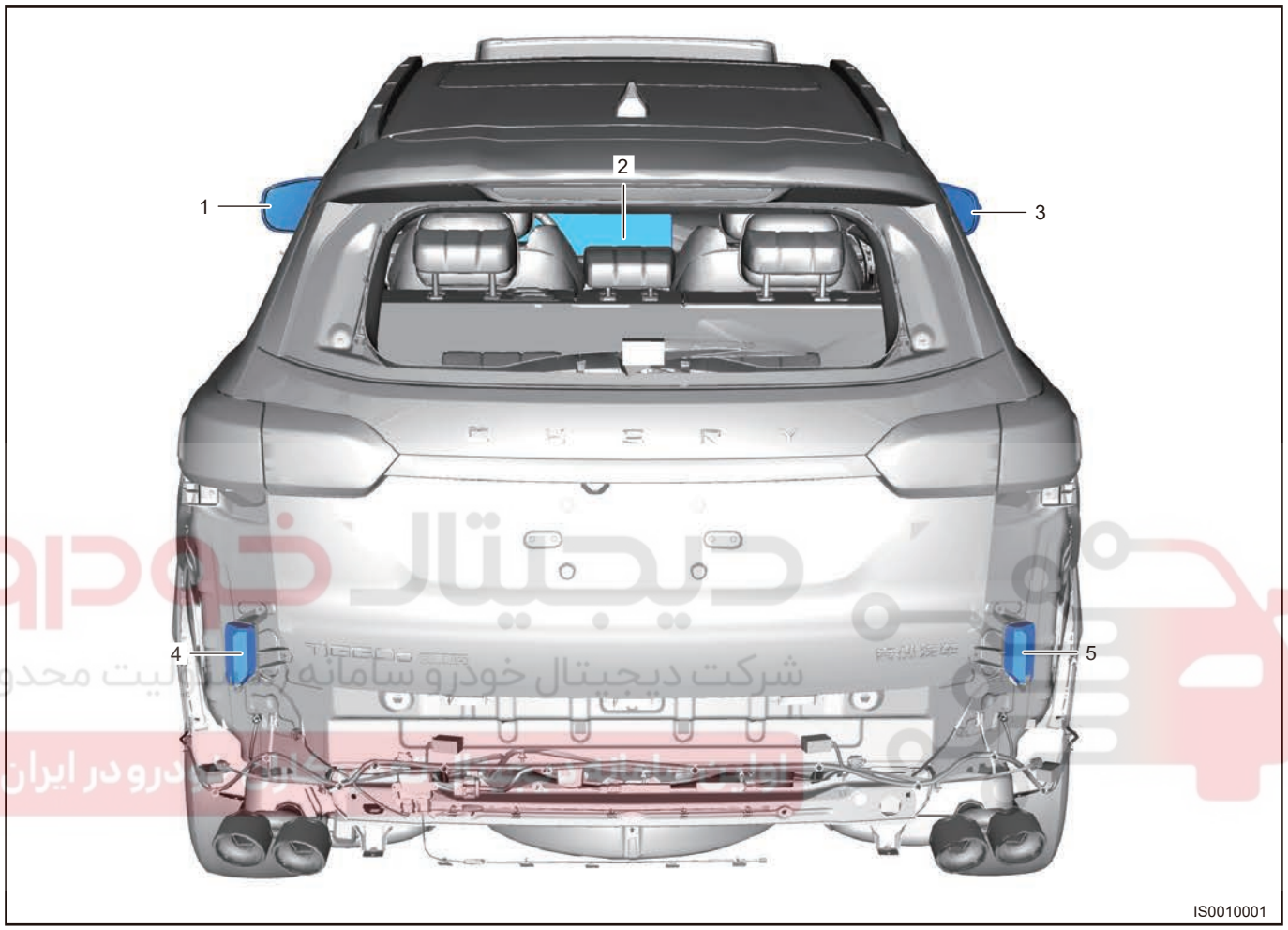
BLIND SPOT DETECTION SYSTEM

GENERAL INFORMATION

System Overview

Description



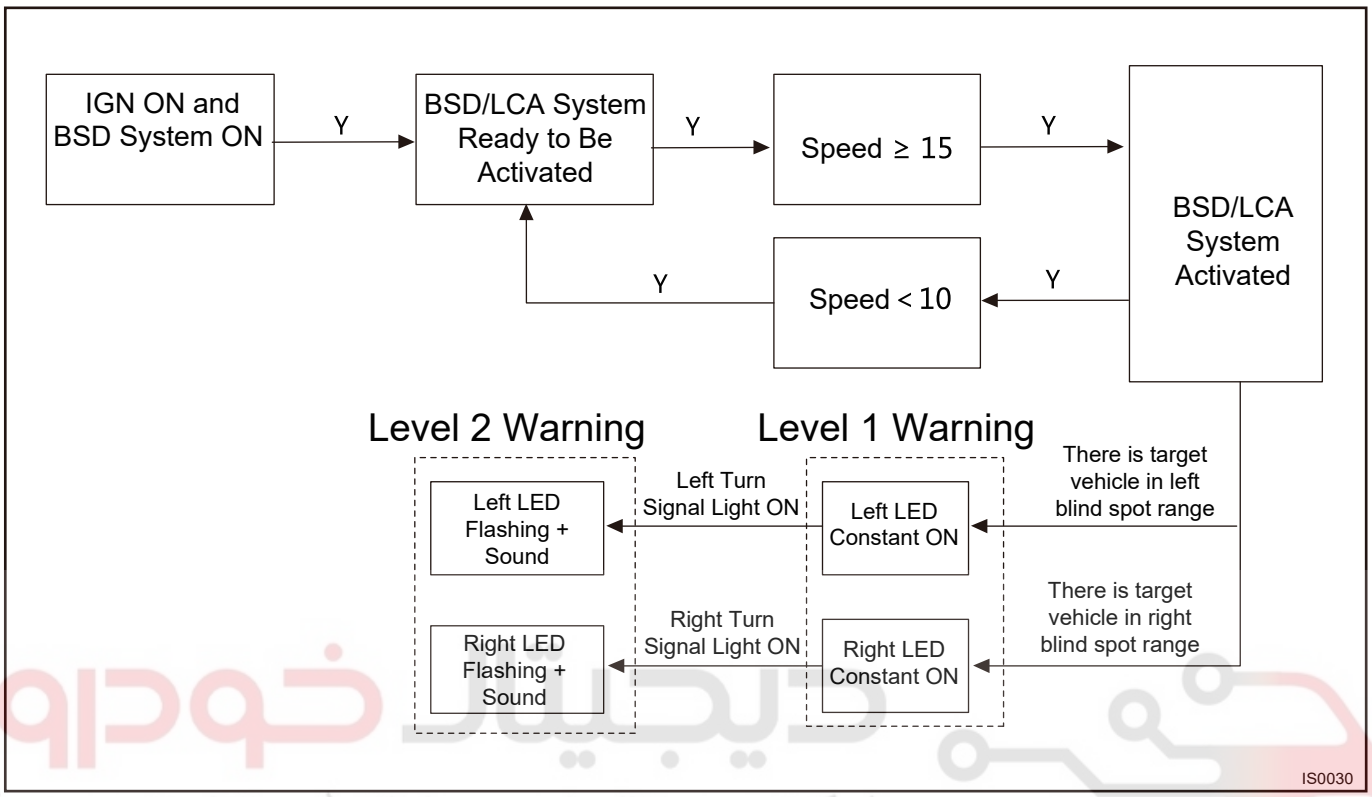
1	Left LED Light	2	Hyperscreen
3	Right LED Light	4	Left Blind Spot Detection Module
5	Right Blind Spot Detection Module	6	

System Principle

Blind spot detection (SBD), door open collision warning system (DOW) and rear approach warning system (RCW) are turned on/off by audio head unit. Main blind spot detection radar/sub blind spot detection radar collects wheel speed signal, door open signal, gear signal, turn signal light signal and ENGINE START STOP switch status signal through CAN line. Outside rear view mirror LED indicator and rear door LED indicator operate and instrument cluster displays relevant warning information through data requirements analysis.

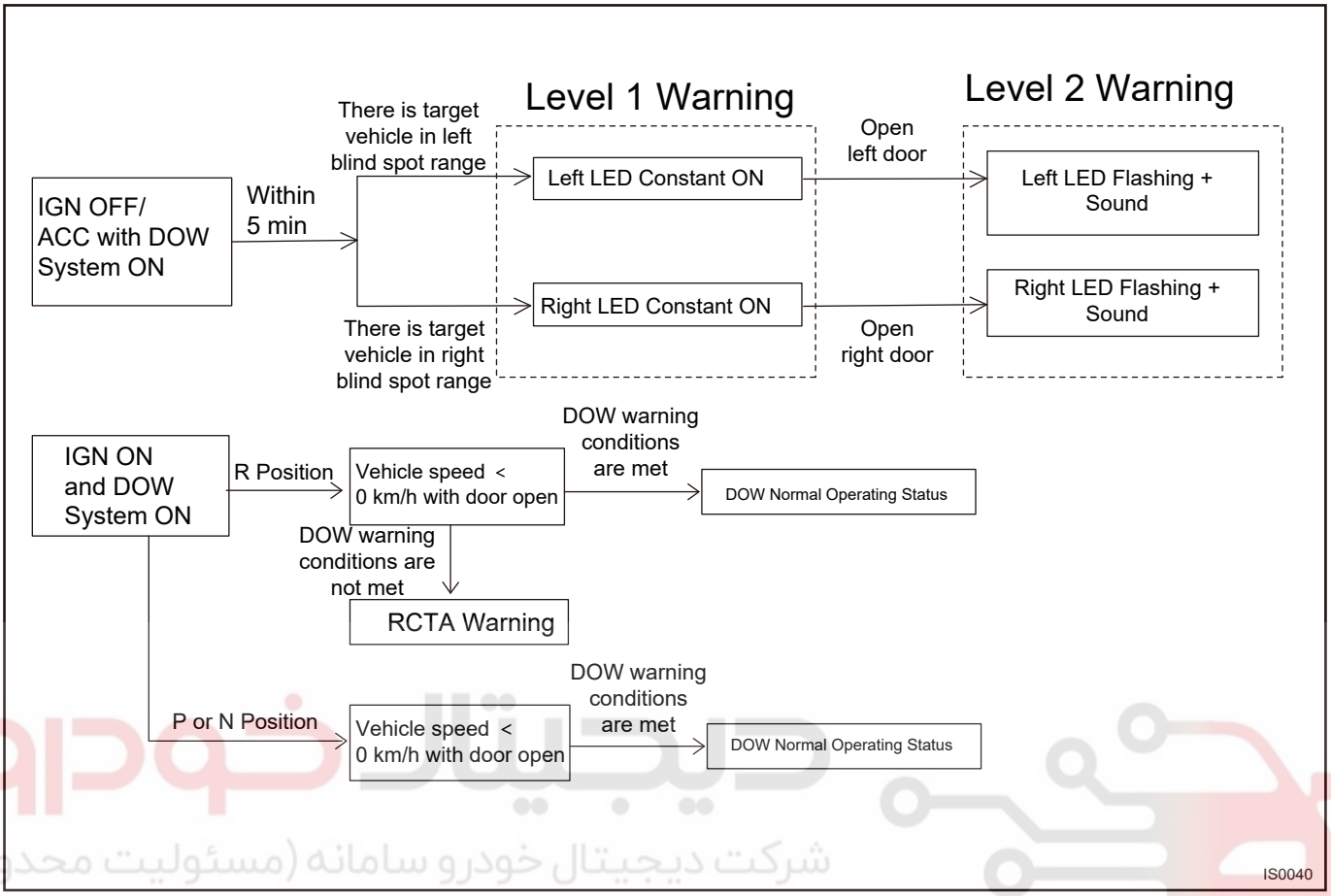
System Function

Blind Spot Detection (BSD)/Lane Change Assist (LCA)



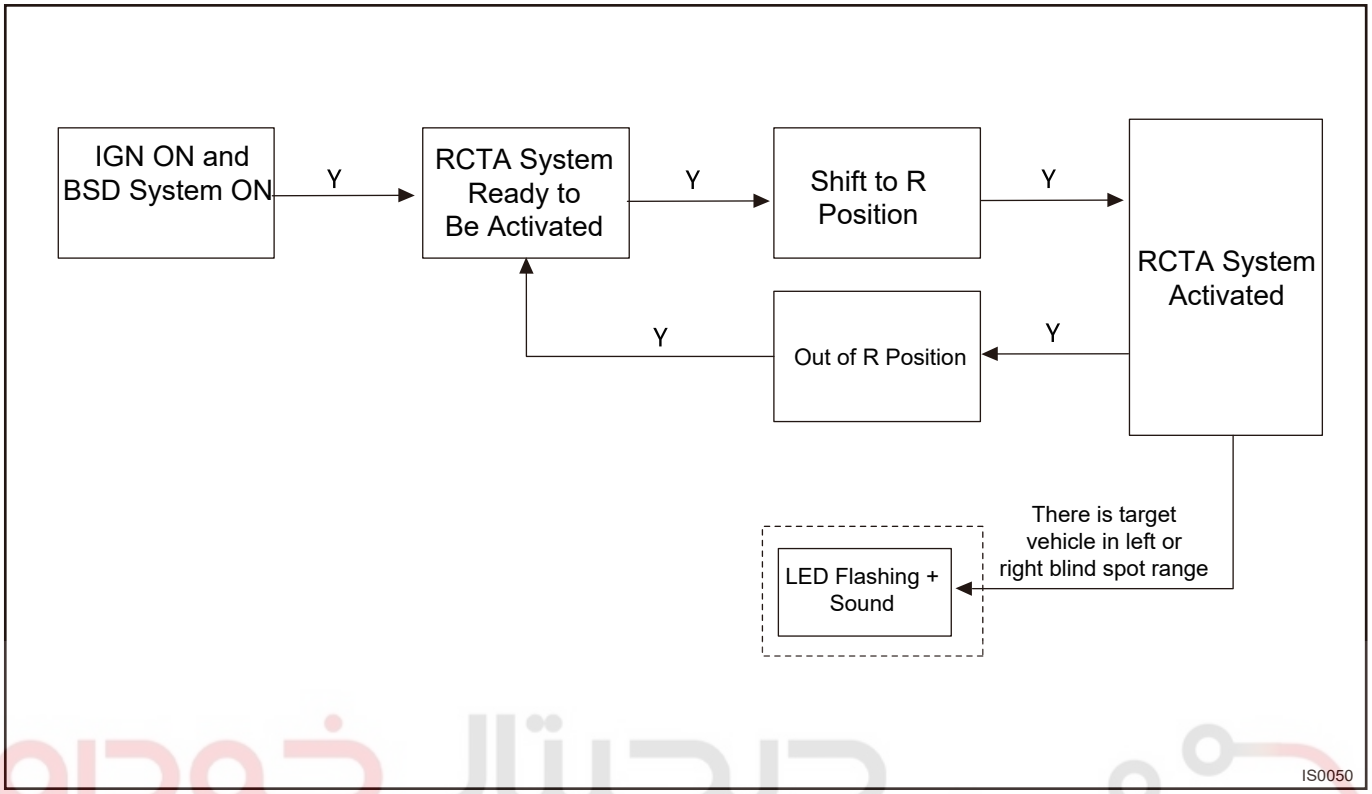
Blind spot detection/lane change assist monitors whether there are moving vehicles in the rear area of left and right sides of vehicle, and sends the information to driver to remind the driver to pay attention to driving safety and lane change safety. This system also extends door open collision warning system, rear cross traffic alert and rear approach warning system.

Door Open Collision Warning System (DOW)



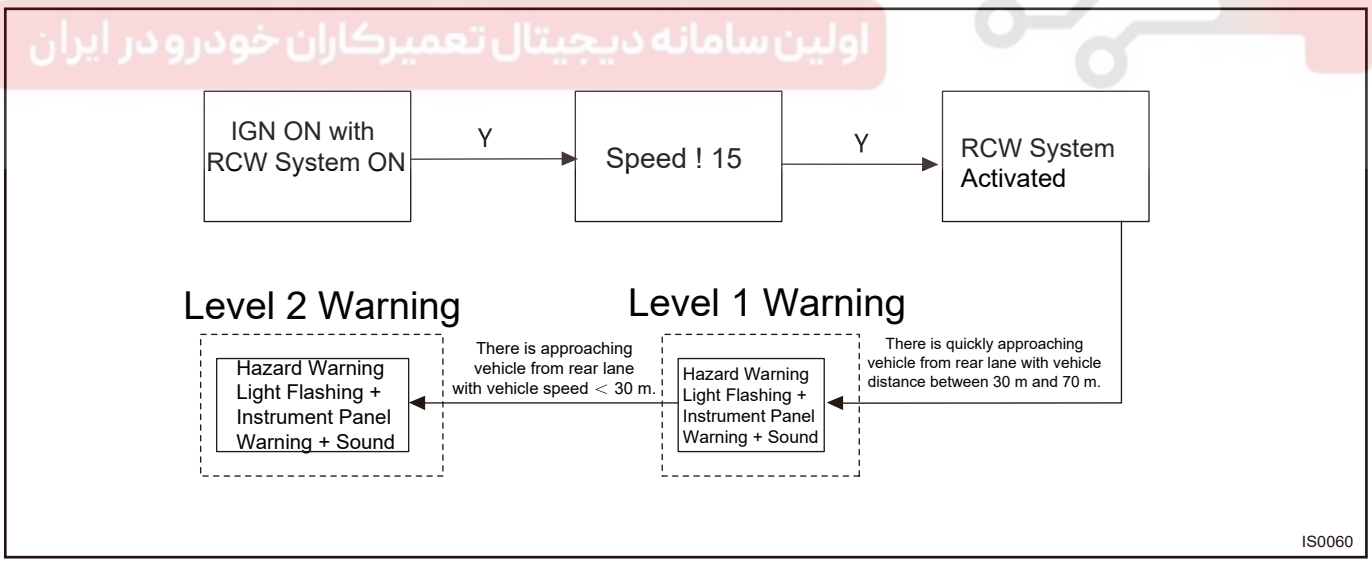
When the vehicle is stationary, blind spot detection detects that there are approaching vehicles on left and right sides and the door is opened, door open collision warning system will give an alarm to remind the driver/occupant to pay attention to the vehicle from rear side when exiting the vehicle to avoid collision.

Rear Cross Traffic Alert (RCTA)



When reversing (shift lever is in R), blind spot detection detects that there are approaching vehicles on left and right sides, it sends the information to driver to remind the driver to pay attention to the vehicle from rear side to avoid collision.

Rear Approach Warning System (RCW)



When driving, blind spot detection detects that there is a rapid approach in the rear of vehicle and there is a danger of rear collision with this vehicle, it sends the information to driver to remind the driver of this vehicle and following vehicle to avoid collision.

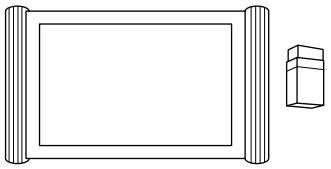
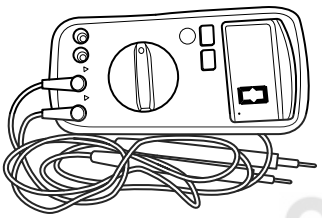
Component Operation Description

Main/Sub Blind Spot Detection Radar

Blind spot detection uses 77 GHz microwave radar technology to detect through the principle of ultrasonic reflection. Main/sub blind spot detection radar sends out ultrasonic and receive back wave from obstacle,

control module calculates obstacle position and distance according to ultrasonic distance measuring principle, and sends data to display terminal to remind.

Tools

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

Fasteners Torque List

Item	Tightening Torque
Main Blind Spot Detection Radar Fixing Nut	3.5 ± 0.5 N·m
Sub Blind Spot Detection Radar Fixing Nut	3.5 ± 0.5 N·m

DIAGNOSIS & TESTING

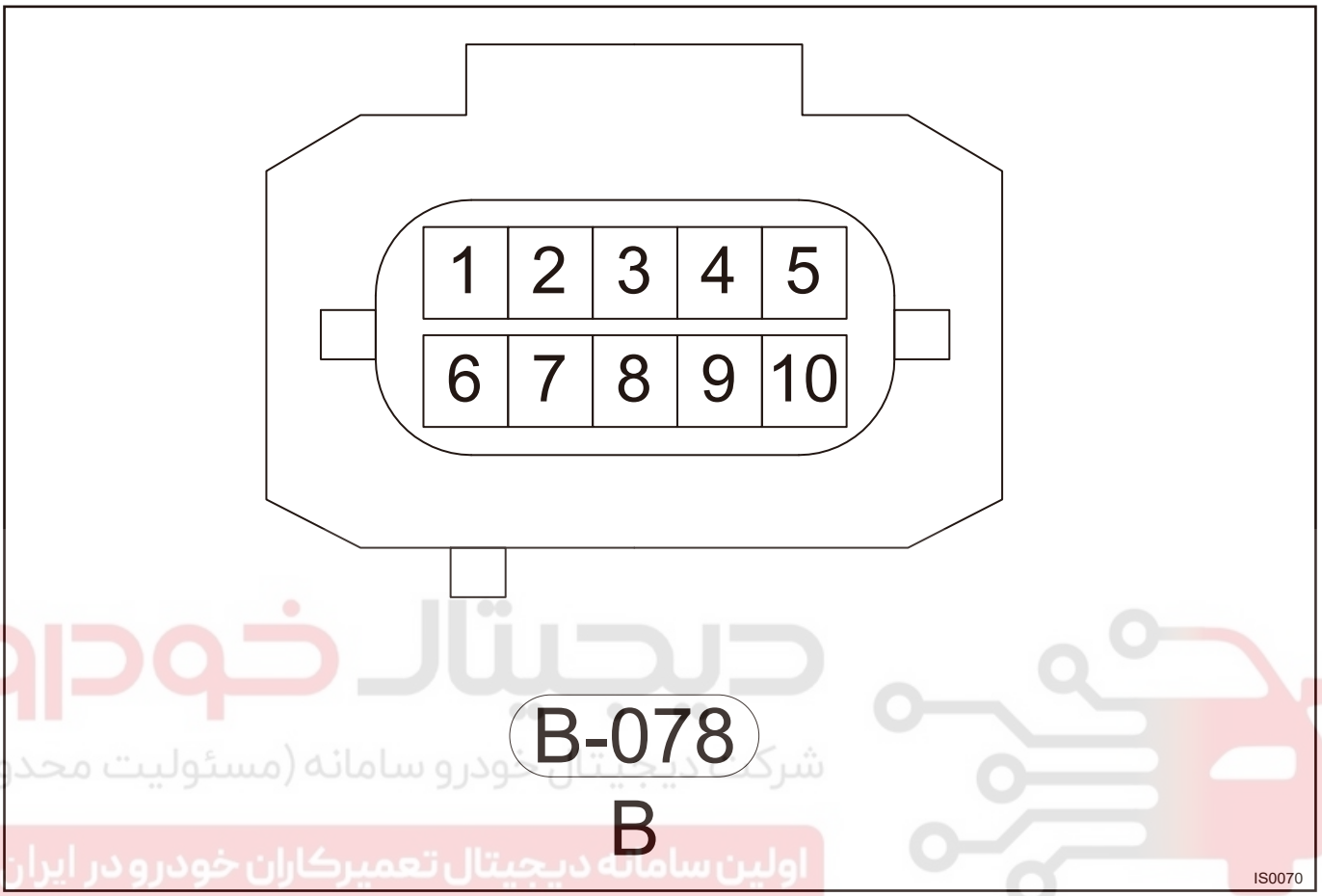
Problem Symptoms Table

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 (BSD) malfunction indicator comes on	Fuse
	Wire harness fault
	Main/sub blind spot detection radar
Blind spot detection (BSD) operates abnormally	Main/sub blind spot detection radar
	Main/sub blind spot detection radar is obstructed or shielded
CAN network fault	Fuse
	Wire harness fault
	Central gateway (CGW)
	Main/sub blind spot detection radar

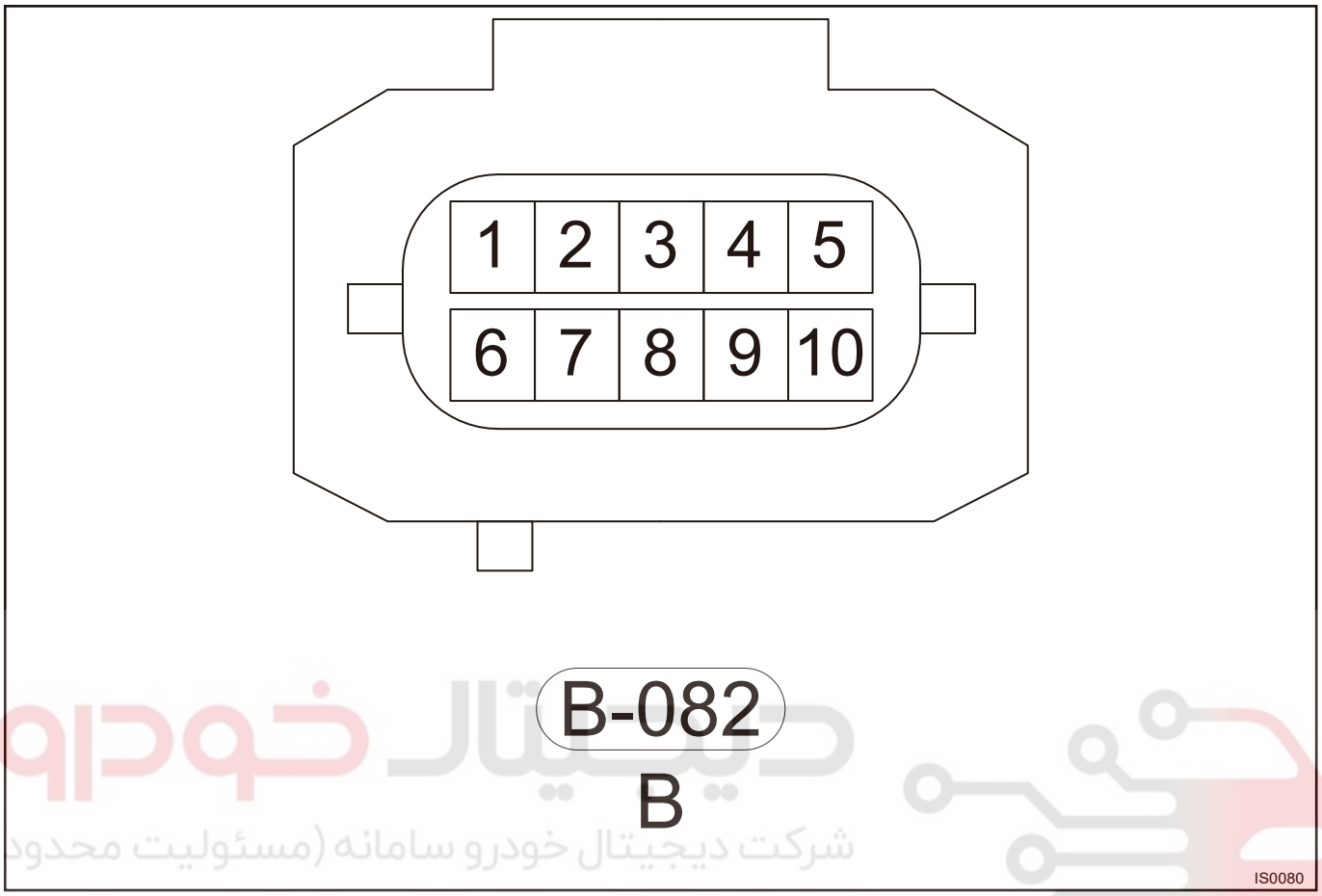
Blind Spot Detection Module Terminal Definition

Main Blind Spot Detection



PIN	Description	PIN	Description
1	\	6	\
2	LOW Warning Light	7	CCAN-H
3	CCAN-L	8	Left Side Indicator Signal
4	Internal CAN-H	9	Ground
5	KL30	10	Internal CAN-L

Sub Blind Spot Detection



PIN	Description	PIN	Description
1	\	6	\
2	\	7	LOW Warning Light
3	Right Side Indicator Signal	8	\
4	Internal CAN-H	9	Ground
5	KL30	10	Internal CAN-L

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.

Diagnostic Help

1. Connect diagnostic tester X-431 3G (the latest software) to Data Link Connector (DLC), and make it communicate with vehicle electronic module through data network.
2. Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
3. If Diagnostic Trouble Code (DTC) cannot be cleared, it indicates that there is a current malfunction.
4. Only use a digital multimeter to measure voltage of electronic system.
5. Refer to any Technical Bulletin that may apply to this malfunction.
6. Visually check related wire harness and connector.
7. Check and clean all CD system grounds related to the latest DTCs.
8. If numerous trouble codes are set, refer to circuit diagram and look for any common ground circuit or power supply circuit applied to DTC.

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 wiggling test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect airbag components and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to this malfunction.

Ground Inspection

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

1. Remove ground bolt or nut.
2. Check all contact surfaces for tarnish, dirt and rust, etc.
3. Clean as necessary to ensure that contact is in good condition.
4. Reinstall ground bolt or nut securely.
5. Check if any additional accessories interfere with ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check for proper crimp condition. Make sure that all wire harnesses are clean and securely fastened while providing a proper ground path.

Diagnostic Trouble Code (DTC) Chart

DTC	DTC Definition
B1A40-11	LED Right Circuit Short to Ground
B1A40-15	LED Right Circuit Short to Battery or Open

DTC	DTC Definition
B1A41-11	LED Left Circuit Short to Ground
B1A41-15	LED Left Circuit Short to Battery or Open
B1A43-4B	System Over Temperature
B1A43-97	System Environmental Failure
B1A44-16	Battery Voltage - Circuit Voltage Below Threshold
B1A44-17	Battery Voltage - Circuit Voltage Above Threshold
B1A45-42	Slave Internal Memory Failure
B1A46-49	Master Internal Electronic Failure
B1A45-49	Slave Internal Electronic Failure
B1A47-87	Lost Communication With Slave
B1A46-42	Master Internal Memory Failure
B1A48-00	Autocalibration Failure
B1A49-11	DOW Right Circuit Short to Ground
B1A49-15	DOW Right Circuit Short to Battery or Open
B1A4A-11	DOW Left Circuit Short to Ground
B1A4A-15	DOW Left Circuit Short to Battery or Open
U0146 - 87	Lost Communication With CGW
U0146 - 87	Lost Communication With CGW
U0100-87	Lost Communication with EMS
U0101-87	Lost Communication with TCU
U1300-55	Central Configuration - Not Configured
U0140-87	Lost Communication with BCM
U0129-87	Lost Communication With Brake System Control Module
U0126-87	Lost Communication with SAM
U0418-81	Invalid Data Received from BSM-Invalid Serial Data Received
U0428-81	Invalid Data Received from SAM
U0422-81	Invalid Data Received from BCM-Invalid Serial Data Received

DTC Diagnosis Procedure

DTC	**B1A44-16**	**Battery Voltage - Circuit Voltage Below Threshold**
DTC	**B1A44-17**	**Battery Voltage - Circuit Voltage Above Threshold**

DTC	DTC Definition	Possible Causes
B1A44-16	Battery Voltage - Circuit Voltage Below Threshold	• Fuse • Wire harness damaged • Main/sub blind spot detection module
B1A44-17	Battery Voltage - Circuit Voltage 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	Check fuse

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

(a) Check the fuse EF32 (10A).

NG → **Replace fuse**

OK

2	Check wire harness and connector

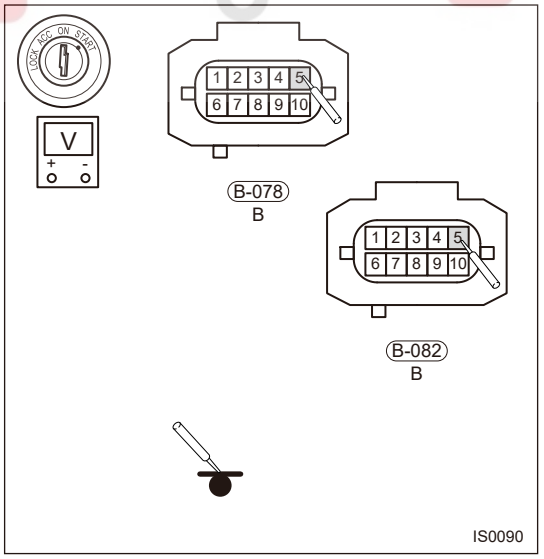
(a) Turn ENGINE START STOP switch to “OFF”, and disconnect the negative battery cable.

(b) Disconnect main blind spot detection module connector B-078 and sub blind spot detection module connector B-082.

(c) Turn ENGINE START STOP switch to ON.

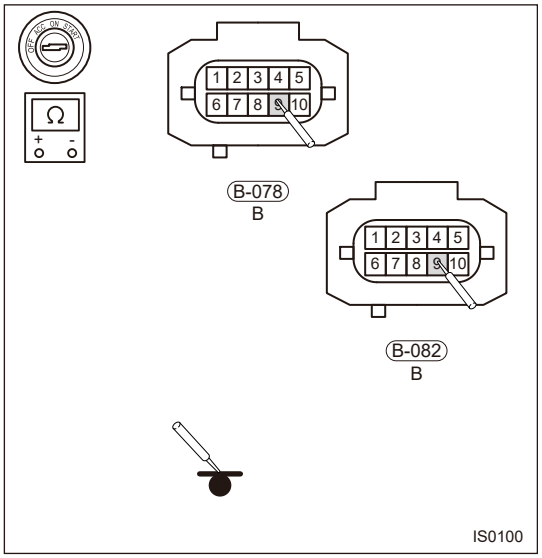
(d) Using ohm band of multimeter, check the voltage between B-078 (5) and body ground, B-082 (5) and body ground separately.

Multimeter Connection	Condition	Specified Condition
B-078 (5) - Body ground	ENGINE START STOP switch OFF	Not less than 12 V
B-082 (5) - Body ground		Not less than 12 V



(e) Using ohm band of multimeter, check the resistance between B-078 (9) and body ground, B-082 (9) and body ground separately.

Multimeter Connection	Condition	Specified Condition
B-078 (9) - Body ground	ENGINE START STOP switch OFF	⩽ 1 Ω
B-082 (9) - Body ground		⩽ 1 Ω



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

OK

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 main blind spot detection module**

DTC	**B1A40-11**	**LED Right Circuit Short to Ground**
DTC	**B1A40-15**	**LED Right Circuit Short to Battery or Open**
DTC	**B1A41-11**	**LED Left Circuit Short to Ground**
DTC	**B1A41-15**	**LED Left Circuit Short to Battery or Open**

DTC	DTC Definition	Possible Causes
B1A40-11	LED Right Circuit Short to Ground	• Wire harness damaged • Power rear view mirror • Main/sub blind spot detection module
B1A40-15	LED Right Circuit Short to Battery or Open	
B1A41-11	LED Left Circuit Short to Ground	
B1A41-15	LED Left Circuit Short to Battery or Open	

DTC Confirmation Procedure

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

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

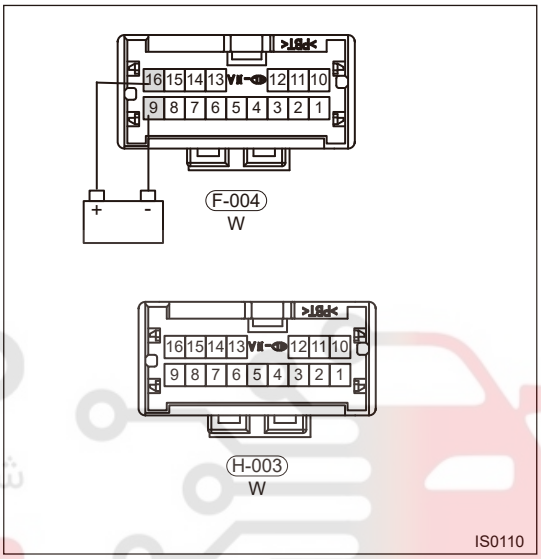
1	**Check LED light**

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

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

(b) Disconnect the negative battery cable.

(c) Check if LED light comes on by connecting positive battery cable to terminal 16 of front right power rear view mirror H-003 (terminal 16 of front left rear view mirror F-004) and negative battery cable to terminal 9 according to table below.



Multimeter Connection	Condition	Specified Condition
F-004 (9) - Battery negative, F-004 (16) - Battery positive	Always	LED light comes on
H-003 (9) - Battery negative, H-003 (16) - Battery positive		LED light comes on

NG → **Replace power mirror/lens**

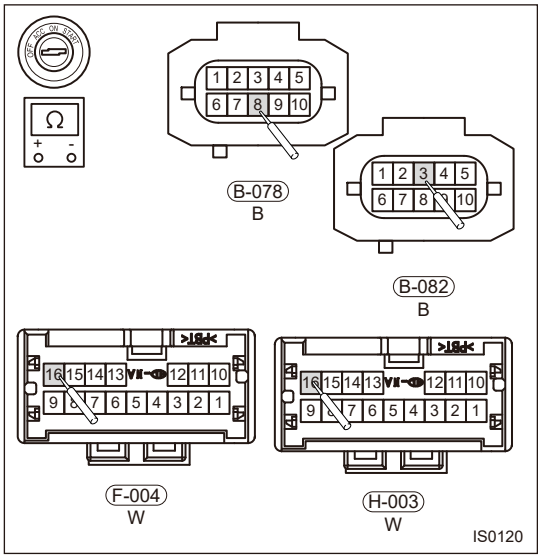
OK

2	**Check wire harness and connector**

(a) Disconnect blind spot detection module connectors B-082, B-078, F-004, H-003 separately.

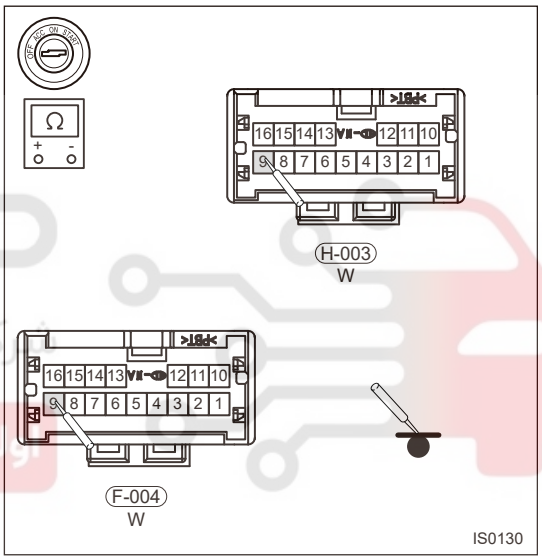
(b) Using ohm band of multimeter, check for continuity between B-078 (8) - F-004 (16), or B-082 (3) - H-003 (16) separately.

Multimeter Connection	Condition	Specified Condition
B-078 (8) - F-004 (16)	ENGINE START STOP switch OFF	⩽ 1 Ω
B-082 (3) - H-003 (16)		⩽ 1 Ω



(c) Using ohm band of multimeter, check for continuity between F-004 (9) or H-003 (9) and body ground separately.

Multimeter Connection	Condition	Specified Condition
F-004 (9) - Body ground	ENGINE START STOP switch OFF	⩽ 1 Ω
H-004 (9) - Body ground		⩽ 1 Ω



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

OK

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 sub blind spot detection module**

DTC	**B1A49-11**	**DOW Right Circuit Short to Ground**
DTC	**B1A49-15**	**DOW Right Circuit Short to Battery or Open**
DTC	**B1A4A-11**	**DOW Left Circuit Short to Ground**
DTC	**B1A4A-15**	**DOW Left Circuit Short to Battery or Open**

DTC	DTC Definition	Possible Causes
B1A49-11	DOW Right Circuit Short to Ground	• Wire harness damaged • Rear DOW indicator • Main/sub blind spot detection module
B1A49-15	DOW Right Circuit Short to Battery or Open	
B1A4A-11	DOW Left Circuit Short to Ground	
B1A4A-15	DOW Left Circuit Short to Battery or Open	

DTC Confirmation Procedure

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

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

Hint:
The following diagnosis takes the left DOW as an example.

1	**Check LED light**

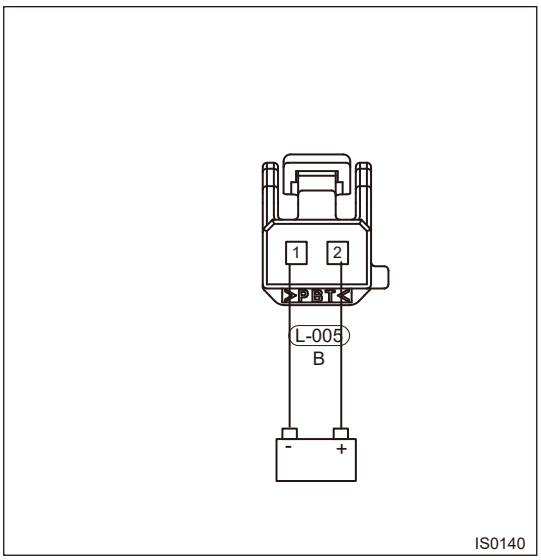
Use circuit diagram as a guide to perform the following inspection procedures:

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

(b) Disconnect the negative battery cable.

(c) Check if LED light comes on by connecting positive battery cable to terminal 1 of front left power mirror L-005 and negative battery cable to terminal 2 of front right power mirror L-005 according to table below.

Multimeter Connection	Condition	Specified Condition
L-005 (2) - Battery negative, L-005 (1) - Battery positive	Always	LED light comes on



NG	**Replace DOW indicator**

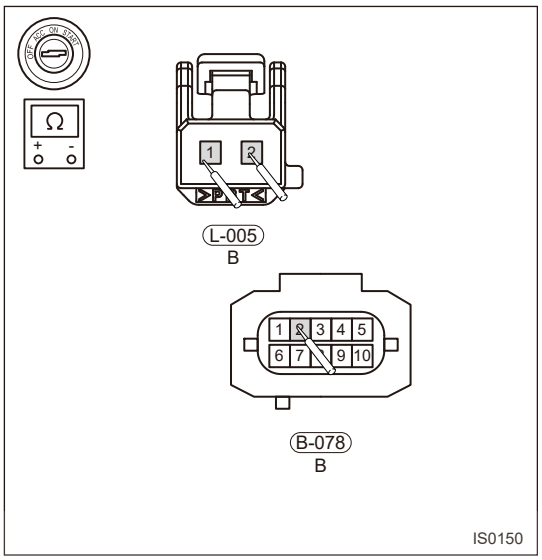
OK

2	Check wire harness and connector

(a) Disconnect connectors B-078 and L-005.

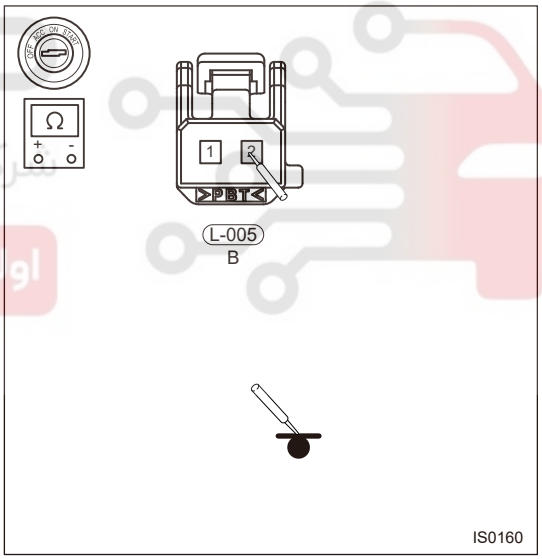
(b) Using ohm band of multimeter, check for continuity between B-078 (2) - L-005 (1), L-005 (1) - L-005 (2) separately.

Multimeter Connection	Condition	Specified Condition
B-078 (2) - L-005 (1)	ENGINE START STOP switch OFF	⩽ 1 Ω
L-005 (1) - L-005 (2)		⩽ 1 Ω



(c) Using ohm band of multimeter, check for continuity between L-005 (2) and body ground separately.

Multimeter Connection	Condition	Specified Condition
L-005 (2) - Body ground	ENGINE START STOP switch OFF	⩽ 1 Ω



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

OK

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 blind spot detection module**

DTC	**U0146 - 87**	**Lost Communication With CGW**
DTC	**U0146 - 87**	**Lost Communication With CGW**
DTC	**U0100-87**	**Lost Communication with EMS**
DTC	**U0101-87**	**Lost Communication with TCU**
DTC	**U1300-55**	**Central Configuration - Not Configured**
DTC	**U0140-87**	**Lost Communication with BCM**
DTC	**U0129-87**	**Lost Communication With Brake System Control Module**
DTC	**U0126-87**	**Lost Communication with SAM**
DTC	**U0418-81**	**Invalid Data Received from BSM-Invalid Serial Data Received**
DTC	**U0428-81**	**Invalid Data Received from SAM**
DTC	**U0422-81**	**Invalid Data Received from BCM-Invalid Serial Data Received**

DTC Confirmation Procedure

Refer to CAN communication system

ON-VEHICLE SERVICE

Blind Spot Detection Module

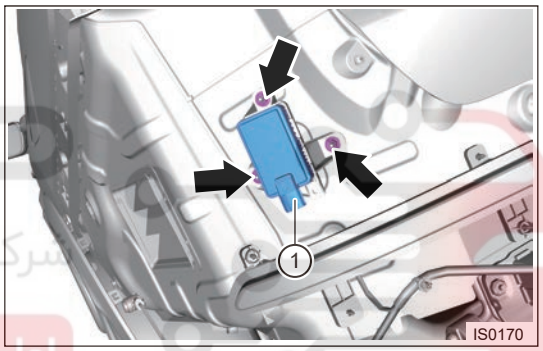
Removal

WARNING

- 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.

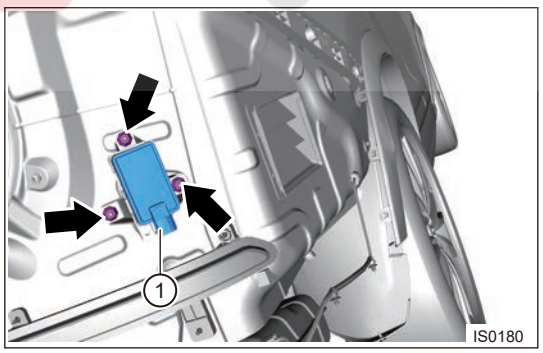
1. Turn off all electrical equipment and ENGINE START STOP switch.
2. Disconnect the negative battery cable for more than 1 minute.
3. Remove the rear bumper assembly.
4. Remove the main blind spot detection radar module.
   a. Disconnect main blind spot detection radar module connector (1), remove 3 fixing screws (arrow) from main blind spot detection radar module.

      Tightening Torque
      3.5 ± 0.5 N m



   b. Disconnect sub blind spot detection radar module connector (arrow), remove 3 fixing screws from sub blind spot detection radar module.

      Tightening Torque
      3.5 ± 0.5 N m



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 45 um)

1. Installation is in the reverse order of removal.