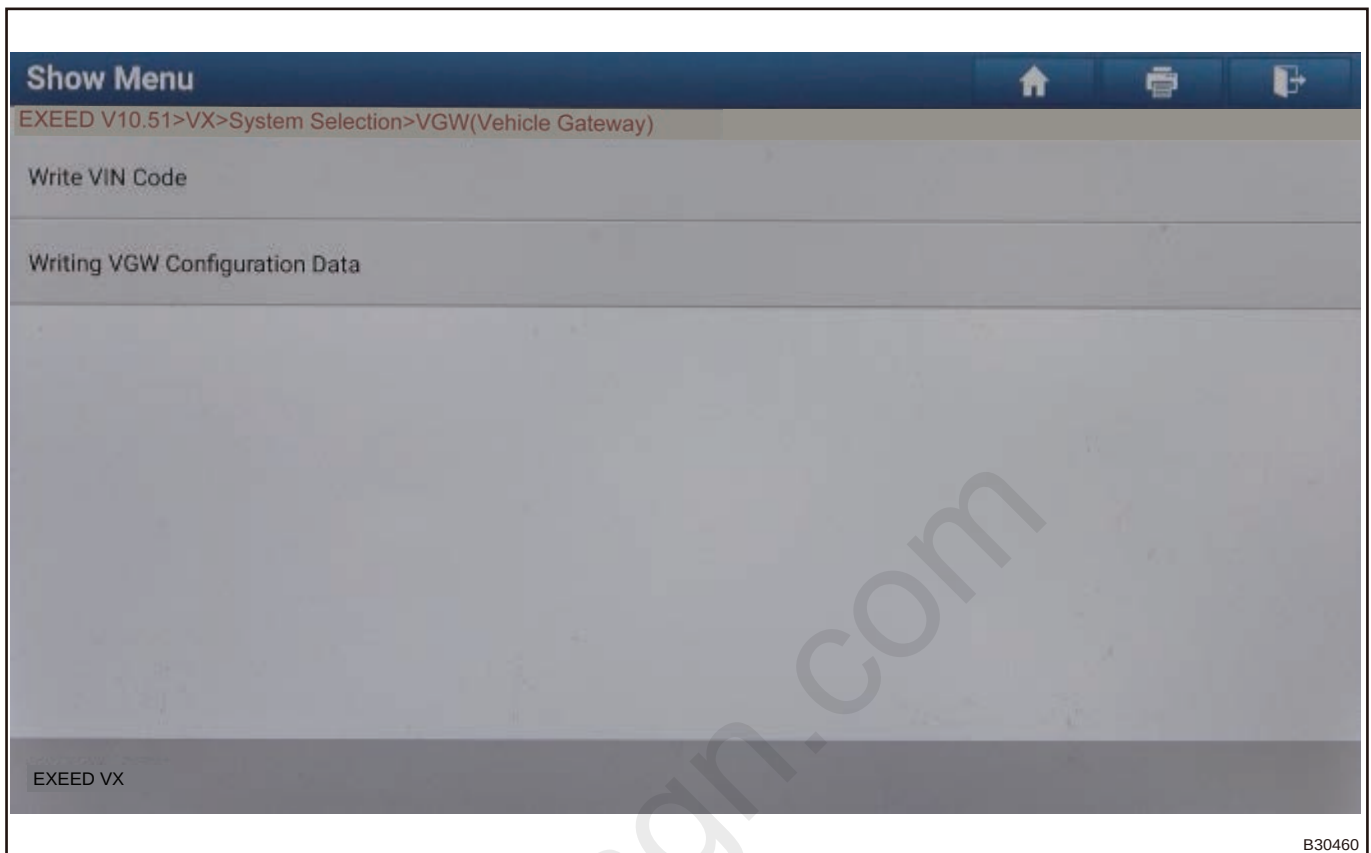


(6) The diagnostic tester interface shows “Read and Save Vehicle Configuration Code Successfully” .

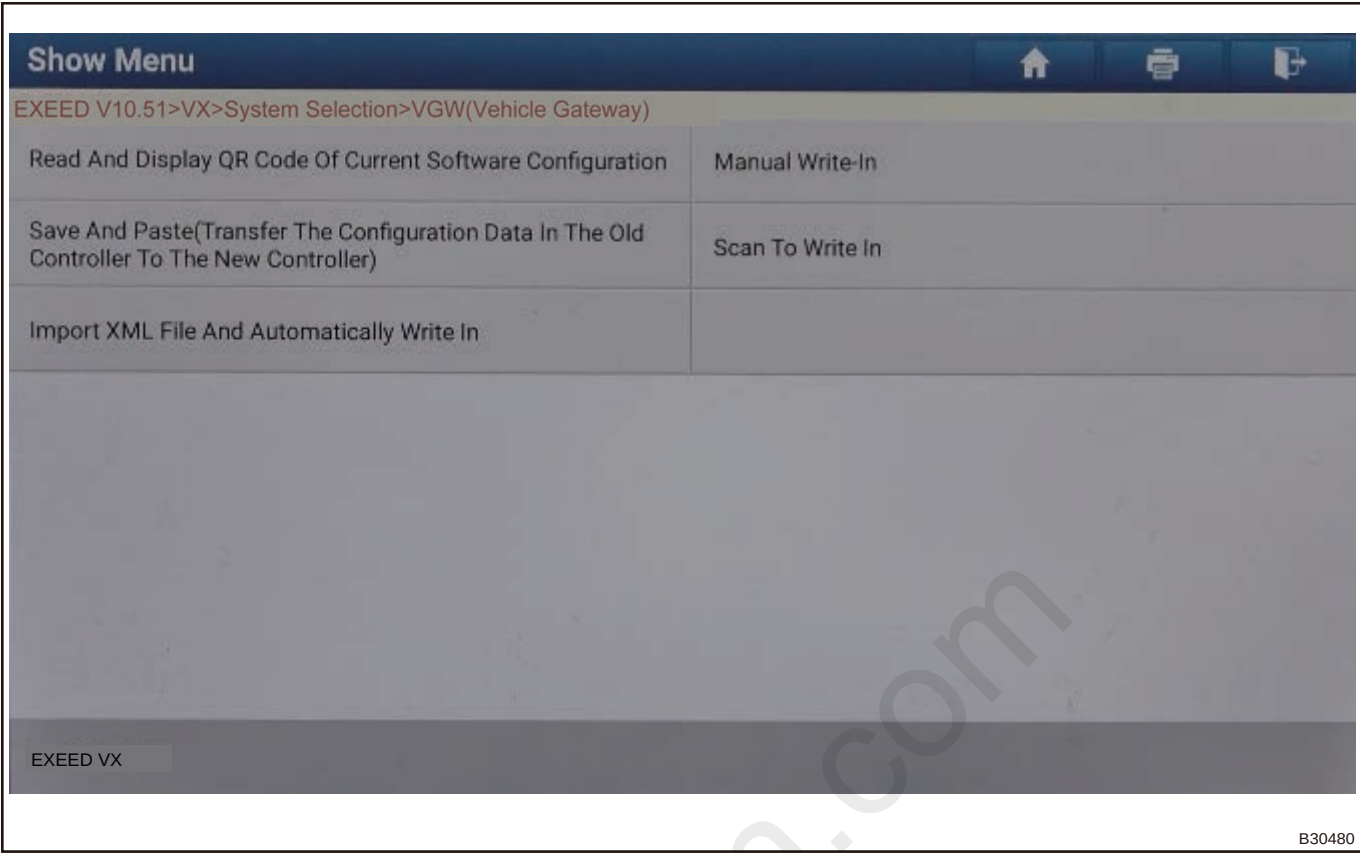


■ Writing VGW configuration data

- (1) Click “Writing VGW Configuration Data” .

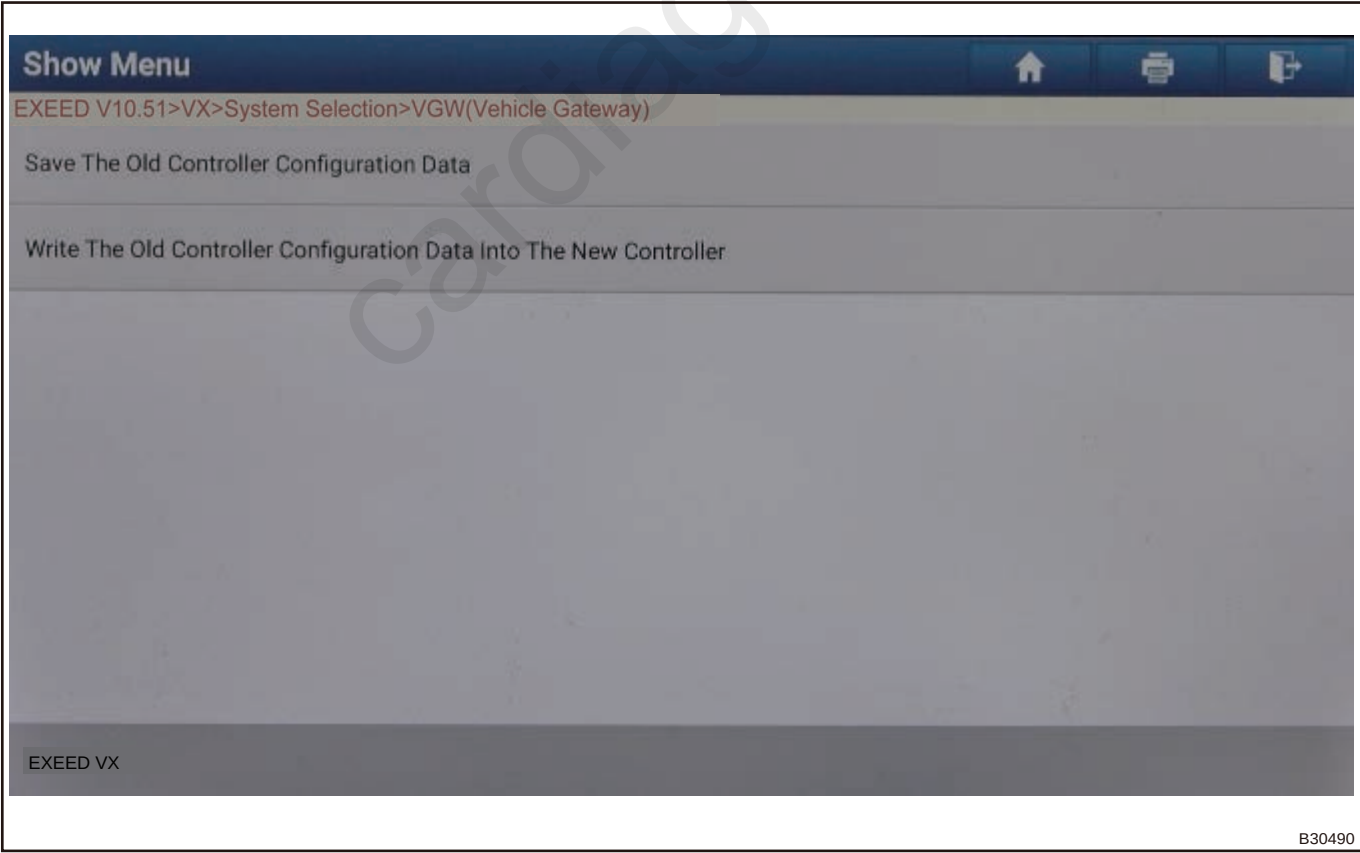


- (2) Click “Save And Paste (Transfer The Configuration Data In The Old Controller To The New Controller)” .



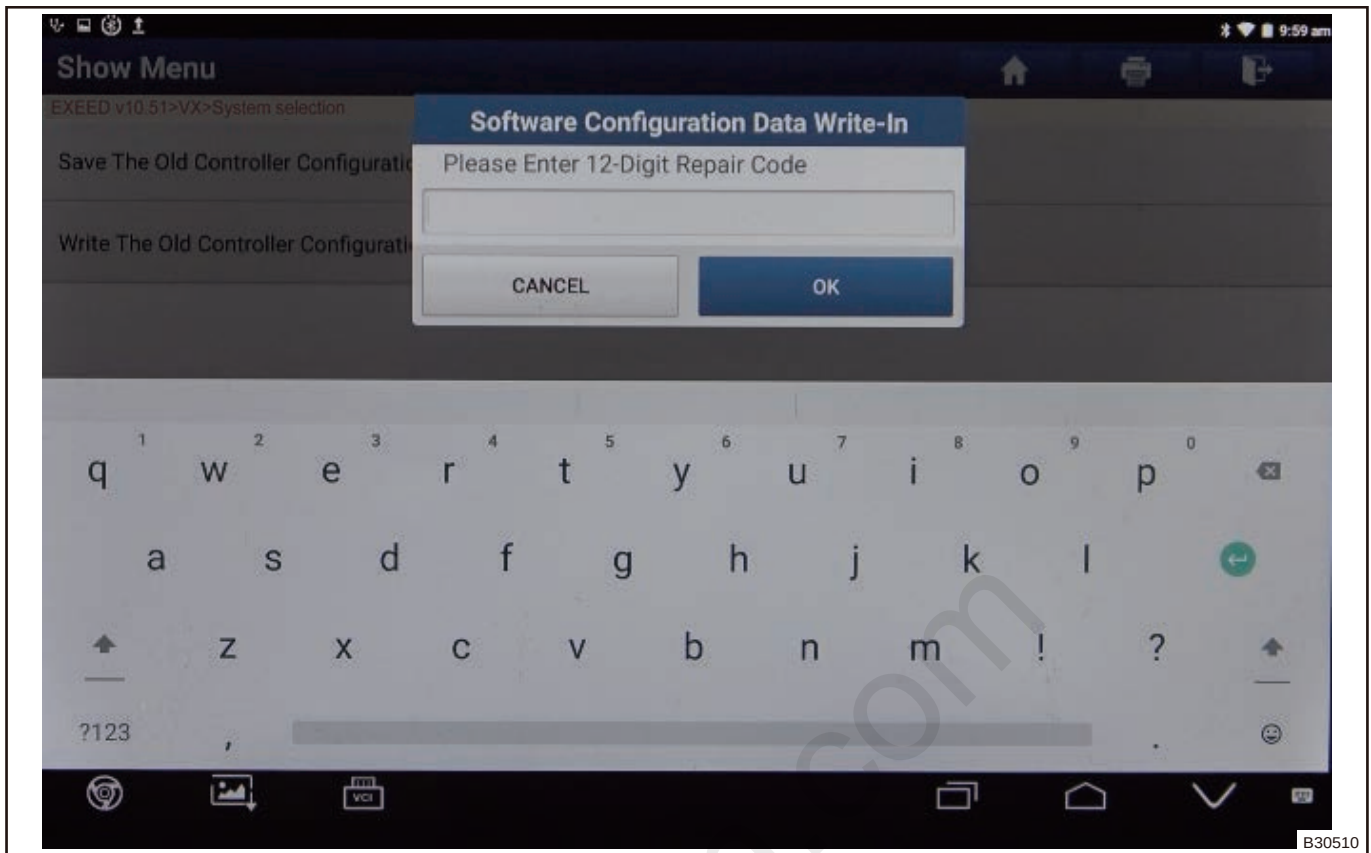
B30480

(3) Click “Write The Old Controller Configuration Data Into The New Controller” .



B30490

(4) The diagnostic tester interface shows “Please Enter 12-Digit Repair Code” .



B30510

- (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.

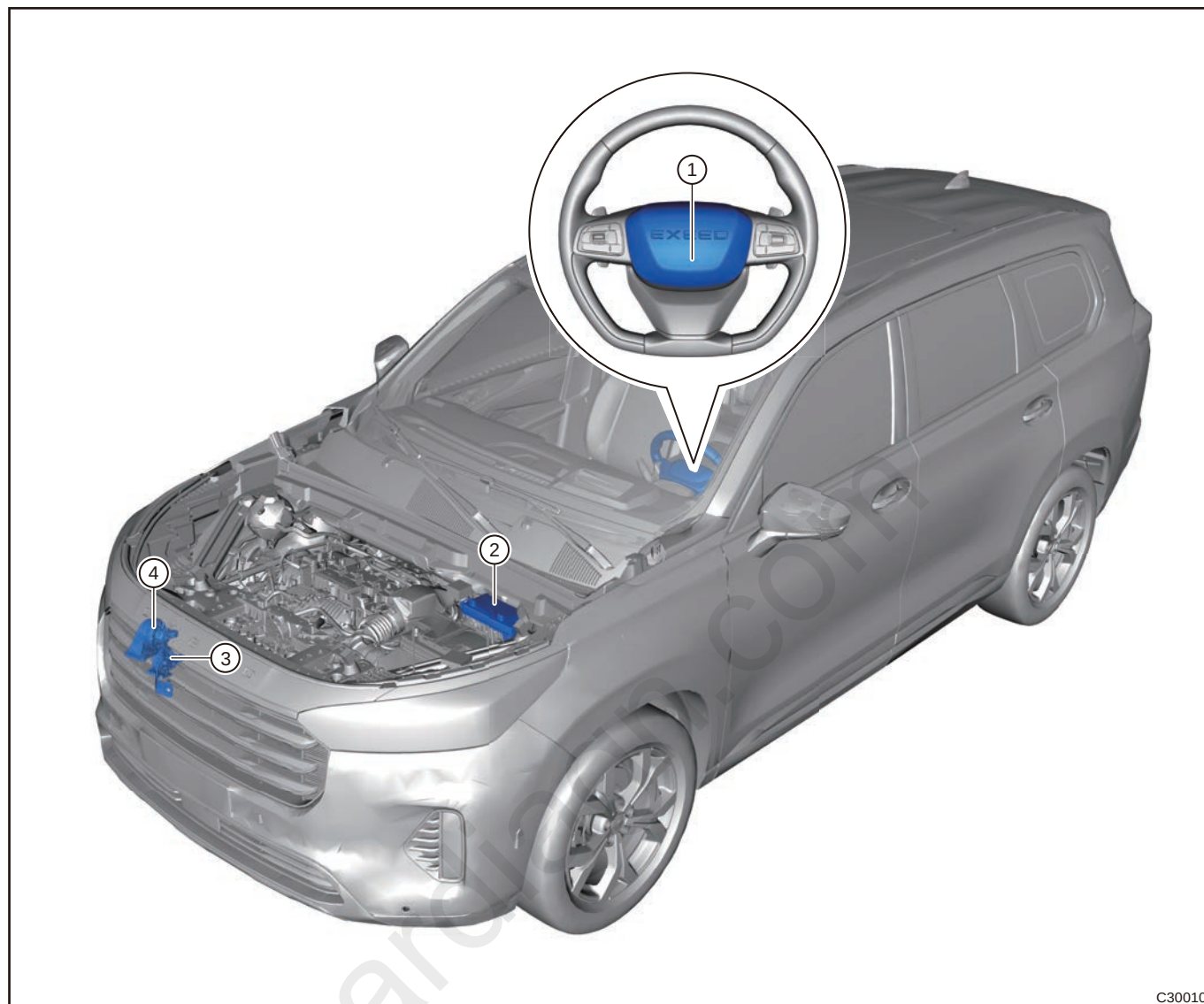
2 System Overview

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.

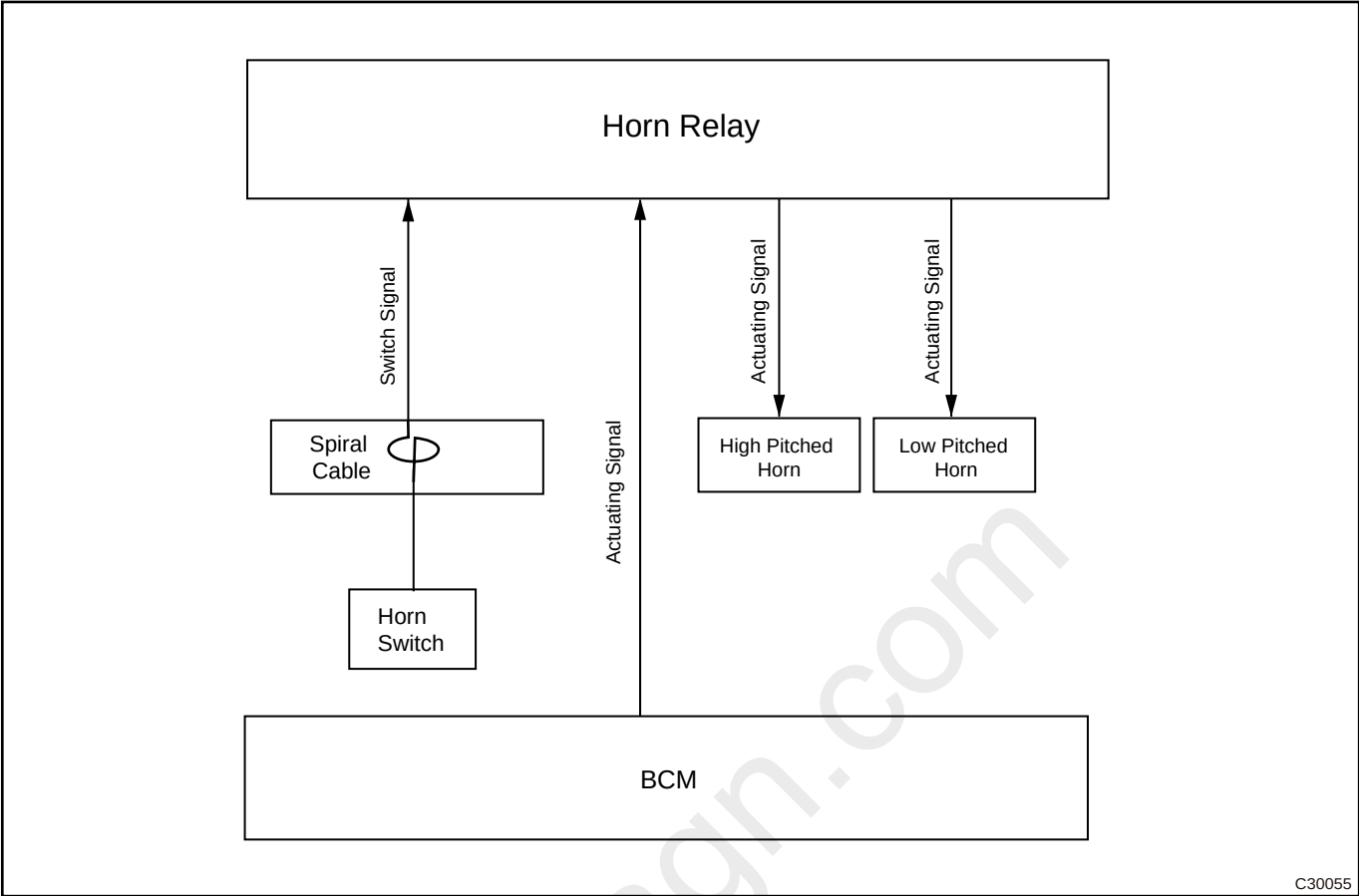
2.2 System Components Diagram



C30010

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

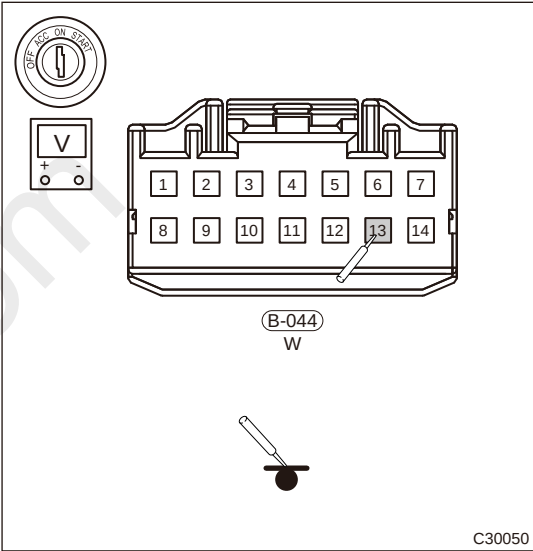
OK

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

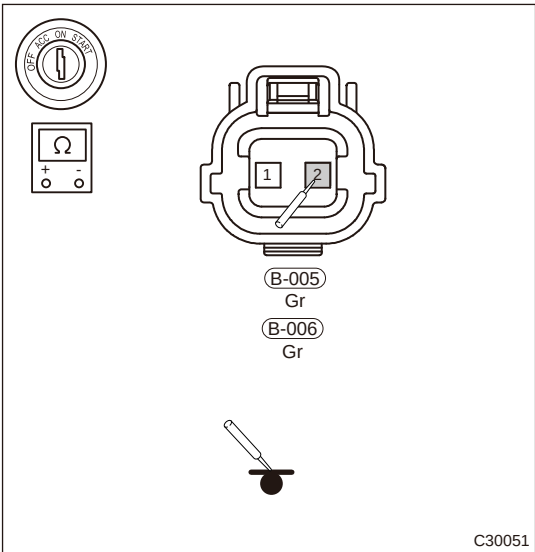
OK

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	$\leq 1 \Omega$
B-005 (2) to ground point GB-014	Always	$\leq 1 \Omega$



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.

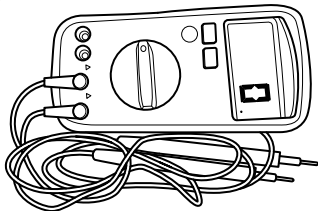
OK

System operates normally.

4 ON-VEHICLE SERVICE

4.1 Tools

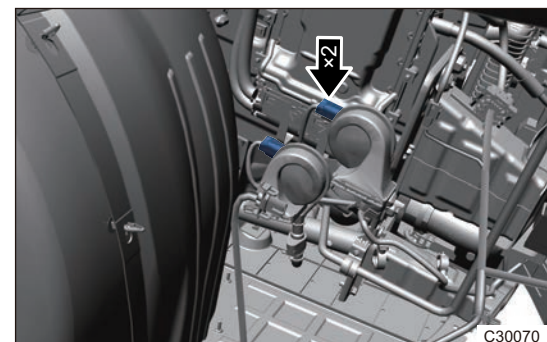
■ General Tools

Tool Name	Tool Drawing
Digital Multimeter	 S00002

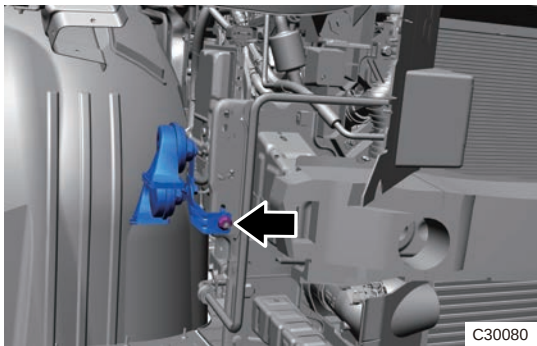
4.2 Replacement of Dual Pitched Horn

■ 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.



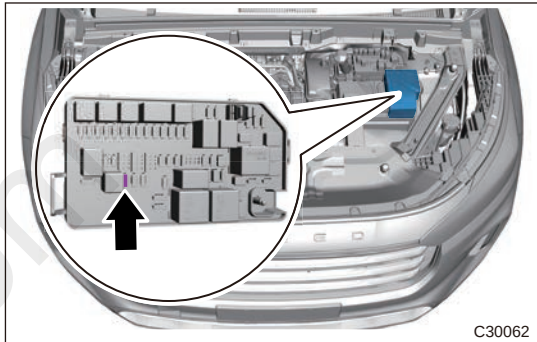
- (5) Remove fixing bolt from dual pitched horn bracket.



■ Inspection

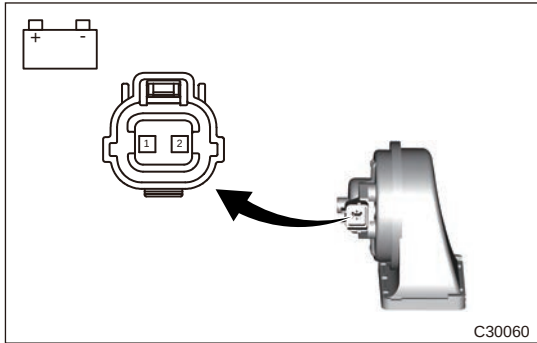
- (1) Check the horn fuse.
- 1) Identify the horn fuse in engine compartment fuse and relay box.
 - 2) Check the horn fuse.
 - 3) Using a fuse puller, remove the horn fuse EF07 (15A).
 - 4) Check if fuse is blown. Replace fuse if it is blown.

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.

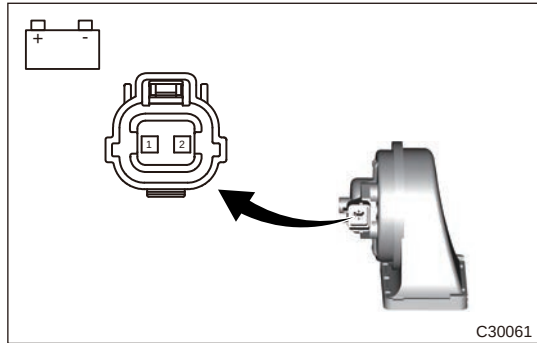
Measurement Condition	Condition	Specified Condition
Battery positive (+) → Terminal 1	Always	Horn sounds
Battery negative (-) - Terminal 2		



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.

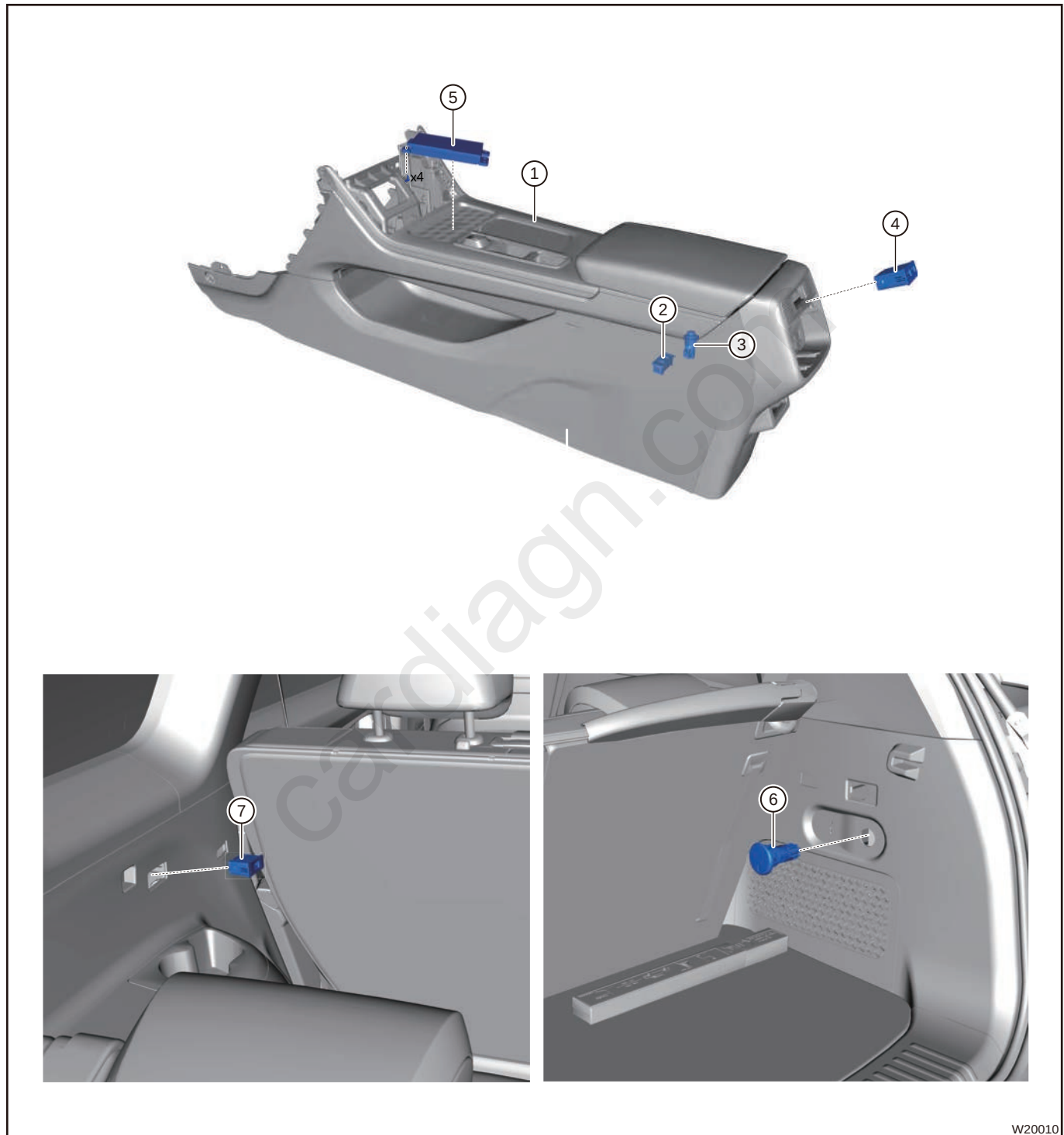
- (4) Connect and tighten negative battery cable.
- (5) Turn the ENGINE START STOP switch to ON and conduct test.

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11.18 Body Control System

1 System Overview

1.1 System Components Diagram



W20010

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 $\pm$ 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°C ~ 5°C), 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

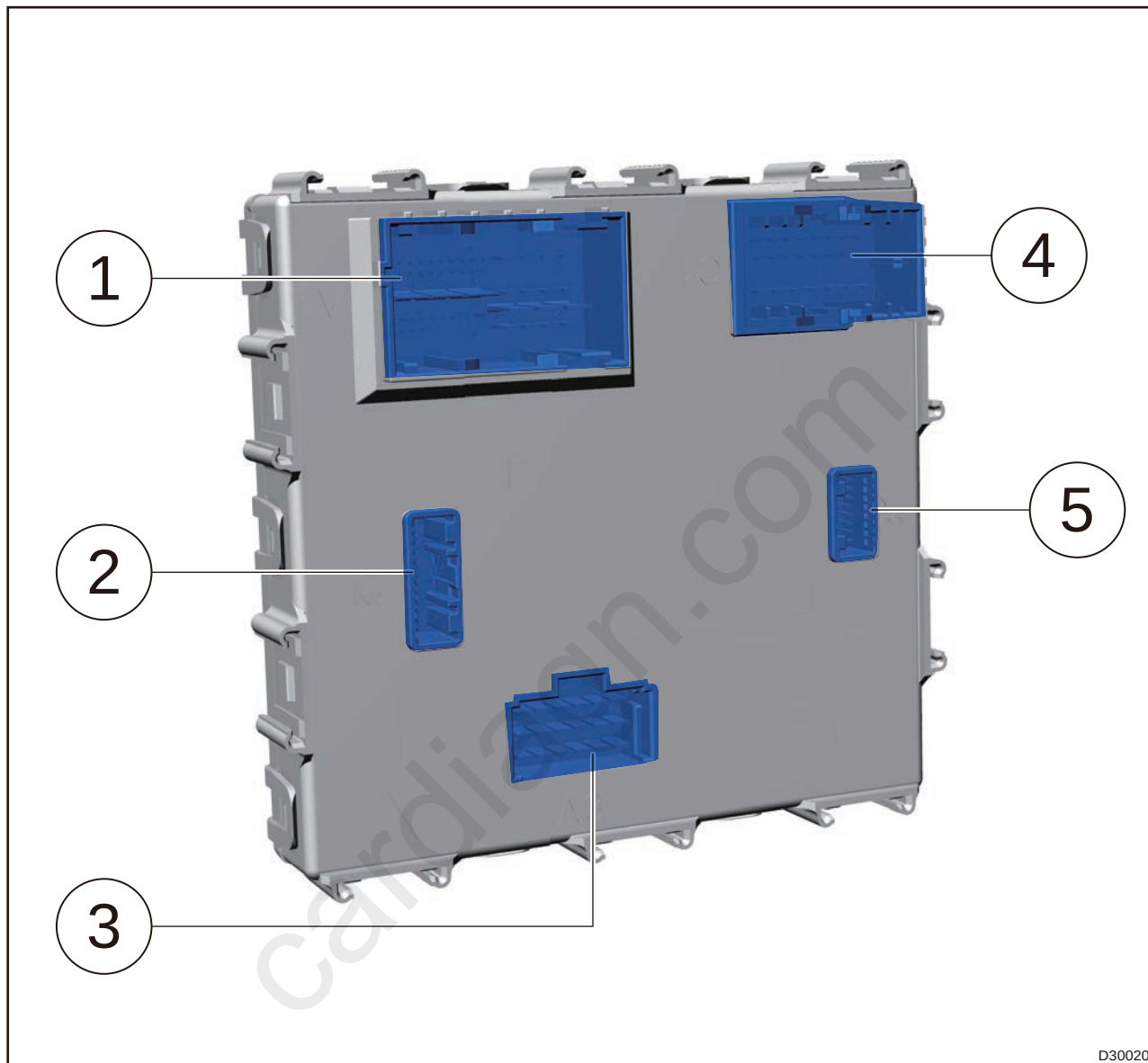
- (1) Initial status
 - When vehicle rolls from the line and powered on for the first time or vehicle battery is powered on again after disconnection, ambient light function default is on, and it turns on/off according to DVD setting.
- (2) Ambient light turns on/off
 - 1) When all the following conditions 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



D30020

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

- 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.
- Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
- If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
- Only use a digital multimeter to measure voltage of electronic system.
- Refer to any Technical Bulletin that may apply to this malfunction.
- Visually check related wire harness and connector.
- Check and clean all CD 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.

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

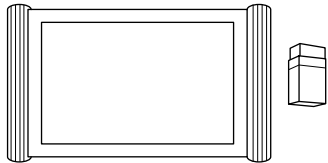
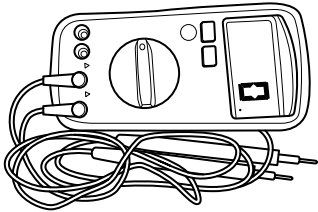
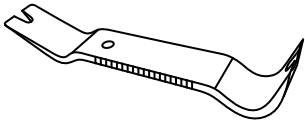
CAUTION

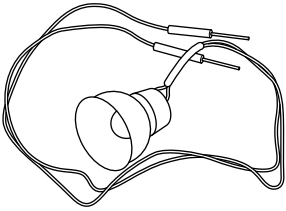
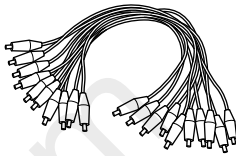
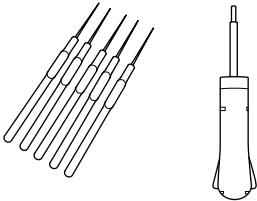
- If a function of BCM is failed, but there is no DTC, perform diagnosis according to trouble symptom.
- This diagnosis needs to combine with control logic (see Operation section). Check input/output signal of BCM for normal operation. If input/output is normal, there is a malfunction in BCM. Otherwise, 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

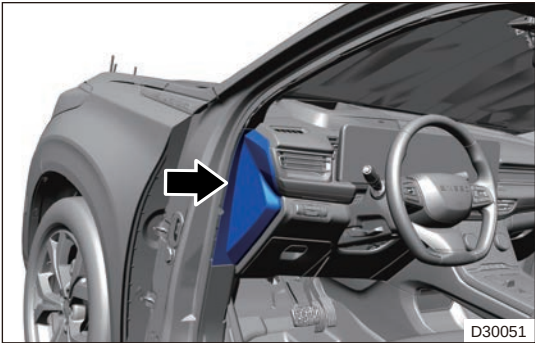
Tool Name	Tool Drawing
Bulb Test Light (21 W)	 RCH008706
Jumper Wire	 RCH008806
Wire Harness Terminal Tools	 RCH008906

3.2 Body Control Module

■ Removal

Hint:

- Before replacing BCM, read configurations of the original software. After replacing it, write the original configuration codes.
- Turn off all electrical equipment and ENGINE START STOP switch.
 - Disconnect the negative battery cable
 - Remove the body control module.
 - Remove the instrument panel left end panel assembly.



- 2) Remove 2 fixing screws from instrument panel lower left protector assembly.

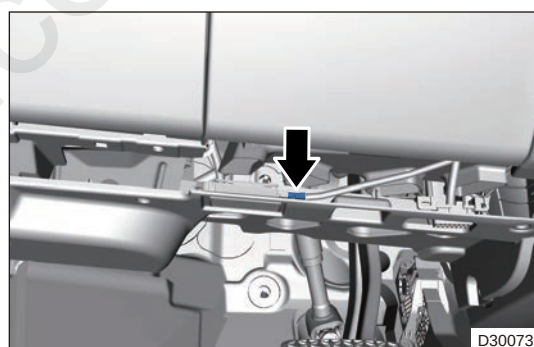
Tightening torque
 $1.5 \pm 0.5 \text{ N m}$



- 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.



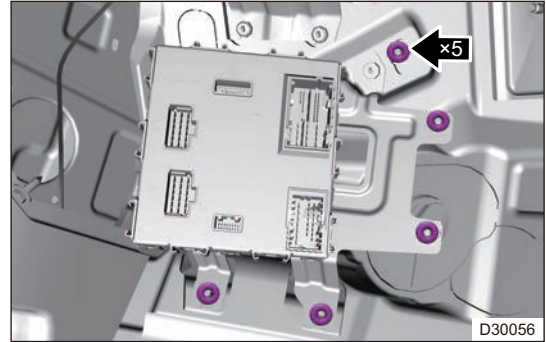
- 5) Remove the instrument panel left lower protector assembly.



- 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.

