

CAN COMMUNICATION

GENERAL INFORMATION	66-3	Diagnosis Tools	66-7
Description	66-3	Diagnostic Help	66-7
Operation	66-3	Intermittent DTC Troubleshooting	66-7
Tools	66-3	Ground Inspection	66-8
Circuit Diagram	66-4	Diagnosis Procedure	66-8
DIAGNOSIS & TESTING	66-6	Diagnostic Interface Cannot Connect To System	66-10
Problem Symptoms Table	66-6	Short in CAN Network	66-20

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



66

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران



GENERAL INFORMATION

Description

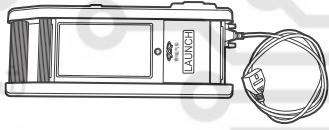
This vehicle is equipped with CAN bus. CAN bus is a kind of field bus, and is a serial communication network which supports distributed control system effectively. It mainly consists of CAN controller, CAN transceiver, data transmission line and data transmission terminating resistor. ECM, TCU, steering angle sensor, EPS, diagnostic interfaces, ABS/ESP, SRS, BCM, PEPS/IMMO, reversing radar, HVAC, AUDIO, IC are connected via CAN bus, CAN controller and CAN transceiver are integrated into electronic control unit. Terminating resistors are respectively integrated into IC, BCM and ECM, forming CAN bus with the IC and BCM as terminating resistors, the ECM and BCM drive CAN bus as terminating resistors.

Operation

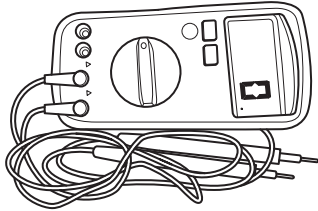
CAN bus is also called vehicle bus, and full name is "Controller Area Network" which means local area network, it connects all control units together in some way to form a complete system. Each control unit collects different signals by each sensor, and transmits data between modules under the same rules. Network information can be priority to meet different real-time requirements. Data transmitted via CAN bus control unit is level model of binary format, and data transmission line transmits the voltage signal.

Tools

Special Tools

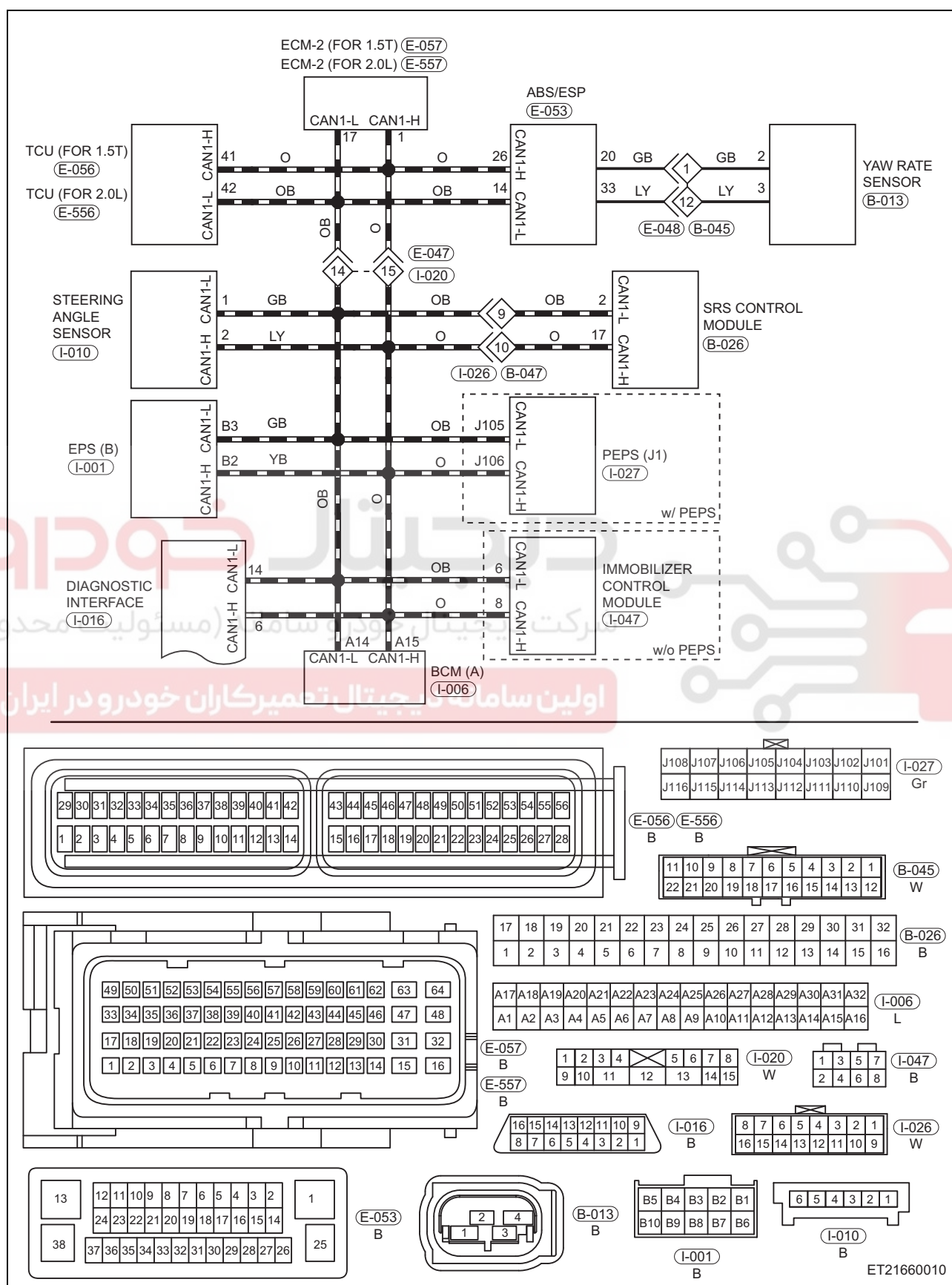
X-431 3G Diagnostic Tester	 RCH0000001
Oscilloscope	 RCH0000061

General Tool

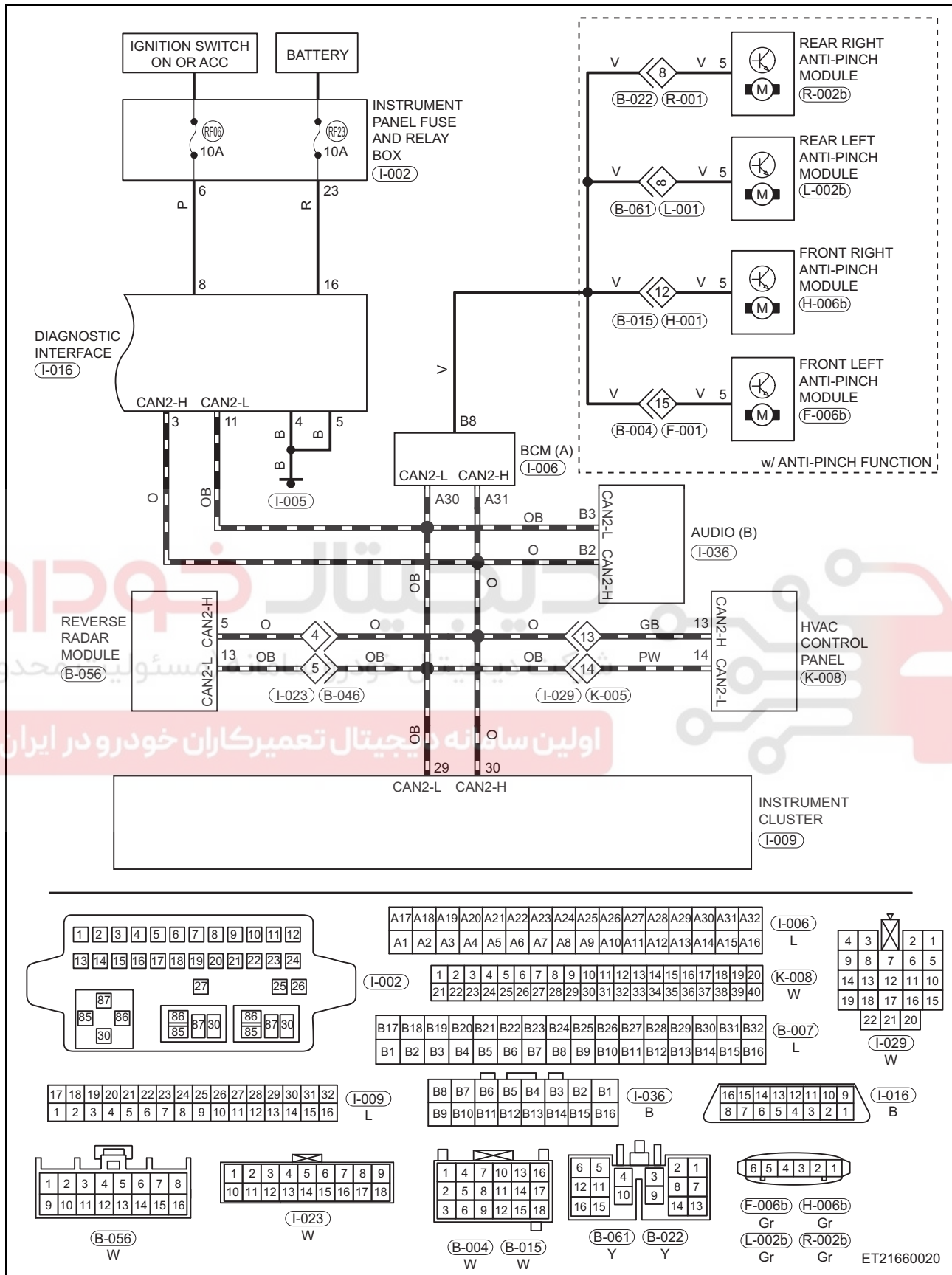
Digital Multimeter	 RCH0000002
---------------------------	--

Circuit Diagram

CAN Bus (Page 1 of 2)



CAN Bus (Page 2 of 2)



DIAGNOSIS & TESTING

Problem Symptoms Table

Symptom	Suspected Area	See page
Diagnostic interface cannot connect to system	CAN bus	-
	BCM failure	-
	Instrument cluster failure	51-48
	ECM failure	06-257
Engine control system failure	CAN bus	-
	Battery voltage	-
	Module damage	06-257
	Ground wire	-
Brake control system failure	Wheel speed sensor	-
	Wire harness or connector	-
	Instrument cluster	51-48
Airbag system failure	Engine speed sensor	06-257
	Wire harness and connector	-
	Instrument cluster	51-48
	Airbag module failure	43-76
Body electrical failure	Body controller (BCM) failure	-
	Wire harness or connector	-
	Instrument cluster	51-48
Keyless entry system failure	Position light switch (steering switch)	48-68
	Wire harness or connector	-
	Body controller (BCM)	-
	Instrument cluster	51-48
Immobilizer system failure	Turn signal light switch (steering switch)	48-68
	Wire harness or connector	-
	Body controller (BCM)	-
	Instrument cluster	51-48
	Immobilizer module failure	45-27
Transmission failure	Transmission Control Unit (TCU) failure	29-130
	Wire harness or connector	-
	Sensor failure	-
	Instrument cluster	51-48

Diagnosis Tools

X-431 3G Diagnostic Tester

When connecting X-431 3G diagnostic tester:

- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC) for communication with vehicle.
- DLC is located at driver side instrument panel crossmember.
- DLC uses a trapezoidal design which can hold 16 terminals.

Digital Multimeter

When using digital multimeter:

- Troubleshoot electrical malfunctions and wire harness system.
- Look for basic fault.
- Measure voltage, current and resistance.

Oscilloscope

- Troubleshoot electrical malfunctions and wire harness system.
- Look for basic fault.
- Measure CAN network output waveform.

Diagnostic Help

1. Connect X-431 3G diagnostic tester (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 DTC cannot be deleted, malfunction is current.
4. Only use a digital multimeter to measure voltage of electronic system.
5. Refer to any Technical Bulletin that may apply to the malfunction.
6. Visually check the related wire harness.
7. Check and clean all DVD system grounds related to the latest DTC.
8. If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to DTC.

66

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the followings:

- Check if connectors are loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Wiggle related wire harnesses and connectors and observe if signal in related circuit is interrupted.
- 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 mounting areas of instrument cluster, wire harness or wire harness connector and so on for damage, foreign matter, etc. that will cause incorrect signals.
- Check and clean all wire harness connectors and ground parts related to DTC.
- Remove instrument cluster from malfunctioning vehicle, then install it to a new vehicle and perform a test. If this DTC cannot be cleared, instrument cluster is malfunctioning. If DTC can be cleared, reinstall instrument cluster to original vehicle.
- If multiple trouble codes were set, refer to circuit diagrams to look for any common ground circuit or power supply circuit applied to DTC.
- Refer to any Technical Bulletin that may apply to malfunction.

Ground Inspection

Groundings are very important to entire circuit system, which are normal or not can seriously affect the entire circuit system. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) and oxidation may increase load resistance. This situation will seriously affect the normal operation of circuit. Check the ground points as follows:

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

Diagnosis Procedure

HINT:

Use following procedures to troubleshoot the instrument cluster system.

1	Vehicle brought to workshop
---	-----------------------------

NEXT

2	Check battery voltage
---	-----------------------

Standard voltage: 11 to 14 V

If voltage is below 11 V, recharge or replace the battery before proceeding to next step.

NEXT

3	Customer problem analysis
---	---------------------------

NEXT

4	Check for DTCs (current DTC and history DTC)
---	--

DTC
occurs

For current DTC, go to step 6

No
DTC

For history DTC, go to step 7

5	Problem repair (no DTC), then go to step 8
---	--

NEXT

6

Troubleshoot according to Diagnostic Trouble Code (DTC) chart, then go to step 8

NEXT

7

Troubleshoot according to Problem Symptoms Table, then go to step 8

NEXT

8

Adjust, repair or replace

NEXT

9

Conduct test and confirm malfunction has been repaired

NEXT

10

End

66

**CAUTION**

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

Diagnostic Interface Cannot Connect To System

1	CAN-H Open to Ground
2	CAN-L Open to Ground
3	ECU Internal Open
4	Body Controller Internal Open
5	Instrument Cluster Internal Open

Diagnosis Procedure

1	Check battery voltage
---	-----------------------

- Using a digital multimeter, measure voltage between positive battery terminal and negative battery terminal.
- Battery voltage should be between 11 and 14 V.

66

NG

Recharge or replace battery

OK

2	Check battery terminal
---	------------------------

- Check if battery terminals are loose or corroded.

NG

Tighten or replace battery terminal

OK

3	Check fuse
---	------------

- Check if engine compartment fuse box RF06 10 A and RF23 10 A fuses are blown.

NG

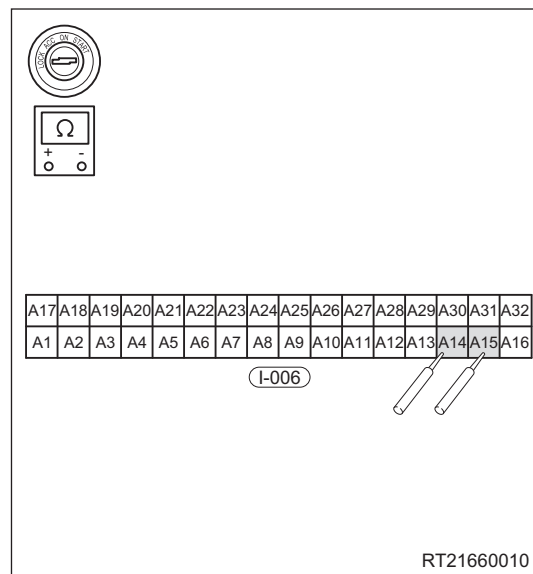
Replace fuse

OK

4

Check each module

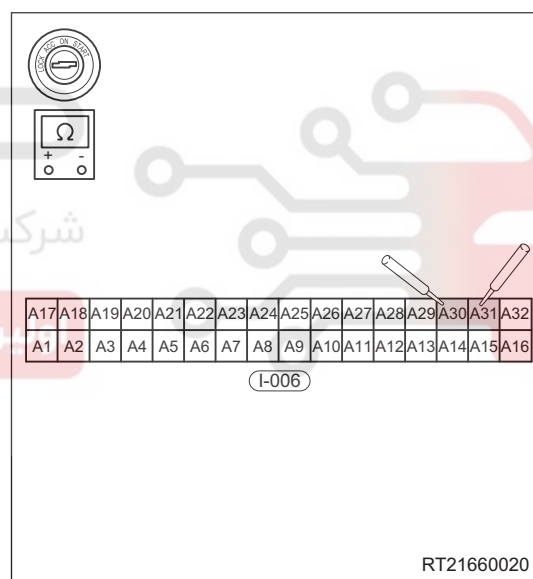
- Disconnect the body controller (BCM) connector I-006.
- Using ohm band of multimeter, measure resistance between I-006 (A15) and I-006 (A14) (standard resistance is 120 Ω).



- Using ohm band of multimeter, measure resistance between I-006 (A30) and I-006 (A31) (standard resistance is 120 Ω).

NG

Replace BCM



OK

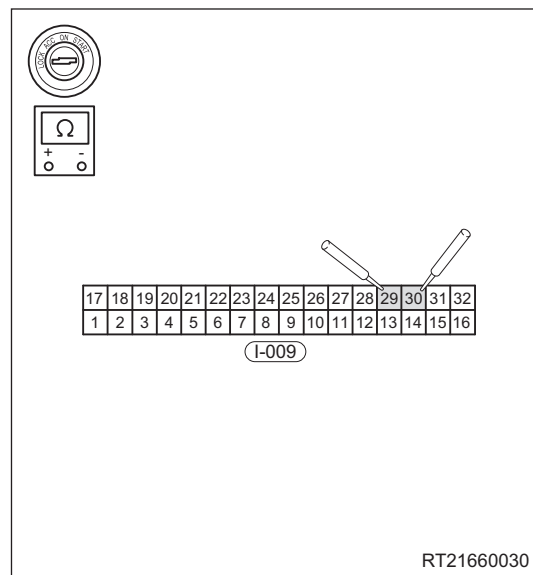
66

66 - CAN COMMUNICATION

- Disconnect the instrument cluster connector I-009.
- Using ohm band of multimeter, measure resistance between I-009 (29) and I-009 (30) (standard resistance is 120 Ω).

NG

Replace instrument cluster assembly



RT21660030

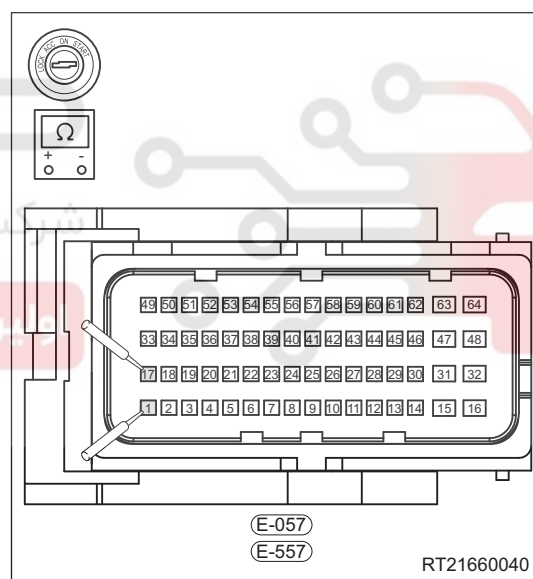
OK

- Disconnect the Engine Control Module (ECM) connectors E-057/E-557.
- Using ohm band of multimeter, measure resistance between E-057/E-557 (1) and E-057/E-557 (17) (standard resistance is 120 Ω).

66

NG

Replace ECM



RT21660040

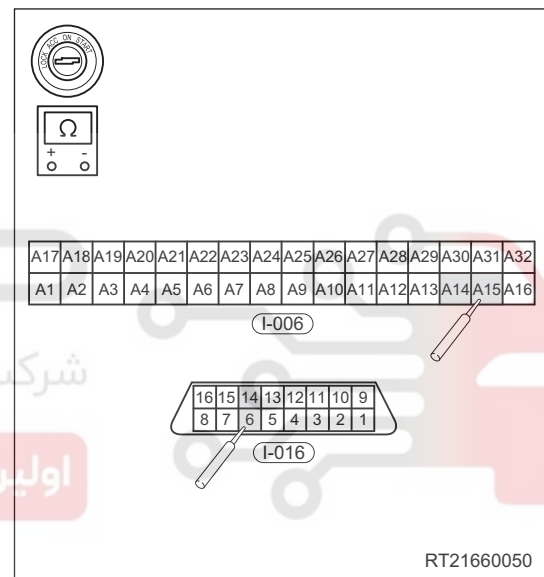
OK

5 Check CAN network resistance

- Using ohm band of multimeter, measure resistance between diagnostic interfaces I-016 (3) and I-016(11) (standard resistance is 60 Ω).
- Using ohm band of multimeter, measure resistance between diagnostic interfaces I-016 (6) and I-016(14) (standard resistance is 60 Ω).

NG**Replace instrument panel wire harness****OK****6 Check connector**

- Turn ignition switch to LOCK.
- Disconnect the negative battery cable.
- Disconnect the body controller (BCM) connector I-006.
- Check for continuity between connectors I-016 (6) and I-006 (A15), between connectors I-016 (14) and I-006 (A14).

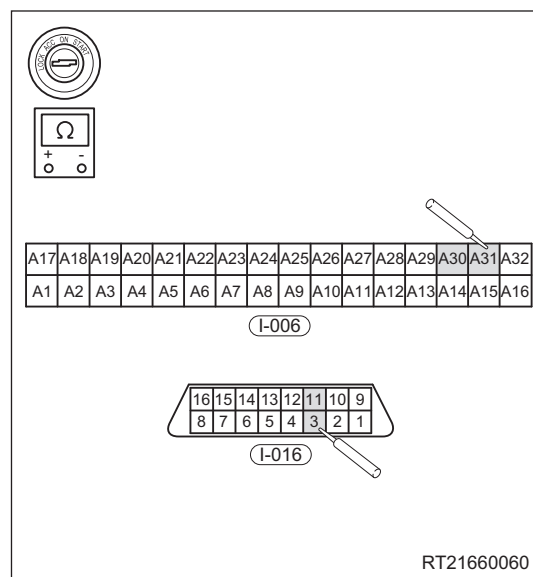
NG**Replace instrument panel wire harness****66****OK**

66 - CAN COMMUNICATION

- e. Check for continuity between connectors I-016 (3) and I-006 (A31), between connectors I-016 (11) and I-006 (A30).

NG

Replace instrument panel wire harness



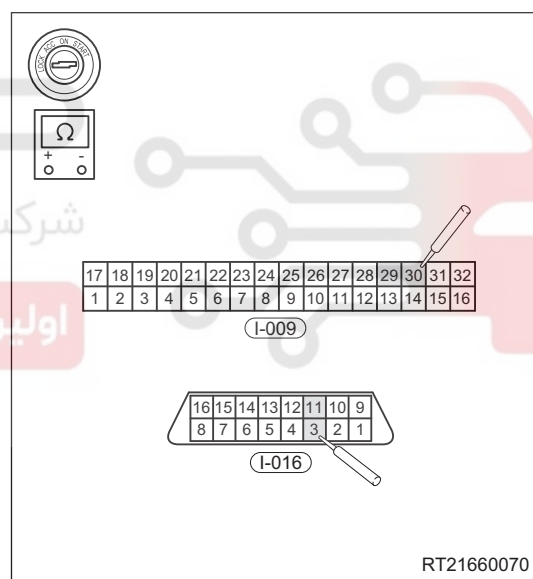
OK

- f. Disconnect the instrument cluster connector I-009.
- g. Check for continuity between connectors I-016 (3) and I-009 (30), between connectors I-016 (11) and I-009 (29).

66

NG

Replace instrument panel wire harness

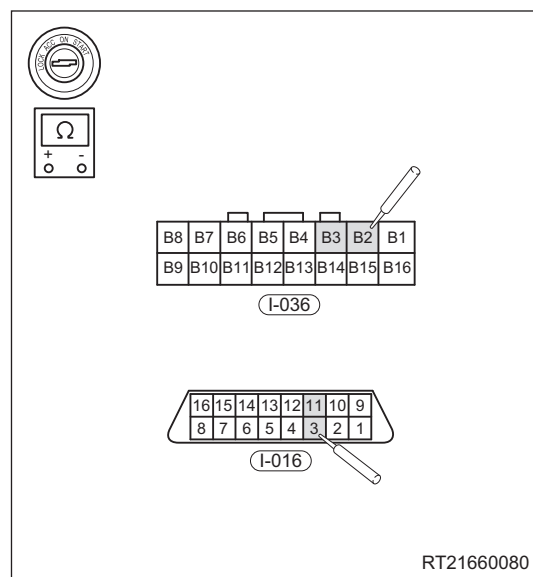


OK

- h. Disconnect the audio system connector I-036.
i. Check for continuity between connectors I-016 (3) and I-036 (B2), between connectors I-016 (11) and I-036 (B3).

NG

Replace instrument panel wire harness

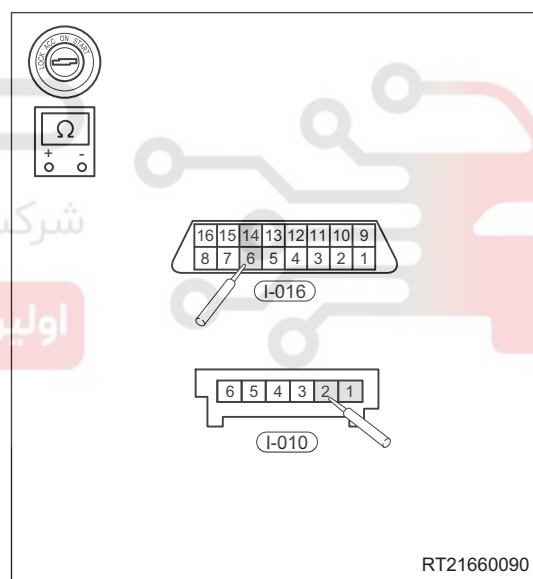


OK

- j. Disconnect the steering angle sensor connector I-010.
k. Check for continuity between connectors I-016 (6) and I-010 (2), between connectors I-016 (14) and I-010 (1).

NG

Replace instrument panel wire harness



OK

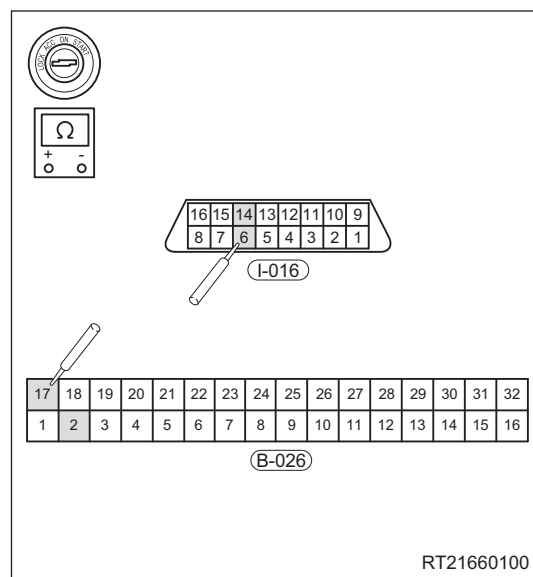
66

66 - CAN COMMUNICATION

- l. Disconnect the airbag control module connector B-026.
- m. Check for continuity between connectors I-016 (6) and B-026 (17), between connectors I-016 (14) and B-026 (2).

NG

Replace instrument panel wire harness



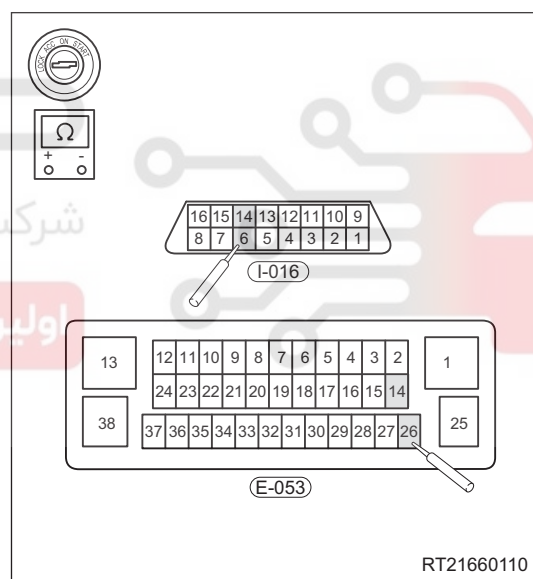
OK

- n. Disconnect the ABS/ESP control module connector E-053.
- o. Check for continuity between connectors I-016 (6) and E-053 (26), between connectors I-016 (14) and E-053 (14).

66

NG

Replace body wire harness

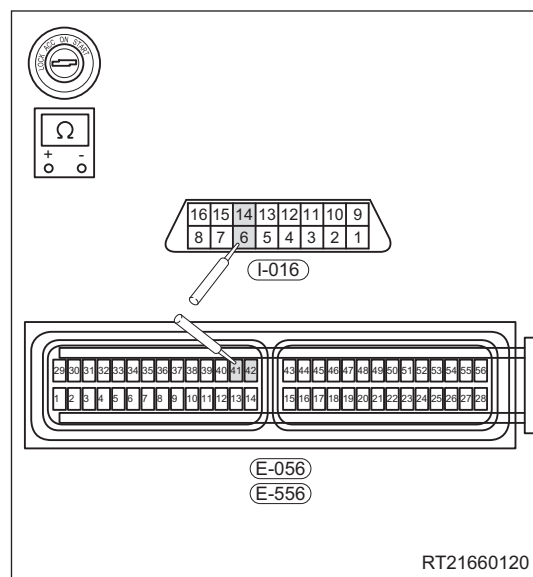


OK

- p. Disconnect the TCU connector E-056/E-556.
- q. Check for continuity between connectors I-016 (6) and E-056/E-556 (41), between connectors I-016 (14) and E-056/E-556 (42).

NG

Replace body wire harness

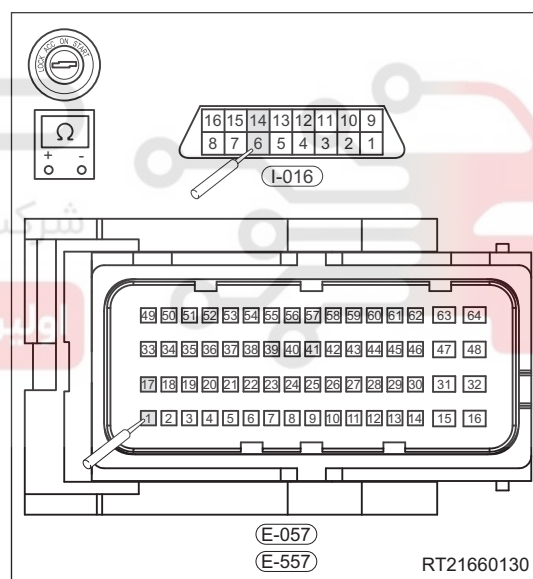


OK

- r. Disconnect the ECM connector E-057/E-557.
- s. Check for continuity between connectors I-016 (6) and E-057/E-557 (1), between connectors I-016 (14) and E-057/E-557 (17).

NG

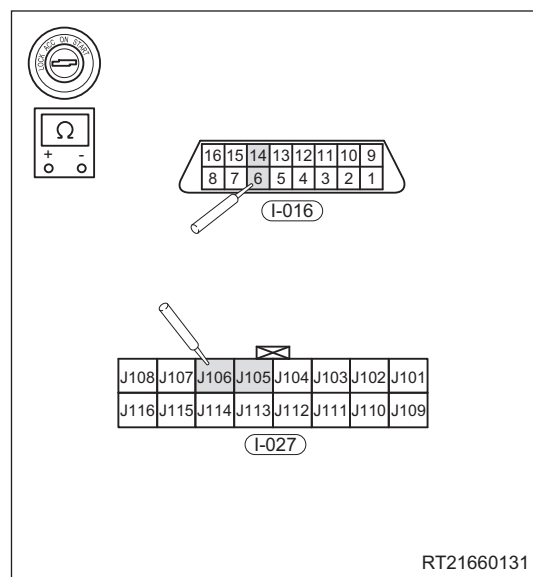
Replace body wire harness



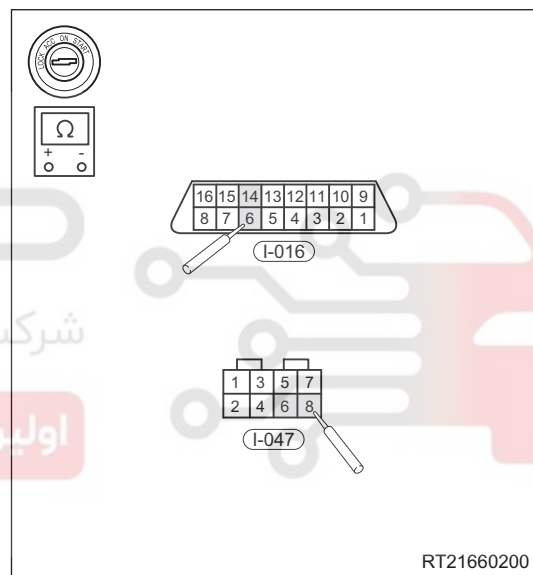
OK

66 - CAN COMMUNICATION

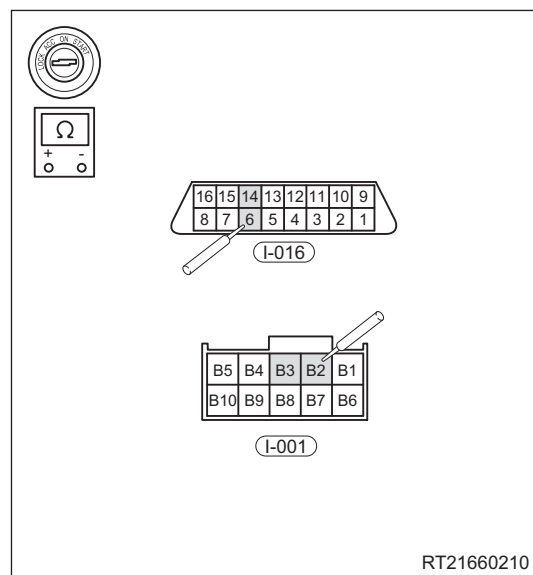
- t. Disconnect the PEPS connector I-027(w/ PEPS).
- u. Check for continuity between connectors I-016 (6) and I-027 (J106), between connectors I-016 (14) and I-027 (J105).



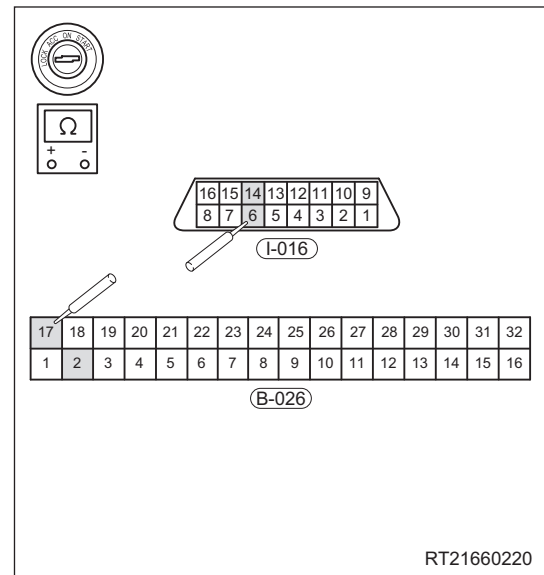
- v. Disconnect the PEPS connector I-047 (w/o PEPS).
- w. Check for continuity between connectors I-016 (6) and I-047 (8), between connectors I-016 (14) and I-047 (6).



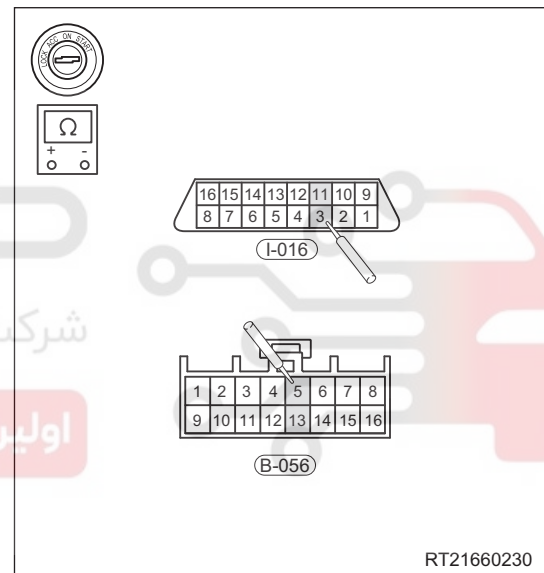
- i. Disconnect the EPS connector I-001.
- ii. Check for continuity between connectors I-016 (6) and I-001 (B2), between connectors I-016 (14) and I-001 (B3).



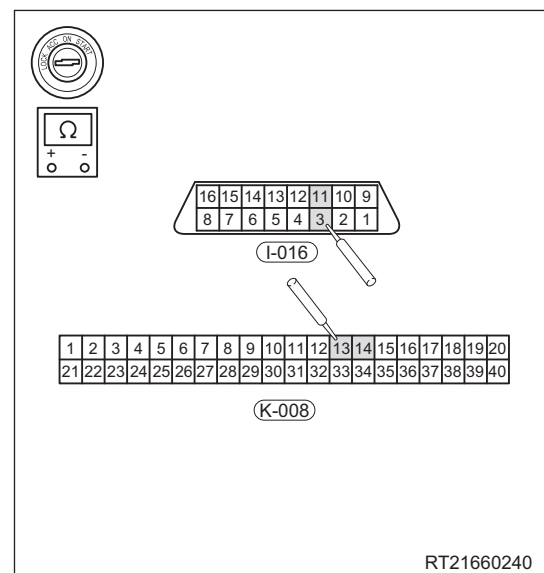
- iii. Disconnect the SRS connector B-026.
- iv. Check for continuity between connectors I-016 (6) and B-026 (17), between connectors I-016 (14) and B-026 (2).



- v. Disconnect the reversing radar sensor connector B-056.
- vi. Check for continuity between connectors I-016 (3) and B-056 (5), between connectors I-016 (11) and B-056 (13).



- vii. Disconnect the HVAC connector K-008.
- viii. Check for continuity between connectors I-016 (3) and K-008 (13), between connectors I-016 (11) and K-008 (14).



Short in CAN Network

1	CAN-H Short to Ground
2	CAN-L Short to Ground
3	CAN-H Short to Power Supply
4	CAN-L Short to Power Supply
5	Short Circuit Between CAN-H and CAN-L

Problem causes:

- BCM internal short circuit
- Instrument cluster internal short circuit
- ECM internal short circuit
- Short circuit between CAN-H and CAN-L

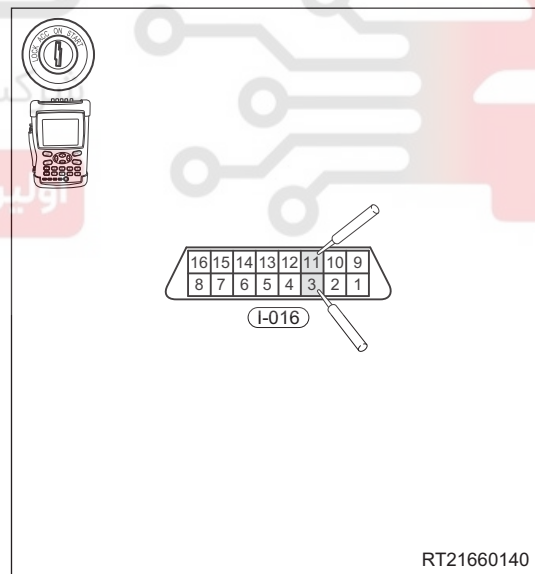
Diagnosis Procedure

66

- Connect oscilloscope to terminals 3, 11 of diagnostic interface connector I-016, and observe waveform of oscilloscope (standard for CAN-H: 2.5 V to 3.5 V, standard for CAN-L: 1.5 V to 2.5 V).

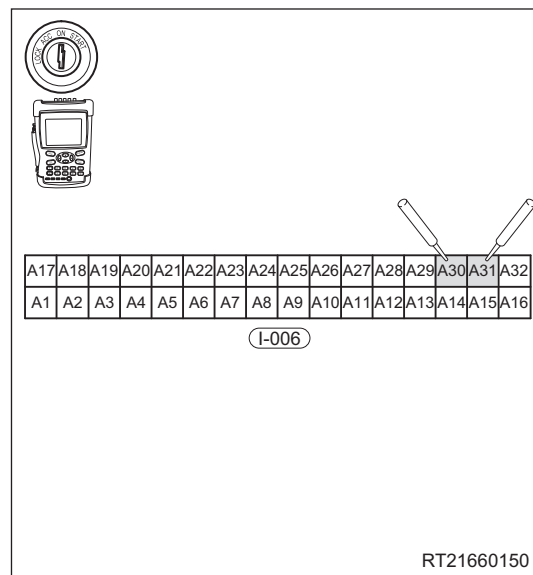
NG

Check BCM



OK

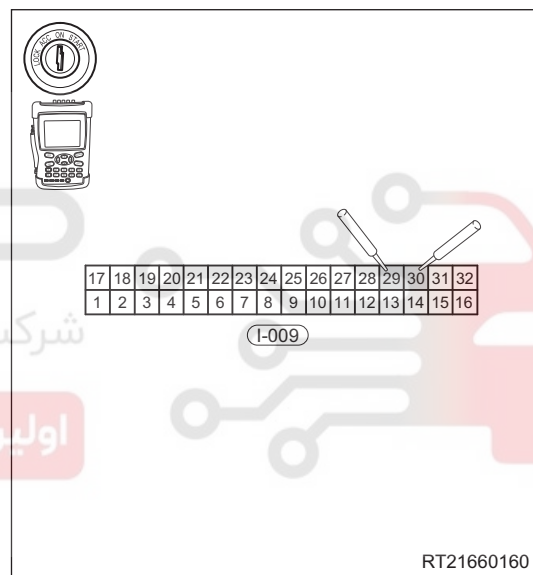
- a. Connect the body controller connector I-006.
- b. Connect oscilloscope to terminals A31, A30 of body controller connector I-006, and observe waveform of oscilloscope (standard for CAN-H: 2.5 V to 3.5 V, standard for CAN-L: 1.5 V to 2.5 V).



- c. Connect the instrument cluster connector I-009.
- d. Connect oscilloscope to terminals 29, 30 of instrument cluster connector I-009, and observe waveform of oscilloscope (standard for CAN-H: 2.5 V to 3.5 V, standard for CAN-L: 1.5 V to 2.5 V).

NG

Replace instrument panel wire harness



66

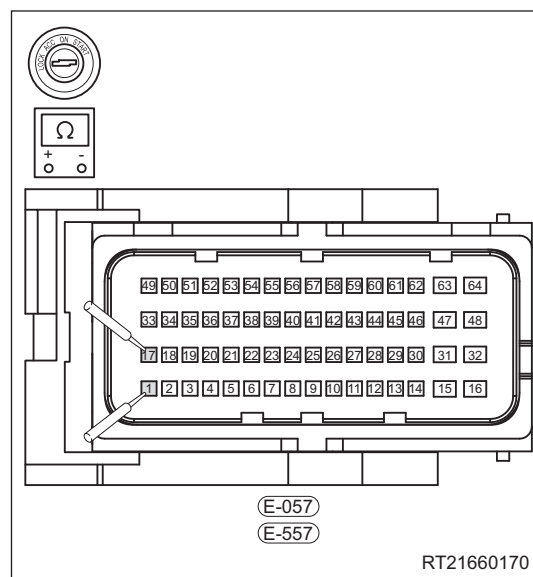
OK

66 - CAN COMMUNICATION

- Connect the ECM connector E-057/E-557.
- Connect oscilloscope to terminals 1, 17 of ECM connector E-057/E-557, and observe waveform of oscilloscope (standard for CAN-H: 2.5 V to 3.5 V, standard for CAN-L: 1.5 V to 2.5 V).

NG

Replace body wire harness



OK

Remove the audio module connector.

OK

66

Replace audio module

NG

Remove the steering angle sensor connector.

OK

Replace steering angle sensor

NG

Remove the airbag control module connector.

OK

Replace airbag control module

NG

Remove the ABS/ESP module connector.

OK

Replace ABS/ESP module

NG

Remove the TCU connector.

OK

Replace TCU module

NG

Remove the PEPS connector.

OK

Replace PEPS module

NG

Remove the EPS connector.

OK

Replace EPS module

NG

Remove the reversing radar sensor connector.

OK

Replace reversing radar module

NG

Remove the HVAC module connector.

OK

Replace HVAC module

دیجیتال خودرو

شرکت دیجیتال خودرو سامانه (مسئولیت محدود)

اولین سامانه دیجیتال تعمیرکاران خودرو در ایران

