BLIND SPOT DETECTION

BLIND SPOT DETECTION 52-3
Warning and Precautions 52-3
Precautions 52-3
System Overview 52-4
System Components Diagram 52-4
System Schematic Diagram 52-5
System Function 52-5
Components Operation Description 52-8
Main/Sub Blind Spot Detection Radar 52-8
Special Tools and Equipment 52-8
General Tools 52-8
Tightening Torque List 52-8
Torque 52-8
System Circuit Diagram 52-9
Blind Spot Detection (BSD) 52-9
Diagnosis Information and Procedures 52-10
Diagnosis Procedure 52-10
Problem Symptoms Table 52-12
Blind Spot Detection Radar Terminal list 52-13
Blind Spot Detection Diagnostic Trouble Code (DTC) Chart 52-15
B1A44-16 52-16
B1A44-17 52-16
B1A40-11 52-17
B1A40-15 52-17
B1A41-11 52-20
B1A41-15 52-20
B1A49-11 52-23
B1A49-15 52-23
B1A4A-11 52-26
B1A4A-15 52-26
U0146-87 52-29
U0146-87 52-29
U0100-87 52-29
U0101-87 52-29
U1300-55 52-29
U0140-87 52-29
U0129-87 52-29
U0126-87 52-29
U0418-81 52-29
U0428-81 52-29
U0422-81 52-29
Matching Learning 52-30
Write Software Configuration Information 52-30
Removal & Installation 52-33
Blind Spot Detection Radar (Take left side as an example) 52-33

BLIND SPOT DETECTION

Warning and Precautions

Precautions

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

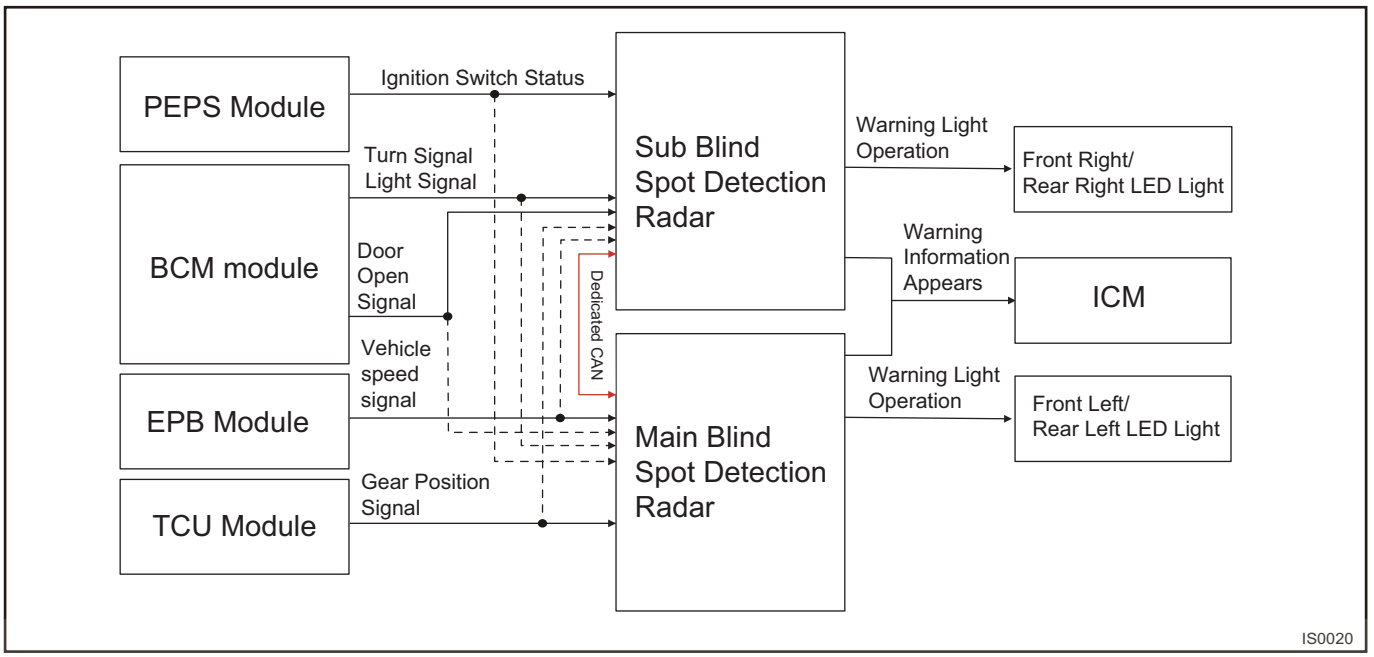
1. Install connector in place when installing blind spot detection module.
2. Check blind spot detection module system for proper operation after installing blind spot detection module.
3. When sheet metal paint operation is performed on the rear bumper, there should not be a sudden change in the thickness 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).
4. Installation angle of blind spot detection is 37°. Installation angle is the angle between sensor emission surface and longitudinal axis of vehicle body.
5. Make sure that the area of sensor view is free of any metal or complex structural parts (such as clips, steps, etc.) when installing.

System Overview

System Components Diagram

1	Instrument Cluster	4	Right LED Light
2	Audio Head Unit	5	Main Blind Spot Detection Radar
3	Left LED Light	6	Sub Blind Spot Detection Radar

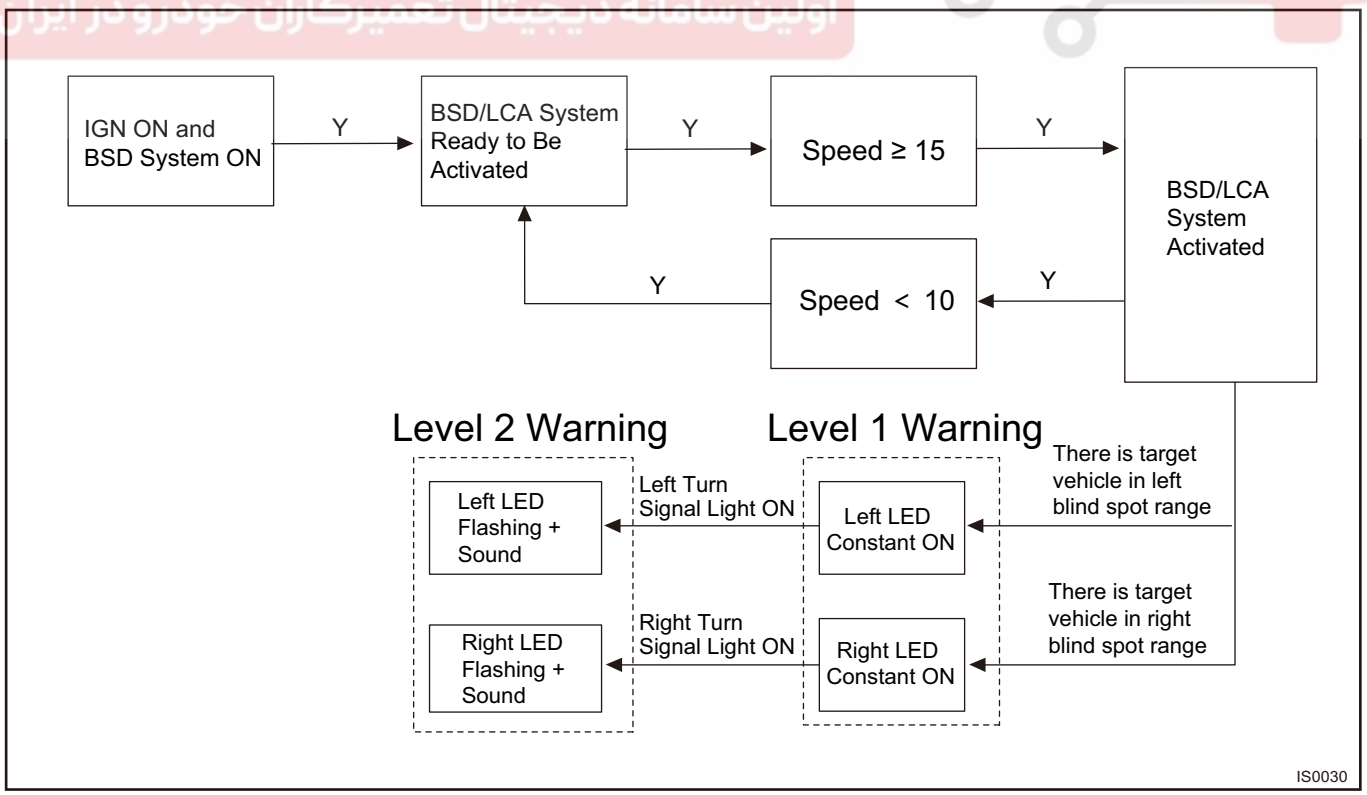
System Schematic Diagram



Blind spot detection (BSD), 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.

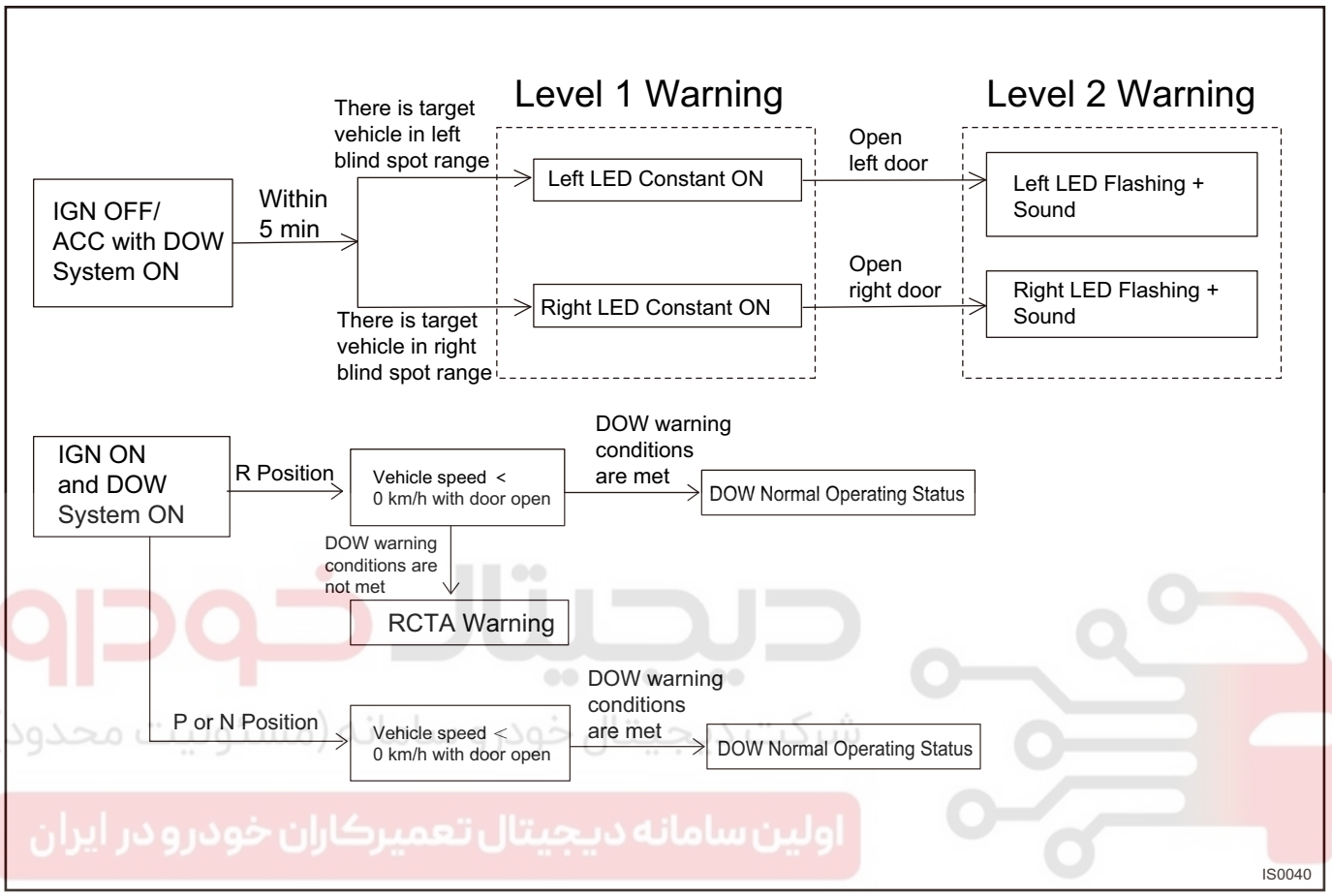
System Function

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



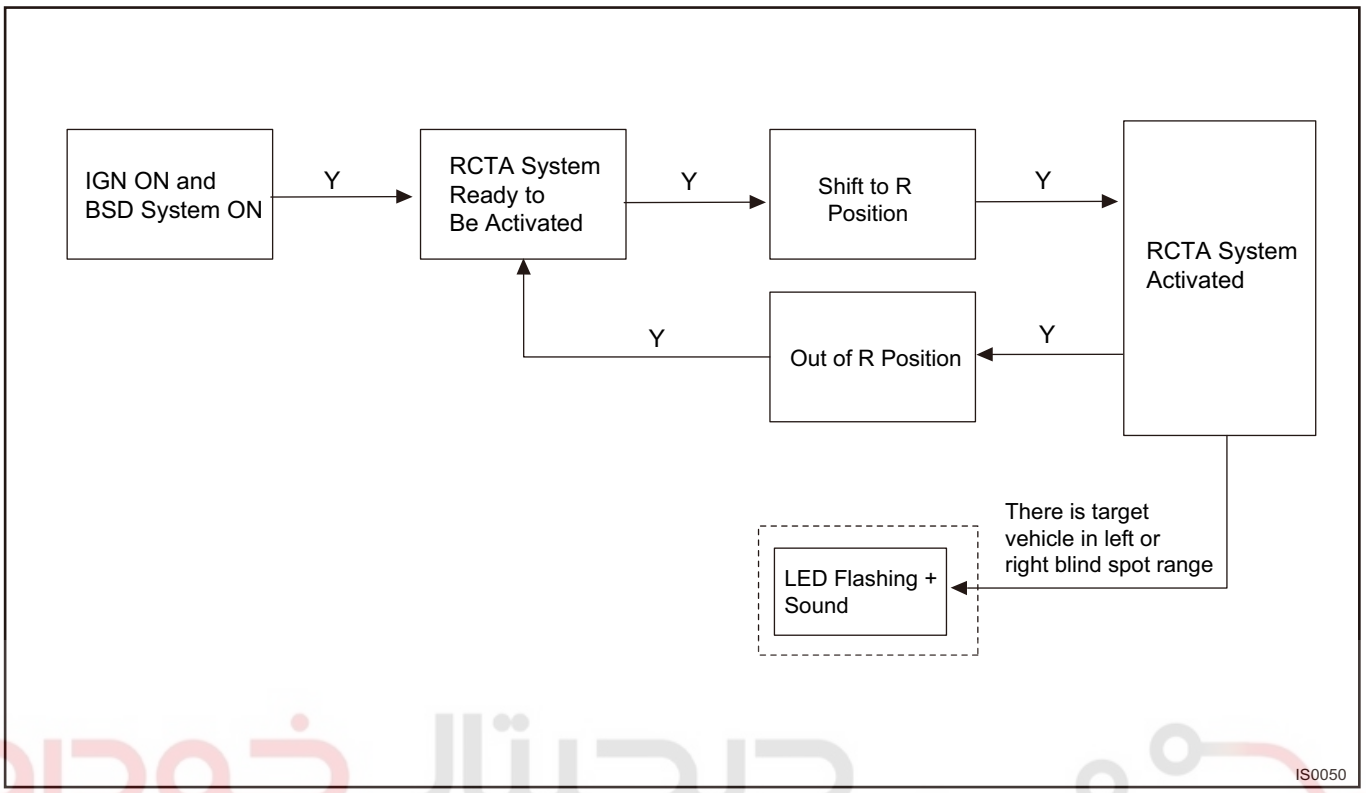
Blind spot detection/lane change assist monitors whether there are moving vehicles in the rear area of left and right sides of vehicle, and sends the information to driver to remind the driver to pay attention to driving safety and lane change safety. This system also extends door open collision warning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

Door Open Collision Warning System (DOW)



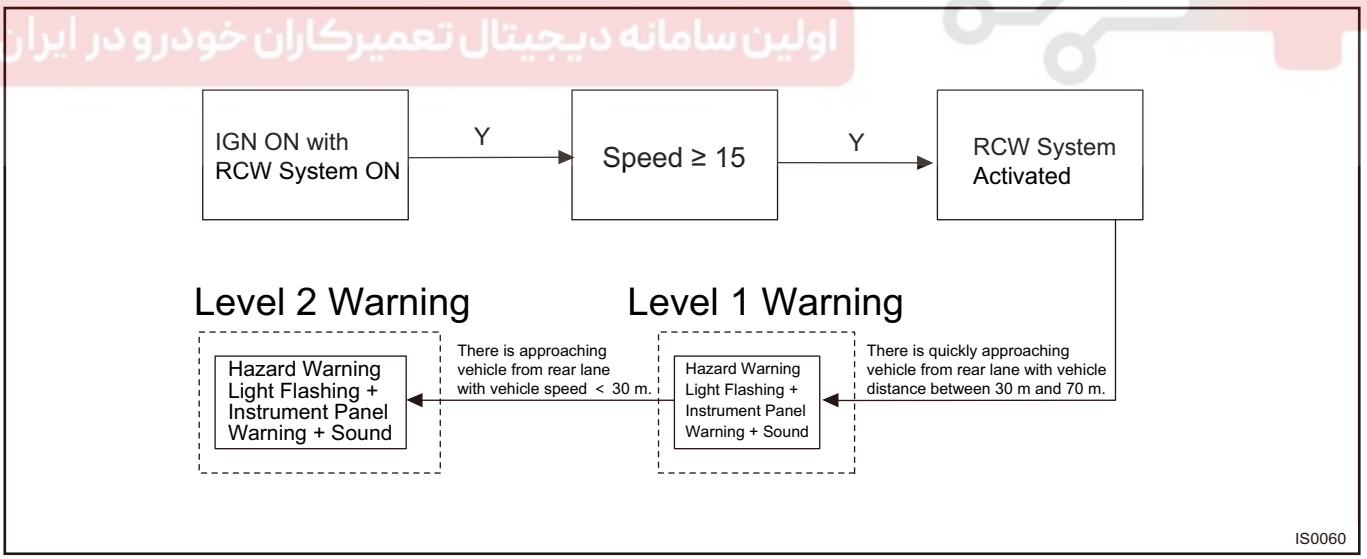
When the vehicle is stationary, blind spot detection detects that there are approaching vehicles on left and right sides and the door is opened, door open collision warning system will give an alarm to remind the driver/occupant to pay attention to the vehicle from rear side when exiting the vehicle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

Components Operation Description

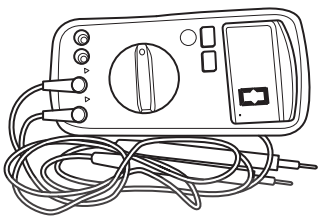
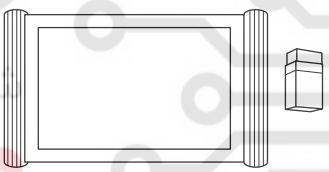
Main/Sub Blind Spot Detection Radar

Main Function

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.

Special Tools and Equipment

General Tools

Tool Name	Tool Drawing
Digital Multimeter	 RCH0002006
Diagnostic Tester	 RCH0001006

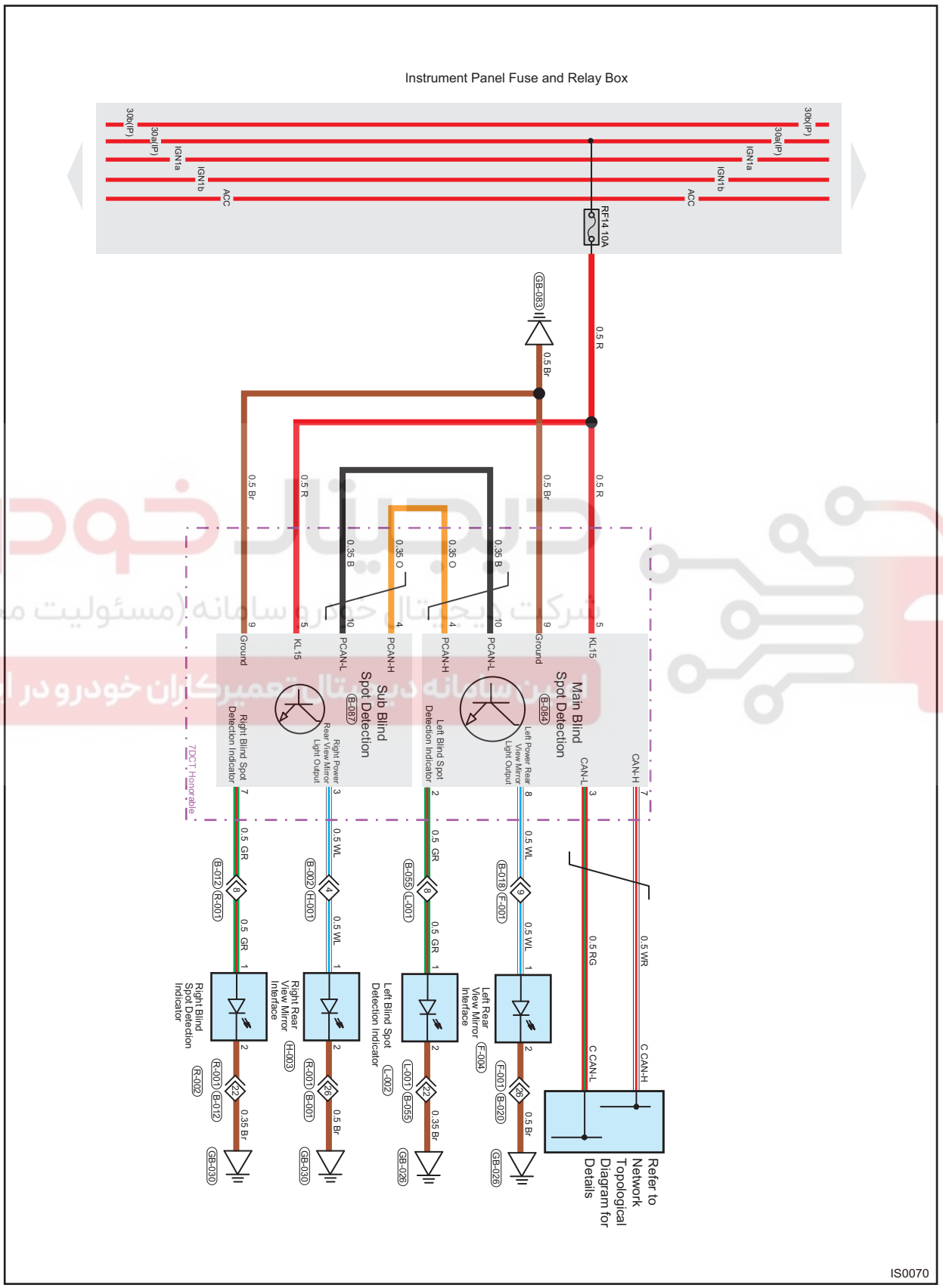
Tightening Torque List

Torque

Description	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

System Circuit Diagram

Blind Spot Detection (BSD)



Diagnosis Information and Procedures

Diagnosis Procedure

Hint:

Use following procedures to troubleshoot the blind spot detection.

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

Result	Go to
OK	A
NG	B

B → **Replace battery**

A

3	**Customer problem analysis**

NEXT

4	**Read DTCs**

Result

Result	Go to
DTC exists	A
No DTC	B

B → **Repair according to Problem Symptoms Table**

A

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

Result

Result	Go to
DTC exists	A
No DTC	B

B → Troubleshoot according to intermittent DTC Troubleshooting

A

6	Repair according to Diagnostic Trouble Code (DTC) Chart

NEXT

7	Adjust, repair or replace

NEXT

8	Conduct test and confirm malfunction has been repaired

NEXT → End

DTC Confirmation Procedure

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

- Turn ENGINE START STOP switch to OFF.
- Connect diagnostic tester (the latest software).
- Turn ENGINE START STOP switch to ON.
- Use the diagnostic tester to record and clear DTCs stored in system.
- Turn ENGINE START STOP switch to OFF and wait several seconds.
- Turn ENGINE START STOP switch to ON and check the DTCs in system again.
- If DTC is detected, it indicates current malfunction.
- If no DTC is detected, malfunction indicated by the DTC is intermittent.

Intermittent DTC Troubleshooting

- Check if connector is loose.
- Check if wire harness is worn, pierced, pinched or partially broken.
- Wiggle related wire harness and connector and observe if signal in related circuit is interrupted.
- If possible, try to duplicate conditions under which DTC was set.
- Look for data that has changed or DTC to reset during wiggle test.
- Check for broken, bent, protruded or corroded terminals.
- Check 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 works. Circuits are very sensitive to proper grounding. A loose or corroded ground can affect the control circuit. Check the ground points as follows:

- Remove ground bolt or nut.
- Check all contact surfaces for tarnish, dirt and rust, etc.
- Clean as necessary to ensure that contact is in good condition.
- Reinstall ground bolt or nut securely.
- Check if add-on accessories interfere with ground circuit.
- If several wire harnesses are crimped into one ground terminal, check for proper crimps. Make sure all wire harnesses are clean, securely fastened with providing a good ground path.

Problem Symptoms Table

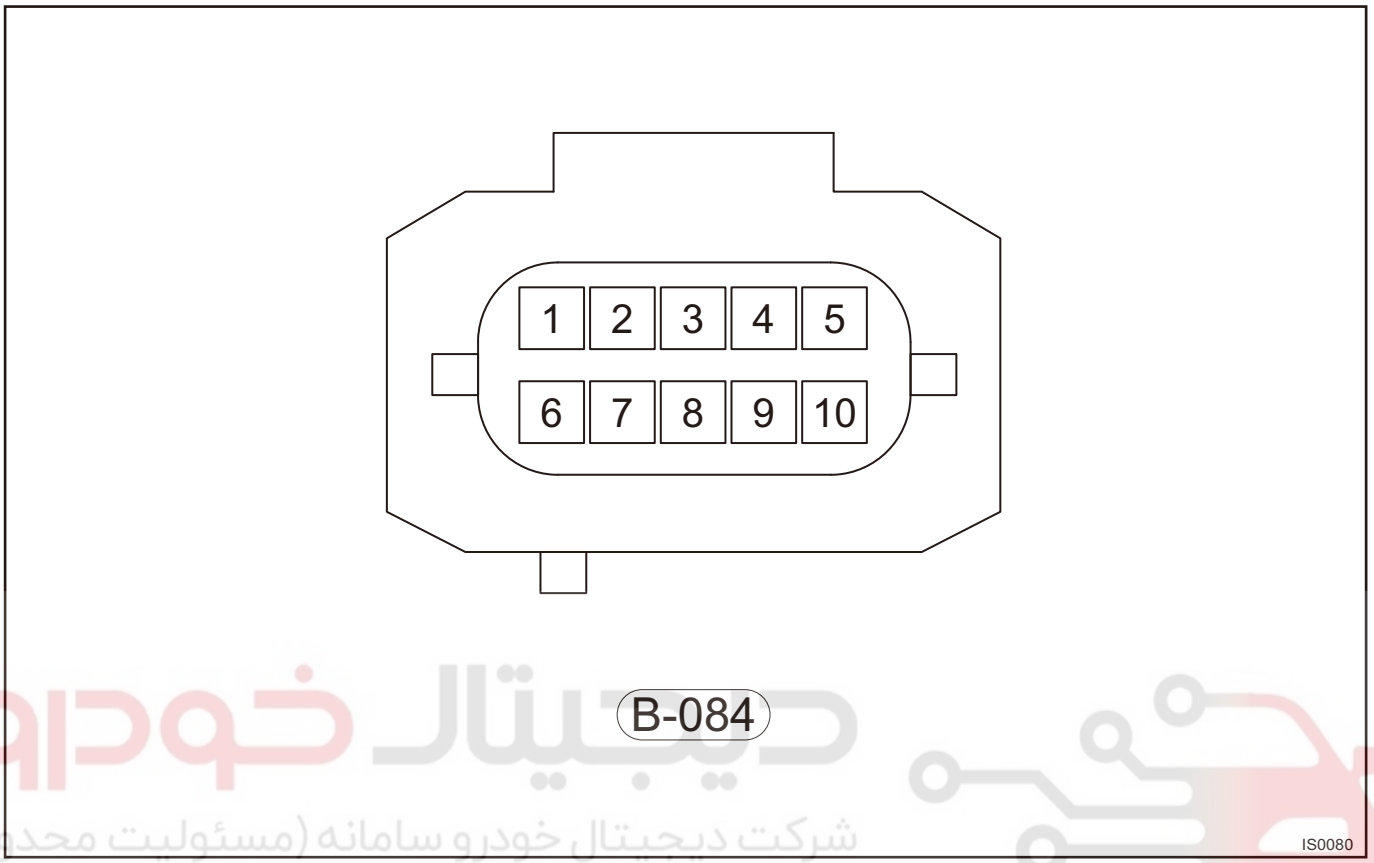
Hint:

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

Symptom	Possible Cause
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 failure	Fuse
	Wire harness fault
	Central gateway (CGW)
	Main/sub blind spot detection radar

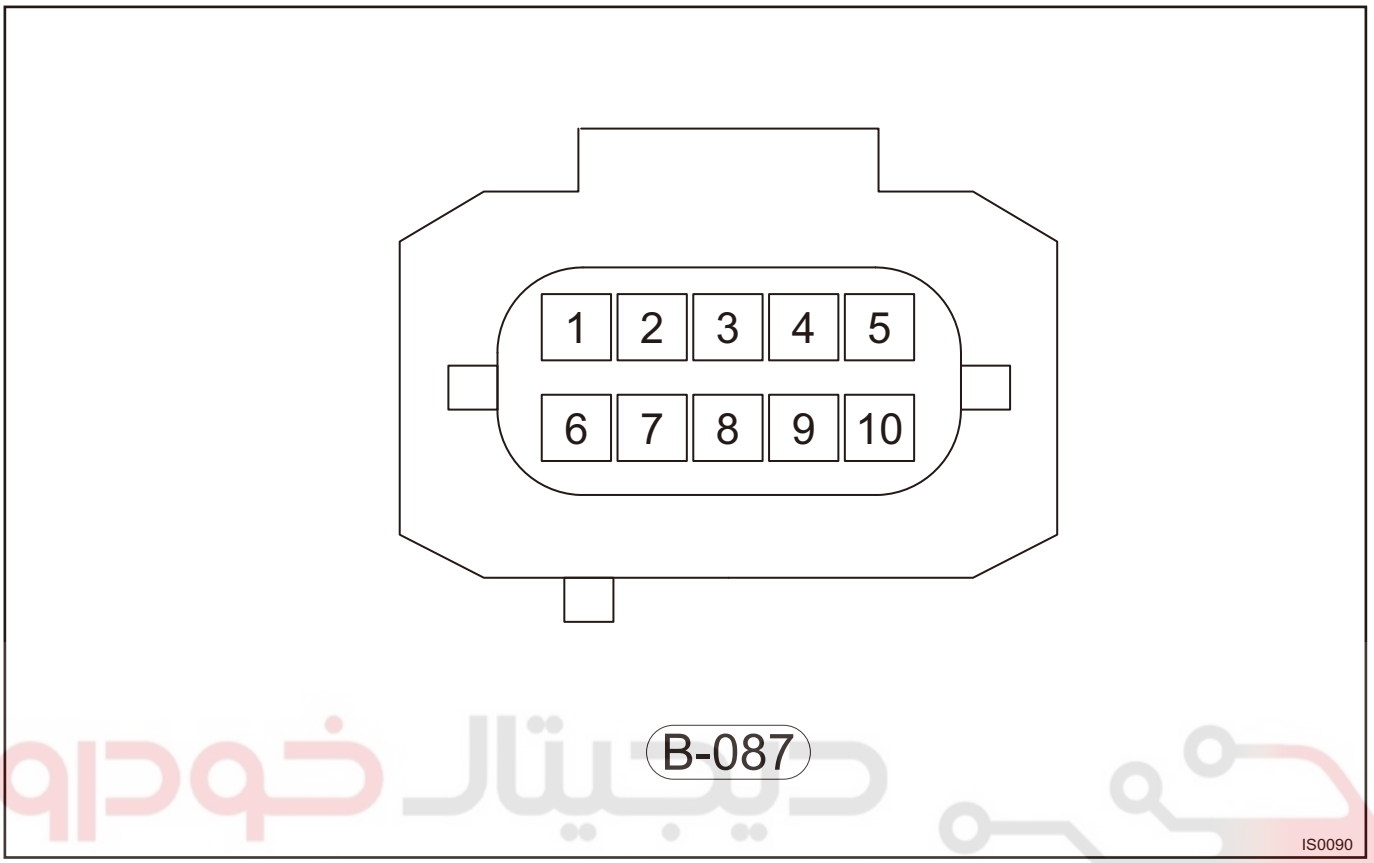
Blind Spot Detection Radar Terminal list

Main Blind Spot Detection Radar Terminal list



Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	\	6	\
2	Rear Left Door DOW Indicator Output	7	C-CAN1-H
3	C-CAN1-L	8	Front Left Indicator Output
4	Private CAN-H	9	Ground
5	IGN1	10	Private CAN-L

Sub Blind Spot Detection Radar Terminal list



Terminal No.	Terminal Definition	Terminal No.	Terminal Definition
1	\	6	\
2	\	7	Rear Right Door DOW Indicator Output
3	Front Right Indicator Output	8	\
4	Private CAN-H	9	Ground
5	IGN1	10	Private CAN-L

Blind Spot Detection 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
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	LED Right Circuit Short to Ground
B1A49-15	LED Right Circuit Short to Battery or Open
B1A4A-11	LED Left Circuit Short to Ground
B1A4A-15	LED Left Circuit Short to Battery or Open
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 BSM
U0126-87	Lost Communication With SAM
U0418-81	Invalid Data Received from BSM
U0428-81	Invalid Data Received from SAM
U0422-81	Invalid Data Received from BCM

DTC	B1A44-16	Battery Voltage - Circuit Voltage Below Threshold

DTC	B1A44-17	Battery Voltage - Circuit Voltage Above Threshold

Description

DTC	DTC Definition	Possible Cause
B1A44-16	Battery Voltage - Circuit Voltage Below Threshold	• Battery voltage is too low or battery is damaged • Battery voltage is too high or battery is damaged • ECU internal fault
B1A44-17	Battery Voltage - Circuit Voltage Above Threshold	

1	Check battery voltage

(a) Turn ENGINE START STOP switch to OFF.
(b) Disconnect the negative battery cable.
(c) Check battery voltage with a digital multimeter (not less than 9 V).

Result

Result	Go to
OK	B
NG	A

A → **Replace battery**

B

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 (12.5 V - 16 V).

Result

Result	Go to
OK	B
NG	A

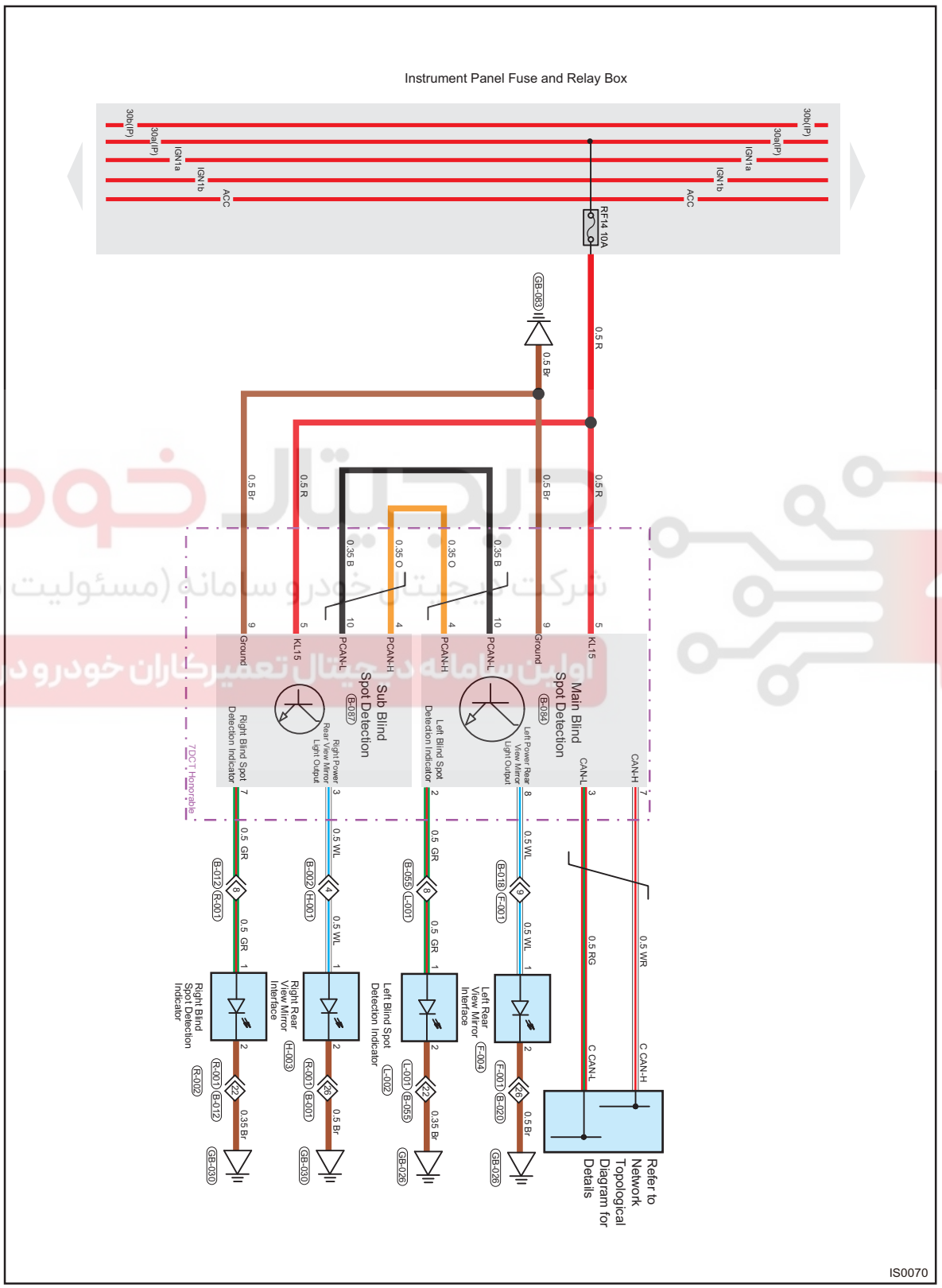
B → **System operates normally**

A → **Repair or replace positive and negative cables and alternator**

DTC	B1A40-11	LED Right Circuit Short to Ground

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

Circuit Diagram



Description

DTC	DTC Definition	Possible Cause
B1A40-11	LED Right Circuit Short to Ground	•Wire harness or power mirror/lens •Sub blind spot detection radar
B1A40-15	LED Right Circuit Short to Battery or Open	

1	Check LED light

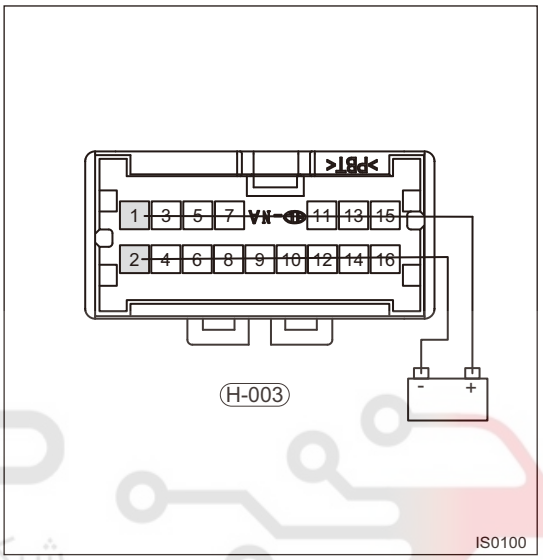
(a) Turn off all electrical equipment and the ENGINE START STOP switch.

(b) Disconnect the negative battery cable.

(c) Check if LED light comes on by connecting positive battery cable to terminal 1 of front right power mirror H-003 and negative battery cable to terminal 2 of front right power mirror H-003 according to table below.

Standard Condition

Multimeter Connection	Condition	Normal Condition
H-003 (2) - Battery negative, H-003 (1) - Battery positive	Always	LED light is ON



Result

Result	Go to
OK	B
NG	A

B → **Replace power mirror/lens**

A

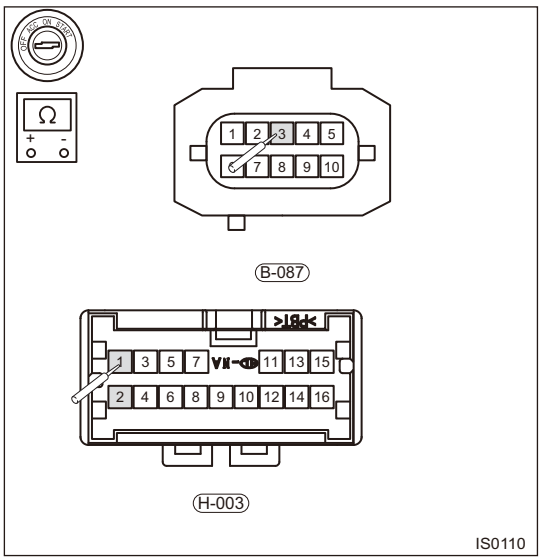
2	Check wire harness and connector

(a) Disconnect connectors B-087 and H-003.

(b) Using ohm band of multimeter, check for continuity between B-087 (3) - H-003 (1), H-003 (1) - H-003 (2) separately.

Standard Condition

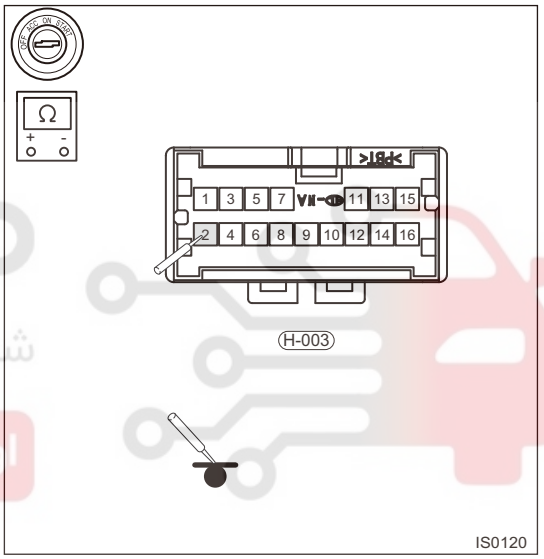
Multimeter Connection	Condition	Normal Condition
B-087 (3) - H-003 (1)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
H-003 (1) - H-003 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



(c) Using ohm band of multimeter, check for continuity between H-003 (2) and body ground separately.

Standard Condition

Multimeter Connection	Condition	Normal Condition
H-003 (2) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω



Result

Result	Go to
OK	B
NG	A

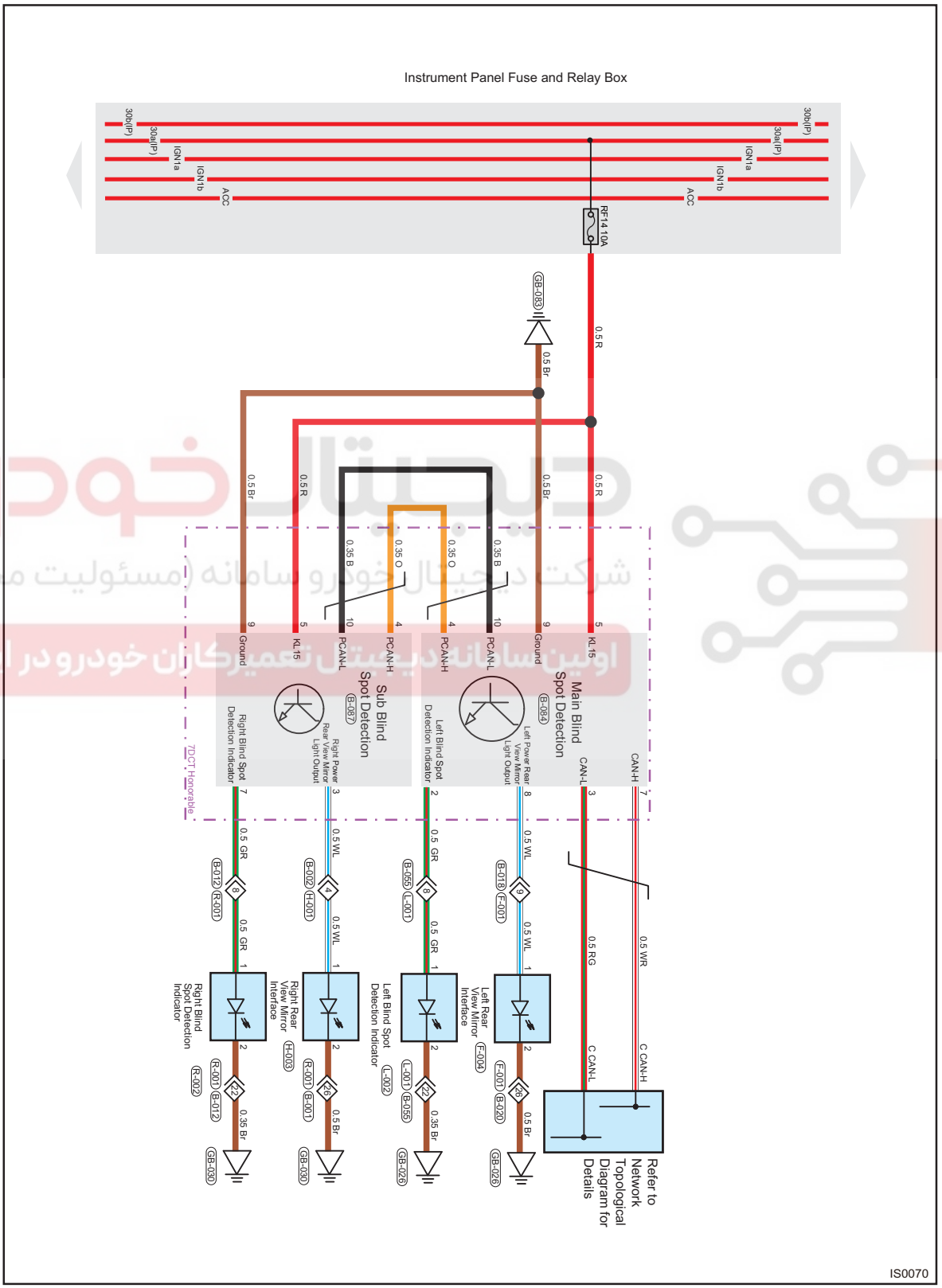
B → **System operates normally**

A → **Replace sub blind spot detection radar**

DTC	B1A41-11	LED Left Circuit Short to Ground

DTC	B1A41-15	LED Left Circuit Short to Battery or Open

Circuit Diagram



Description

DTC	DTC Definition	Possible Cause
B1A41-11	LED Left Circuit Short to Ground	• Wire harness or power mirror/lens • Main blind spot detection radar
B1A41-15	LED Left Circuit Short to Battery or Open	

1	Check LED light

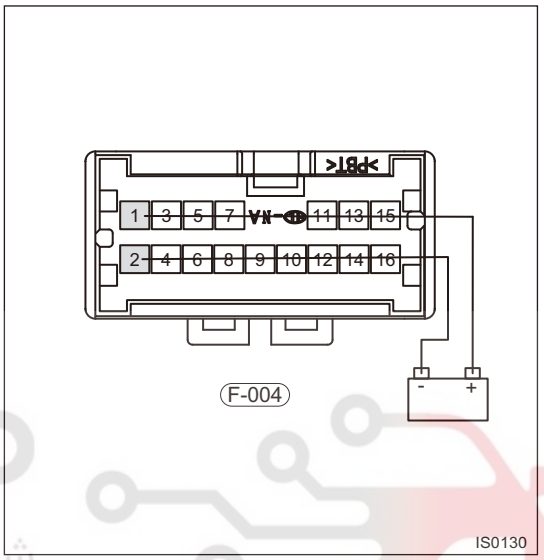
(a) Turn off all electrical equipment and the ENGINE START STOP switch.

(b) Disconnect the negative battery cable.

(c) Check if LED light comes on by connecting positive battery cable to terminal 1 of front left mirror F-004 and negative battery cable to terminal 2 of front left mirror F-004 according to table below.

Standard Condition

Multimeter Connection	Condition	Normal Condition
F-004 (2) - Battery negative, F-004 (1) - Battery positive	Always	LED light is ON



Result

Result	Go to
OK	B
NG	A

B → **Replace power mirror/lens**

A

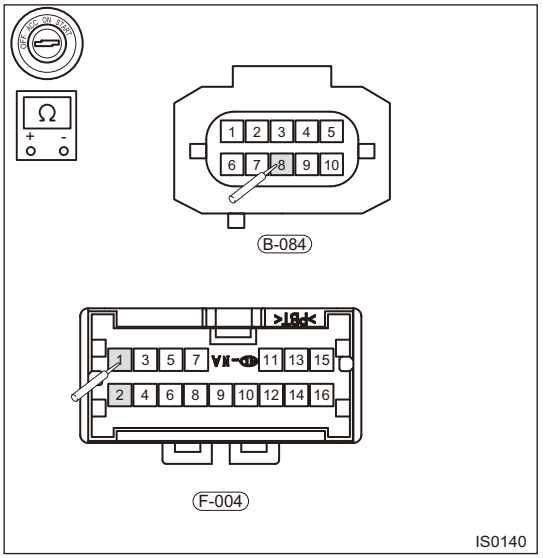
2	Check wire harness and connector

(a) Disconnect connectors B-084 and F-004.

(b) Using ohm band of multimeter, check for continuity between B-084 (8) - F-004 (1), F-004 (1) - F-004 (2) separately.

Standard Condition

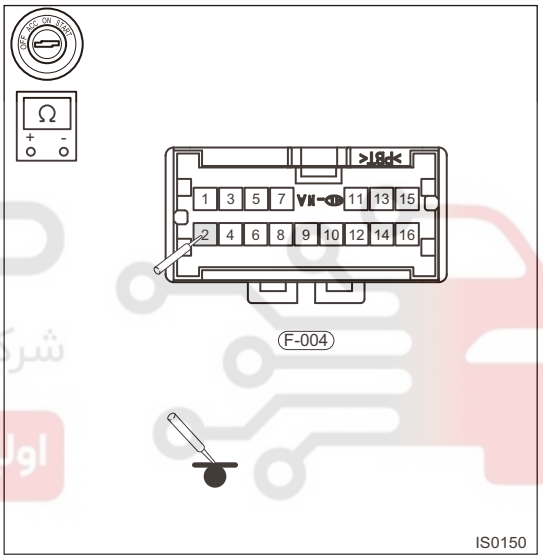
Multimeter Connection	Condition	Normal Condition
B-084 (8) - F-004 (1)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
F-004 (1) - F-004 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



(c) Using ohm band of multimeter, check for continuity between F-004 (2) and body ground separately.

Standard Condition

Multimeter Connection	Condition	Normal Condition
F-004 (2) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω



Result

Result	Go to
OK	B
NG	A

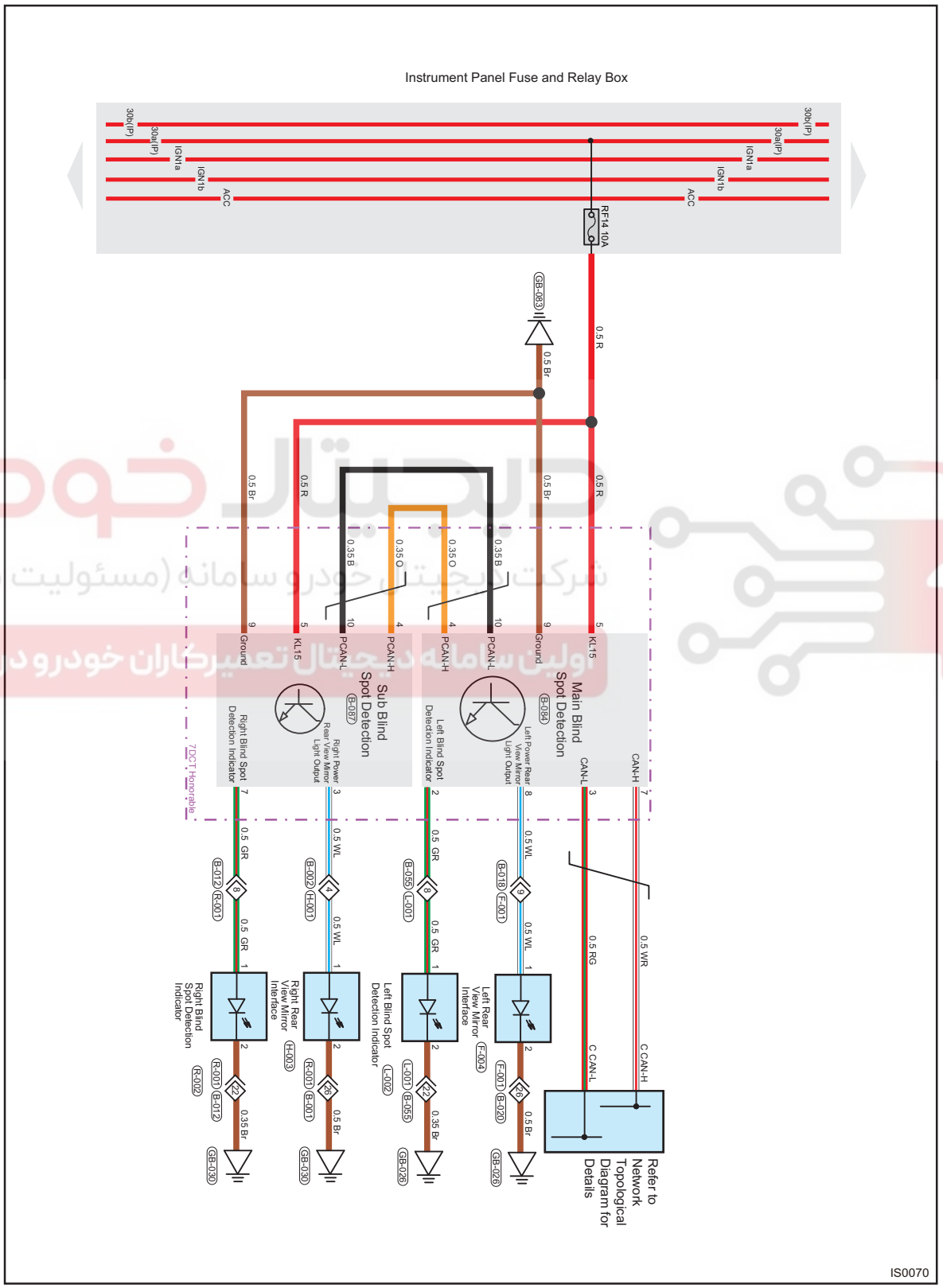
B → **System operates normally**

A → **Replace main blind spot detection radar**

DTC	B1A49-11	LED Right Circuit Short to Ground

DTC	B1A49-15	LED Right Circuit Short to Battery or Open

Circuit Diagram



Description

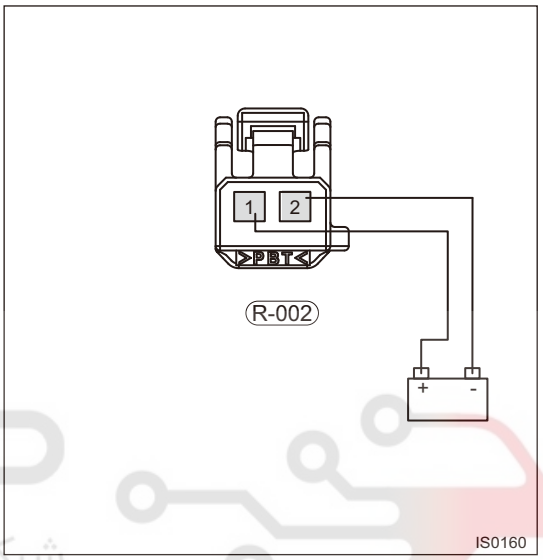
DTC	DTC Definition	Possible Cause
B1A49-11	LED Right Circuit Short to Ground	• Rear DOW indicator • Sub blind spot detection radar
B1A49-15	LED Right Circuit Short to Battery or Open	

1	Check LED light

(a) Turn off all electrical equipment and the 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 right power mirror R-002 and negative battery cable to terminal 2 of front right power mirror R-002 according to table below.

Standard Condition

Multimeter Connection	Condition	Normal Condition
R-002 (2) - Battery negative, R-002 (1) - Battery positive	Always	LED light is ON



Result

Result	Go to
OK	B
NG	A

B → Replace DOW indicator

A

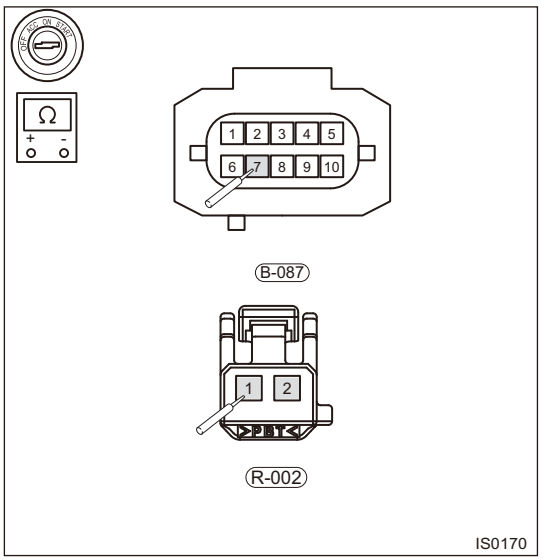
2	Check wire harness and connector

(a) Disconnect connectors B-087 and R-002.

(b) Using ohm band of multimeter, check for continuity between B-087 (7) - R-002 (1), R-002 (1) - R-002 (2) separately.

Standard Condition

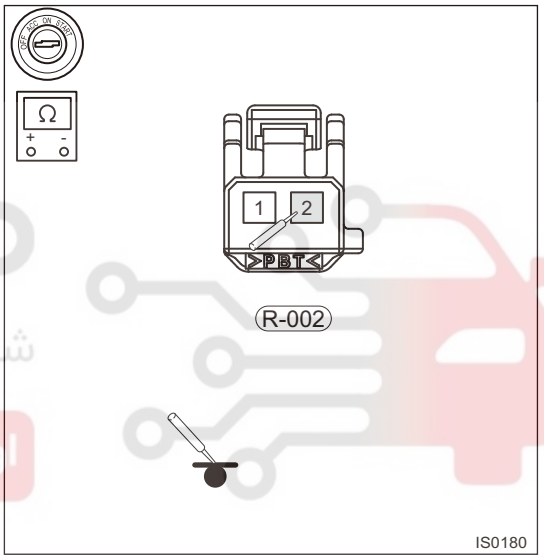
Multimeter Connection	Condition	Normal Condition
B-087 (7) - R-002 (1)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
R-002 (1) - R-002 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



(c) Using ohm band of multimeter, check for continuity between R-002 (2) and body ground separately.

Standard Condition

Multimeter Connection	Condition	Normal Condition
R-002 (2) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω



Result

Result	Go to
OK	B
NG	A

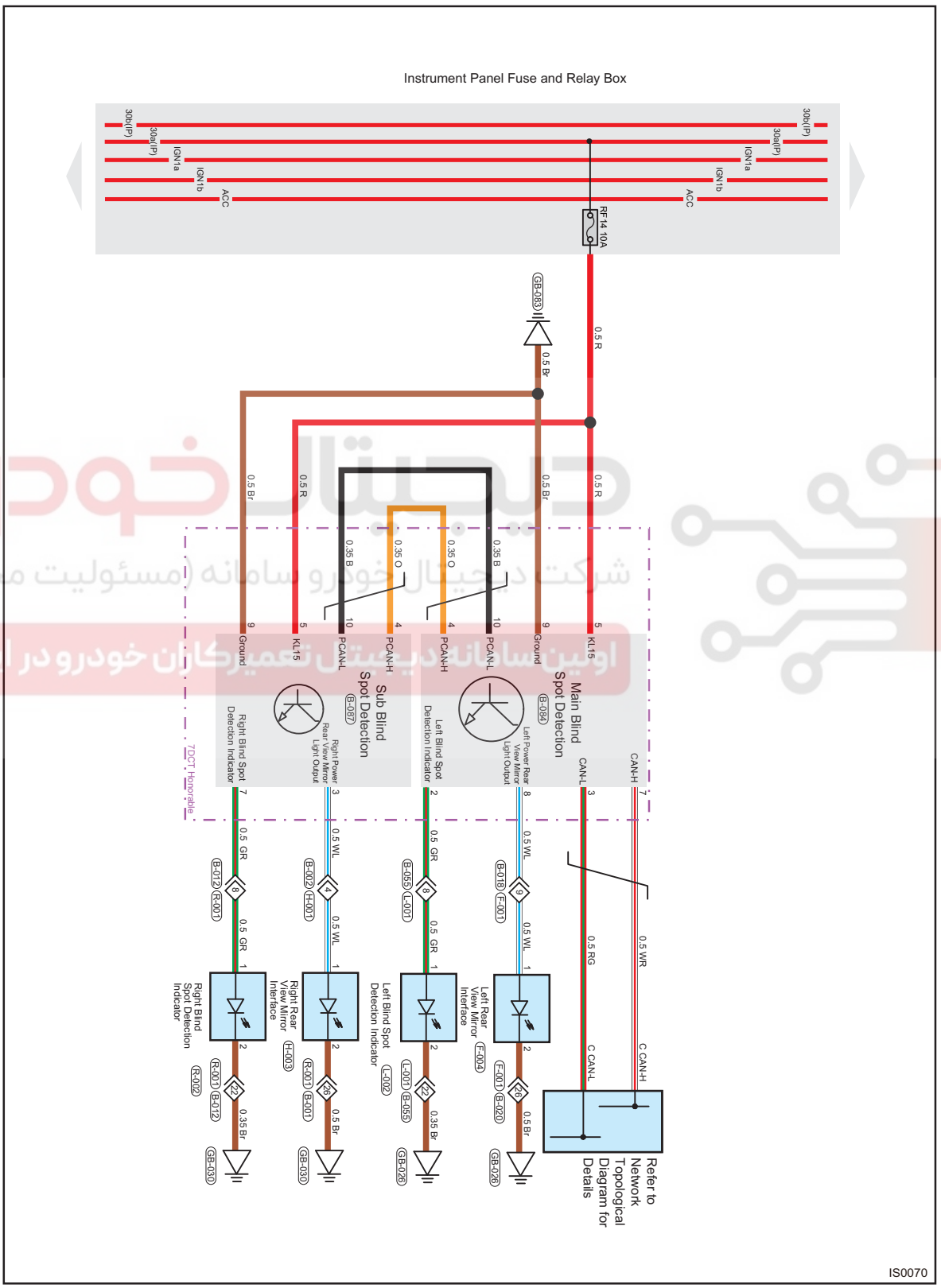
B → **System operates normally**

A → **Replace sub blind spot detection radar**

DTC	B1A4A-11	LED Left Circuit Short to Ground

DTC	B1A4A-15	LED Left Circuit Short to Battery or Open

Circuit Diagram



Description

DTC	DTC Definition	Possible Cause
B1A4A-11	LED Left Circuit Short to Ground	• Rear DOW indicator • Main blind spot detection radar
B1A4A-15	LED Left Circuit Short to Battery or Open	

1	Check LED light

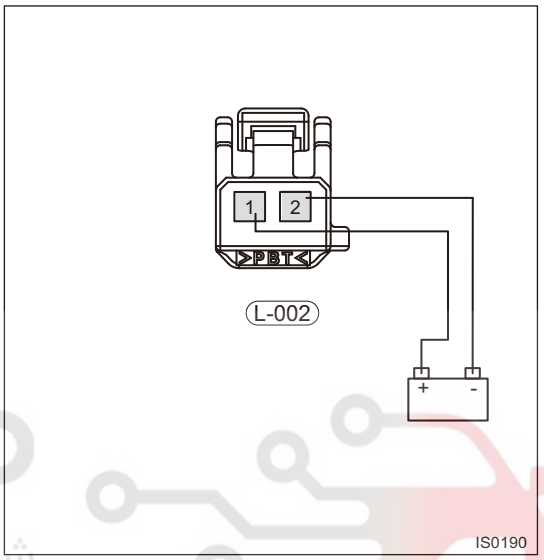
(a) Turn off all electrical equipment and the ENGINE START STOP switch.

(b) Disconnect the negative battery cable.

(c) Check if LED light comes on by connecting positive battery cable to terminal 1 of front right power mirror L-002 and negative battery cable to terminal 2 of front right power mirror L-002 according to table below.

Standard Condition

Multimeter Connection	Condition	Normal Condition
L-002 (2) - Battery negative, L-002 (1) - Battery positive	Always	LED light is ON



Result

Result	Go to
OK	B
NG	A

B → Replace DOW indicator

A

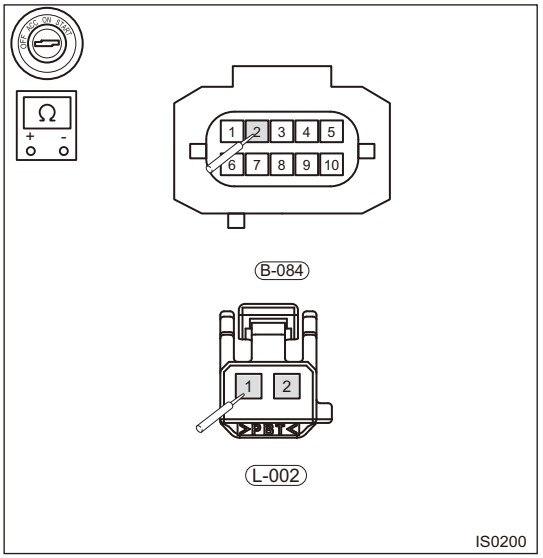
2	Check wire harness and connector

(a) Disconnect connectors B-084 and L-002.

(b) Using ohm band of multimeter, check for continuity between B-084 (2) - L-002 (1), L-002 (1) - L-002 (2) separately.

Standard Condition

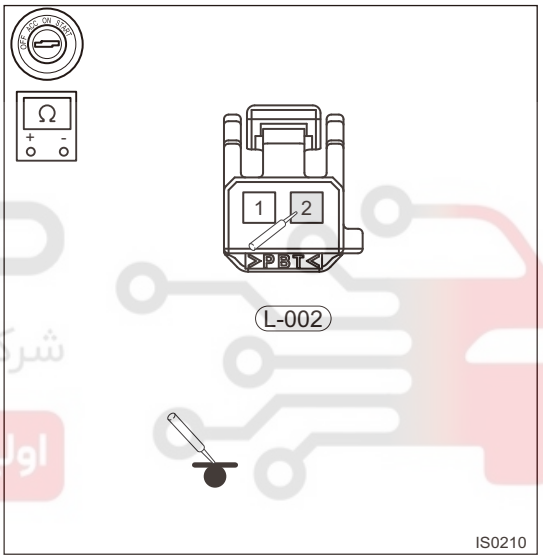
Multimeter Connection	Condition	Normal Condition
B-084 (2) - L-002 (1)	ENGINE START STOP switch "OFF"	⩽ 1 Ω
L-002 (1) - L-002 (2)	ENGINE START STOP switch "OFF"	⩽ 1 Ω



(c) Using ohm band of multimeter, check for continuity between L-002 (2) and body ground separately.

Standard Condition

Multimeter Connection	Condition	Normal Condition
L-002 (2) - Body ground	ENGINE START STOP switch "OFF"	⩽ 1 Ω



Result

Result	Go to
OK	B
NG	A

B → **System operates normally**

A → **Replace main blind spot detection radar**

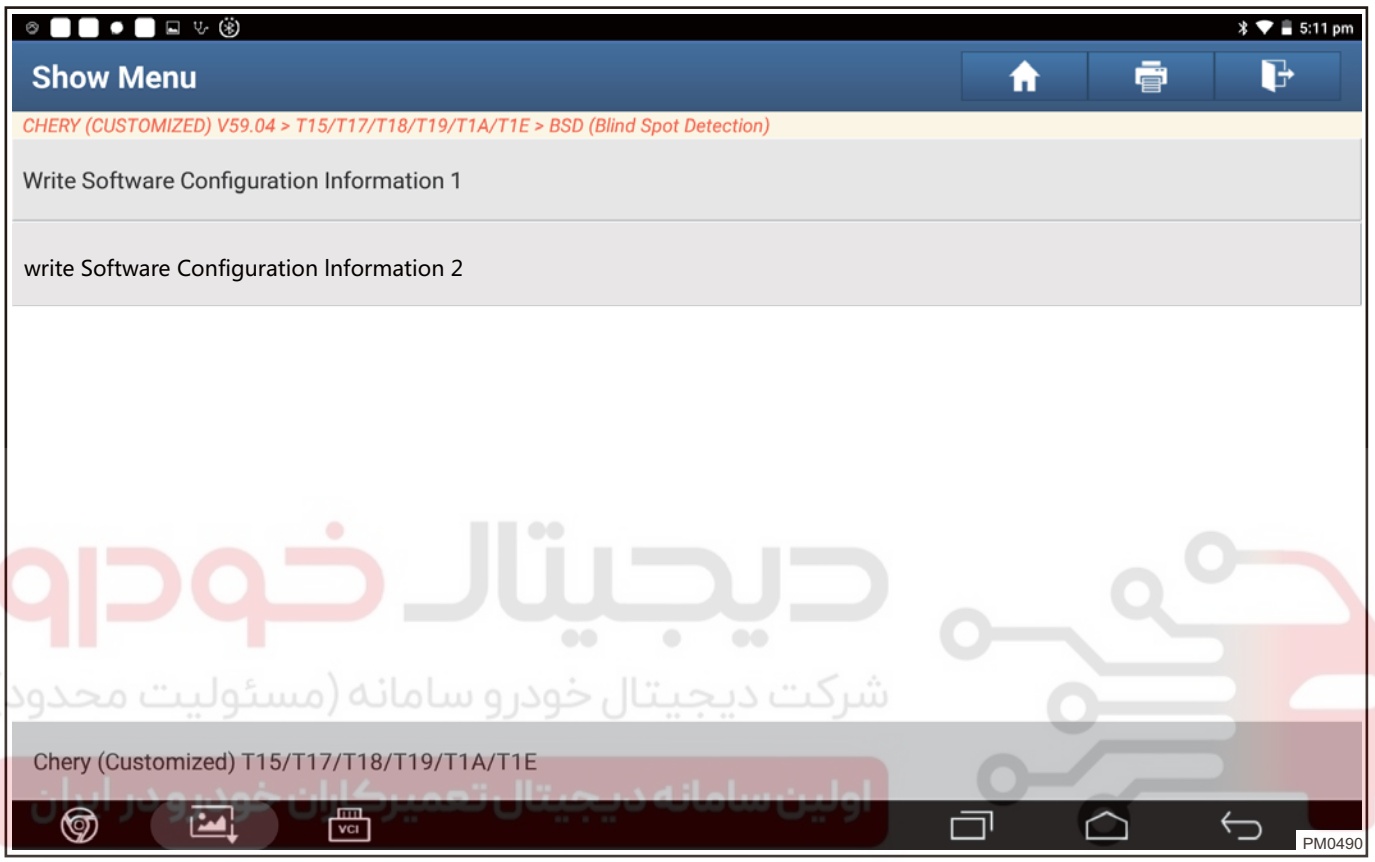
DTC	U0146-87	Lost Communication With CGW
DTC	U0146-87	Lost Communication With CGW
DTC	U0100-87	Lost Communication With EMS
DTC	U0101-87	Lost Communication With TCU
DTC	U1300-55	Central Configuration - Not Configured
DTC	U0140-87	Lost Communication With BCM
DTC	U0129-87	Lost Communication With BSM
DTC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

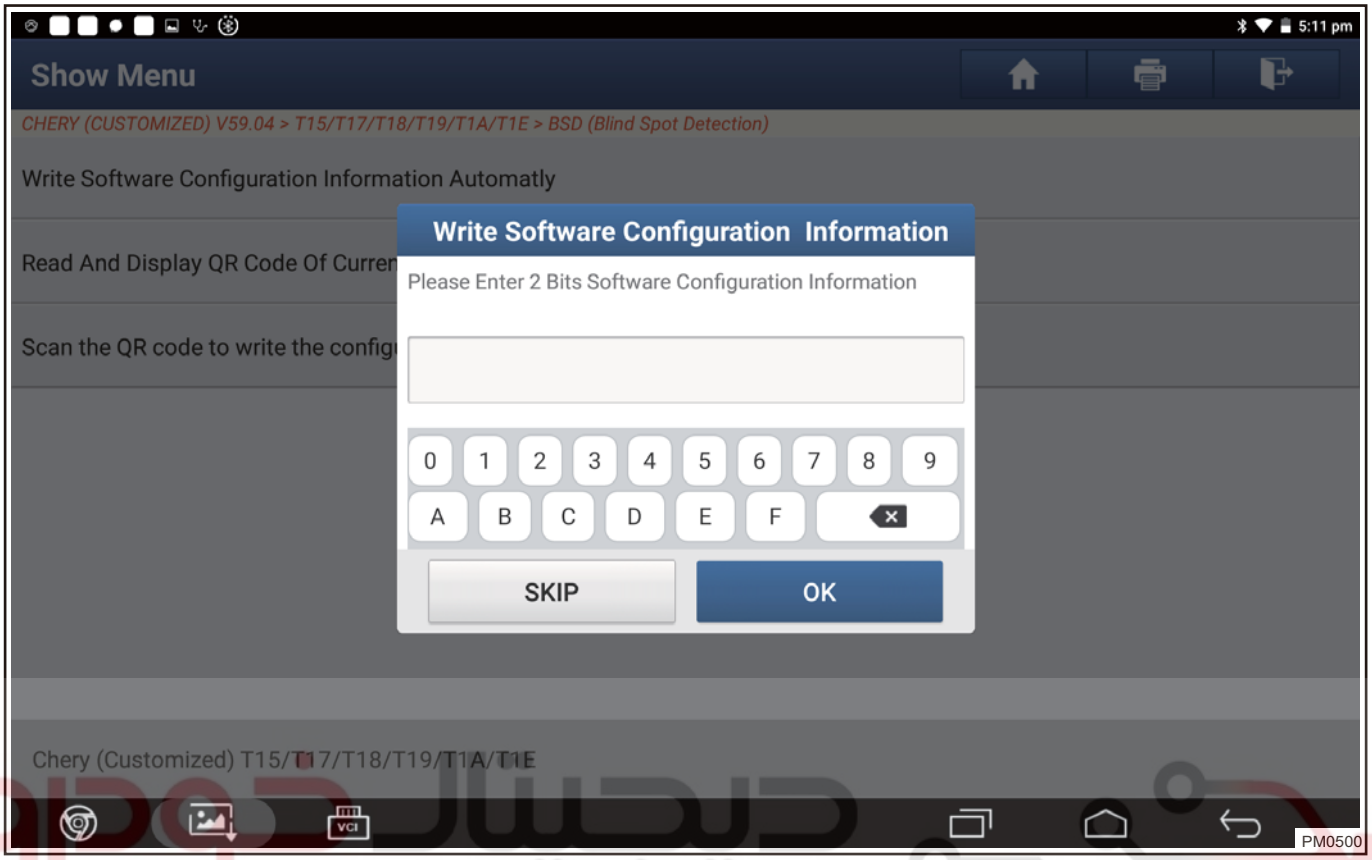
Refer to CAN communication system

Matching Learning

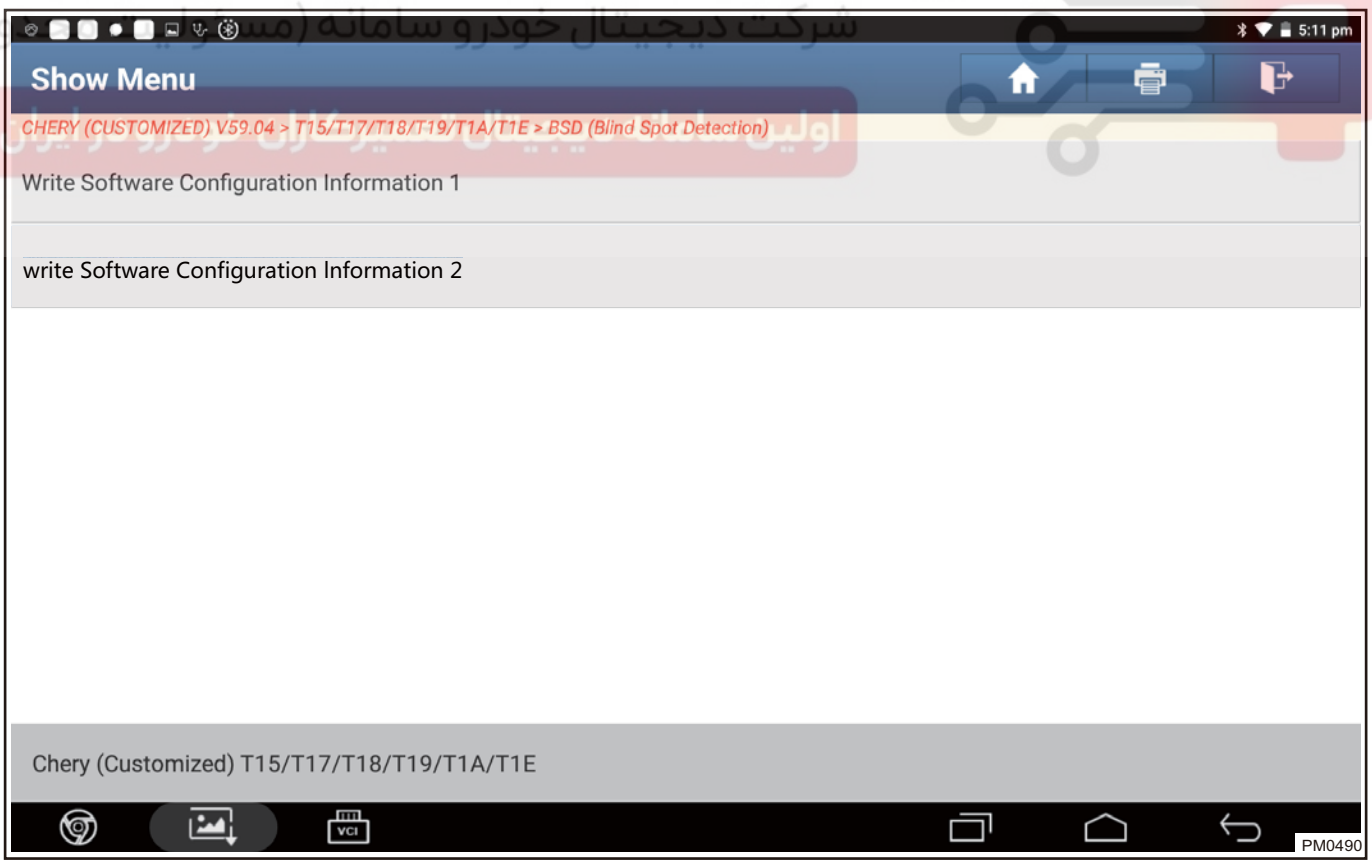
Write Software Configuration Information

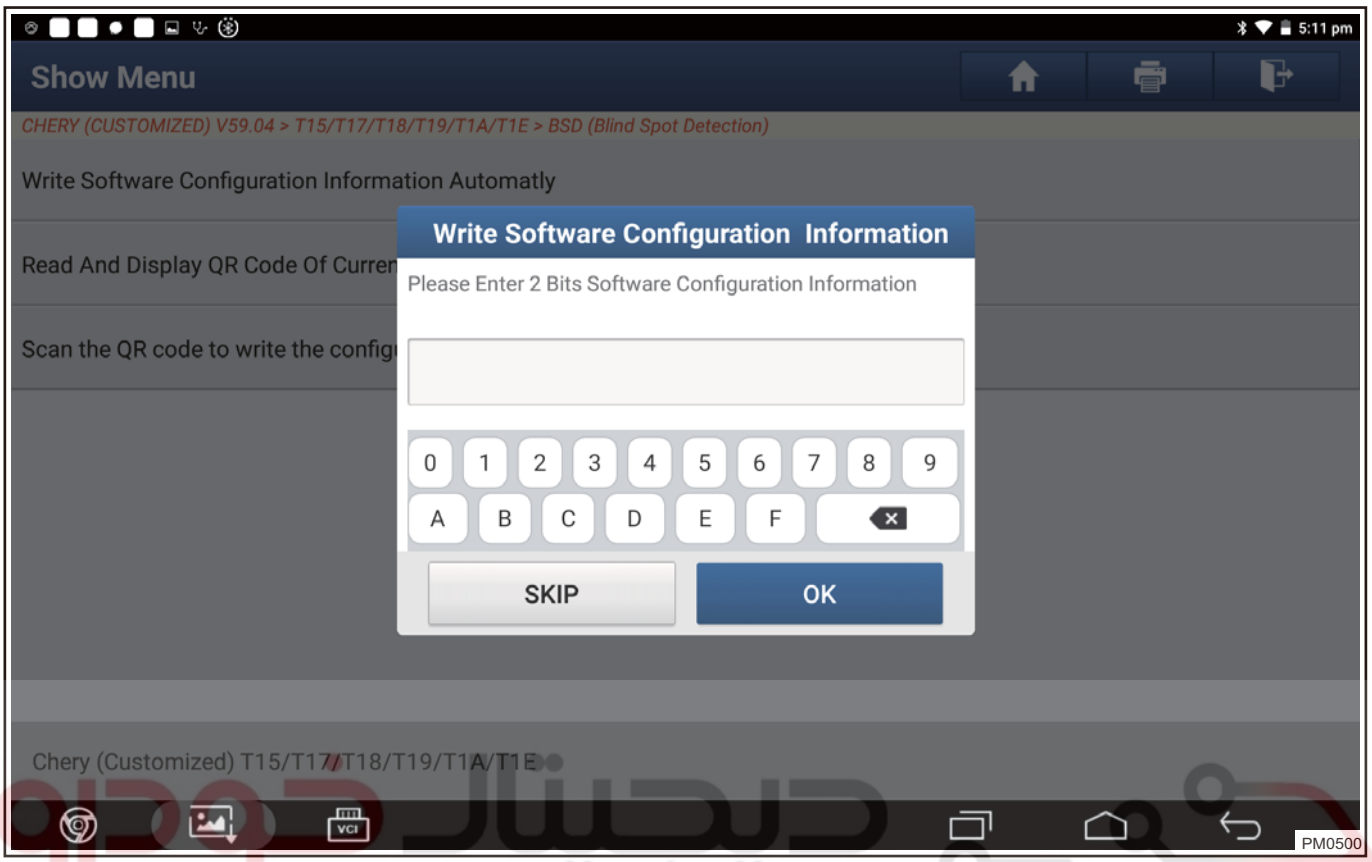
1. Click "BSD (Blind Spot Detection)".
2. Click "Special Function".
3. Click "Write Software Configuration Information 1".





4. Click "Write Software Configuration Information 2".





Removal & Installation

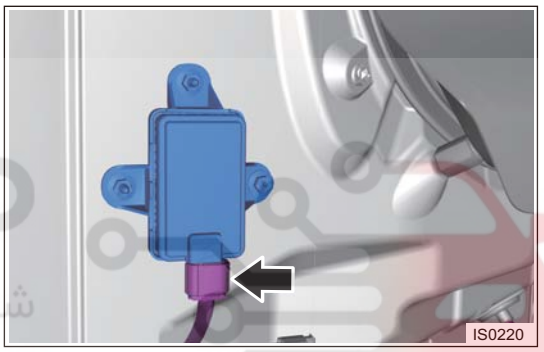
Blind Spot Detection Radar (Take left side as an example)

Removal

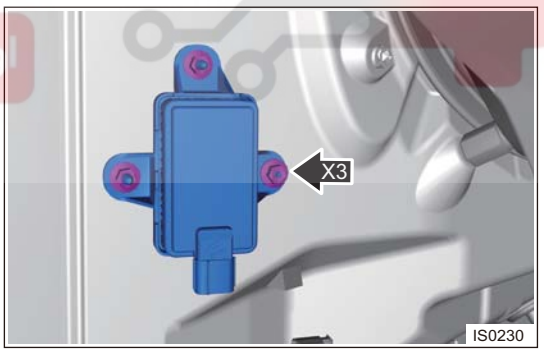
Warning:

- Be sure to wear safety equipment to prevent accidents, when removing blind spot detection radar.
- Operate carefully to prevent damage to blind spot detection module, when removing blind spot detection radar.
- Install connector in place when installing blind spot detection radar.
- Check blind spot detection for proper operation after installing blind spot detection radar.
- 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).

1. Turn ENGINE START STOP switch to OFF.
2. Disconnect the negative battery cable.
3. Remove the rear bumper assembly (See page 61-26).
4. Disconnect the main blind spot detection radar connector.



5. Remove 3 fixing nuts from main blind spot detection radar.
   Torque: 3.5 ± 0.5 N·m



6. Remove the main blind spot detection radar module.

Installation

Installation is in the reverse order of removal.

- MEMO -