SQR484F ENGINE MANAGEMENT SYSTEM

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GENERAL INFORMATION

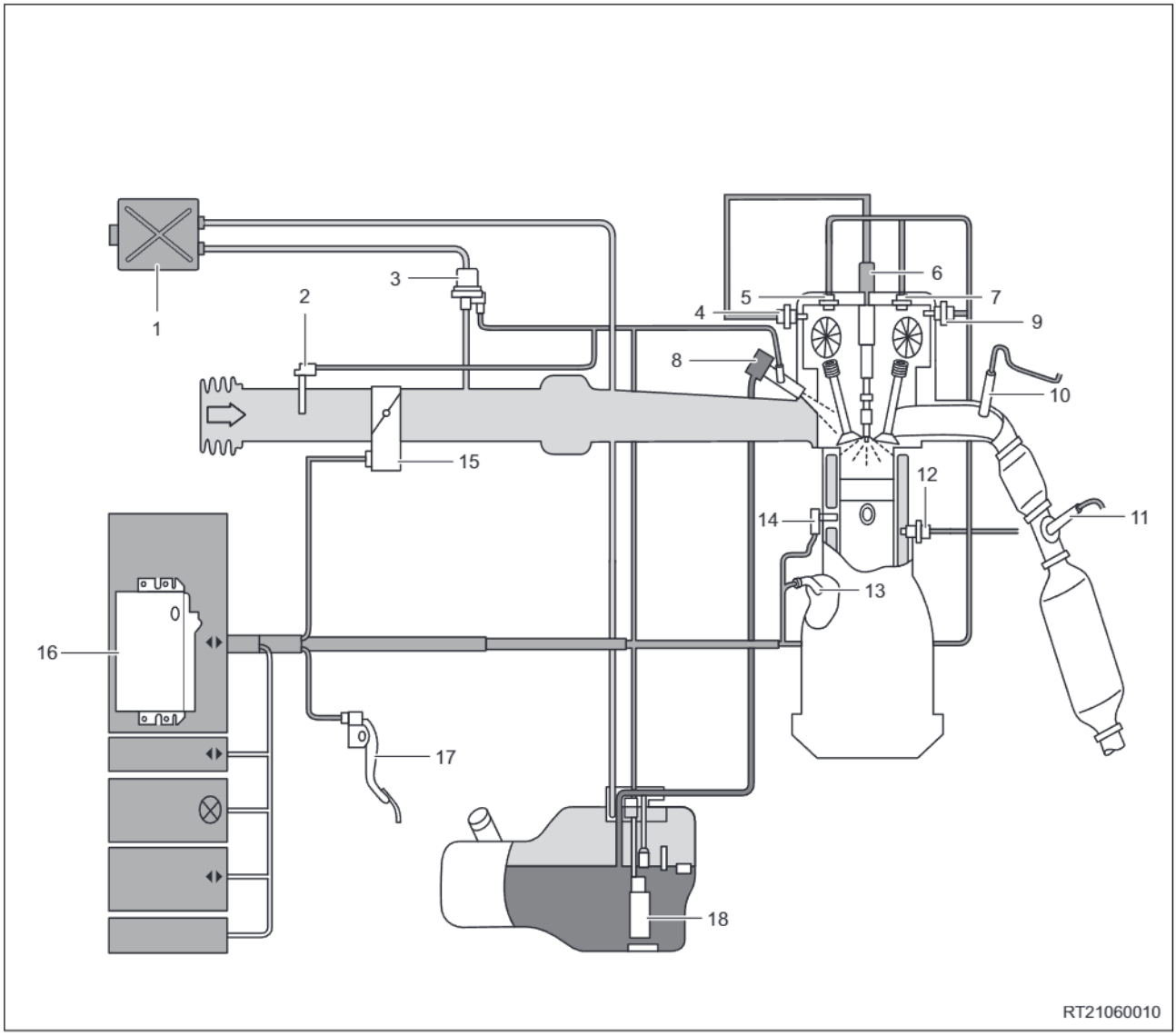
Description

The engine of T21 model adopts UAES engine management system. This system mainly consists engine Control Module (ECM), sensors and actuators, which controls intake air amount, injection volume and ignition timing, etc. when engine is operating.

In engine management system, sensors are used as the input part to measure various physical signals (temperature and pressure, etc.), and converts them into corresponding electrical signals; the function of ECM is to receive the input signals from sensors and perform calculation according to set procedure, producing corresponding control signals and outputting them to power drive circuit. The power drive circuit drives each actuator to perform various actions, thus making the engine run according to preset program.

Also, the trouble diagnosis system of ECM monitors each component and control function in this system. Once detecting and confirming a fault, it will store trouble code and recall "Limp Home" function. When detecting that fault has been eliminated, it will return to use normal value.

Basic Components of Engine Management System



1 - Canister	2 - Air Flow Meter
3 - Canister Solenoid Valve	4 - Intake VVT Control Valve
5 - Camshaft Position Sensor (Intake)	6 - Ignition Coil
7 - Camshaft Position Sensor (Exhaust)	8 - Fuel Injector
9 - Exhaust VVT Control Valve	10 - Upstream Oxygen Sensor
11 - Downstream Oxygen Sensor	12 - Coolant Temperature Sensor
13 - Crankshaft Position Sensor	14 - Knock Sensor
15 - Electronic Throttle	16 - Engine Control Module (ECM)
17 - Electronic Accelerator Pedal	18 - Electric Fuel Pump

System Function

- Calculate air flow

  ECM calculates air flow by the signals from air flow meter and then adjusts injection volume to make air-fuel ratio meet the requirements of various operating conditions.
- Measure crankshaft position and engine speed

  ECM determines crankshaft position and engine speed according to the signals from crankshaft position sensor and accurately controls engine ignition and injection timing.
- Determine operating sequence of cylinders

  ECM recognizes the top dead center of No.1 cylinder by camshaft position sensor, so as to determine the operating sequence of cylinders.
- Fuel control

  There are two modes of fuel control: closed-loop fuel control and open-loop fuel control. The closed-loop fuel control can accurately regulate the air-fuel ratio of engine, thus effectively controlling emissions. The open-loop fuel control is applied when engine is starting or warming up, or when a oxygen sensor is malfunctioning.
- Ignition control

  The ignition control system of engine adopts packet control.
- Knock control

  When a knocking is detected by knock sensor, the system will calculate the ignition advance angle that needs to be delayed or advanced according to current operating conditions and knock intensity and adjusts ignition angle, thus avoiding or reducing knocking.
- Emission control

  The three-way catalytic converter can convert engine exhaust gas into harmless gas and discharge it into atmosphere. When engine temperature becomes normal after warming up, ECM will activate closed-loop fuel control to correct air-fuel ratio, thus realizing the optimum conversion efficiency of three-way catalytic converter.
- Three-way catalytic converter protection

  The engine management system has the function to protect three-way catalytic converter. The ECM estimates three-way catalytic converter temperature according to engine operating conditions. When it is estimated that exhaust temperature will exceed the converter's maximum permissible temperature for a long time, ECM will automatically activate the protection function of three-way catalytic converter to keep the temperature normal.
- System voltage protection

  When system voltage becomes extremely high due to charging system malfunction, engine management system will activate the protection program to limit engine speed, thus avoiding damage to ECM and battery.

Precautions

General service requirements

- Only digital multimeter can be used to perform inspection for engine management system.
- Use genuine components to perform service work, otherwise, the appropriate engine management system operation cannot be guaranteed.
- Only use unleaded gasoline during servicing.
- Please observe normative service and diagnostic flowchart to perform service work.
- Never disassemble the components of engine management system during servicing.
- When holding electronic elements (ECM, sensor, etc.) during servicing, take extra care not to drop them on the ground.
- Set up a consciousness of environmental protection and dispose of the waste effectively that is produced during servicing.

Precautions during servicing

1. Do not causally remove any component or its connector of engine management system from its installation position to prevent damage accidentally, or foreign matter, such as moisture, oil from entering connectors, which will affect the normal operation of engine management system.
2. Be sure to turn ignition switch off when disconnecting and connecting connectors. Otherwise, electric elements may be damaged.
3. When simulating hot operating condition of malfunction and performing other service work that may cause the temperature to rise, never allow ECM temperature to exceed 80°C.
4. As the supplying pressure of fuel system is high (approximately 400 kPa), all the fuel pipes are high pressure resistant pipe. The fuel pressure in fuel lines is still high even when engine is not running. Therefore, be careful not to casually remove the fuel pipe during servicing; when it is necessary to service the fuel system, discharge the pressure in fuel system before removing fuel pipe. The way to discharge pressure is as follows:

   Remove fuel pump relay, start the engine and idle it until the engine stops running by itself. Then attempt to start the engine 2 - 3 times to ensure fuel pressure is discharged completely. The removal of fuel pipe and replacement of fuel filter should be performed in a well-ventilated area by professional service men.
5. Do not energize electric fuel pump when removing it from fuel tank to prevent electric sparks, which will cause a fire.
6. Running test for fuel pump is prohibited when it is empty or in water; otherwise, it will shorten the service life. Never connect the positive and negative of fuel pump in reverse.
7. When checking ignition system, only perform spark jump test when it is necessary and the time should be shortened as much as possible. Do not open throttle during test; otherwise, a large amount of unburned gasoline will enter the exhaust pipe, causing damage to three-way catalytic converter.
8. As idling adjustment is performed by engine management system completely, manual adjustment is not required. The accelerator pedal stopper screw of throttle body has been adjusted at the factory, and the user is not allowed to change its original position.
9. Do not connect battery with its polarity reversed to prevent damage to electronic elements. This system adopts negative ground.
10. Never remove battery cable when engine is running.
11. The positive, negative battery cables and ECM must be removed before performing welding on vehicle.
12. Do not puncture wire outer coat to detect electric signals input and output by components.

Specifications

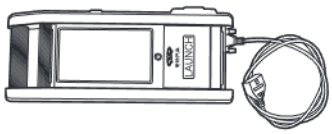
Torque Specifications

Description	Torque (N·m)
Coolant Temperature Sensor	11 - 16
Knock Sensor Fixing Bolt	20 ± 5
Engine Speed Sensor Fixing Bolt	8 ± 2
Camshaft Position Sensor Fixing Bolt	8 ± 0.5
VVT Control Valve Fixing Bolt	8 ± 2
Engine Control Module Bracket Fixing Nut	7 ± 1

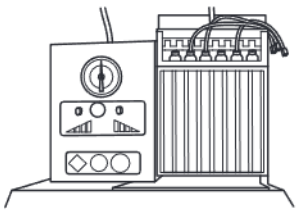
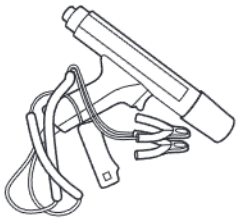
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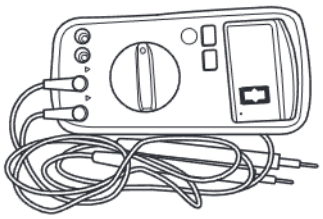
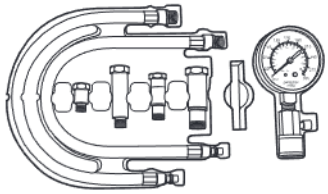
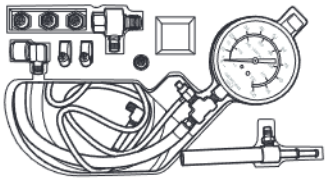
Tools

Special Tool

X-431 3G Diagnostic Tester	 RCH0000001

General Tools

Fuel Injector Cleaning Analyzer	 RCH0000062
Ignition Timing Light	 RCH0000016

Digital Multimeter	 RCH0000002
Cylinder Pressure Gauge	 RCH0000044
Fuel Pressure Gauge	 RCH0000048
Oscilloscope	 RCH0000061

ECM Pin Definition

ECM connector 1

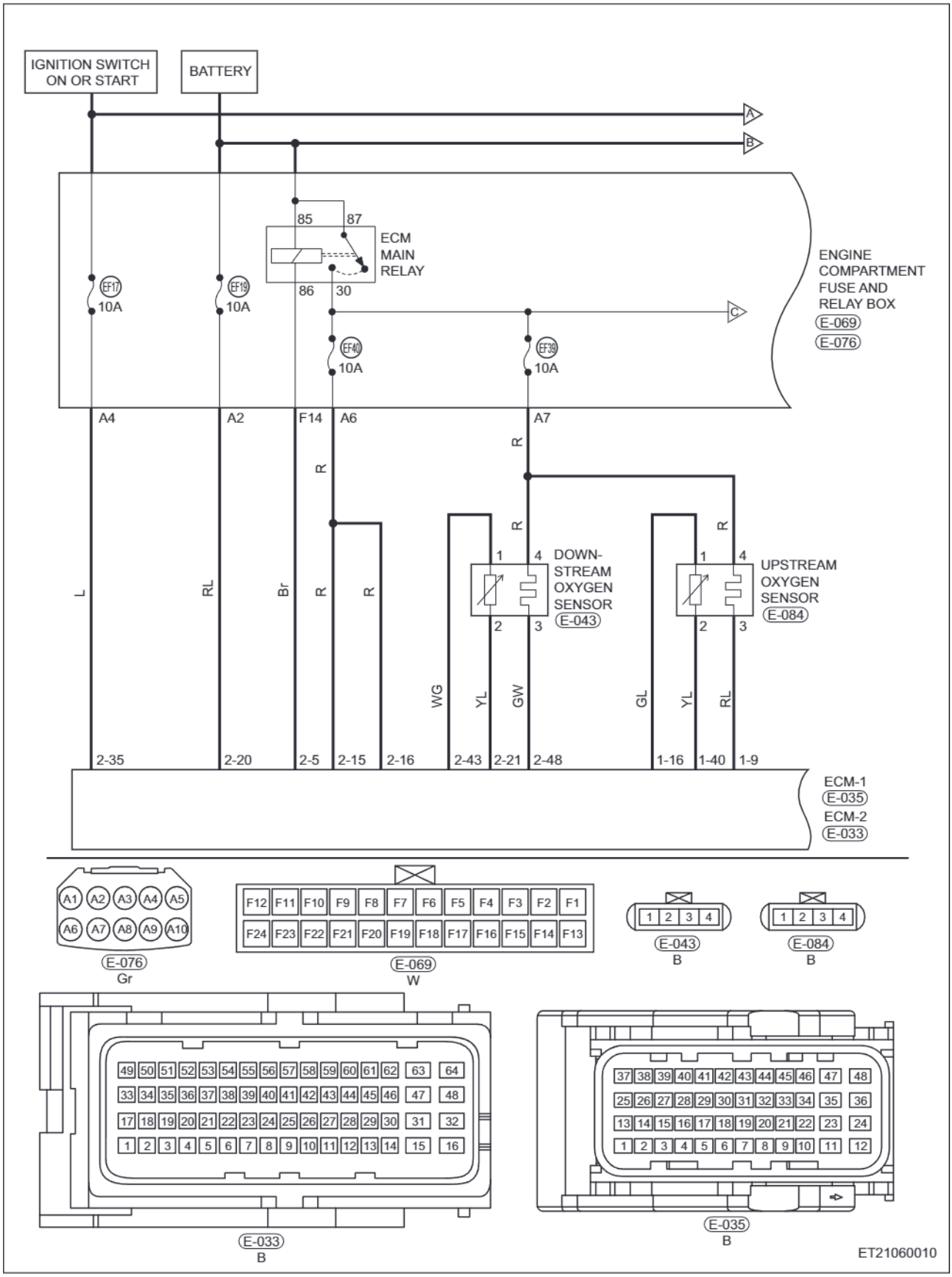
Pin No.	Definition	Pin No.	Definition
1	-	25	Knock Sensor B
2	-	26	Knock Sensor A
3	Fuel Injector (Bank 2)	27	Air Flow Meter
4	Fuel Injector (Bank 1)	28	-
5	Variable Camshaft Timing Valve (Exhaust)	29	Camshaft Position Sensor 1 (Intake)
6	-	30	Canister Solenoid Valve
7	Variable Camshaft Timing Valve (Intake)	31	Sensor Ground
8	Fuel Injector (Bank 3)	32	Engine Speed Sensor A
9	Upstream Oxygen Sensor Heater	33	Engine Speed Sensor B
10	Fuel Injector (Bank 4)	34	5 V Power Supply 1
11	Throttle Actuator (+)	35	Ignition Coil Drive 2
12	-	36	Ignition Coil Drive 1
13	Throttle Position Sensor 1	37	Engine Coolant Temperature Sensor
14	Throttle Position Sensor 2	38	Intake Temperature Signal
15	-	39	-
16	Oxygen Sensor Ground	40	Upstream Oxygen Sensor
17	-	41	Camshaft Position Sensor 2 (Exhaust)
18	-	42	-
19	-	43	Throttle 5 V Power Supply
20	Ground	44	-
21	Air Flow Meter Ground	45	5 V Power Supply
22	Throttle Ground	46	-
23	Throttle Actuator (-)	47	ECU Ground 4
24	-	48	ECU Ground 3

ECM connector 2

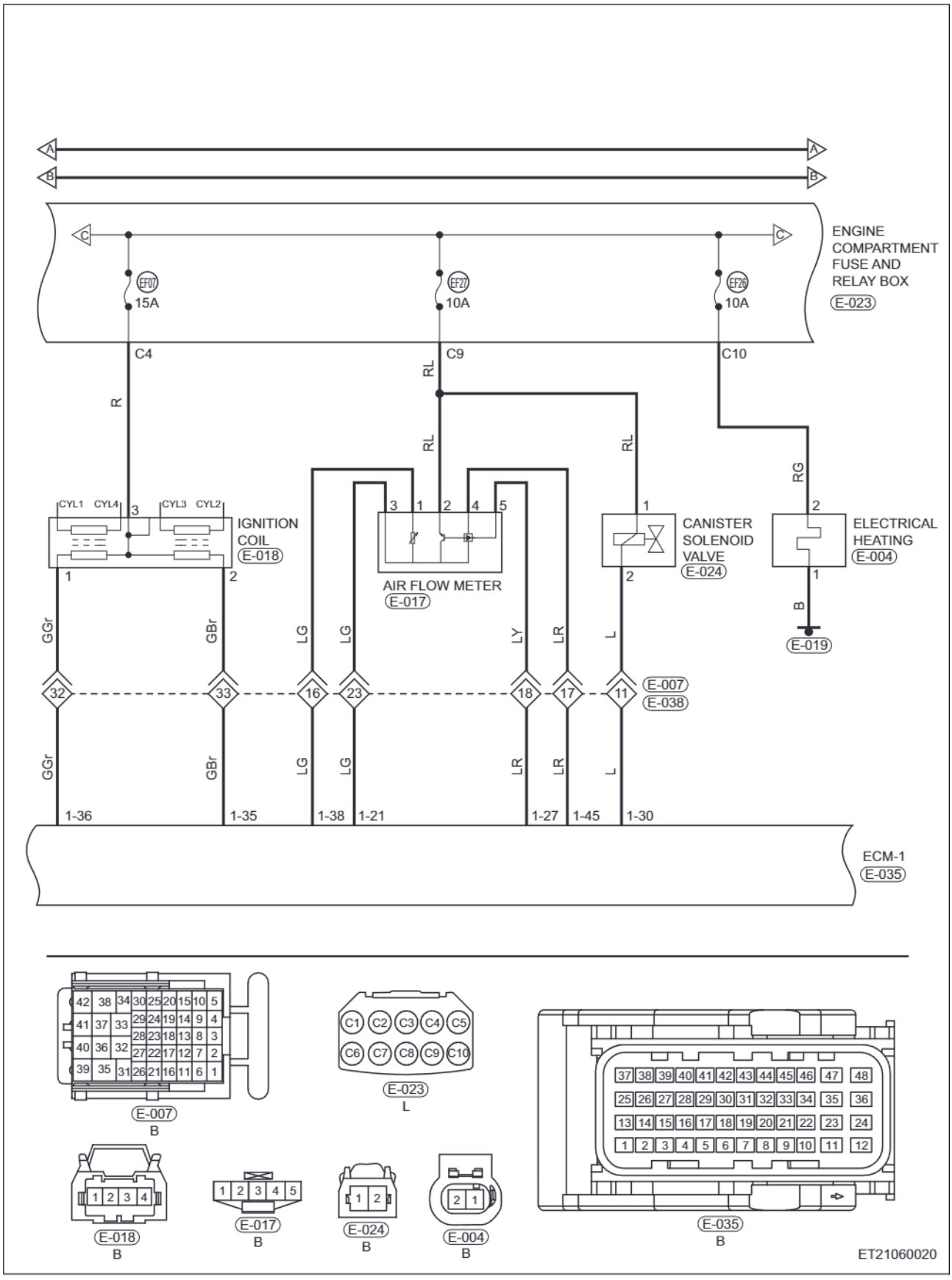
Pin No.	Definition	Pin No.	Definition
1	CAN Bus Line High	33	-
2	-	34	-
3	-	35	Ignition Switch
4	-	36	5 V Power Supply
5	Main Relay Coil	37	5 V Power Supply
6	Clutch Switch (MT)	38	-
7	Accelerator Pedal Position Sensor 1 Ground	39	-
8	-	40	-
9	-	41	Fuel Pump Relay Coil
10	-	42	A/C Compressor Relay Coil (MT)
11	-	43	Oxygen Sensor Ground
12	-	44	-
13	Ignition Switch Start (MT)	45	Electronic Accelerator Pedal Sensor 1
14	-	46	-
15	Noncontinuous Power Supply	47	Ground
16	Noncontinuous Power Supply	48	Downstream Oxygen Sensor Heater
17	CAN Bus Line Low	49	-
18	-	50	-
19	5 V Power Supply 1	51	-
20	Battery Continuous Power Supply	52	-
21	Downstream Oxygen Sensor	53	-
22	-	54	-
23	Brake Switch	55	-
24	A/C Pressure Sensor	56	Fan Control
25	Brake Light Switch	57	-
26	-	58	A/C Compressor Relay Coil (CVT) Starter Relay Coil (MT)
27	-	59	Electronic Accelerator Pedal Sensor 2 Ground
28	A/C Switch	60	-
29	-	61	-
30	Electronic Accelerator Pedal Sensor 2	62	-
31	-	63	ECU Ground 2
32	5 V Power Supply	64	ECU Ground 1

Circuit Diagram

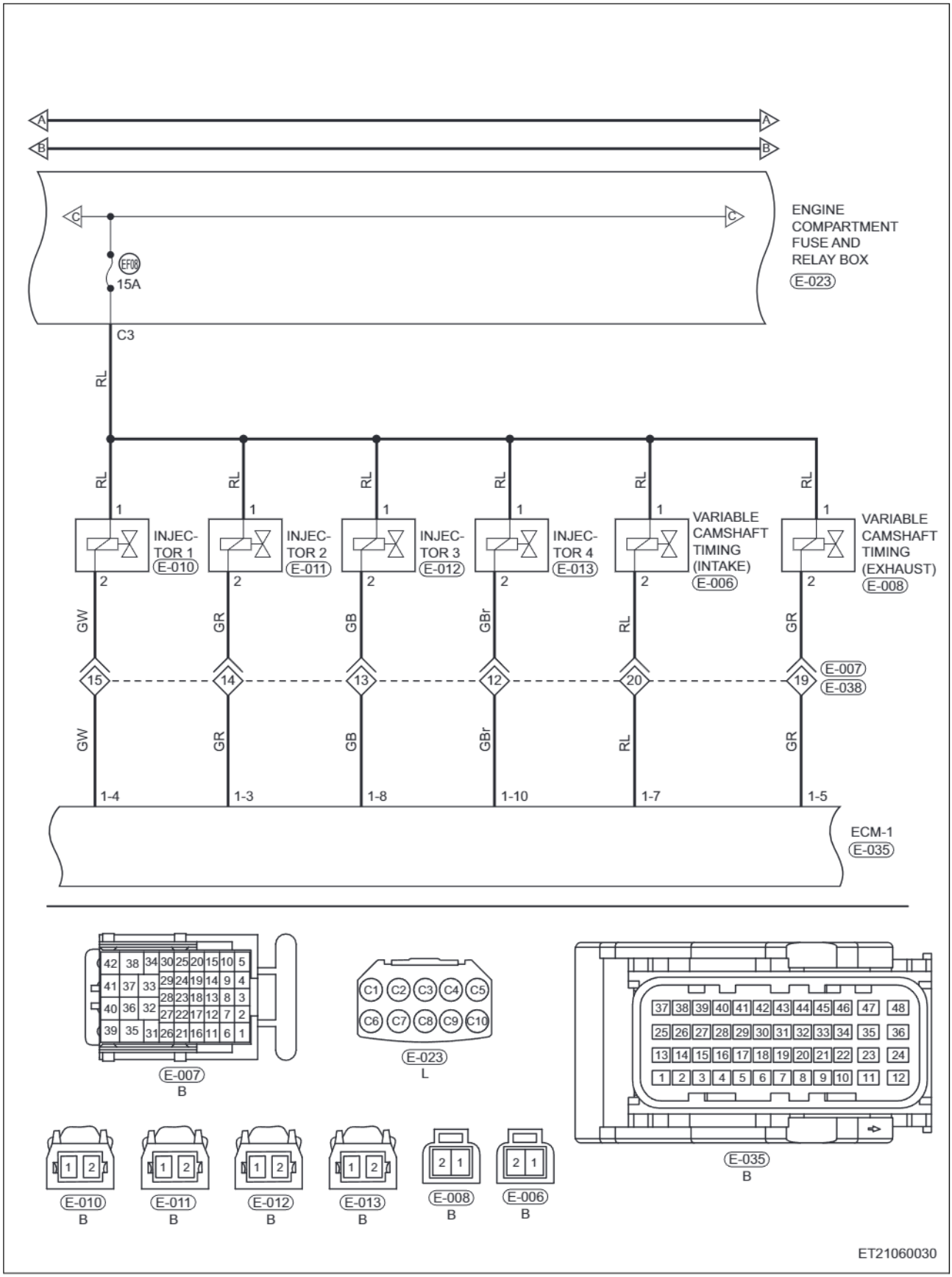
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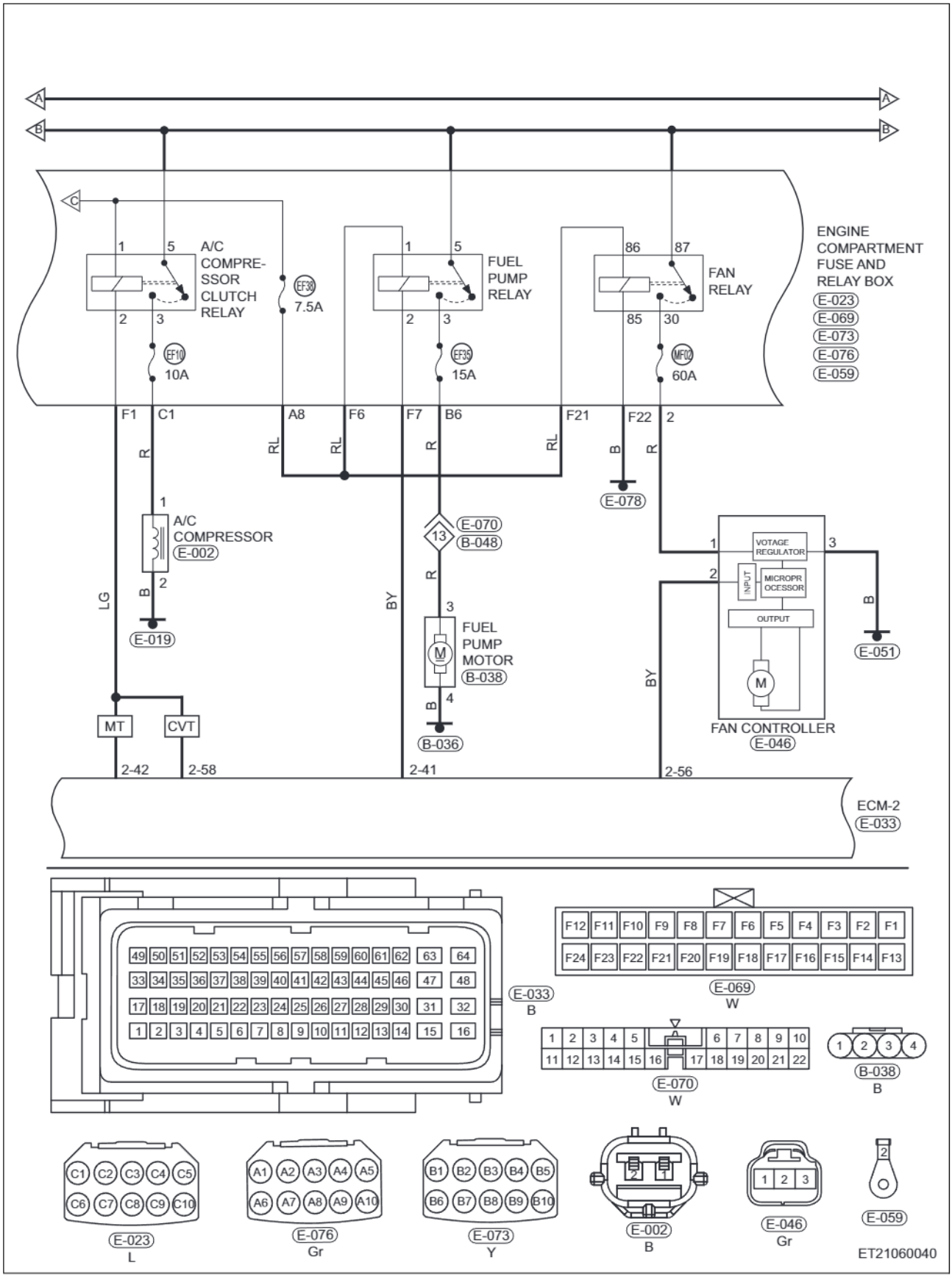
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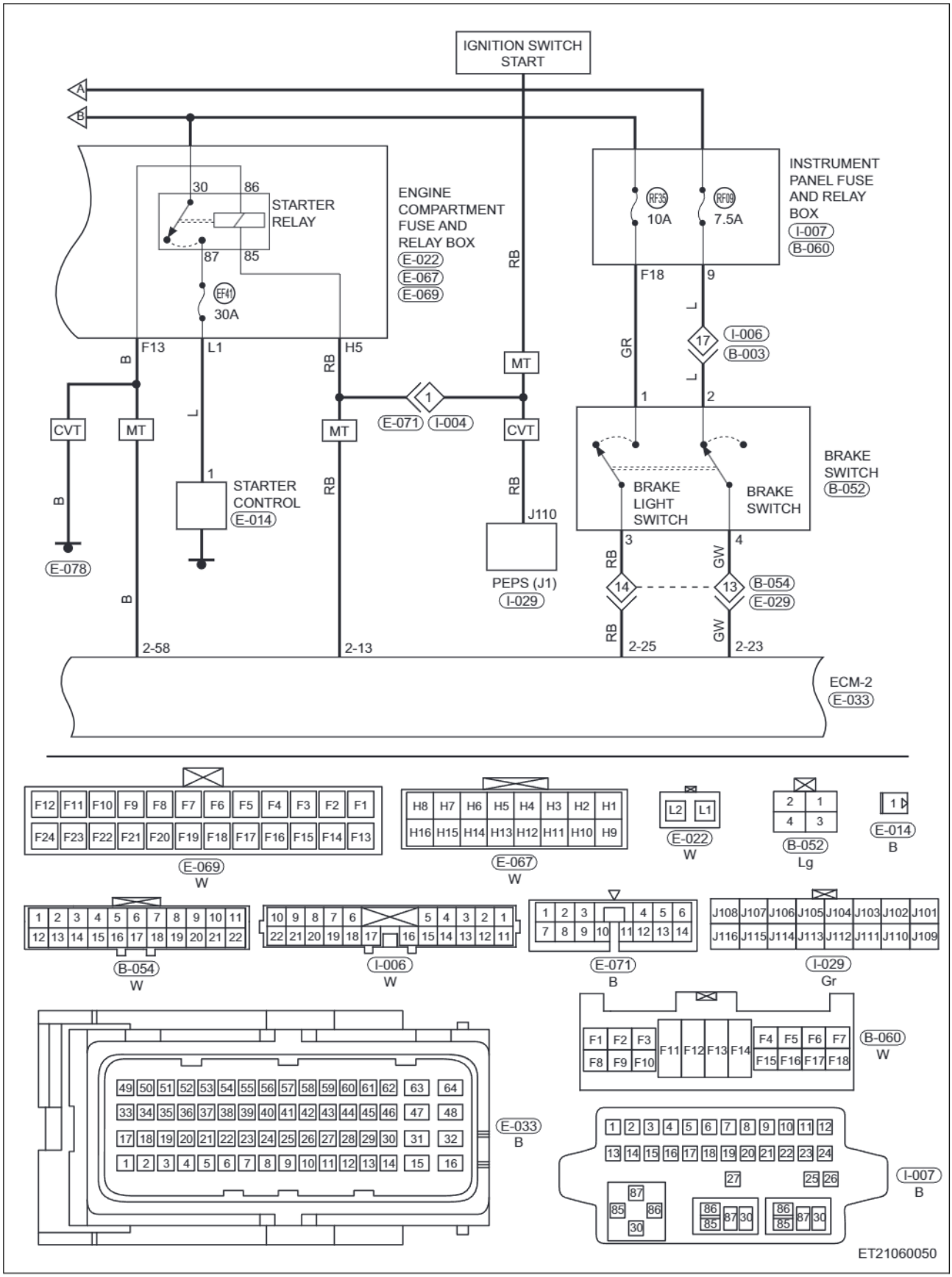
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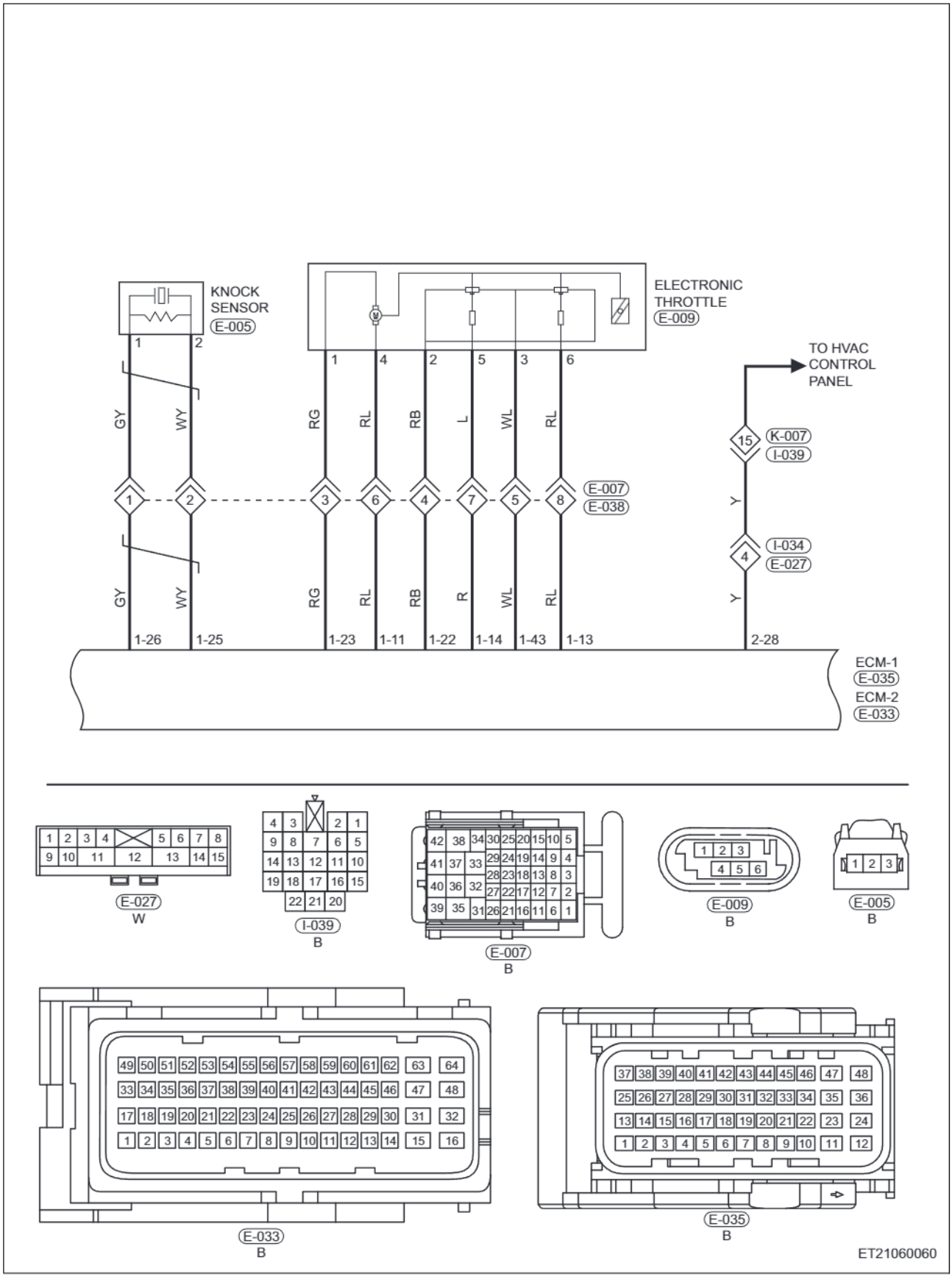
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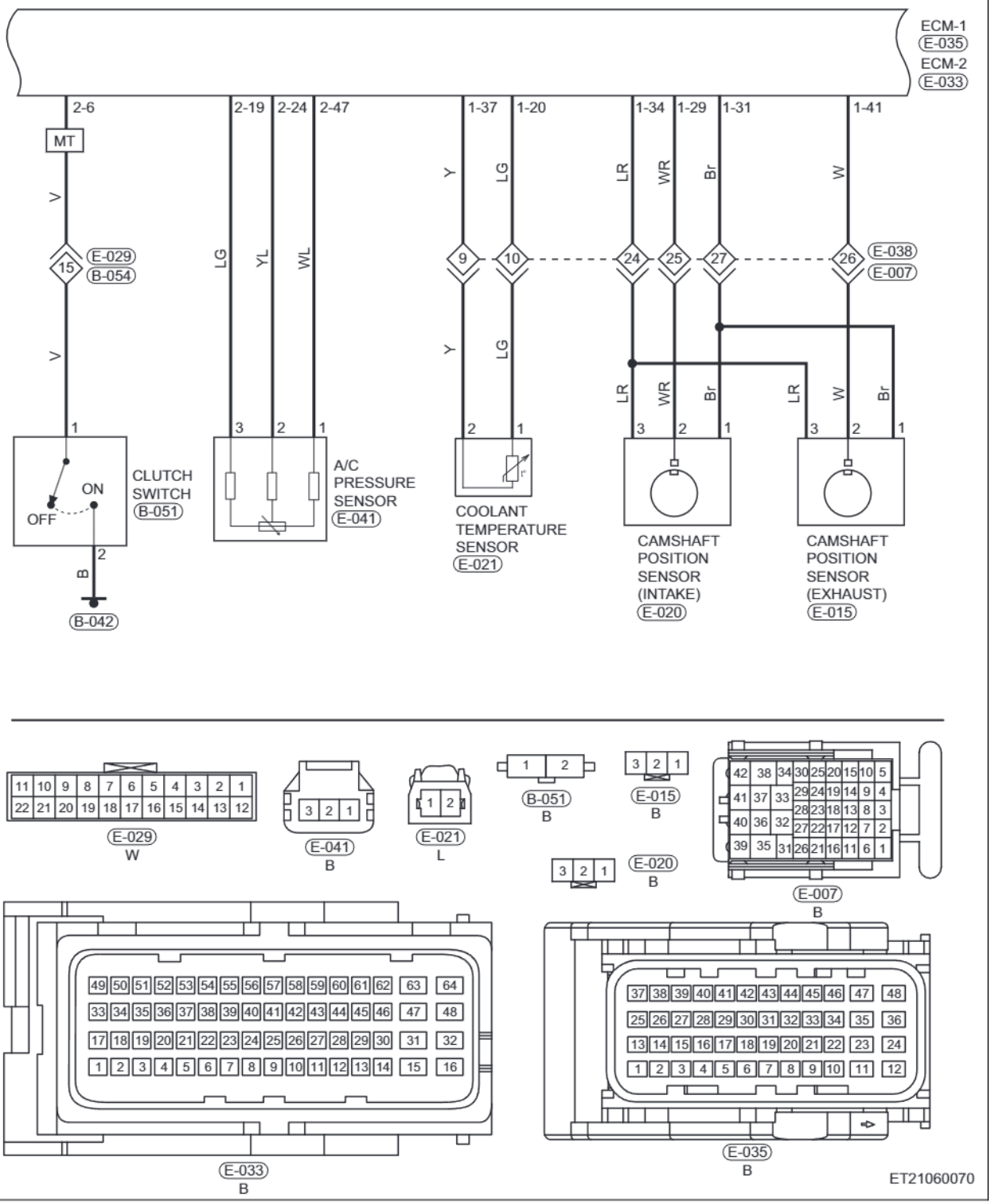
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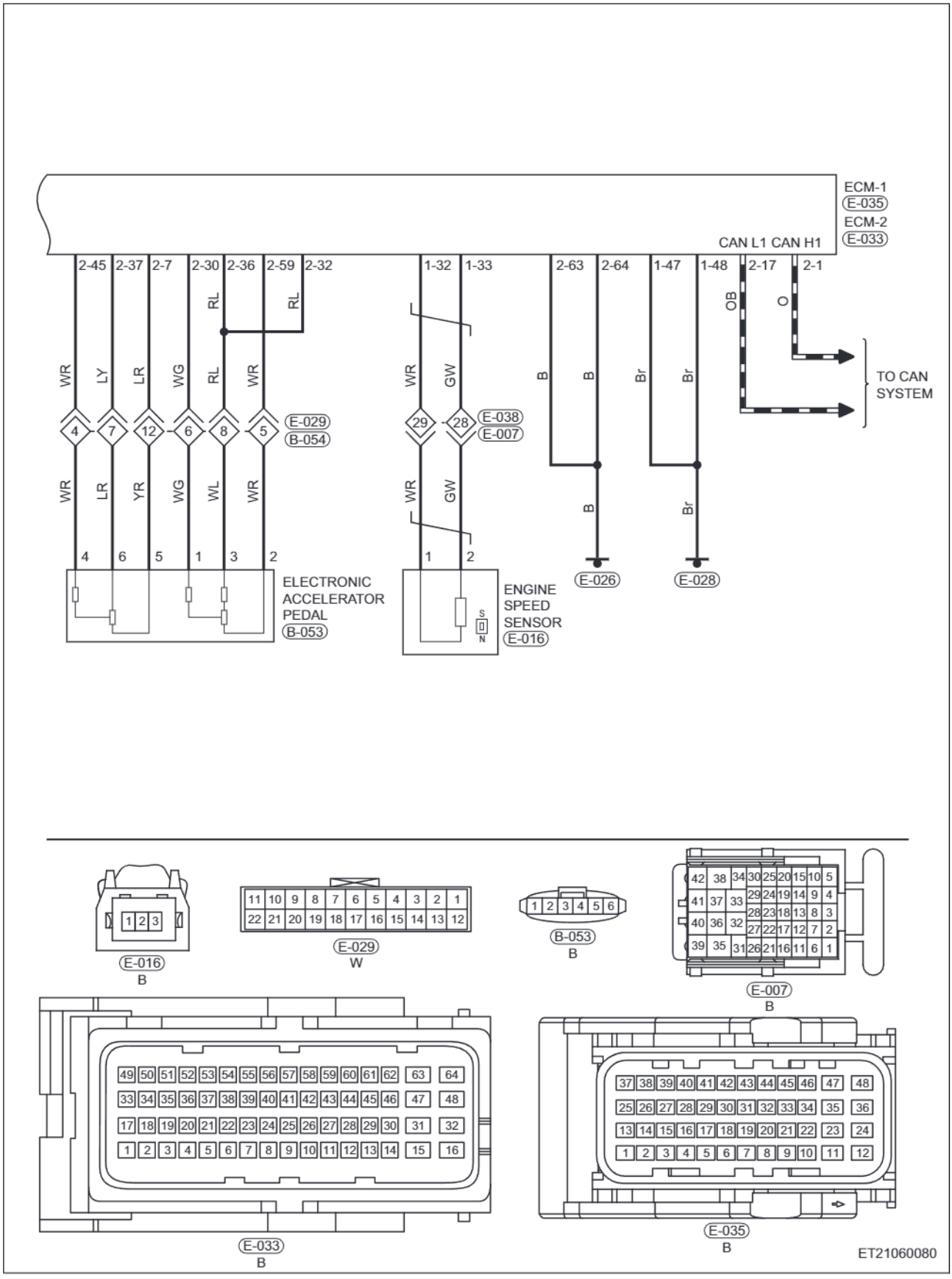
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DIAGNOSIS & TESTING

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 by the data network.
2. Confirm that malfunction is current, and carry out diagnostic test and repair procedures.
3. If DTC cannot be deleted, the malfunction is current.
4. Only use a digital multimeter to measure the 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 Engine Control Module (ECM) grounds related to the current DTC.
8. If multiple trouble codes were set, use circuit diagrams and look for any common ground circuit or power supply circuit applied to the DTC.

Intermittent DTC Troubleshooting

If malfunction is intermittent, perform the following:

- Check if connectors are loose.
- Check if wire harnesses are worn, pierced, pinched or partially broken.
- Monitor X-431 3G diagnostic tester (the latest software) data that is related to this circuit.
- Wiggle related wire harnesses and connectors and observe if the signal is interrupted in the related circuit.
- If possible, try to duplicate the conditions under which the DTC was set.
- Look for the data that has changed or the DTC to reset during the wiggle test.
- Look for broken, bent, protruded or corroded terminals.
- Inspect sensors and mounting areas for damage, foreign matter, etc. that will cause incorrect signals.
- Use data recorder and/or oscilloscope to help diagnose intermittent malfunctions.
- Remove the Engine Control Module (ECM) from the malfunctioning vehicle and install it on a new car to perform test. If DTC cannot be cleared, ECM is malfunctioning. If DTC can be cleared, reinstall ECM to the original vehicle.

Ground Inspection

Groundings are very important to proper operation of circuits. Ground points are often exposed to moisture, dirt and other corrosive environments. Corrosion (rust) can increase resistance which will change the way in which a circuit works.

Electrical control circuits are very sensitive to proper grounding. A loose or corroded ground can seriously affect control circuit. Perform the following operations when checking ground points:

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 a good condition.
4. Reinstall the ground bolt or nut securely.
5. Check if add-on accessories interfere with the ground circuit.
6. If several wire harnesses are crimped into one ground terminal, check if they are installed correctly. Make sure all wire harnesses are clean, securely fastened and well contacted without crimping any excessive insulation coat.

Throttle Self-learning

Perform throttle self-learning in the following conditions:

- Battery is removed and negative battery cable is disconnected.
- ECM is replaced.
- ECM is disconnected and reconnected.
- Throttle is replaced or cleaned.

Throttle self-learning conditions:

- Engine intake temperature > 5°C
- 100.5°C > coolant temperature > 5°C
- Engine speed less than 250 rpm
- Vehicle speed = 0
- Battery voltage > 10 V
- Accelerator pedal opening angle < 14.9%

Throttle self-learning procedures:

Turn ignition switch to OFF and then to ON. Wait for 1 minute to finish throttle self-learning.

Diagnostic Trouble Code (DTC) Chart

DTC Code	DTC Definition
P000A-00	"A" Camshaft Position Slow Response
P000B-00	"B" Camshaft Position Slow Response
P0010-00	"A" Camshaft Position Actuator Circuit/Open
P0012-00	"A" Camshaft Position - Timing Over-Retarded
P0013-00	"B" Camshaft Position Actuator Circuit/Open
P0015-00	"B" Camshaft Position - Timing Over-Retarded
P0016-00	Crankshaft Position-Camshaft Position Correlation Bank 1 Sensor A
P0018-00	Crankshaft Position-Camshaft Position Correlation Bank 2 Sensor A
P0030-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1)
P0031-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1) Low
P0032-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1) High
P0036-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2)
P0037-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2) Low
P0038-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2) High
P0053-00	O2 Sensor Heater Resistance (Bank1 (1) Sensor 1)
P0054-00	O2 Sensor Heater Resistance (Bank1 (1) Sensor 2)
P0105-00	Manifold Absolute Pressure/Barometic Pressure Circuit
P0106-00	Manifold Abs. Pressure or Bar. Pressure Range/Performance
P0107-00	Manifold Abs. Pressure or Bar. Pressure Low Input
P0108-00	Manifold Abs. Pressure or Bar. Pressure High Input
P0112-00	Intake Air Temp. Circ. Low Input
P0113-00	Intake Air Temp. Circ. High Input

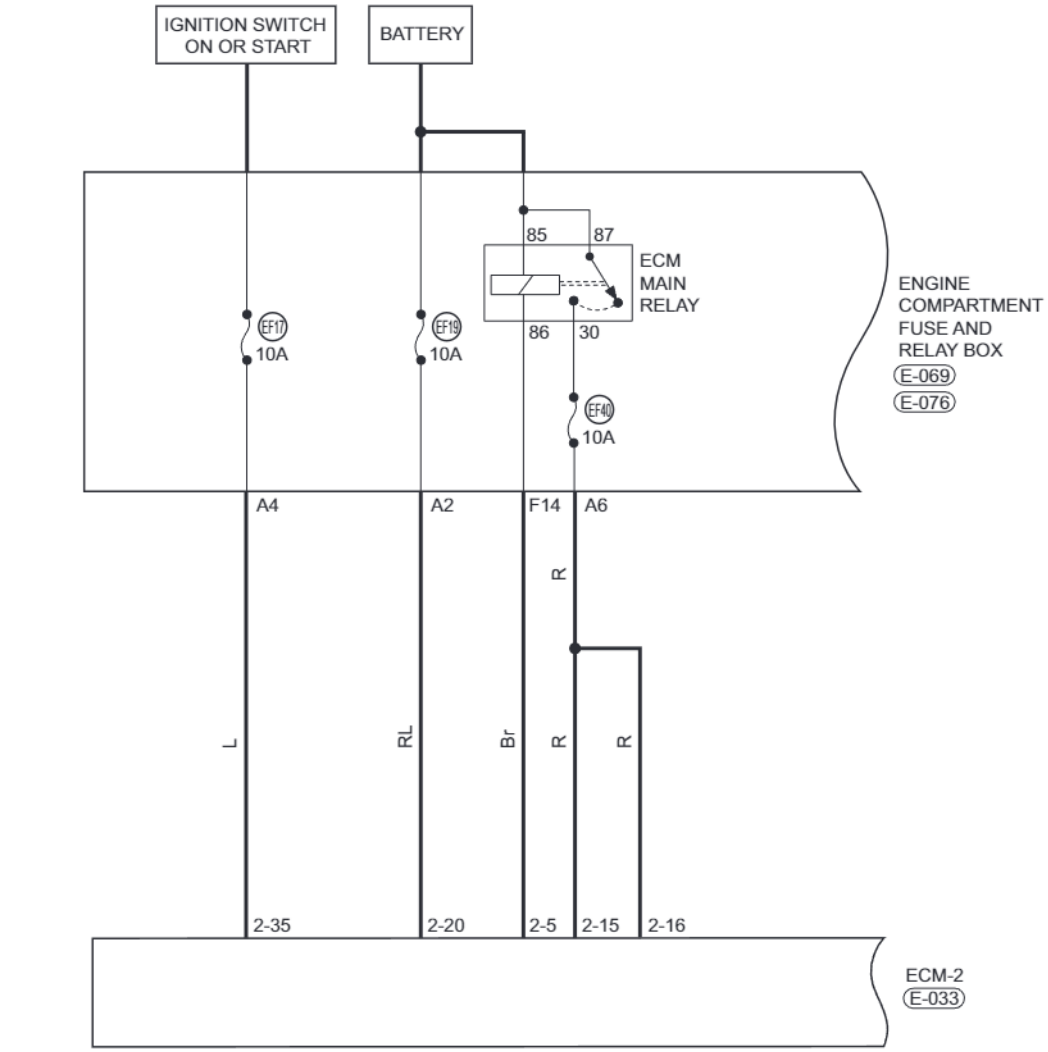
DTC Code	DTC Definition
P0116-00	Engine Coolant Temp. Circ. Range/Performance
P0117-00	Engine Coolant Temp. Circ. Low Input
P0118-00	Engine Coolant Temp. Circ. High Input
P0121-00	Throttle/Pedal Pos. Sensor A Circ. Range/Performance
P0122-00	Throttle/Pedal Pos. Sensor A Circ. Low Input
P0123-00	Throttle/Pedal Pos. Sensor A Circ. High Input
P0130-00	O2 Sensor Circ., Bank1-Sensor1 Malfunction
P0131-00	O2 Sensor Circ., Bank1-Sensor1 Low Voltage
P0132-00	O2 Sensor Circ., Bank1-Sensor1 High Voltage
P0133-00	O2 Sensor Circ., Bank1-Sensor1 Slow Response
P0134-00	O2 Sensor Circ., Bank1-Sensor1 No Activity Detected
P0136-00	O2 Sensor Circ., Bank1-Sensor2 Malfunction
P0137-00	O2 Sensor Circ., Bank1-Sensor2 Low Voltage
P0138-00	O2 Sensor Circ., Bank1-Sensor2 High Voltage
P0140-00	O2 Sensor Circ., Bank1-Sensor2 No Activity Detected
P0170-00	Fuel Trim, Bank1 Malfunction
P0171-00	Fuel Trim, Bank1 System too Lean
P0172-00	Fuel Trim, Bank1 System too Rich
P0201-00	Cylinder 1 - Injector Circuit
P0271-00	Cylinder 4 - Injector Circuit High
P0300-00	Random/Multiple Cylinder Misfire Detected
P0301-00	Cyl.1 Misfire Detected
P0302-00	Cyl.2 Misfire Detected
P0303-00	Cyl.3 Misfire Detected
P0304-00	Cyl.4 Misfire Detected
P0322-00	Ign./Distributor Eng. Speed Inp. Circ. No Signal
P0327-00	Knock Sensor 1 Circ. Low Input
P0328-00	Knock Sensor 1 Circ. High Input
P0341-00	Camshaft Pos. Sensor Circ. Range/Performance
P0346-00	Camshaft Pos. Sensor Circ. Range/Performance (Bank2)
P0420-00	Catalyst System, Bank1 Efficiency Below Threshold
P0444-00	Evaporative Emiss. System Purge Control Valve Circ. Open
P0458-00	Evaporative Emission System Purge Control Valve Circuit Low
P0459-00	Evaporative Emission System Purge Control Valve Circuit High
P0480-00	Cooling Fan 1 Control Circuit
P0481-00	Cooling Fan 2 Control Circuit
P0501-00	Vehicle Speed Sensor Range/Performance

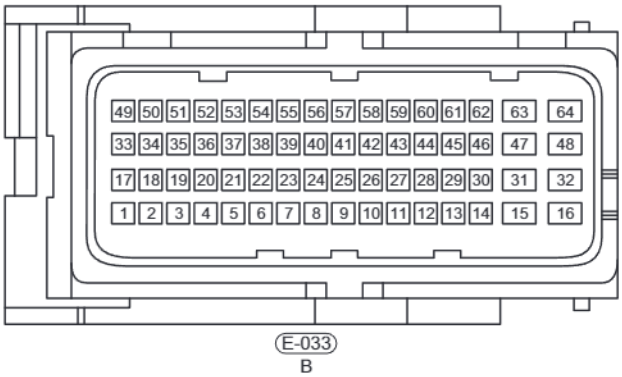
DTC Code	DTC Definition
P0506-00	Idle Control System RPM Lower than Expected
P0507-00	Idle Control System RPM Higher than Expected
P0560-00	System Voltage Malfunction
P0562-00	System Voltage Low Voltage
P0563-00	System Voltage High Voltage
P0568-00	Cruise Control Signal (CVT only)
P0571-00	Brake Switch "A" Circuit
P0604-00	Internal Contr. Module Random Access Memory (RAM) Error
P0605-00	Internal Contr. Module ROM Test Error
P0606-00	ECM/PCM Processor
P0627-00	Fuel Pump "A" Control Circuit/Open
P0628-00	Fuel Pump "A" Control Circuit Low
P0629-00	Fuel Pump "A" Control Circuit High
P0645-00	A/C Clutch Relay Circuit
P0646-00	A/C Clutch Relay Control Circuit Low
P0647-00	A/C Clutch Relay Control Circuit High
P0660-00	Intake Manifold Tuning Valve Control Circuit/Open (Bank 1)
P0661-00	Intake Manifold Tuning Valve Control Circuit Low (Bank 1)
P0662-00	Intake Manifold Tuning Valve Control Circuit High (Bank 1)
P0688-00	EMC/PCM Power Relay Sense Circuit Open
P0691-00	Cooling Fan 1 Control Circuit Low
P1106-00	Throttle Pos. Contr. Malfunction
P1110-00	Throttle Actuator Electrical Malfunction (MT only)
P1111-00	Idle Speed Control Throttle Position Mechanical Malfunction
P1130-00	Diagnosis of Brake Booster Pump
P1131-17	Diagnosis of Brake Booster Pump Control Circuit High
P1132-16	Diagnosis of Brake Booster Pump Control Circuit Low
P1133-13	Diagnosis of Brake Booster Pump Control Circ. Open
P1336-00	Engine Torque Control Adaption at Limit (CVT only)
P1137-13	Diagnosis of Pressure Sensor in Brake Booster Pump
P1138-16	Diagnosis of Pressure Sensor in Brake Booster Pump
P1139-7A	Diagnosis of Pressure Sensor in Brake Booster Pump
P1270-00	ECU Defective Secret Key and Security
P1271-00	Immo Wrong Security Code Received Security
P1272-00	Electronic Control Module Incorrect Coding
P1273-00	MIL Call-up Circ. Open/Short to B+ IMMO
P1274-00	MIL Call-up Circ./Transm. Contr. Module Range/Performance

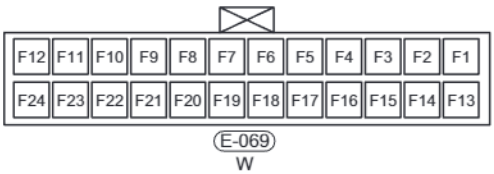
DTC Code	DTC Definition
P1275-00	Manufacturer Controlled Computer and Auxiliary Outputs
P1276-00	Manufacturer Controlled Computer and Auxiliary Outputs
P1615-00	ECM Status Unknown
P1616-00	Authentication not OK
P1617-00	No Response from SIM During Challenge Period
P1618-00	Fail to Write EOL Confiditional Data into EEPROM
P1619-00	ECM Not Programmed (Virgin State)
P1811-13	Manufacturer Controlled Computer and Auxiliary Outputs
P1812-11	Manufacturer Controlled Computer and Auxiliary Outputs
P1813-12	Manufacturer Controlled Computer and Auxiliary Outputs
P2188-00	System Too Rich at Idle
P2195-00	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 1
P2196-00	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 1
P2270-00	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 2
P2271-00	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 2
U0101-87	Lost Communication With TCM (CVT only)
U0129-87	Lost Communication With BSM
U0140-87	Lost Communication With BCM
U0155-87	Lost Communication With ICM
U0164-87	Lost Communication With CLM
U0167-87	Lost Communication With IMMO
P0101-00	Mass or Volume Air Flow Circ. Range/Performance
P0102-00	Mass or Volume Air Flow Circ. Low Input
P0103-00	Mass or Volume Air Flow Circ. High Input
P0531-00	A/C Refrigerant Pressure Sensor "A" Circuit Range/Performance
P1568-00	DV-E Cause of Failure: Spring Check
U0001-00	High Speed CAN Defective

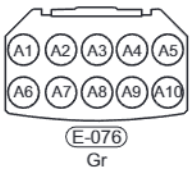
ECM Power Supply Circuit & Ground Circuit Testing

Power Supply Circuit (Page 1 of 1)



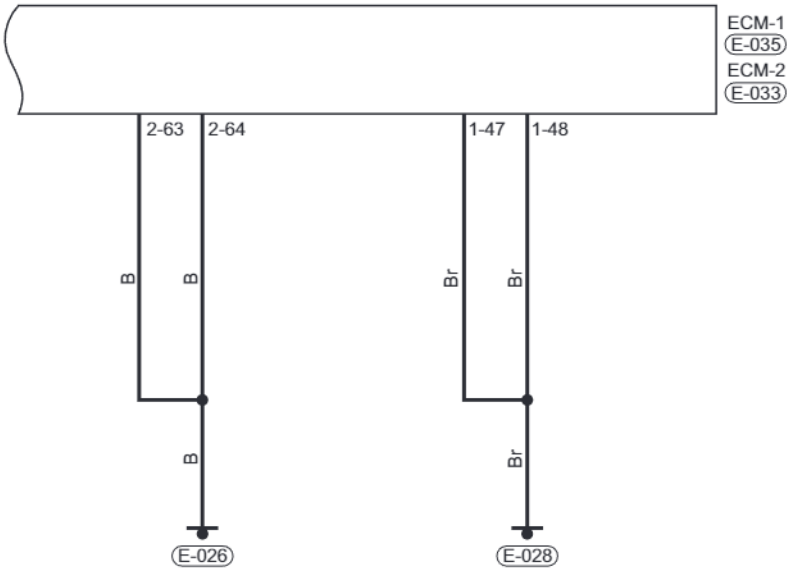


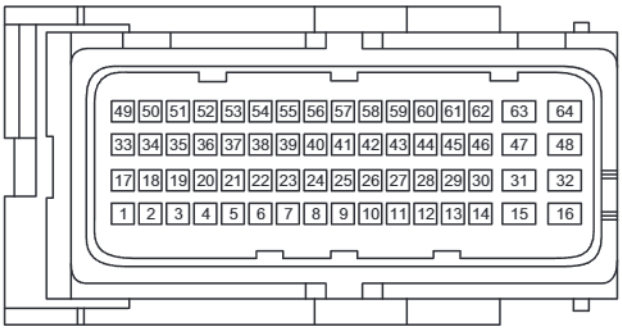


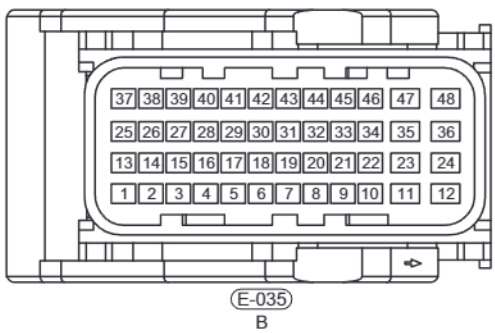


ET21065000

Ground Circuit (Page 1 of 1)







ET21065001

Confirmation Procedure

Before performing the following procedures, confirm that battery voltage is higher than 12 V.

- Turn ignition switch off.
- Connect X-431 3G diagnostic tester (the latest version) to Data Link Connector (DLC).
- Turn ignition switch ON.
- Using diagnostic tester, select Read Datastream.
- If the datastream is not detected, the malfunction indicated by the datastream is current. Go to the diagnosis procedure - Step 1.
- If the datastream is detected, the malfunction indicated by the datastream is intermittent (See page 06-18).

Diagnosis Procedure

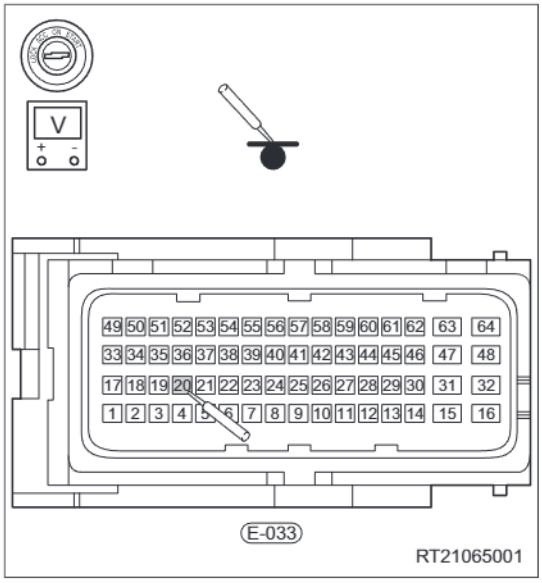
1	Check ECM power supply circuit

a. Turn ignition switch off.

b. Disconnect ECM connector E-033.

c. Check voltage between terminals of ECM connector E-033 and body ground.

Multimeter Connection	Condition	Specified Condition
E-033 (20) - Body Ground	Always	11 to 14 V



OK → **Go to step 4**

NG

2	Check ECM fuse

a. Unplug ECM fuse EF19 (10A) from engine compartment fuse and relay box.

b. Check resistance of fuse.

Standard resistance: less than 1 Ω

NG → **Replace ECM fuse**

OK

3	Check wire harness and connector (ECM - engine compartment fuse and relay box)

a. Disconnect engine compartment fuse and relay box connector E-076.

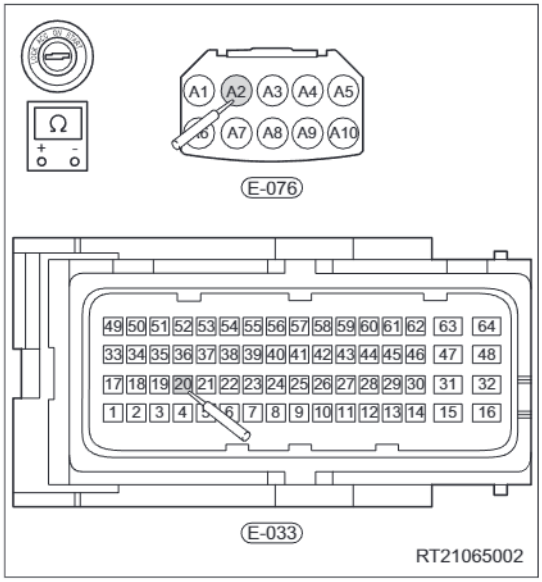
b. Check wire harness between connector terminals on wire harness side.

Check for Open

Multimeter Connection	Specified Condition
E-033 (20) - E-076 (A2)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (20) or E-076 (A2) - Body ground	No continuity
E-033 (20) or E-076 (A2) - Battery positive	No continuity



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

OK

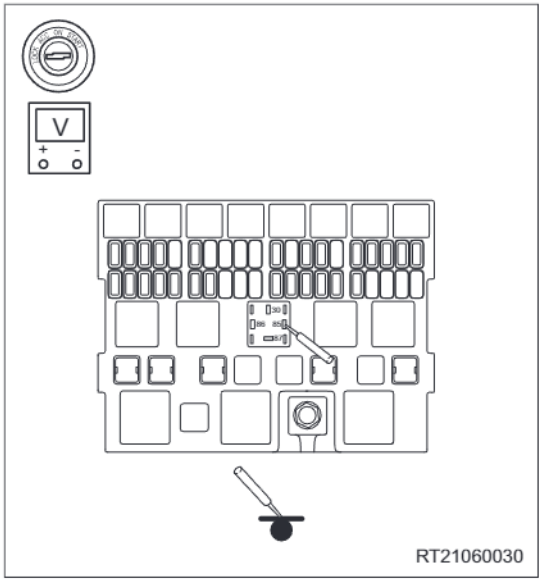
Repair or replace engine compartment fuse and relay box or wire harness (engine compartment fuse and relay box - battery)

4	Check main relay circuit voltage

a. Remove main relay from engine compartment fuse and relay box.

b. Measure voltage between terminals of main relay and body ground.

Multimeter Connection	Condition	Specified Condition
Main relay terminals 85 and 87 (engine compartment fuse and relay box side) - Body ground	Always	11 to 14 V



NG → **Repair or replace wire harness or connector (main relay - battery)**

OK

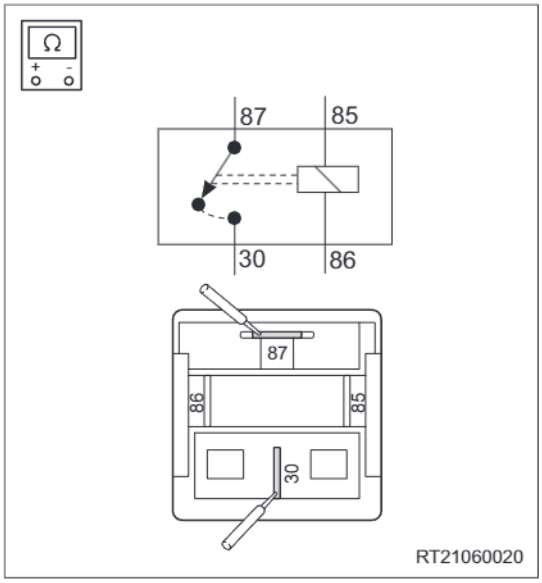
5	Check main relay and fuse EF40

a. Check if fuse EF40 is normal.

b. Check for continuity between terminals of main relay.

Multimeter Connection	Specified Condition
30 - 87	No continuity
30 - 87	Continuity (when battery voltage is applied between terminals 85 and 86)

NG → Replace fuse or main relay



OK

6	Check wire harness and connector (ECM - engine compartment fuse and relay box)

a. Check wire harness between connector terminals.

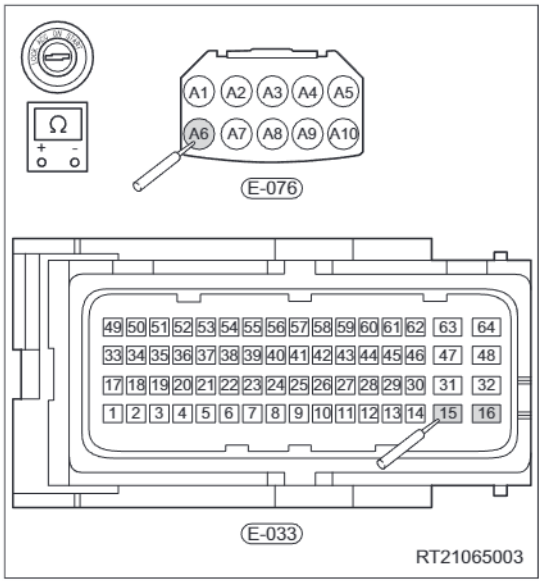
b. Disconnect engine compartment fuse and relay box connector E-069.

Check for Open

Multimeter Connection	Specified Condition
E-033 (15, 16) - E-076 (A6)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (15, 16) or E-076 (A6) - Body ground	No continuity
E-033 (15, 16) or E-076 (A6) - Battery positive	No continuity

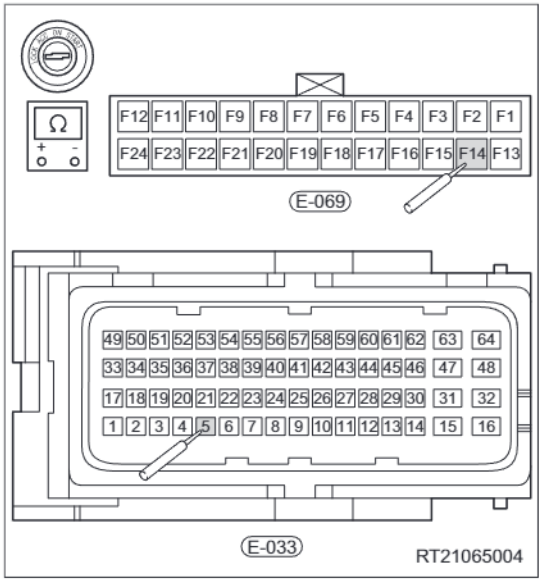


Check for Open

Multimeter Connection	Specified Condition
E-033 (5) - E-069 (F14)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (5) or E-069 (F14) - Body ground	No continuity
E-033 (5) or E-069 (F14) - Battery positive	No continuity



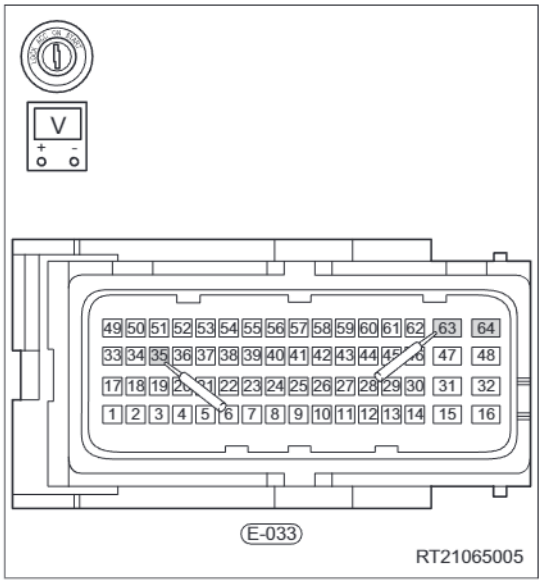
NG → **Repair or replace wire harness or connector**

OK

7 Check ECM power supply circuit (ignition switch voltage)

a. Connect fuse and relay box connector E-076.
b. Turn ignition switch to ON.
c. Check voltage between terminals of ECM connector.

Multimeter Connection	Condition	Specified Condition
E-033 (35) - E-033 (63, 64)	Ignition switch ON	11 to 14 V



OK → **Replace ECM**

NG

8 Check ECM fuse

a. Unplug ECM fuse EF17 (10A) from engine compartment fuse and relay box.
b. Check resistance of fuse.

Standard resistance: less than 1 Ω

NG → **Replace ECM fuse**

OK

9	Check wire harness and connector (ECM - body ground and engine compartment fuse and relay box)

a. Disconnect engine compartment fuse and relay box connector E-076.

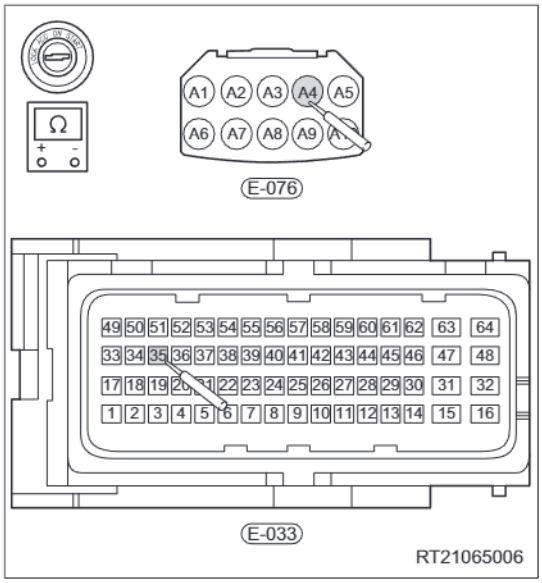
b. Check wire harness between connector terminals on wire harness side.

Check for Open

Multimeter Connection	Specified Condition
E-033 (35) - E-076 (A4)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (35) or E-076 (A4) - Body ground	No continuity
E-033 (35) or E-076 (A4) - Battery positive	No continuity



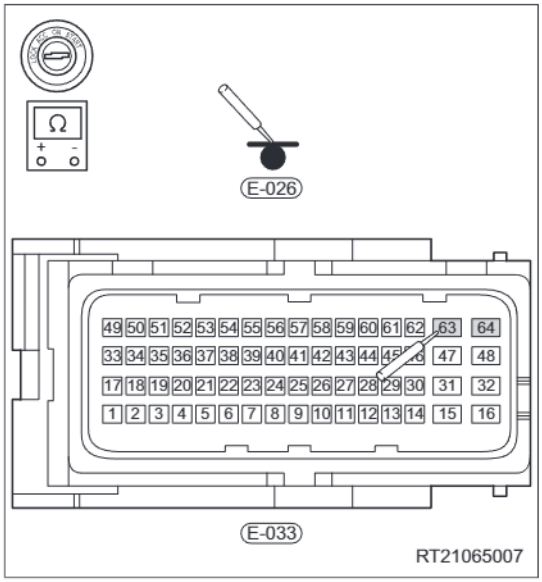
c. Disconnect ECM ground point E-026 and E-028.

d. Check ECM ground point (See page 06-18).

e. Check ECM ground wire harness.

Check for Open

Multimeter Connection	Specified Condition
E-033 (63, 64) - E-026	Continuity
E-035 (47, 48) - E-028	Continuity



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

OK

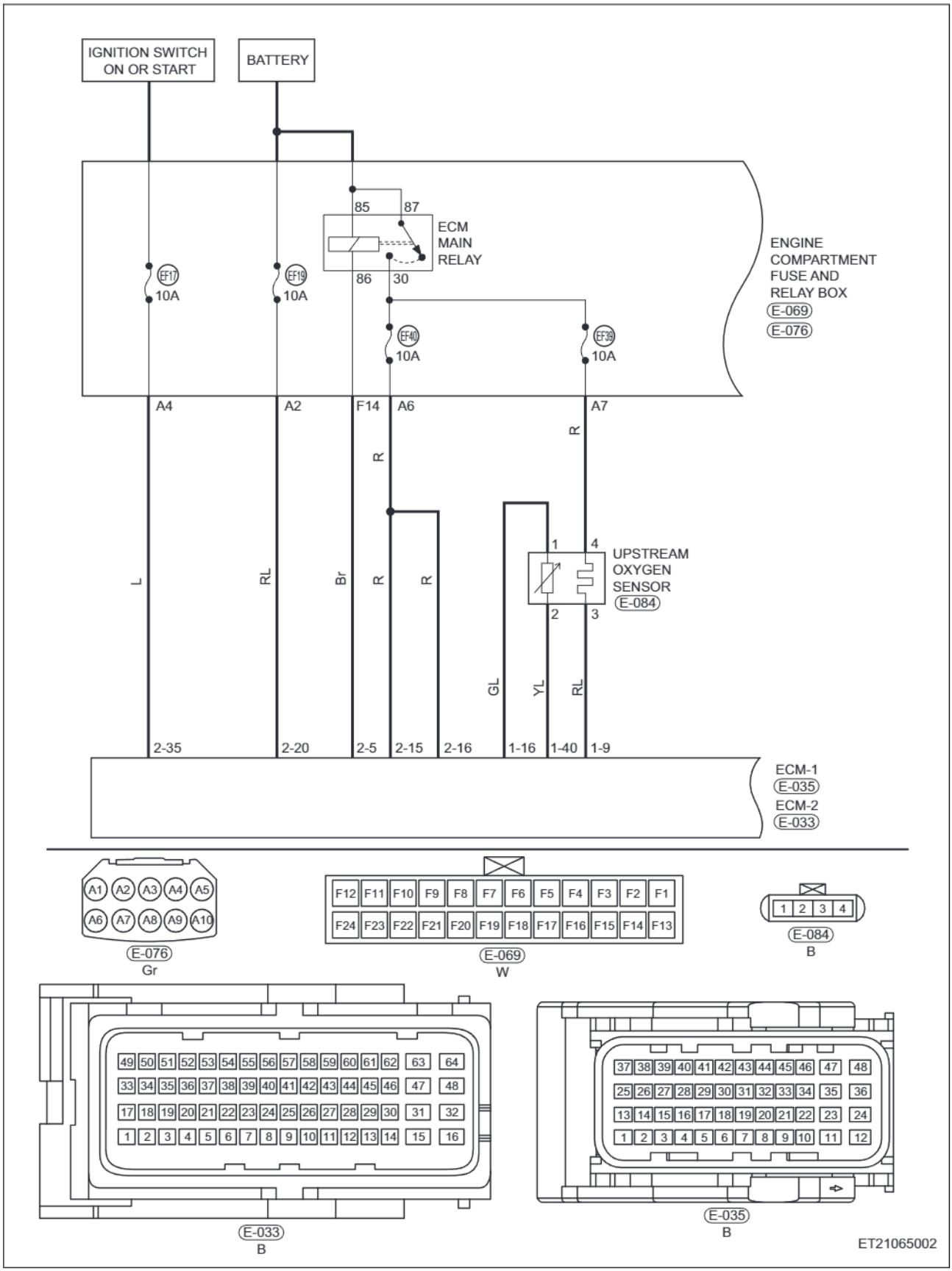
10	Check ignition switch assembly (See page 15-67)

NG → Replace ignition switch assembly

OK ↓

Repair or replace engine compartment fuse and relay box or wire harness (engine compartment fuse and relay box - ignition switch)

DTC	P0030-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1)
DTC	P0031-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1) Low
DTC	P0032-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1) High
DTC	P0053-00	O2 Sensor Heater Resistance (Bank1 (1) Sensor 1)


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF39
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
A4
A2
F14
A6
A7
R
R
L
RL
Br
R
R
GL
YL
RL
1
4
2
3
UPSTREAM OXYGEN SENSOR
E-084
2-35
2-20
2-5
2-15
2-16
1-16
1-40
1-9
ECM-1
E-035
ECM-2
E-033
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
1 2 3 4
E-084
B
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B
ET21065002

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0030-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1)	Ignition switch ON Engine running	• Upstream oxygen sensor • Wire harness or connector • Fuse • ECM
P0031-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1) Low		
P0032-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 1) High		
P0053-00	O2 Sensor Heater Resistance (Bank1 (1) Sensor 1)		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

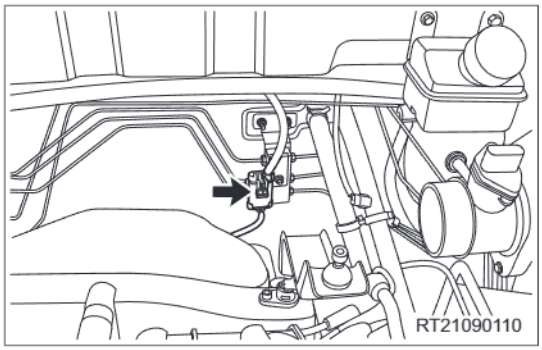
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check upstream oxygen sensor connector

a. Disconnect upstream oxygen sensor connector E-084.
b. Check upstream oxygen sensor connector.



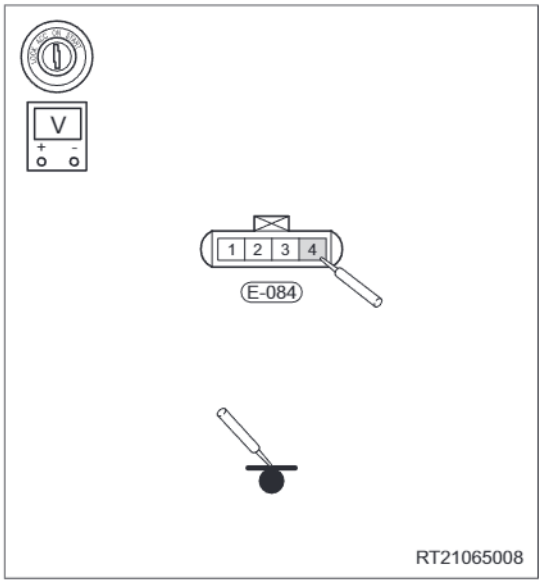
NG → Repair or replace connector

OK

3	Check upstream oxygen sensor heater power supply voltage

a. Turn ignition switch to ON.
b. Check voltage between terminal 4 of upstream oxygen sensor connector E-084 and body ground.

Multimeter Connection	Condition	Specified Condition
E-084 (4) - Body ground	Ignition switch ON	11 to 14 V



OK → Go to step 5

NG

4	Check upstream oxygen sensor power supply circuit

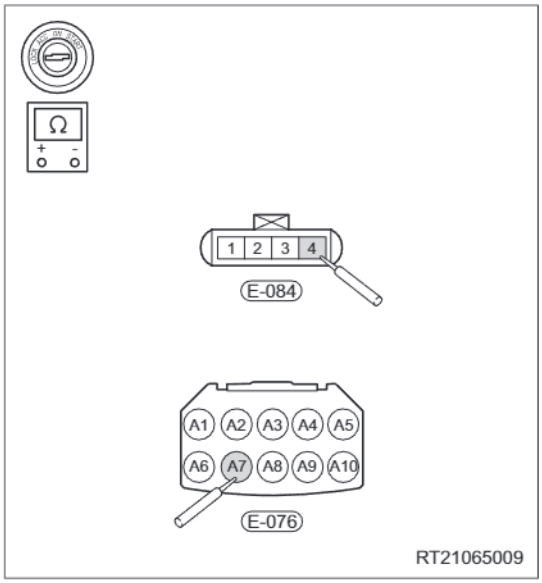
a. Turn ignition switch to LOCK.
b. Check fuse EF39 and main relay.
c. Disconnect engine compartment fuse and relay box connector E-076.
d. Check wire harness between upstream oxygen sensor connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-084 (4) - E-076 (A7)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-084 (4) or E-076 (A7) - Body ground	Always	No continuity
E-084 (4) or E-076 (A7) - Battery positive	Always	No continuity



NG → **Replace fuse, main relay, wire harness or connector (upstream oxygen sensor - engine compartment fuse and relay box)**

OK →

5	Check upstream oxygen sensor heater control circuit

a. Disconnect ECM connector E-035.

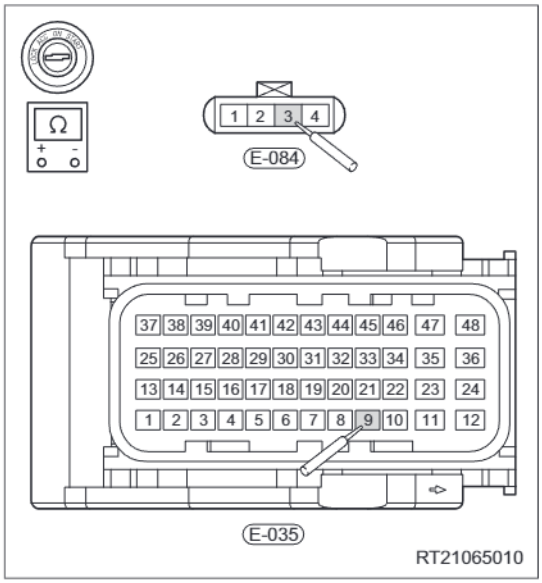
b. Check wire harness between upstream oxygen sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-084 (3) - E-035 (9)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-084 (3) or E-035 (9) - Body ground	Always	No continuity
E-084 (3) or E-035 (9) - Battery positive	Always	No continuity



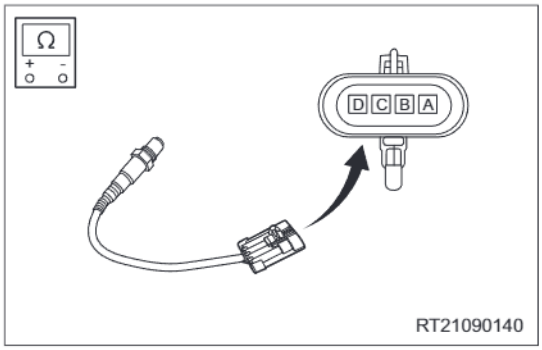
NG → **Repair or replace wire harness or connector (upstream oxygen sensor - ECM)**

OK

6	Check upstream oxygen sensor heater

a. Measure resistance of upstream oxygen sensor.

Multimeter Connection	Condition	Specified Condition
Terminal C - Terminal D	20°C	7 - 11 Ω
Terminal A - Terminal B	Always	No continuity
Terminal A - Terminal C		
Terminal A - Terminal D		
Terminal B - Terminal C		
Terminal B - Terminal D		



NG → **Replace upstream oxygen sensor**

OK

7	Check for DTCs

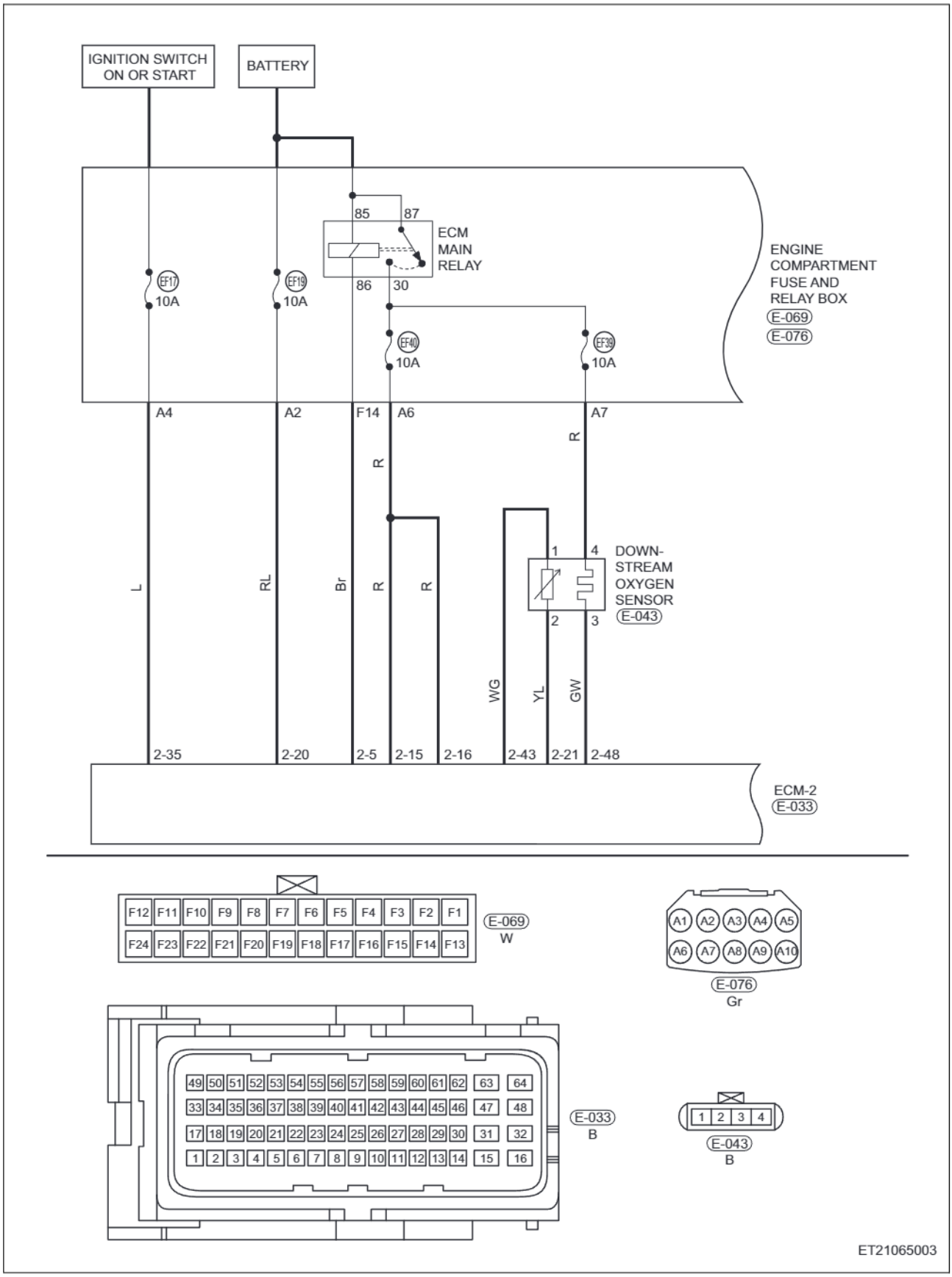
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0030-00, P0031-00, P0032-00 or P0053-00 still exists.

NG → **Replace ECM**

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0036-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2)
DTC	P0037-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2) Low
DTC	P0038-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2) High
DTC	P0054-00	O2 Sensor Heater Resistance (Bank1 (1) Sensor 2)


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF39
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
A4
A2
F14
A6
A7
R
R
L
RL
Br
R
R
1
4
DOWN-STREAM OXYGEN SENSOR
E-043
2
3
WG
YL
GW
2-35
2-20
2-5
2-15
2-16
2-43
2-21
2-48
ECM-2
E-033
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
1 2 3 4
E-043
B
ET21065003

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0036-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2)	Ignition switch ON Engine running	• Downstream oxygen sensor • Wire harness or connector • Fuse • ECM
P0037-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2) Low		
P0038-00	O2 Sensor Heater Contr. Circ. (Bank1 (1) Sensor 2) High		
P0054-00	O2 Sensor Heater Resistance (Bank1 (1) Sensor 2)		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

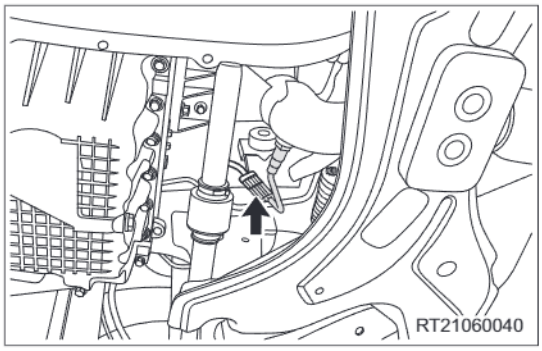
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check downstream oxygen sensor connector

a. Disconnect downstream oxygen sensor connector.
b. Check downstream oxygen sensor connector.



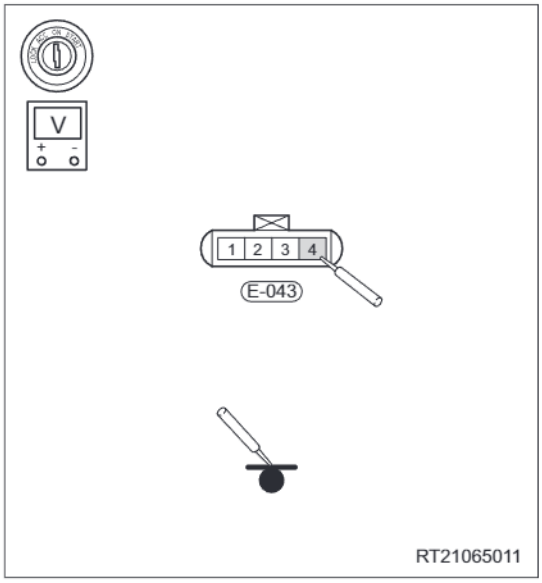
NG → Repair or replace connector

OK

3	Check downstream oxygen sensor heater power supply voltage

a. Turn ignition switch to ON.
b. Check voltage between terminal 4 of downstream oxygen sensor connector E-043 and body ground.

Multimeter Connection	Condition	Specified Condition
E-043 (4) - Body ground	Ignition switch ON	11 to 14 V



OK → Go to step 5

NG

4	Check downstream oxygen sensor power supply circuit

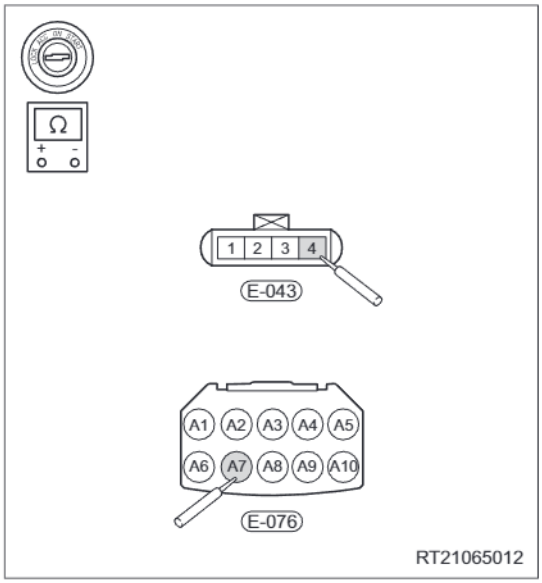
a. Turn ignition switch to LOCK.
b. Check fuse EF39 and main relay.
c. Disconnect engine compartment fuse and relay box connector E-076.
d. Check wire harness between downstream oxygen sensor connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-043 (4) - E-076 (A7)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-043 (4) or E-076 (A7) - Body ground	Always	No continuity
E-043 (4) or E-076 (A7) - Battery positive	Always	No continuity



NG → **Replace fuse, main relay, wire harness or connector (downstream oxygen sensor - engine compartment fuse and relay box)**

OK

5	Check downstream oxygen sensor heater control circuit

a. Disconnect ECM connector E-033.

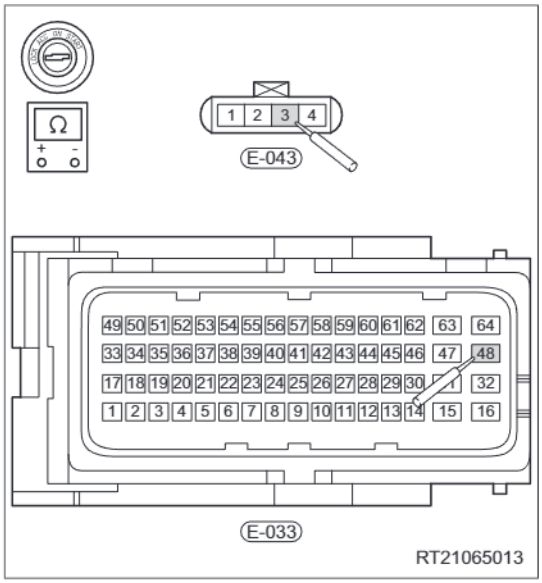
b. Check wire harness between downstream oxygen sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-043 (3) - E-033 (48)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-043 (3) or E-033 (48) - Body ground	Always	No continuity
E-043 (3) or E-033 (48) - Battery positive	Always	No continuity



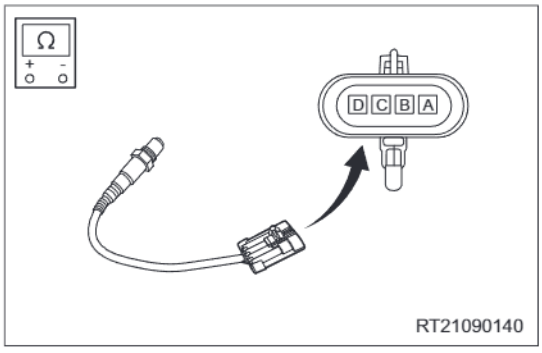
NG → **Repair or replace wire harness or connector (downstream oxygen sensor - ECM)**

OK

6	Check downstream oxygen sensor heater

a. Measure resistance of downstream oxygen sensor.

Multimeter Connection	Condition	Specified Condition
Terminal C - Terminal D	20°C	7 - 11 Ω
Terminal A - Terminal B	Always	No continuity
Terminal A - Terminal C		
Terminal A - Terminal D		
Terminal B - Terminal C		
Terminal B - Terminal D		



NG → **Replace downstream oxygen sensor**

OK

7	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0036-00, P0037-00, P0038-00 or P0054-00 still exists.

NG → Replace ECM

OK

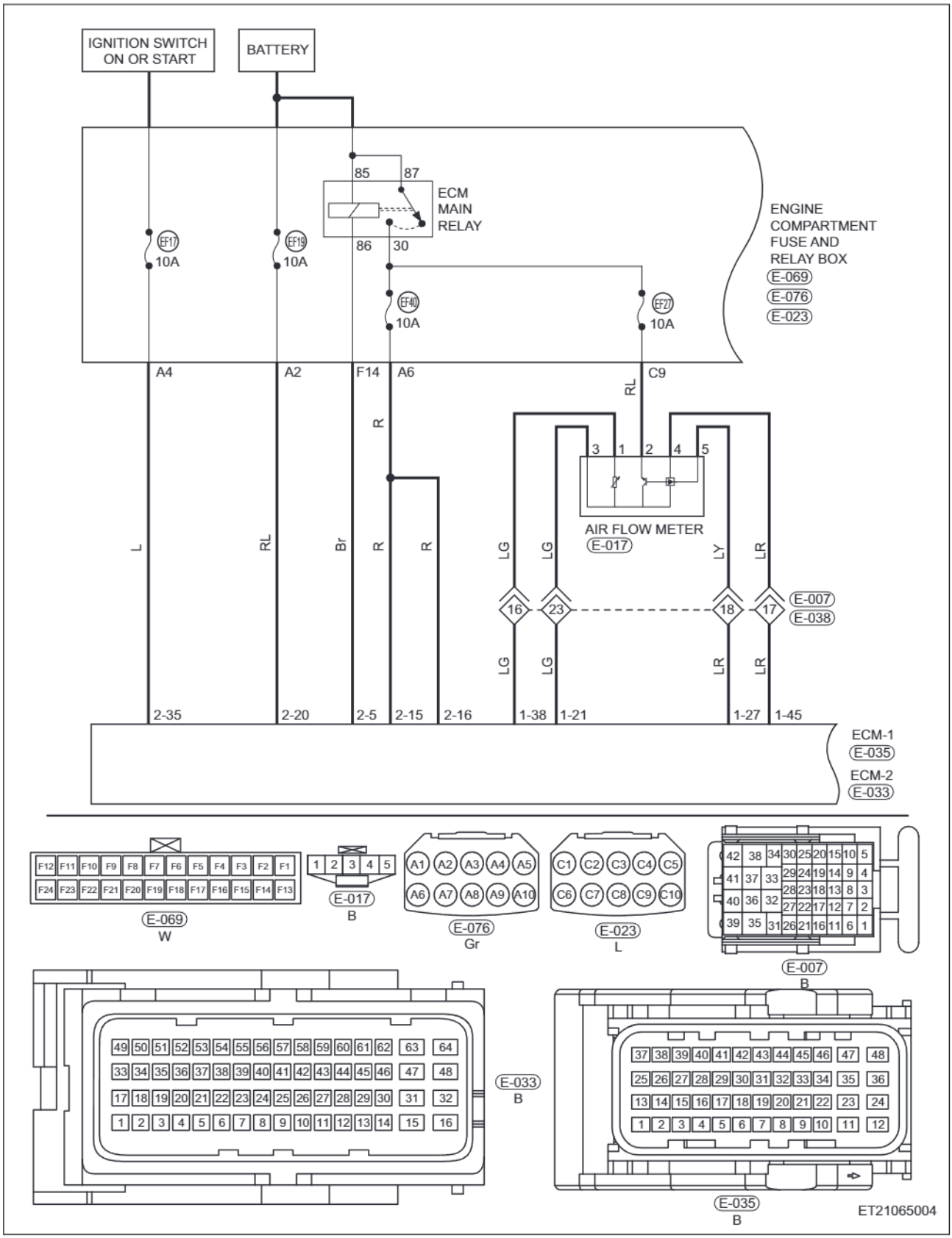
06

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0101-00	Mass or Volume Air Flow Circ. Range/Performance

DTC	P0102-00	Mass or Volume Air Flow Circ. Low Input

DTC	P0103-00	Mass or Volume Air Flow Circ. High Input


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF27
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
E-023
A4
A2
F14
A6
C9
RL
R
3
1
2
4
5
AIR FLOW METER
E-017
L
RL
Br
R
R
LG
LG
LY
LR
16
23
18
17
E-007
E-038
LG
LG
LR
LR
2-35
2-20
2-5
2-15
2-16
1-38
1-21
1-27
1-45
ECM-1
E-035
ECM-2
E-033
E-069
W
E-017
B
E-076
Gr
E-023
L
E-007
B
E-033
B
E-035
B
ET21065004

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0101-00	Mass or Volume Air Flow Circ. Range/ Performance	Ignition switch ON Engine running	• Air flow meter • Wire harness or connector • ECM
P0102-00	Mass or Volume Air Flow Circ. Low Input		
P0103-00	Mass or Volume Air Flow Circ. High Input		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	**Check ECM ground point**

a. Turn ignition switch to LOCK.

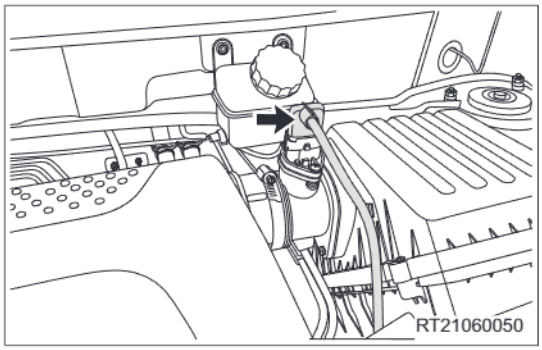
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check air flow meter connector

a. Disconnect air flow meter connector E-017.
b. Check air flow meter connector.



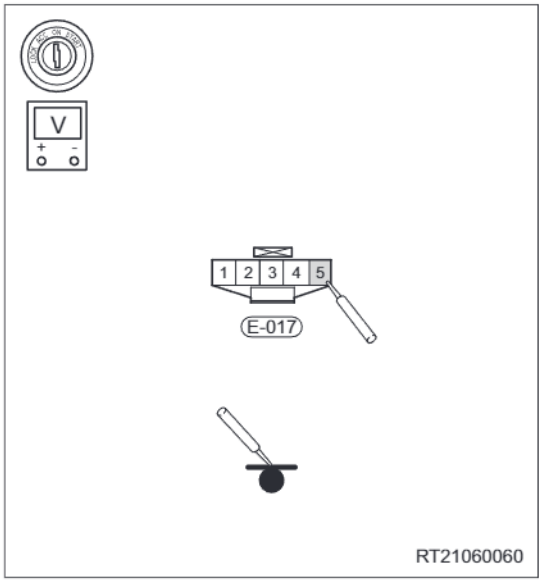
NG → Repair or replace connector

OK

3	Check air flow meter signal voltage

a. Connect air flow meter connector E-017.
b. Turn ignition switch to ON and start the engine.
c. Using multimeter, measure voltage between connector E-017 terminal 5 and body ground.

Multimeter Connection	Condition	Specified Condition
E-017 (5) - Body ground	Idle	Voltage is about 1.3 V (value changes with model)
	Rapidly depress accelerator pedal	Instantaneous voltage is about 4 V (value changes with model)



OK → Go to step 8

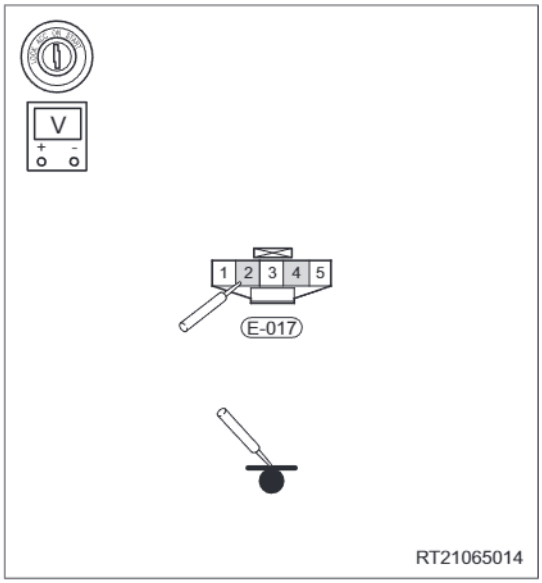
NG

4	Check air flow meter power supply voltage

a. Disconnect air flow meter connector E-017.

b. Check voltage between air flow meter connector terminals and body ground.

Multimeter Connection	Condition	Specified Condition
E-017 (4) - Body ground	Ignition switch ON	5 V
E-017 (2) - Body ground		11 to 14 V



OK → **Go to step 6**

NG

5	Check air flow meter power supply circuit

a. Turn ignition switch to LOCK.

b. Disconnect ECM connector E-035 and engine compartment fuse and relay box connector E-023.

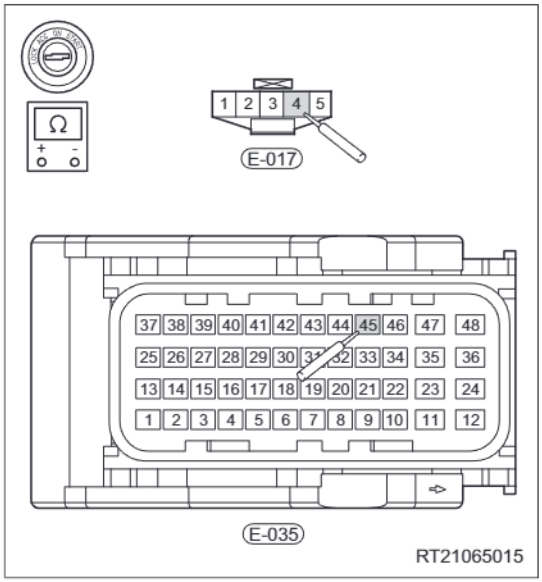
c. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-017 (4) - E-035 (45)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-017 (4) or E-035 (45) - Body ground	Always	No continuity
E-017 (4) or E-035 (45) - Battery positive	Always	No continuity

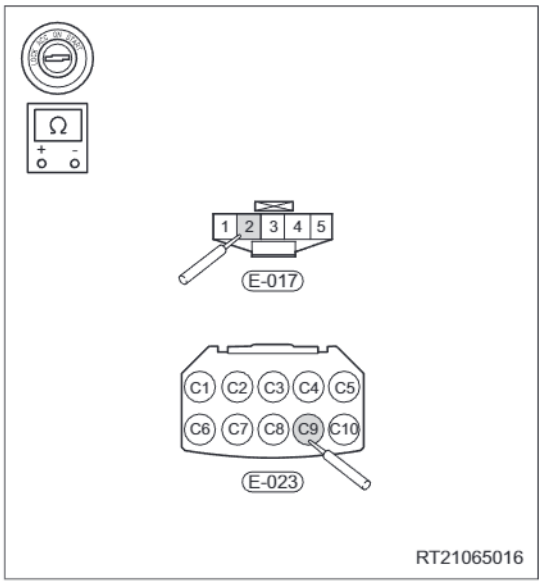


Check for Open

Multimeter Connection	Condition	Specified Condition
E-017 (2) - E-023 (C9)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-017 (2) or E-023 (C9) - Body ground	Always	No continuity
E-017 (2) or E-023 (C9) - Battery positive	Always	No continuity



NG → **Replace wire harness or connector (air flow meter - ECM or engine compartment fuse and relay box)**

OK

6	Check air flow meter signal circuit

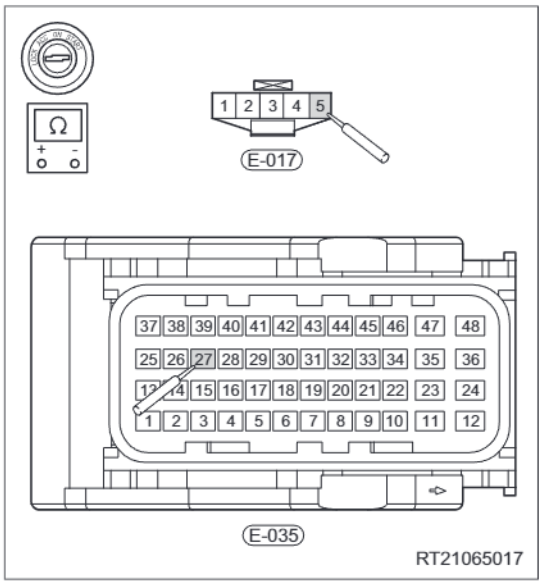
a. Check wire harness between air flow meter connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-017 (5) - E-035 (27)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-017 (5) or E-035 (27) - Body ground	Always	No continuity
E-017 (5) or E-035 (27) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (air flow meter - ECM)**

OK

7	Check air flow meter

a. Remove air flow meter.
b. Check air flow meter for debris and damage.

NG → **Clean or replace air flow meter, and go to next step**

OK ↓

8	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0101-00, P0102-00 or P0103-00 still exists.

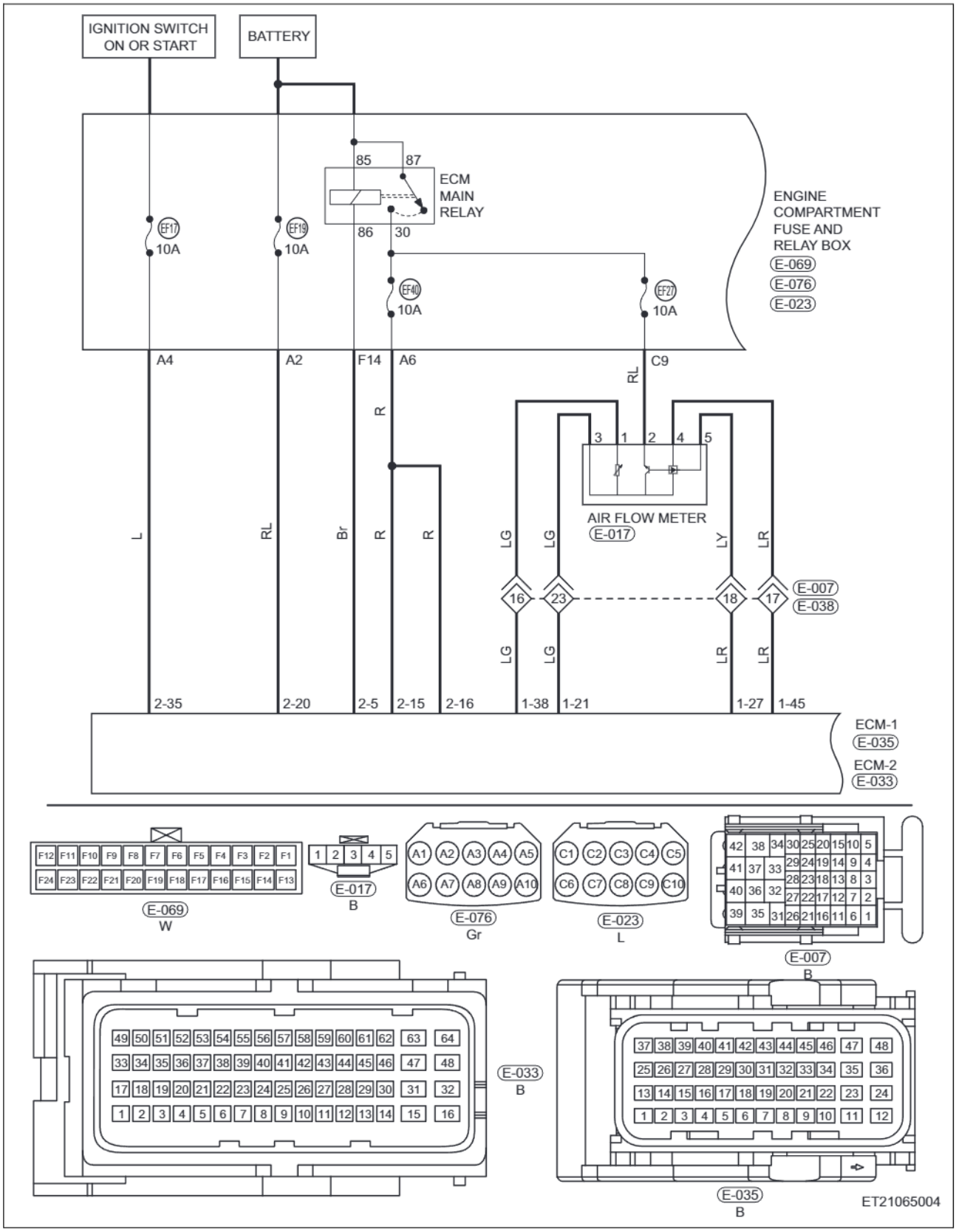
NG → **Replace ECM**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0112-00	Intake Air Temp. Circ. Low Input

DTC	P0113-00	Intake Air Temp. Circ. High Input



DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0112-00	Intake Air Temp. Circ. Low Input	Ignition switch ON Engine running	• Air flow meter • Wire harness or connector • ECM
P0113-00	Intake Air Temp. Circ. High Input		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

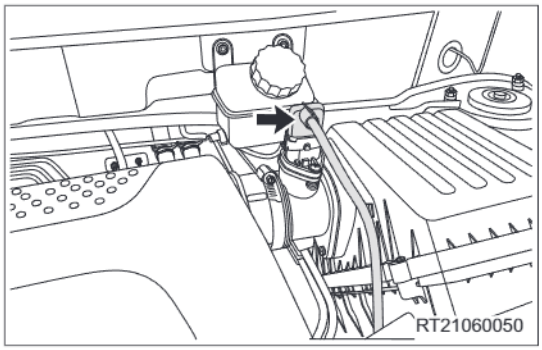
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check air flow meter connector

a. Disconnect air flow meter connector E-017.
b. Check air flow meter connector.



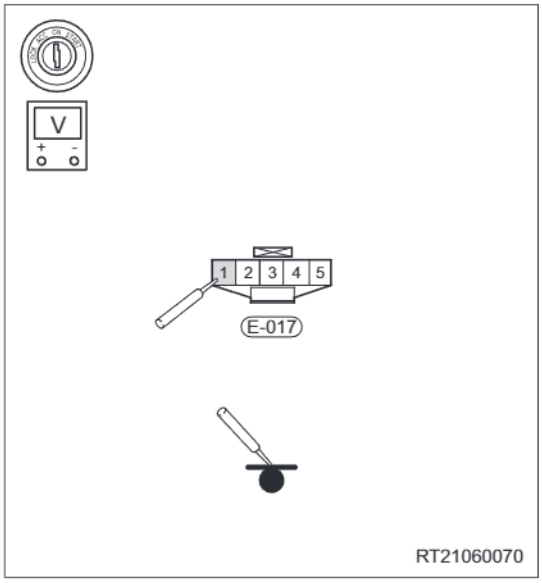
NG → Repair or replace connector

OK

3	Check intake temperature sensor signal

a. Connect air flow meter connector E-017.
b. Turn ignition switch to ON and start the engine.
c. Using multimeter, measure voltage between connector E-017 terminal 1 and body ground.

Multimeter Connection	Condition	Specified Condition
E-017 (1) - Body ground	Engine running after warming up	Voltage is about 1.6 V (value changes with model); signal voltage does not change when increasing speed.



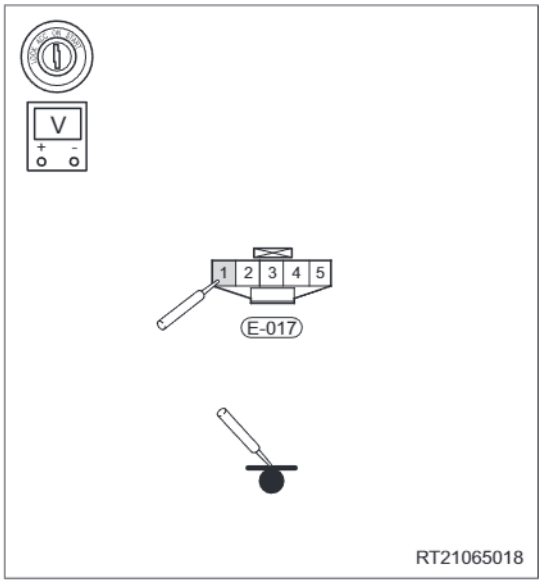
OK → Go to step 7

NG

4	Check intake temperature sensor voltage

a. Disconnect air flow meter connector E-017.
b. Turn ignition switch to ON.
c. Check voltage between connector terminal and body ground.

Multimeter Connection	Condition	Specified Condition
E-017 (1) - Body ground	Ignition switch ON	5 V



OK → **Go to step 6**

NG

5	Check intake temperature sensor signal circuit

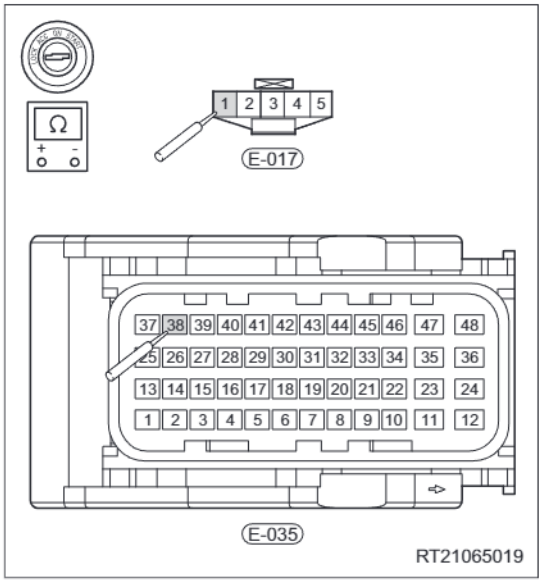
a. Turn ignition switch to LOCK.
b. Disconnect ECM connector E-035.
c. Check wire harness between air flow meter connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-017 (1) - E-035 (38)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-017 (1) or E-035 (38) - Body ground	Always	No continuity
E-017 (1) or E-035 (38) - Battery positive	Always	No continuity



NG → **Replace wire harness or connector (air flow meter - ECM)**

OK

6	Check intake pressure sensor ground circuit

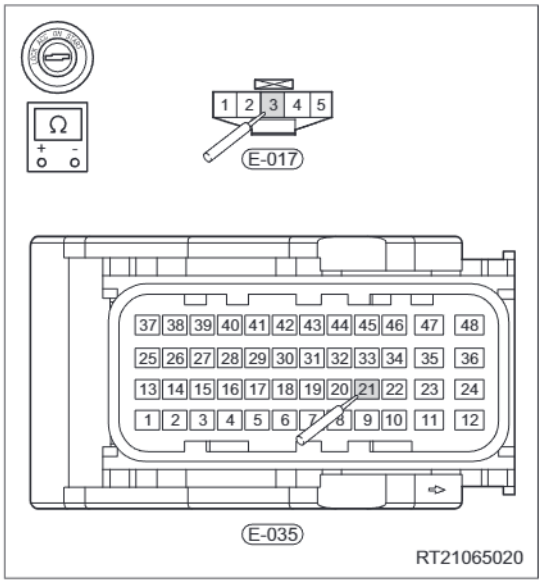
a. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-017 (3) - E-035 (21)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-017 (3) or E-035 (21) - Body ground	Always	No continuity
E-017 (3) or E-035 (21) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (air flow meter - ECM)**

OK

Replace air flow meter, and go to step 7

7	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0112-00 or P0113-00 still exists.

NG → **Replace ECM**

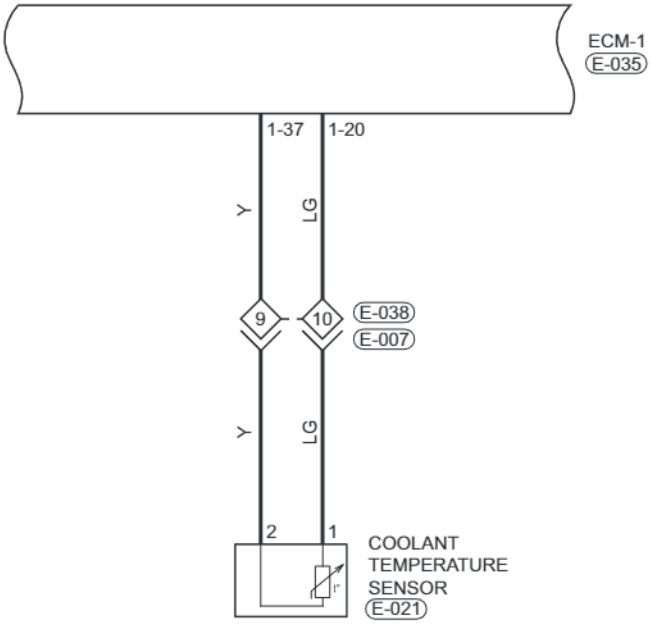
OK

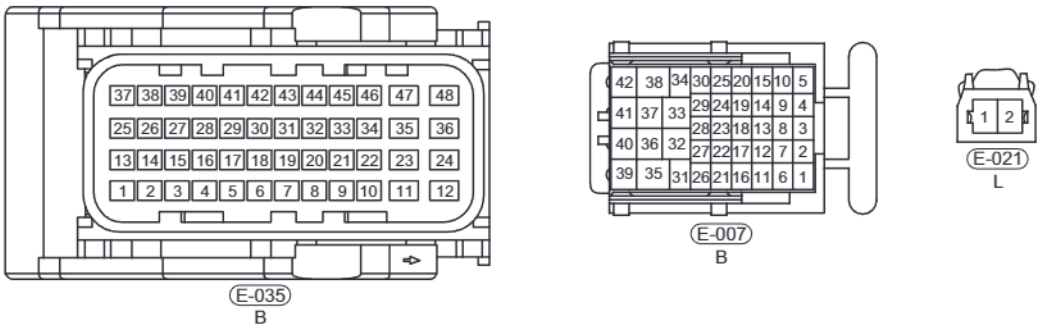
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0116-00	Engine Coolant Temp. Circ. Range/Performance

DTC	P0117-00	Engine Coolant Temp. Circ. Low Input

DTC	P0118-00	Engine Coolant Temp. Circ. High Input





ET21065005

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0116-00	Engine Coolant Temp. Circ. Range/ Performance	Ignition switch ON Engine running	• Engine coolant temperature sensor • Wire harness or connector • ECM
P0117-00	Engine Coolant Temp. Circ. Low Input		
P0118-00	Engine Coolant Temp. Circ. High Input		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	**Check ECM ground point**

a. Turn ignition switch to LOCK.

b. Check ECM grounds E-026 and E-028 (See page 06-18).

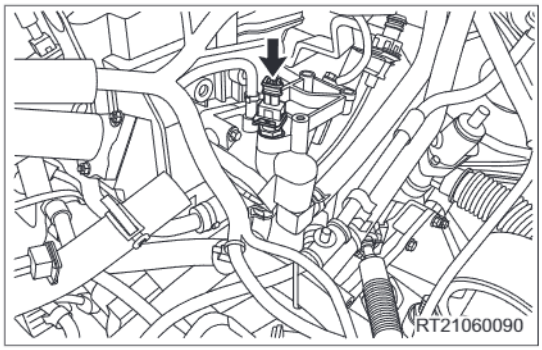
NG → **Repair or replace ground wire harness or ground point**

OK

2	Check engine coolant temperature sensor connector

a. Disconnect engine coolant temperature sensor connector E-021.

b. Check engine coolant temperature sensor connector.



NG → Repair or replace connector

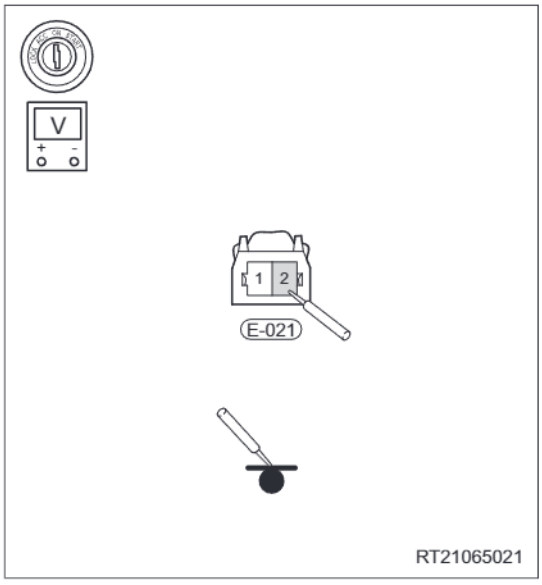
OK

3	Check engine coolant temperature sensor power supply voltage

a. Turn ignition switch to ON.

b. Check voltage between engine coolant temperature sensor terminal and body ground.

Multimeter Connection	Condition	Specified Condition
E-021 (2) - Body ground	Ignition switch ON	5 V

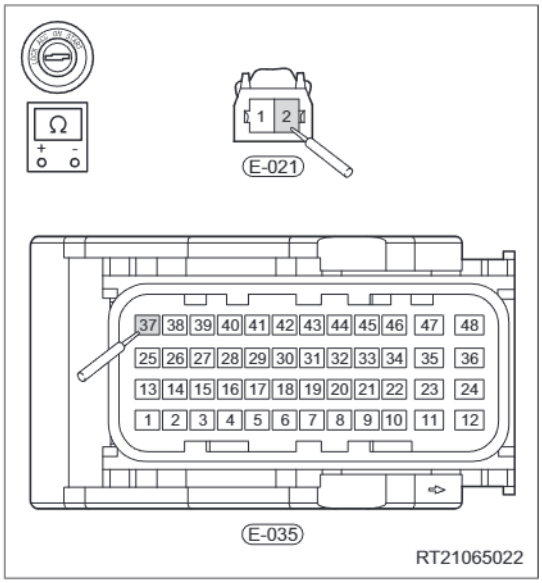


OK → Go to step 5

NG

4	Check engine coolant temperature sensor power supply circuit

a. Turn ignition switch to LOCK.
b. Disconnect ECM connector E-035.
c. Check wire harness between engine coolant temperature sensor connector terminals and ECM connector terminals.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-021 (2) - E-035 (37)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-021 (2) or E-035 (37) - Body ground	Always	No continuity
E-021 (2) or E-035 (37) - Battery positive	Always	No continuity

NG → **Replace wire harness or connector (engine coolant temperature sensor - ECM)**

OK →

5	Check engine coolant temperature sensor ground circuit

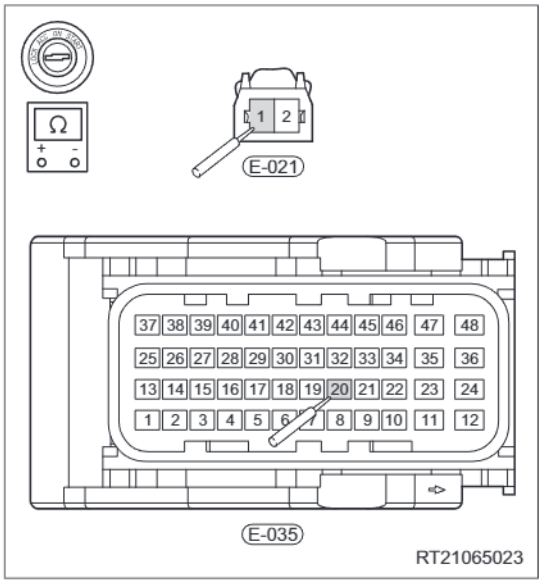
a. Check wire harness between engine coolant temperature sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-021 (1) - E-035 (20)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-021 (1) or E-035 (20) - Body ground	Always	No continuity
E-021 (1) or E-035 (20) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (engine coolant temperature sensor - ECM)**

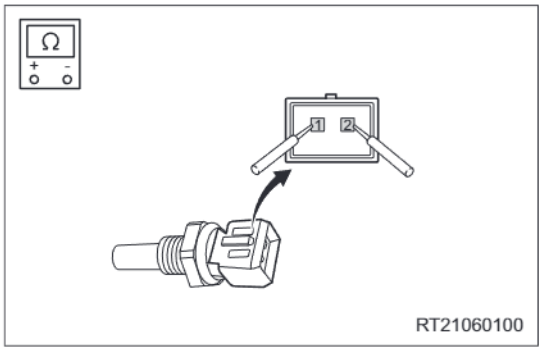
OK

6	Check engine coolant temperature sensor

a. Remove engine coolant temperature sensor.

b. Check resistance of engine coolant temperature sensor.

Multimeter Connection	Specified Condition
1 - 2	Resistance is 2.5 kΩ ± 5% (20°C), 300 - 400 Ω in boiled water (value changes with boiled water temperature)



NG → **Replace engine coolant temperature sensor**

OK

7	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0116-00, P0117-00 or P0118-00 still exists.

NG → **Replace ECM**

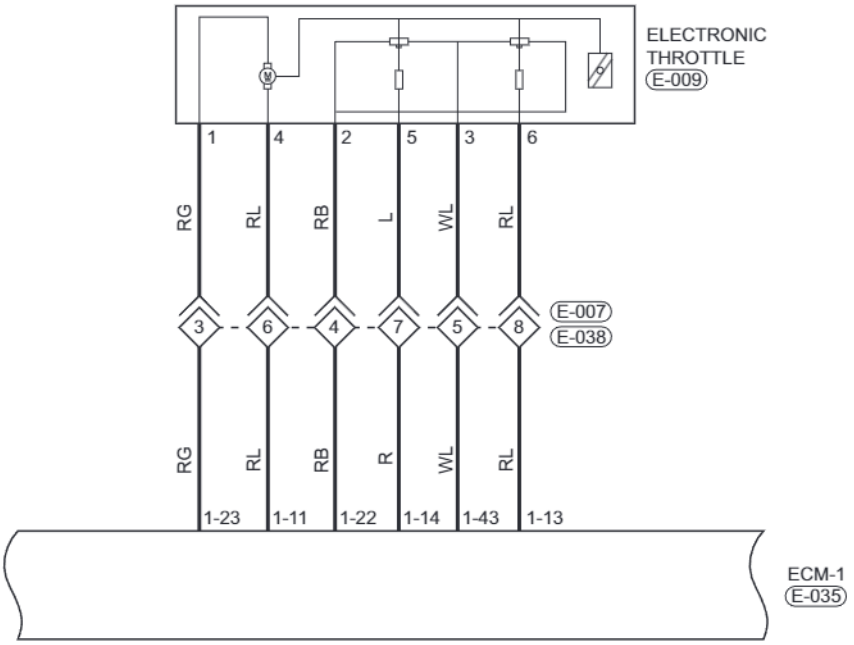
OK ↓

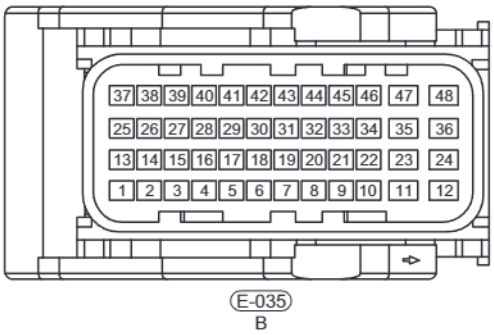
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

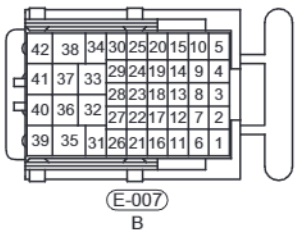
DTC	P0121-00	Throttle/Pedal Pos. Sensor A Circ. Range/Performance

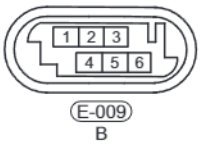
DTC	P0122-00	Throttle/Pedal Pos. Sensor A Circ. Low Input

DTC	P0123-00	Throttle/Pedal Pos. Sensor A Circ. High Input









ET21065006

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0121-00	Throttle/Pedal Pos. Sensor A Circ. Range/ Performance	Ignition switch ON Engine running	• Throttle position sensor 1 • Wire harness or connector • ECM
P0122-00	Throttle/Pedal Pos. Sensor A Circ. Low Input		
P0123-00	Throttle/Pedal Pos. Sensor A Circ. High Input		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

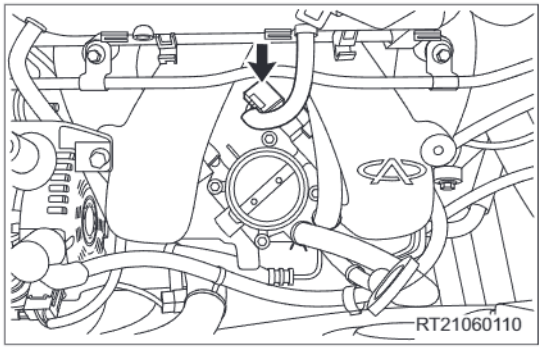
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK →

2	Check electronic throttle connector

a. Disconnect electronic throttle connector E-009.
b. Check electronic throttle connector.



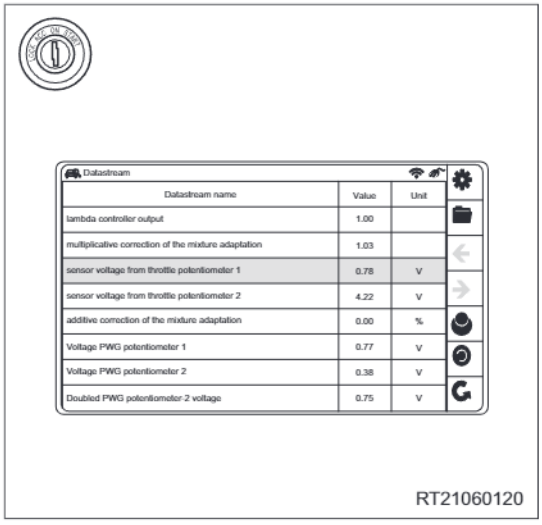
NG → Repair or replace connector

OK

3	Check throttle position sensor 1 signal voltage

a. Connect throttle position sensor connector E-009.
b. Turn ignition switch to ON.
c. Using diagnostic tester, check throttle position sensor 1 signal voltage.

Condition	Standard Value (V)
Accelerator pedal released	0.78
Accelerator pedal depressed	4.29



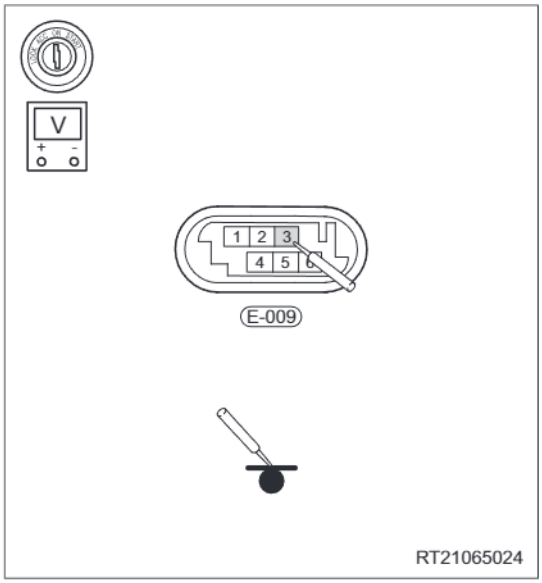
OK → Go to step 8

NG

4	Check throttle position sensor power supply voltage

a. Turn ignition switch to LOCK.
b. Disconnect electronic throttle connector E-009.
c. Turn ignition switch to ON and check voltage between electronic throttle connector terminal and body ground.

Multimeter Connection	Condition	Specified Condition
E-009 (3) - Body ground	Ignition switch ON	5 V



OK → **Go to step 6**

NG

5	Check throttle position sensor power supply circuit

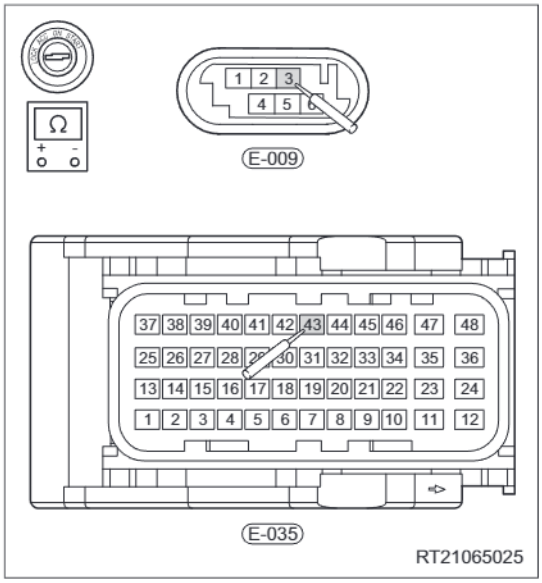
a. Turn ignition switch to LOCK.
b. Disconnect ECM connector E-035.
c. Check wire harness between electronic throttle connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-009 (3) - E-035 (43)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-009 (3) or E-035 (43) - Body ground	Always	No continuity
E-009 (3) or E-035 (43) - Battery positive		



NG → **Replace wire harness or connector (electronic throttle - ECM)**

OK

6	Check throttle position sensor 1 signal circuit and ground circuit

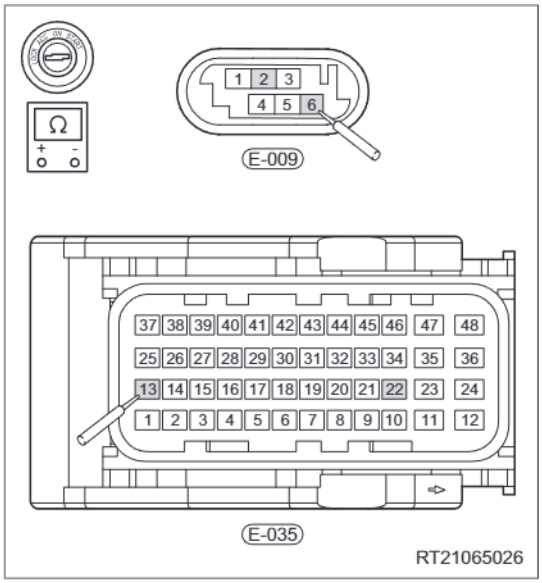
a. Check wire harness between electronic throttle connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-009 (6) - E-035 (13)	Always	Continuity
E-009 (2) - E-035 (22)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-009 (6) or E-035 (13) - Body ground	Always	No continuity
E-009 (6) or E-035 (13) - Battery positive		
E-009 (2) or E-035 (22) - Body ground		
E-009 (2) or E-035 (22) - Battery positive		

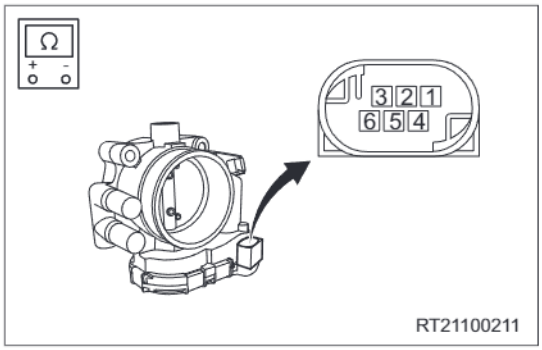


NG → **Repair or replace wire harness or connector (electronic throttle - ECM)**

OK →

7	Check electronic throttle

a. Check electronic throttle for carbon deposits and foreign matter accumulation inside.
b. Check if throttle valve body is stuck.
c. Check resistance of electronic throttle.



Multimeter Connection	Condition	Specified Condition
Terminal 3 - Terminal 2	At normal temperature	1.067 kΩ
Terminal 6 - Terminal 2	Throttle valve is rotated	Resistance increases as throttle valve opens
Terminal 6 - Terminal 3		Resistance decreases as throttle valve opens
Terminal 5 - Terminal 2		Resistance decreases as throttle valve opens
Terminal 5 - Terminal 3		Resistance increases as throttle valve opens

NG → **Clean or replace electronic throttle assembly, and go to next step**

OK

8	Check for DTCs

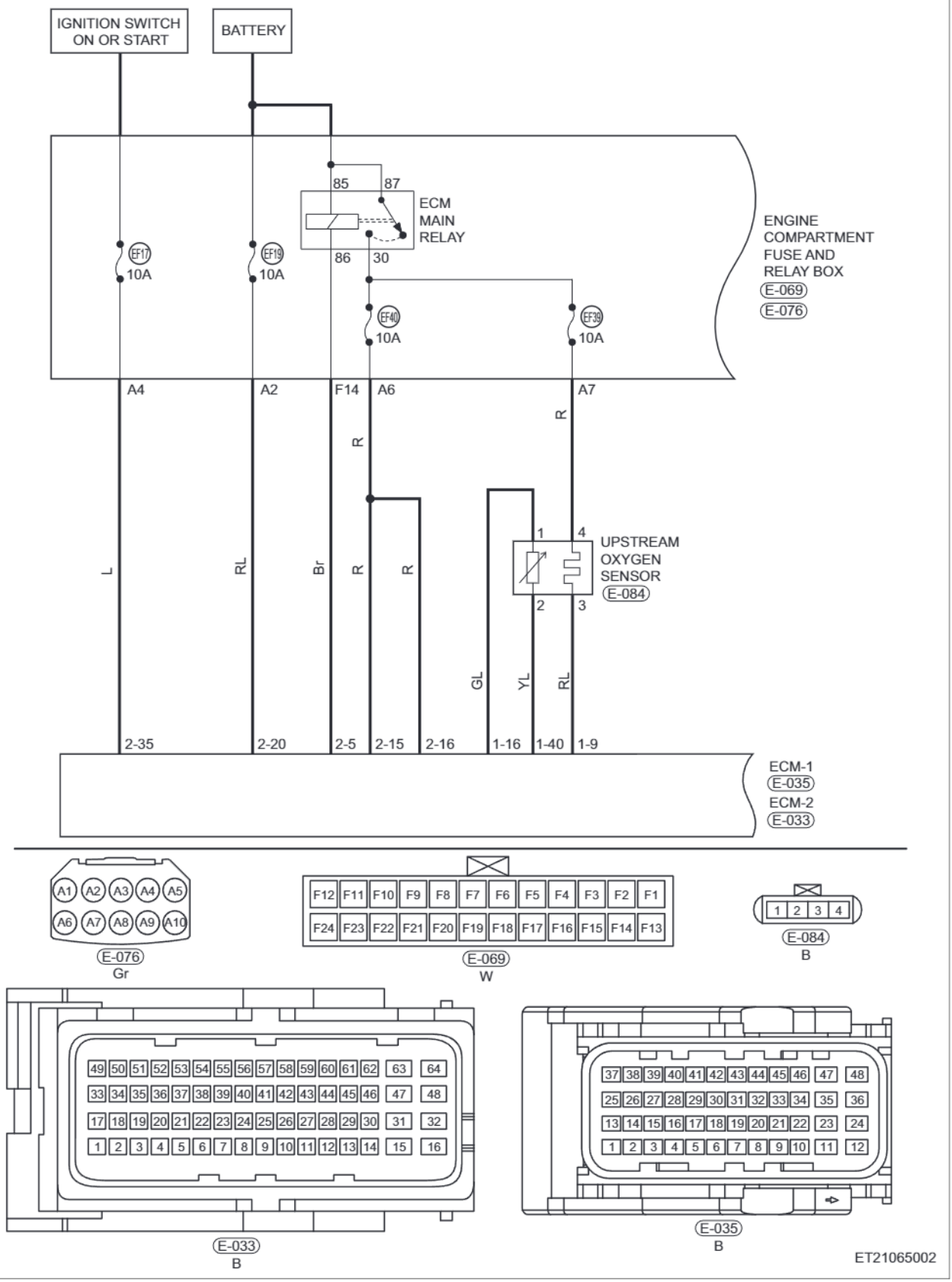
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0121-00, P0122-00 or P0123-00 still exists.

NG → **Replace ECM**

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0130-00	O2 Sensor Circ., Bank1-Sensor1 Malfunction
DTC	P0131-00	O2 Sensor Circ., Bank1-Sensor1 Low Voltage
DTC	P0132-00	O2 Sensor Circ., Bank1-Sensor1 High Voltage
DTC	P0133-00	O2 Sensor Circ., Bank1-Sensor1 Slow Response
DTC	P0134-00	O2 Sensor Circ., Bank1-Sensor1 No Activity Detected
DTC	P2195-00	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 1
DTC	P2196-00	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 1


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF39
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
A4
A2
F14
A6
A7
R
R
R
L
RL
Br
R
R
1
4
2
3
UPSTREAM OXYGEN SENSOR
E-084
GL
YL
RL
2-35
2-20
2-5
2-15
2-16
1-16
1-40
1-9
ECM-1
E-035
ECM-2
E-033
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
1 2 3 4
E-084
B
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B
ET21065002

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0130-00	O2 Sensor Circ., Bank1-Sensor1 Malfunction	Ignition switch ON Engine running	• Upstream oxygen sensor • Wire harness or connector • ECM
P0131-00	O2 Sensor Circ., Bank1-Sensor1 Low Voltage		
P0132-00	O2 Sensor Circ., Bank1-Sensor1 High Voltage		
P0133-00	O2 Sensor Circ., Bank1-Sensor1 Slow Response		
P0134-00	O2 Sensor Circ., Bank1-Sensor1 No Activity Detected		
P2195-00	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 1		
P2196-00	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 1		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

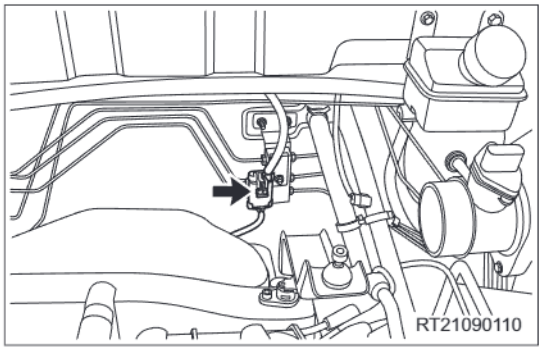
a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK ↓

2	Check upstream oxygen sensor connector

a. Disconnect upstream oxygen sensor connector E-084.
b. Check upstream oxygen sensor connector.



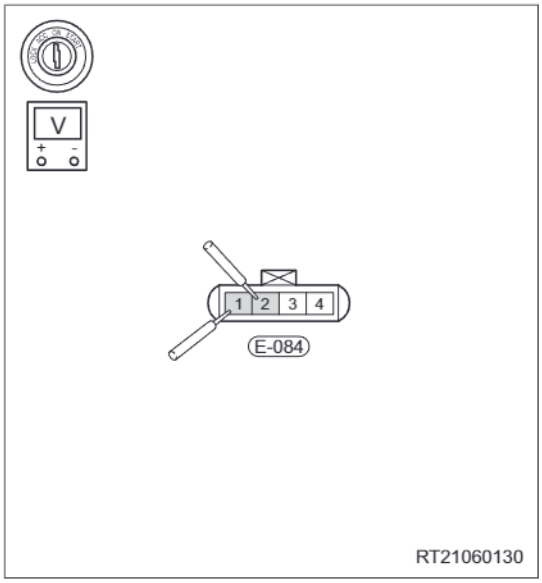
NG → **Repair or replace connector**

OK ↓

3	Check upstream oxygen sensor signal

a. Connect upstream oxygen sensor connector E-084.
b. Turn ignition switch to ON, start the engine and idle it for about 3 minutes.
c. Using multimeter, measure voltage between terminals 2 and 1 of connector E-084.

Multimeter Connection	Condition	Specified Condition
E-084 (2) - E-084 (1)	Engine running	Fluctuates fast between 0.1 and 0.9 V (when operating temperature is 350°C)



OK → **Go to step 7**

NG ↓

4	Check upstream oxygen sensor signal circuit

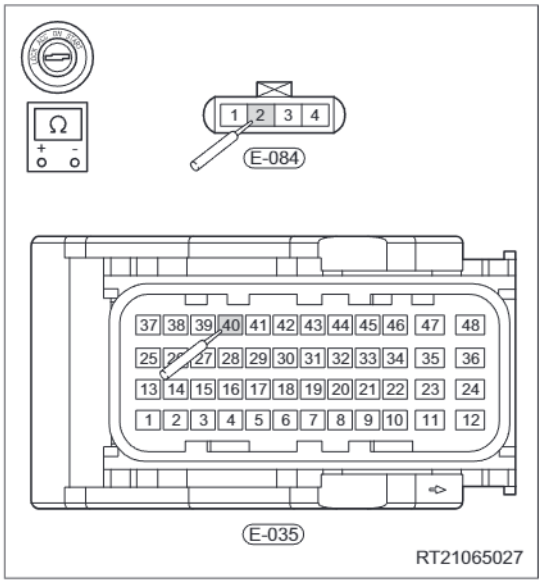
a. Turn ignition switch to LOCK.
b. Disconnect ECM connector E-035.
c. Disconnect upstream oxygen sensor connector E-084.
d. Check wire harness between upstream oxygen sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-084 (2) - E-035 (40)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-084 (2) or E-035 (40) - Body ground	Always	No continuity
E-084 (2) or E-035 (40) - Battery positive		



NG → **Replace wire harness or connector (upstream oxygen sensor - ECM)**

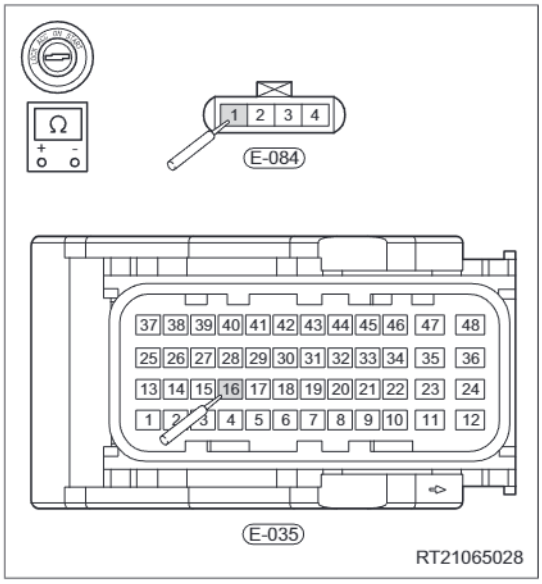
OK

5	Check upstream oxygen sensor ground circuit

a. Check wire harness between upstream oxygen sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-084 (1) - E-035 (16)	Always	Continuity



Check for Short

Multimeter Connection	Condition	Specified Condition
E-084 (1) or E-035 (16) - Body ground	Always	No continuity
E-084 (1) or E-035 (16) - Battery positive		

NG → **Repair or replace wire harness or connector (upstream oxygen sensor - ECM)**

OK ↓

6	Check upstream oxygen sensor

a. Remove upstream oxygen sensor.
b. Check upstream oxygen sensor for following problems.
   - Moisture enters the internal of sensor, temperature changes greatly, and probe is broken.
   - Oxygen sensor is "poisoned" (Pb, S, Br, Si, etc.).

NG → **Replace upstream oxygen sensor**

OK ↓

7	Check for DTCs

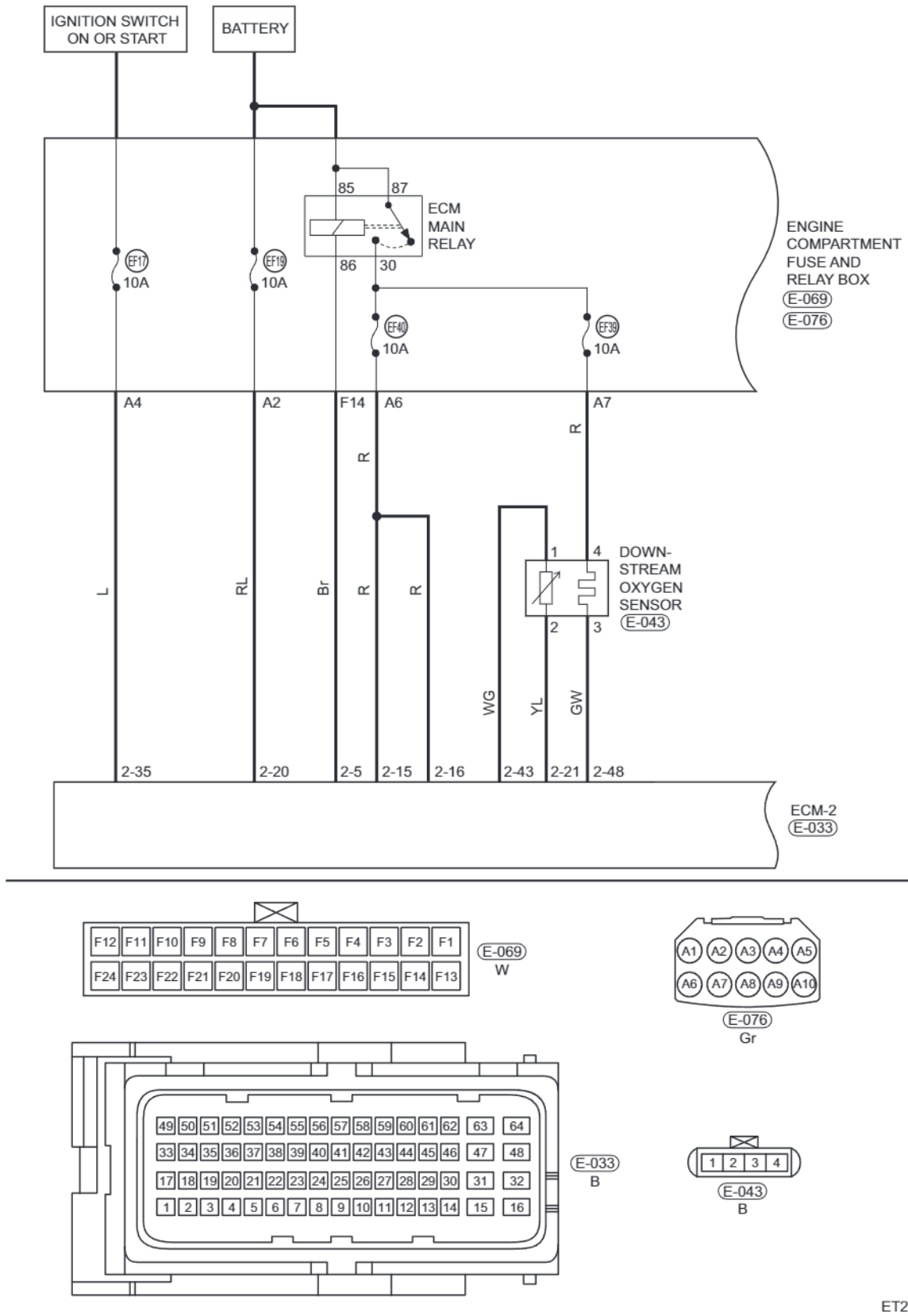
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0130-00, P0131-00, P0132-00, P0133-00, P0134-00, P2195-00 or P2196-00 still exists.

NG → **Replace ECM**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0136-00	O2 Sensor Circ., Bank1-Sensor2 Malfunction
DTC	P0137-00	O2 Sensor Circ., Bank1-Sensor2 Low Voltage
DTC	P0138-00	O2 Sensor Circ., Bank1-Sensor2 High Voltage
DTC	P0140-00	O2 Sensor Circ., Bank1-Sensor2 No Activity Detected
DTC	P2270-00	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 2
DTC	P2271-00	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 2


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF39
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
A4
A2
F14
A6
A7
R
R
L
RL
Br
R
R
1
4
2
3
DOWN-STREAM OXYGEN SENSOR
E-043
WG
YL
GW
2-35
2-20
2-5
2-15
2-16
2-43
2-21
2-48
ECM-2
E-033
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
1 2 3 4
E-043
B
ET21065003

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0136-00	O2 Sensor Circ., Bank1-Sensor2 Malfunction	Ignition switch ON Engine running	• Downstream oxygen sensor • Wire harness or connector • ECM
P0137-00	O2 Sensor Circ., Bank1-Sensor2 Low Voltage		
P0138-00	O2 Sensor Circ., Bank1-Sensor2 High Voltage		
P0140-00	O2 Sensor Circ., Bank1-Sensor2 No Activity Detected		
P2270-00	O2 Sensor Signal Stuck Lean; Bank 1 Sensor 2		
P2271-00	O2 Sensor Signal Stuck Rich; Bank 1 Sensor 2		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

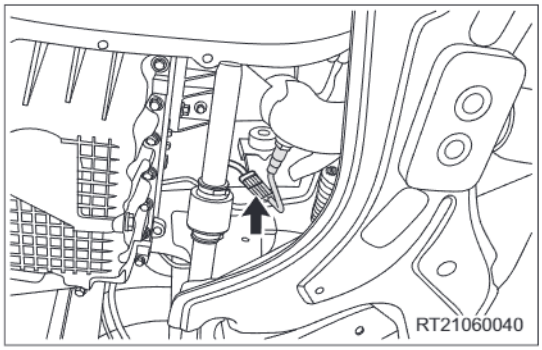
a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check downstream oxygen sensor connector

a. Disconnect downstream oxygen sensor connector.
b. Check downstream oxygen sensor connector.



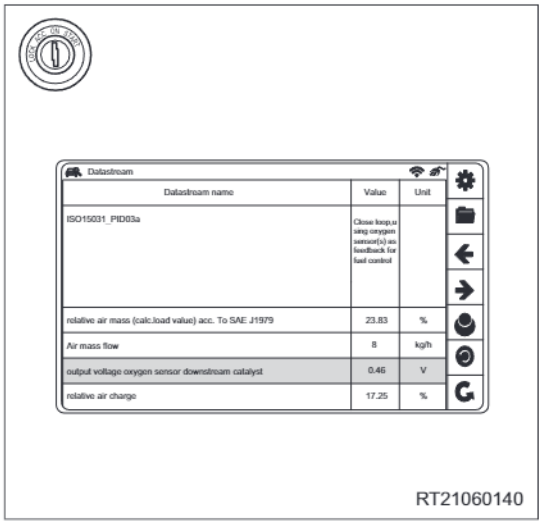
NG → **Repair or replace connector**

OK

3	Check downstream oxygen sensor signal

a. Connect downstream oxygen sensor connector E-043.
b. Turn ignition switch to ON, start the engine and idle it for about 3 minutes.
c. Using diagnostic tester, measure downstream oxygen sensor signal voltage, or using multimeter, measure voltage between terminals 2 and 1 of connector E-043.

Multimeter Connection	Condition	Specified Condition
E-043 (2) - E-043 (1)	Engine running	Fluctuates slightly at about 0.45 V



OK → **Go to step 7**

NG

4	Check downstream oxygen sensor signal circuit

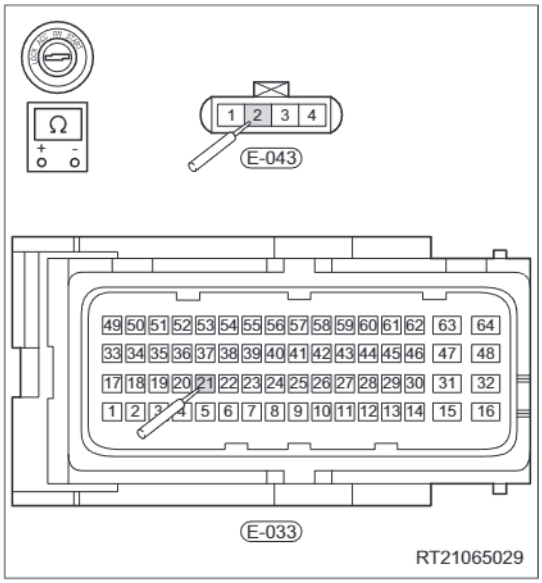
a. Turn ignition switch to LOCK.
b. Disconnect ECM connector E-033.
c. Disconnect downstream oxygen sensor connector E-043.
d. Check wire harness between downstream oxygen sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-043 (2) - E-033 (21)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-043 (2) or E-033 (21) - Body ground	Always	No continuity
E-043 (2) or E-033 (21) - Battery positive		



NG → **Replace wire harness or connector (downstream oxygen sensor - ECM)**

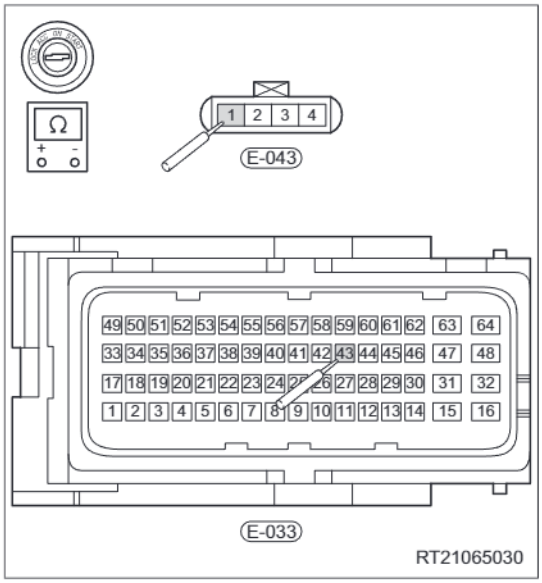
OK →

5	Check downstream oxygen sensor ground circuit

a. Check wire harness between downstream oxygen sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-043 (1) - E-033 (43)	Always	Continuity



Check for Short

Multimeter Connection	Condition	Specified Condition
E-043 (1) or E-033 (43) - Body ground	Always	No continuity
E-043 (1) or E-033 (43) - Battery positive		

NG → **Repair or replace wire harness or connector (downstream oxygen sensor - ECM)**

OK

6	Check downstream oxygen sensor

a. Remove downstream oxygen sensor.
b. Check downstream oxygen sensor for following problems.
   - Moisture enters the internal of sensor, temperature changes greatly, and probe is broken.
   - Oxygen sensor is "poisoned" (Pb, S, Br, Si, etc.).

NG → **Replace downstream oxygen sensor**

OK

7	Check for DTCs

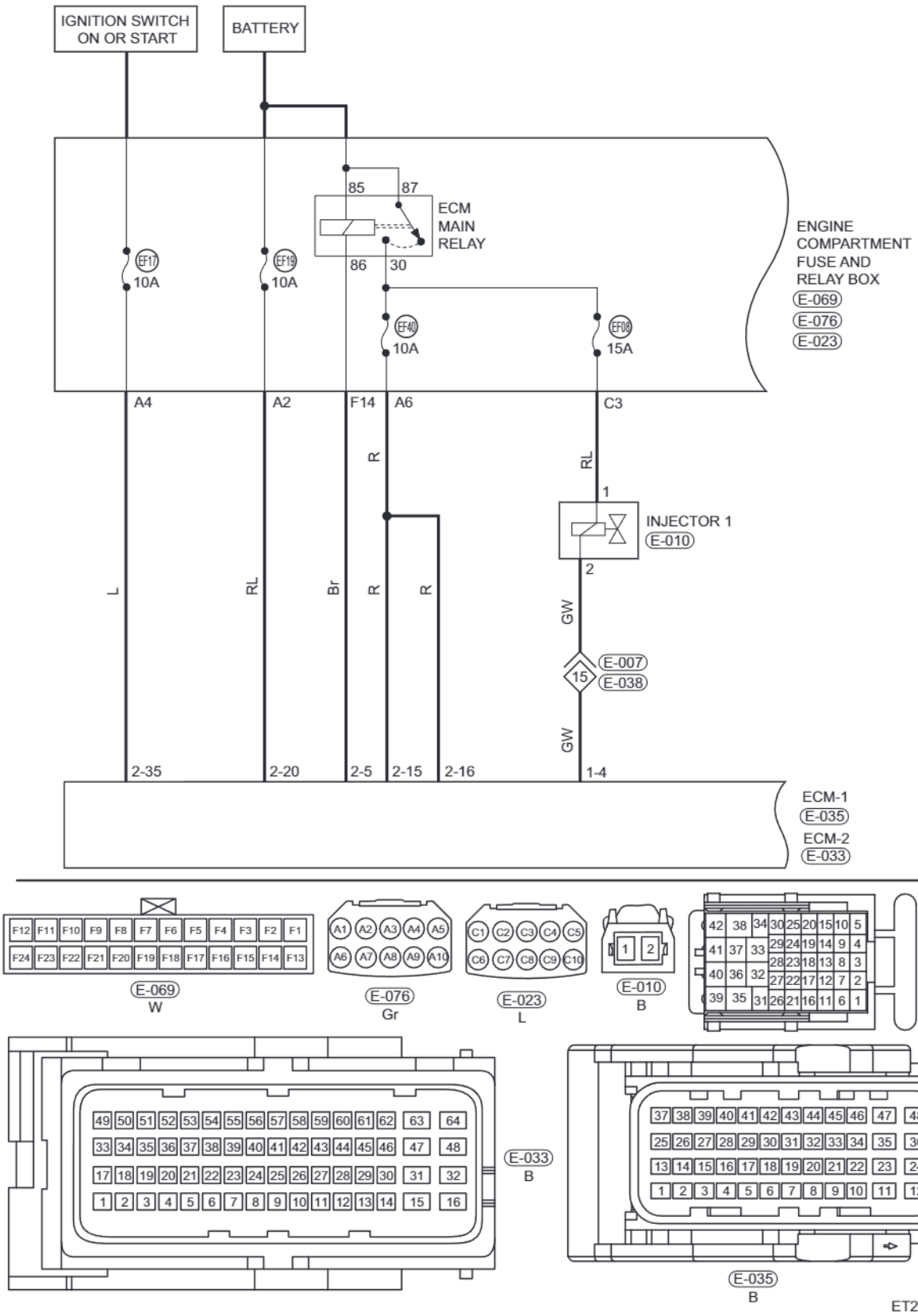
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0136-00, P0137-00, P0138-00, P0140-00, P2270-00 or P2271-00 still exists.

NG → **Replace ECM**

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0201-00	Cylinder 1 - Injector Circuit



DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0201-00	Cylinder 1 - Injector Circuit	Engine running	• Injector of cylinder 1 • Wire harness or connector • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

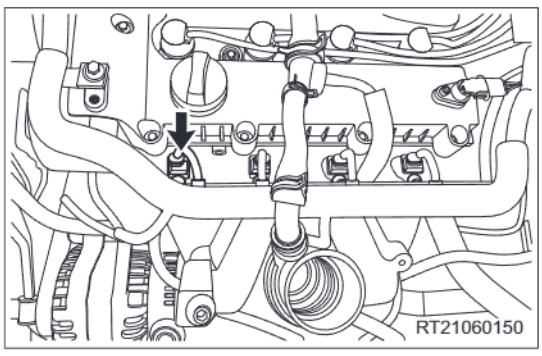
NG → **Repair or replace ground wire harness or ground point**

OK

2	Check injector connector of cylinder 1

a. Disconnect injector connector E-010 of cylinder 1.
b. Check injector connector.

NG → **Repair or replace connector**



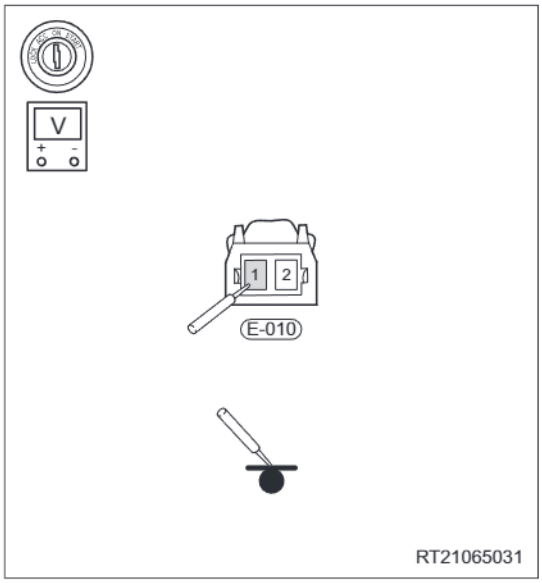
OK

3	Check injector power supply voltage of cylinder 1

a. Disconnect injector connector E-010 of cylinder 1.
b. Turn ignition switch to ON.
c. Check voltage between injector connector terminal of cylinder 1 and body ground.

Multimeter Connection	Condition	Specified Condition
E-010 (1) - Body ground	Ignition switch ON	11 to 14 V

OK → Go to step 5



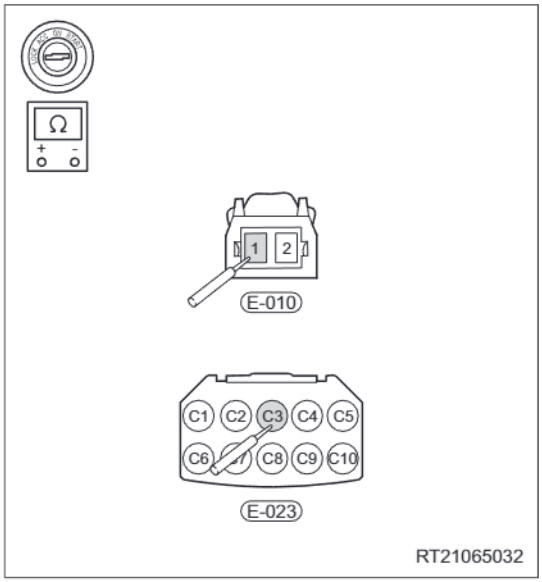
NG

4	Check injector power supply circuit of cylinder 1

a. Turn ignition switch to LOCK.
b. Check fuse EF08 and main relay.
c. Disconnect engine compartment fuse and relay box connector E-023.
d. Check wire harness between injector connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-010 (1) - E-023 (C3)	Always	Continuity



Check for Short

Multimeter Connection	Condition	Specified Condition
E-010 (1) or E-023 (C3) - Body ground	Always	No continuity
E-010 (1) or E-023 (C3) - Battery positive		

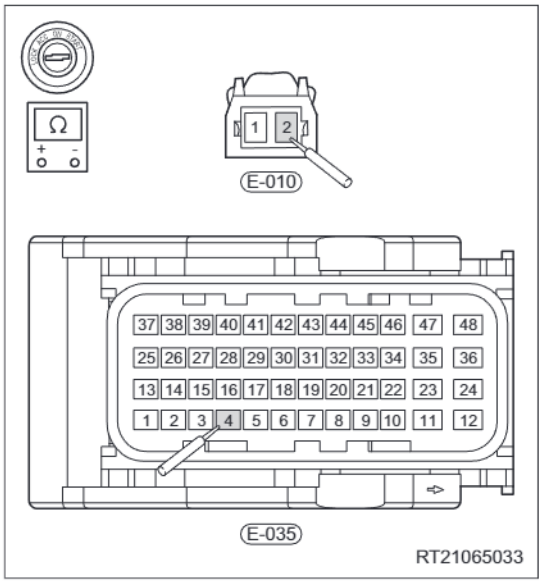
NG → **Repair or replace wire harness or connector (injector of cylinder 1 - engine compartment fuse and relay box)**

OK

5	Check injector control circuit of cylinder 1

a. Disconnect ECM connector E-035.

b. Check wire harness between injector connector terminals and ECM connector terminals.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-010 (2) - E-035 (4)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-010 (2) or E-035 (4) - Body ground	Always	No continuity
E-010 (2) or E-035 (4) - Battery positive		

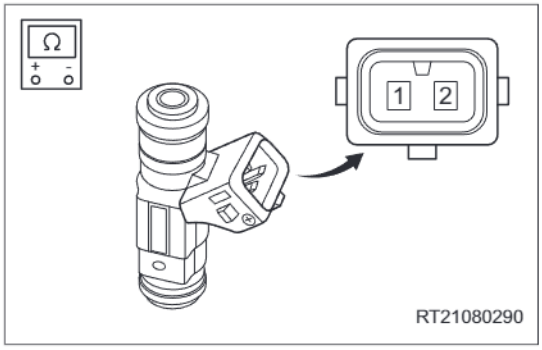
NG → **Repair or replace wire harness or connector (injector of cylinder 1 - ECM)**

OK

6	Check injector of cylinder 1

a. Check resistance of injector of cylinder 1.

Multimeter Connection	Specified Condition
1 - 2	12 Ω (at 20°C)



NG → Replace injector of cylinder 1

OK

7	Check for DTCs

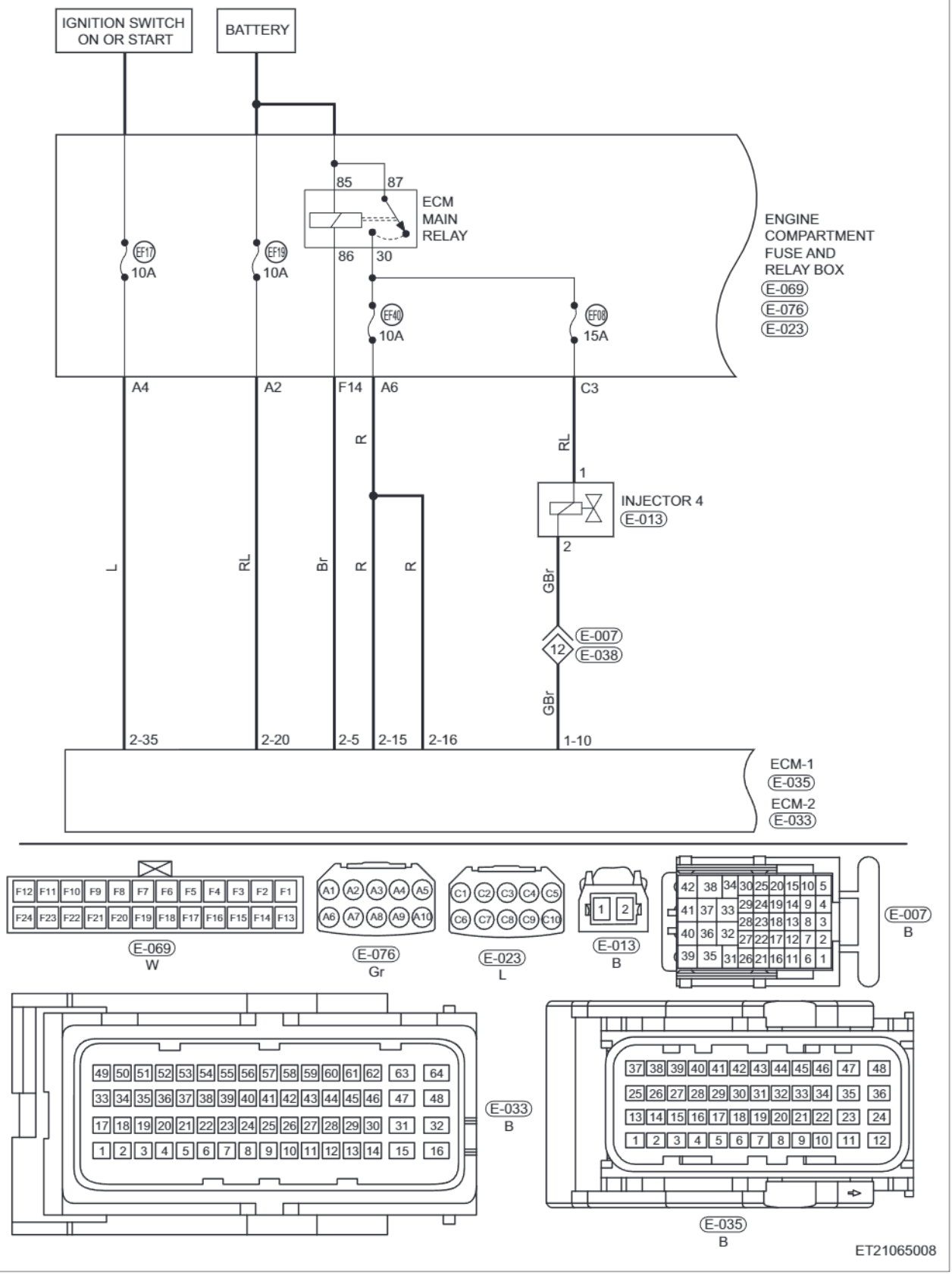
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0201-00 still exists.

NG → Replace ECM

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0271-00	Cylinder 4 - Injector Circuit High



DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0271-00	Cylinder 4 - Injector Circuit High	Engine running	• Injector of cylinder 4 • Wire harness or connector • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

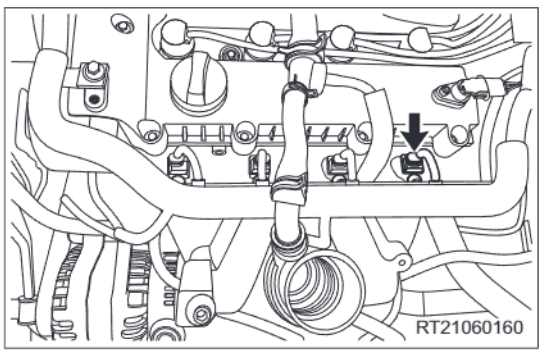
NG → **Repair or replace ground wire harness or ground point**

OK

2	Check injector connector of cylinder 4

a. Disconnect injector connector E-013 of cylinder 4.
b. Check injector connector.

NG → **Repair or replace connector**



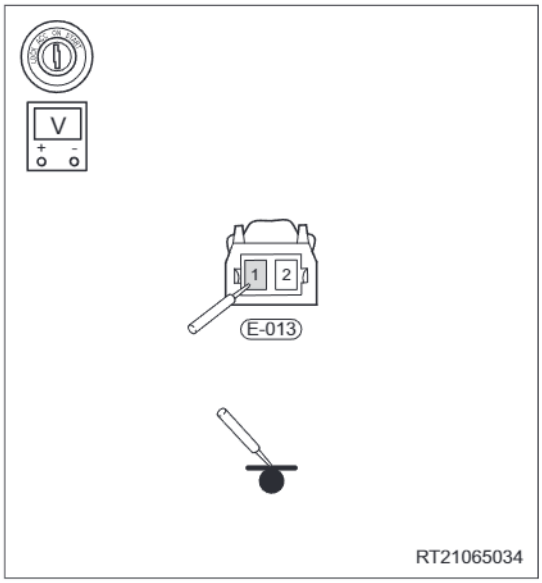
OK

3	Check injector power supply voltage of cylinder 4

a. Disconnect injector connector E-013 of cylinder 4.
b. Turn ignition switch to ON.
c. Check voltage between injector connector terminal of cylinder 4 and body ground.

Multimeter Connection	Condition	Specified Condition
E-013 (1) - Body ground	Ignition switch ON	11 to 14 V

OK → Go to step 5



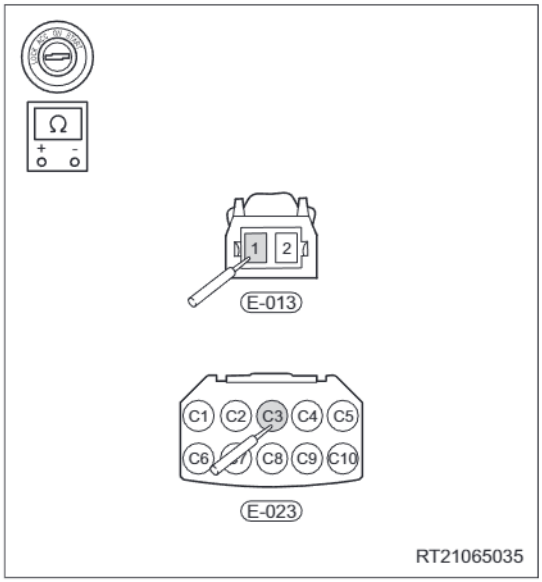
NG

4	Check injector power supply circuit of cylinder 4

a. Turn ignition switch to LOCK.
b. Check fuse EF08 and main relay.
c. Disconnect engine compartment fuse and relay box connector E-023.
d. Check wire harness between injector connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-013 (1) - E-023 (C3)	Always	Continuity



Check for Short

Multimeter Connection	Condition	Specified Condition
E-013 (1) or E-023 (C3) - Body ground	Always	No continuity
E-013 (1) or E-023 (C3) - Battery positive		

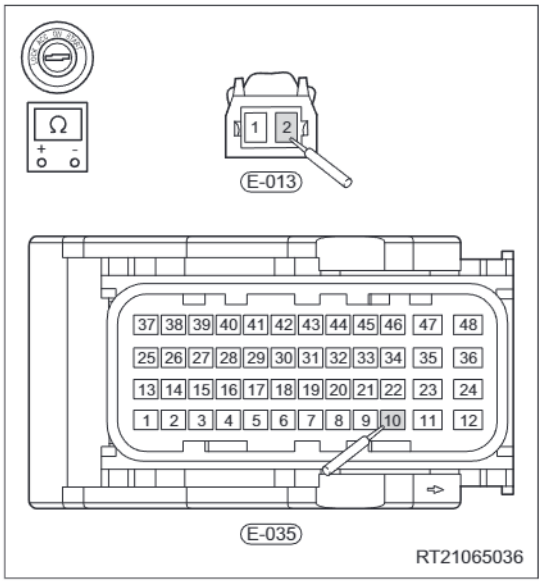
NG → **Repair or replace wire harness or connector (injector of cylinder 4 - engine compartment fuse and relay box)**

OK

5	Check injector control circuit of cylinder 4

a. Disconnect ECM connector E-035.

b. Check wire harness between injector connector terminals and ECM connector terminals.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-013 (2) - E-035 (10)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-013 (2) or E-035 (10) - Body ground	Always	No continuity
E-013 (2) or E-035 (10) - Battery positive		

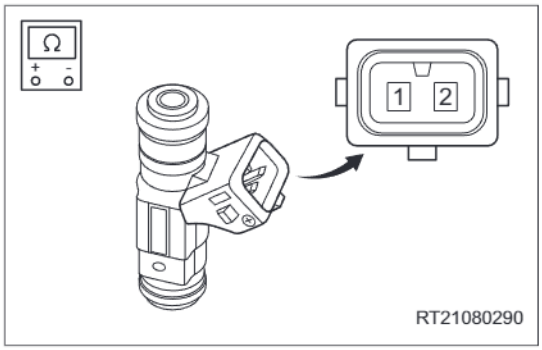
NG → **Repair or replace wire harness or connector (injector of cylinder 4 - ECM)**

OK

6	Check injector of cylinder 4

a. Check resistance of injector of cylinder 4.

Multimeter Connection	Specified Condition
1 - 2	20 Ω (at 20°C)



NG → Replace injector of cylinder 4

OK

7	Check for DTCs

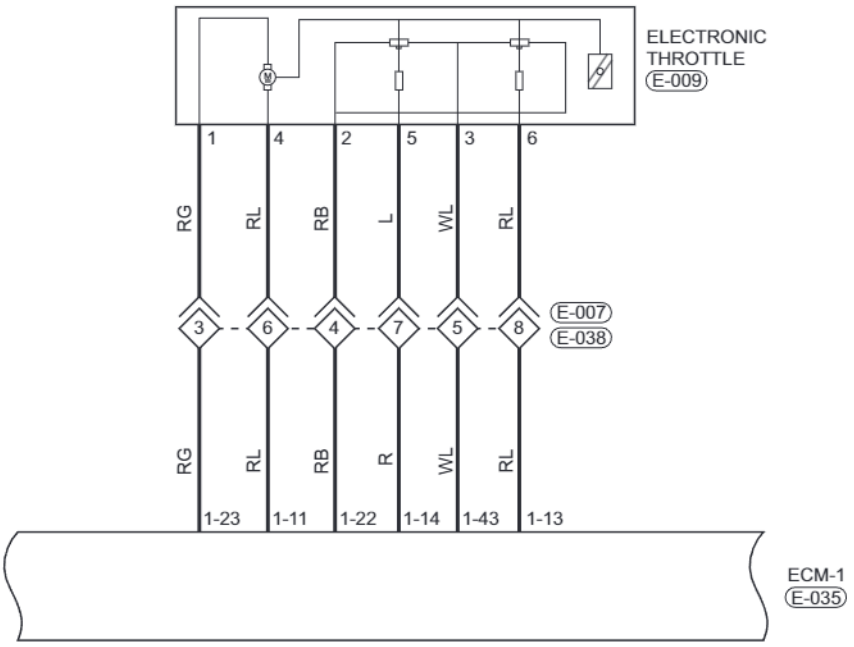
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0271-00 still exists.

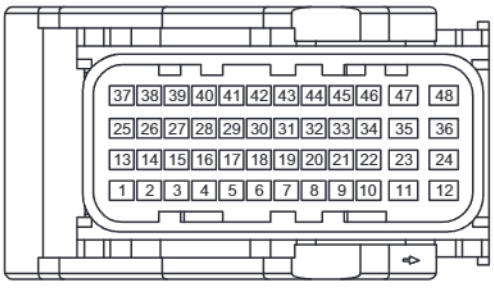
NG → Replace ECM

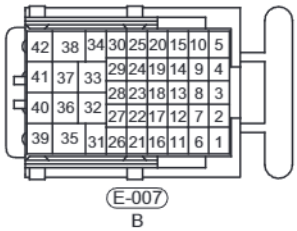
OK

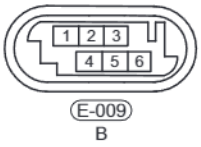
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P1106-00	Throttle Pos. Contr. Malfunction
DTC	P1110-00	Throttle Actuator Electrical Malfunction (MT only)
DTC	P1111-00	Idle Speed Control Throttle Position Mechanical Malfunction
DTC	P1568-00	DV-E Cause of Failure: Spring Check
DTC	P0606-00	ECM/PCM Processor


ELECTRONIC
THROTTLE
E-009
1
4
2
5
3
6
RG
RL
RB
L
WL
RL
3
6
4
7
5
8
E-007
E-038
RG
RL
RB
R
WL
RL
1-23
1-11
1-22
1-14
1-43
1-13
ECM-1
E-035


37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B


42 38 34 30 25 20 15 10 5
41 37 33 29 24 19 14 9 4
40 36 32 28 23 18 13 8 3
39 35 31 27 22 17 12 7 2
26 21 16 11 6 1
E-007
B


1 2 3
4 5 6
E-009
B

ET21065006

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P1106-00	Throttle Pos. Contr. Malfunction	Ignition switch ON	• Electronic throttle • Wire harness or connector • ECM
P1110-00	Throttle Actuator Electrical Malfunction (MT only)		
P1111-00	Idle Speed Control Throttle Position Mechanical Malfunction		
P1568-00	DV-E Cause of Failure: Spring Check		
P0606-00	ECM/PCM Processor		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

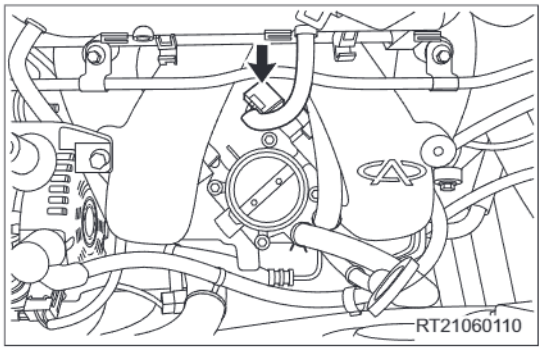
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK ↓

2	Check electronic throttle connector

a. Disconnect electronic throttle connector E-009.
b. Check electronic throttle connector.



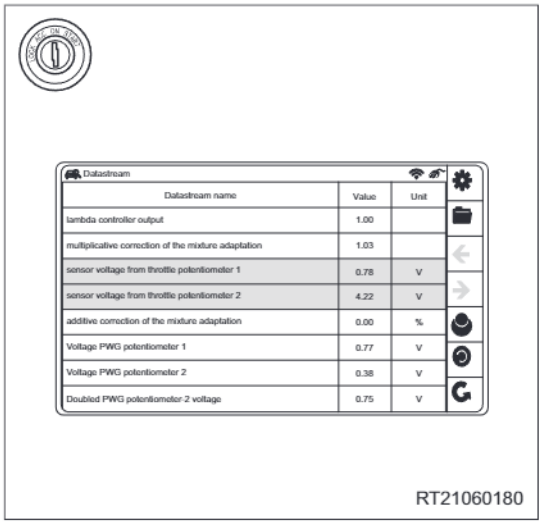
NG → Repair or replace connector

OK

3 Check throttle position sensor signal voltage

a. Connect electronic throttle connector E-009.
b. Turn ignition switch to ON.
c. Using diagnostic tester, check throttle position sensor signal voltage.

Item	Condition	Standard Value (V)
Throttle position sensor 1	Accelerator pedal released	0.78
	Accelerator pedal depressed	4.29
Throttle position sensor 2	Accelerator pedal released	4.22
	Accelerator pedal depressed	0.71

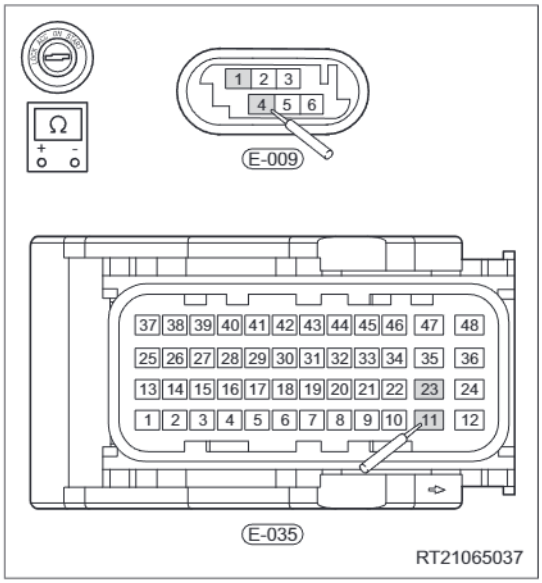


OK → Go to step 7

NG

4	Check electronic throttle actuator circuit

a. Turn ignition switch to LOCK.
b. Disconnect electronic throttle connector E-009.
c. Disconnect ECM connector E-035.
d. Check wire harness between connector terminals.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-035 (23) - E-009 (1)	Always	Continuity
E-035 (11) - E-009 (4)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-035 (23) or E-009 (1) - Body ground	Always	No continuity
E-035 (23) or E-009 (1) - Battery positive	Always	No continuity
E-035 (11) or E-009 (4) - Body ground	Always	No continuity
E-035 (11) or E-009 (4) - Battery positive	Always	No continuity

NG → Repair or replace related wire harness

OK

5	Check throttle position sensor circuit

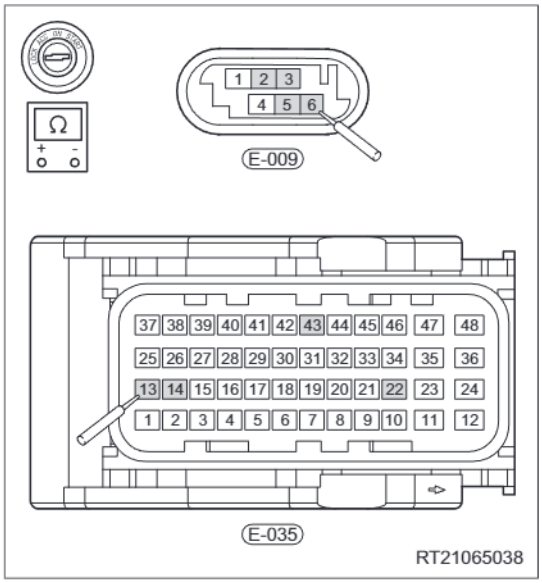
a. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-035 (22) - E-009 (2)	Always	Continuity
E-035 (14) - E-009 (5)	Always	Continuity
E-035 (43) - E-009 (3)	Always	Continuity
E-035 (13) - E-009 (6)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-035 (22, 14, 43, 13) or E-009 (2, 5, 3, 6) - Body ground	Always	No continuity
E-035 (22, 14, 43, 13) or E-009 (2, 5, 3, 6) - Battery positive	Always	No continuity

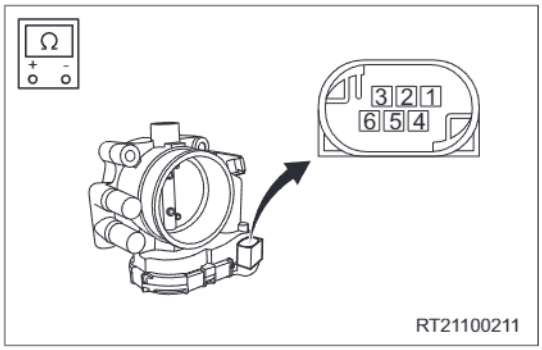


NG → **Replace wire harness or connector (electronic throttle - ECM)**

OK

6	Check electronic throttle

a. Check electronic throttle for carbon deposits and foreign matter accumulation inside.
b. Check if throttle valve body is stuck.
c. Check resistance of electronic throttle.



Multimeter Connection	Condition	Specified Condition
Terminal 3 - Terminal 2	At normal temperature	1.067 kΩ
Terminal 6 - Terminal 2	Throttle valve is rotated	Resistance increases as throttle valve opens
Terminal 6 - Terminal 3		Resistance decreases as throttle valve opens
Terminal 5 - Terminal 2		Resistance decreases as throttle valve opens
Terminal 5 - Terminal 3		Resistance increases as throttle valve opens

NG → **Clean or replace electronic throttle assembly, and go to next step**

OK

7	Check for DTCs

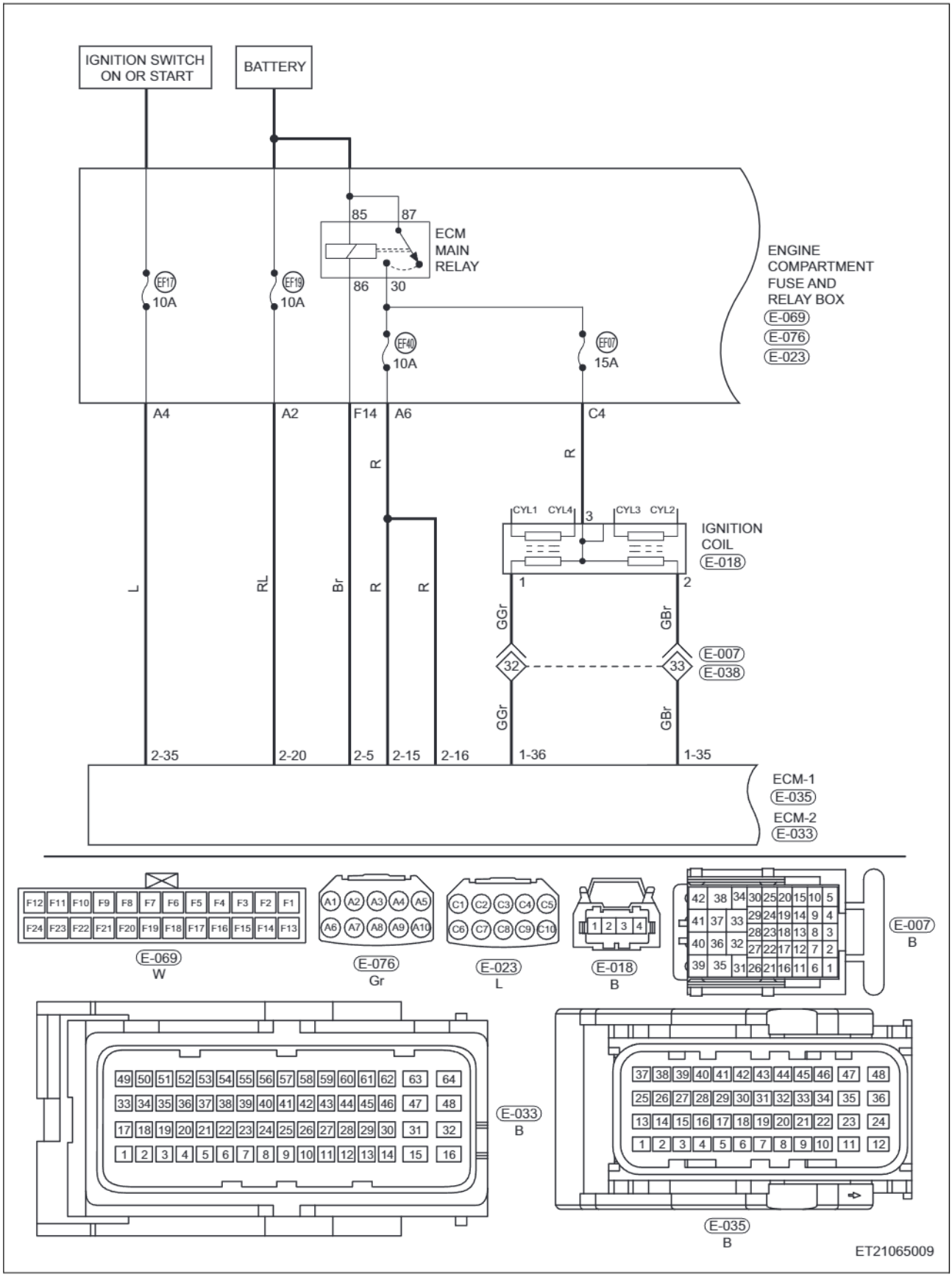
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P1106-00, P1110-00, P1111-00, P1568-00 or P0606-00 still exists.

NG → **Replace ECM**

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0300-00	Random/Multiple Cylinder Misfire Detected
DTC	P0301-00	Cyl.1 Misfire Detected
DTC	P0302-00	Cyl.2 Misfire Detected
DTC	P0303-00	Cyl.3 Misfire Detected
DTC	P0304-00	Cyl.4 Misfire Detected


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF07
15A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
E-023
A4
A2
F14
A6
C4
L
RL
Br
R
R
R
R
CYL1 CYL4 3 CYL3 CYL2
IGNITION COIL
E-018
1
2
GGr
GBr
32
33
E-007
E-038
GGr
GBr
2-35
2-20
2-5
2-15
2-16
1-36
1-35
ECM-1
E-035
ECM-2
E-033
E-069
W
E-076
Gr
E-023
L
E-018
B
E-007
B
E-033
B
E-035
B
ET21065009

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0300-00	Random/Multiple Cylinder Misfire Detected	Engine running	• Ignition coil • Spark plug • Wire harness or connector • ECM
P0301-00	Cyl.1 Misfire Detected		
P0302-00	Cyl.2 Misfire Detected		
P0303-00	Cyl.3 Misfire Detected		
P0304-00	Cyl.4 Misfire Detected		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

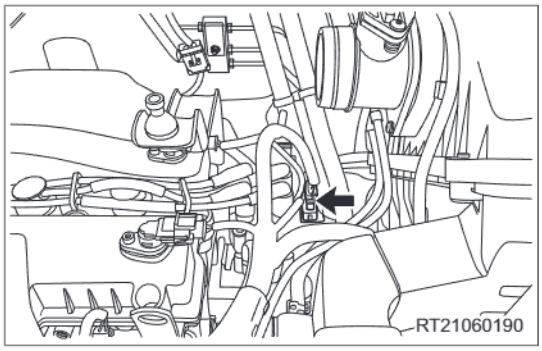
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check ignition coil connector

a. Turn ignition switch to LOCK.
b. Disconnect ignition coil connector E-018.
c. Check ignition coil connector.

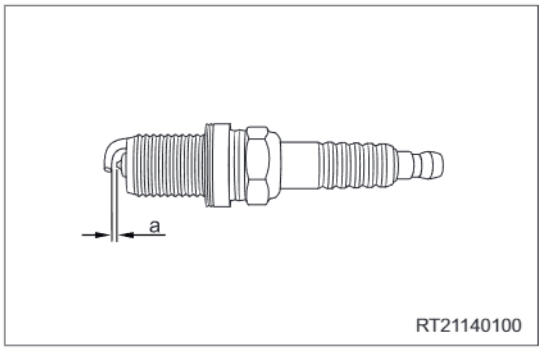


NG → **Repair or replace connector**

OK

3	Check spark plug of misfiring cylinder

a. Remove the spark plug of misfiring cylinder.
b. Check spark plug for burns, cracks or deposits.
c. Check spark plug gap.
OK: 0.8 - 0.9 mm



NG → **Clean or replace spark plug**

OK

4	Check spark

a. Connect ignition coil connector.
b. Connect spark plug and ignition coil, and ground spark plug housing.
c. Start and run the engine for no more than 2 seconds, and check if spark is generated.

NG → **Go to step 6**

OK

5	Check compression of misfiring cylinder

a. Measure the compression of misfiring cylinder (See page 07-20).

NG → **Check engine to confirm cause of low compression**

OK

Check injectors, valve clearance, intake system and fuel pressure, etc. of misfiring cylinder

6	Check spark of misfiring cylinder with a normally functioning spark plug

a. Replace the spark plug with a normally functioning one.

b. Perform spark test.

- Connect ignition coil connector.
- Connect spark plug and ignition coil, and ground spark plug housing.
- Start and run the engine for no more than 2 seconds, and check if spark is generated.

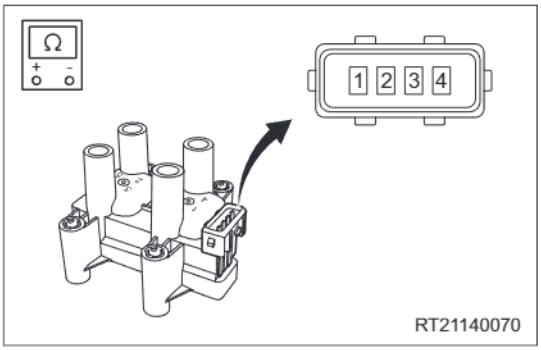
OK → **Replace spark plug**

NG

7	Check ignition coil

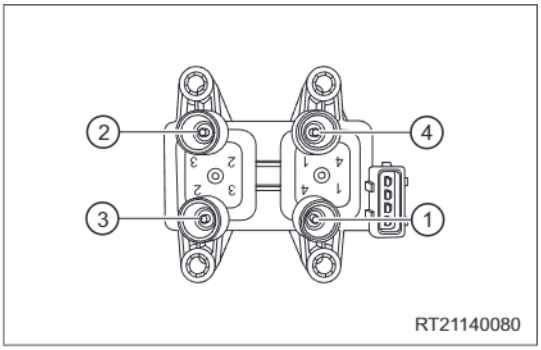
a. Check resistance of primary winding of ignition coil.

Multimeter Connection	Condition	Specification (Ω)
Terminal 1 - Terminal 3	Normal temperature	0.50 - 0.64
Terminal 2 - Terminal 3	Normal temperature	0.50 - 0.64



b. Check resistance of secondary winding of ignition coil.

Multimeter Connection	Condition	Specification (kΩ)
Post 1 - Post 4	Normal temperature	9.5 - 12.1
Post 2 - Post 3	Normal temperature	9.5 - 12.1



NG → **Replace ignition coil**

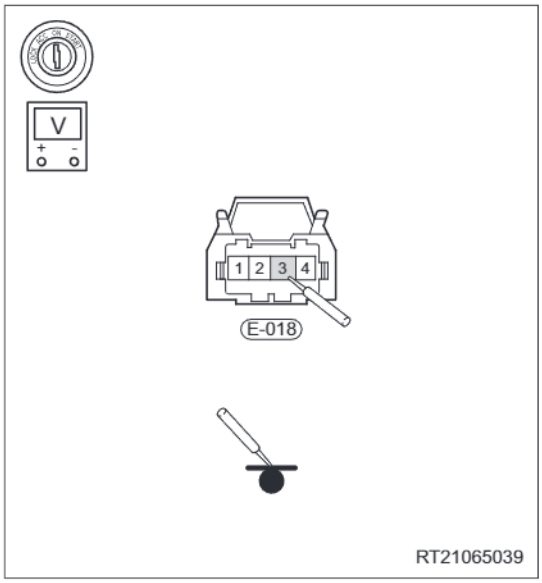
OK

8	Check ignition coil power supply voltage

a. Turn ignition switch to ON.
b. Check voltage between ignition coil connector terminals and body ground.

Multimeter Connection	Condition	Specified Condition
E-018 (3) - Body ground	Ignition switch ON	11 to 14 V

OK → Go to step 10



NG

9	Check ignition coil power supply circuit

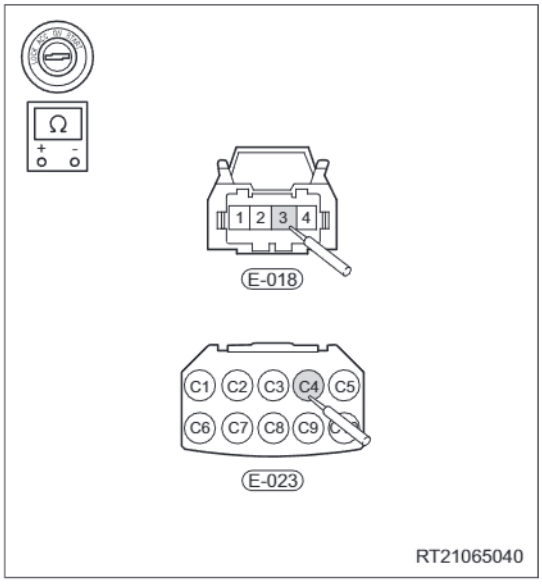
a. Turn ignition switch to LOCK.
b. Check fuse EF07 and main relay.
c. Check wire harness between ignition coil connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-018 (3) - E-023 (C4)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-018 (3) or E-023 (C4) - Body ground	Always	No continuity
E-018 (3) or E-023 (C4) - Battery positive	Always	No continuity

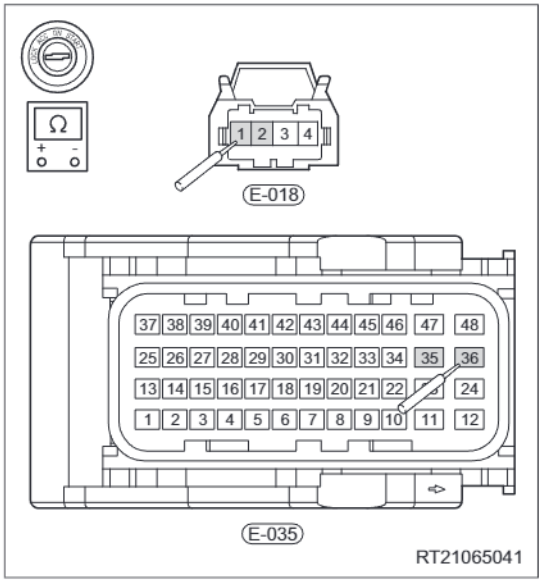


NG → **Replace wire harness or connector (ignition coil - engine compartment fuse and relay box)**

OK

10	Check ignition coil control circuit

a. Turn ignition switch to LOCK.
b. Disconnect ECM connector E-035.
c. Check wire harness between ignition coil connector terminals and ECM connector terminals.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-018 (1) - E-035 (36)	Always	Continuity
E-018 (2) - E-035 (35)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-018 (1) or E-035 (36) - Body ground	Always	No continuity
E-018 (1) or E-035 (36) - Battery positive	Always	No continuity
E-018 (2) or E-035 (35) - Body ground	Always	No continuity
E-018 (2) or E-035 (35) - Battery positive	Always	No continuity

NG → **Repair or replace wire harness or connector (ignition coil - ECM)**

OK

11	Check for DTCs

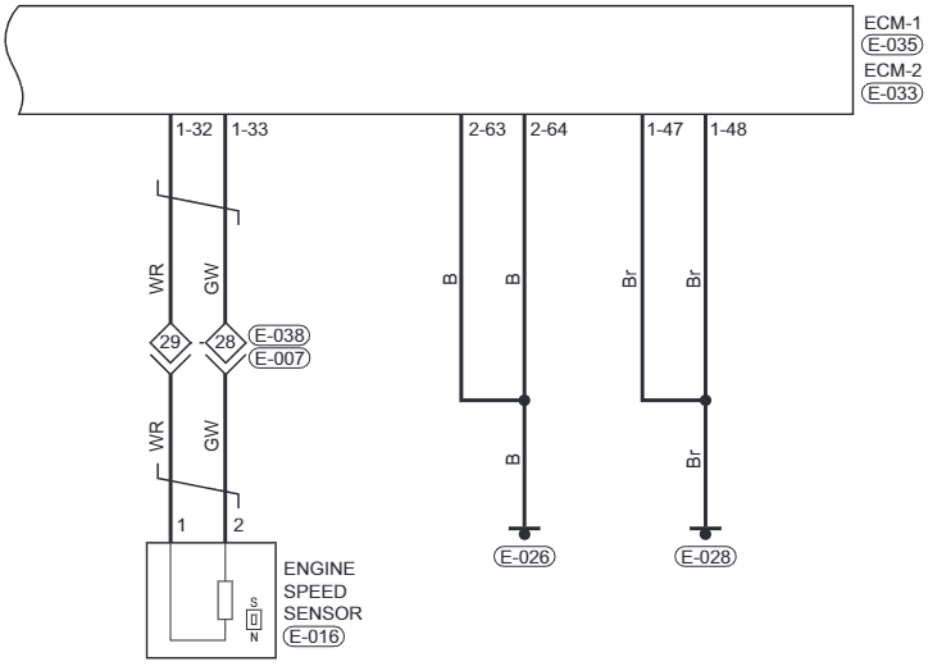
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0300-00, P0301-00, P0302-00, P0303-00 or P0304-00 still exists.

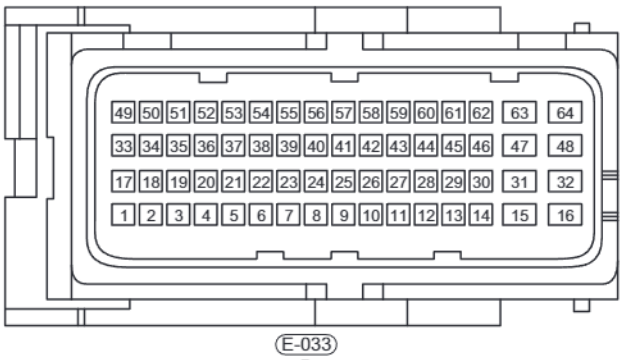
NG → Replace ECM

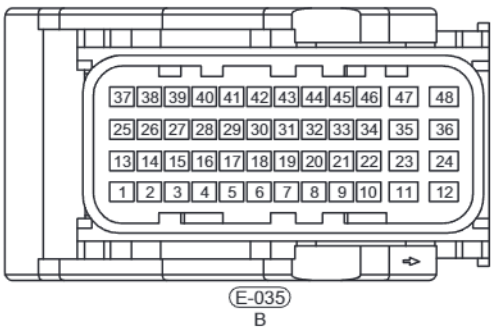
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

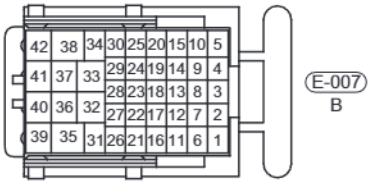
DTC	P0322-00	Ign./Distributor Eng. Speed Inp. Circ. No Signal











ET21065010

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0322-00	Ign./Distributor Eng. Speed Inp. Circ. No Signal	Engine running	• Engine speed sensor • Flywheel gear ring • Wire harness or connector • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

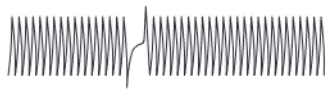
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK →

2	Check engine speed sensor signal waveform

a. Turn ignition switch to ON, start the engine and observe the signal waveform of engine speed sensor with an oscilloscope.

	Normal Waveform of Engine Speed Senor Signal
Oscilloscope	 RT21060200

OK → Go to step 9

NG

3	Check engine speed sensor connector

a. Turn ignition switch to LOCK.
b. Disconnect engine speed sensor connector E-016.
c. Check engine speed sensor connector.

NG → Repair or replace engine speed sensor connector

OK

4	Check installation of engine speed sensor

a. Remove engine speed sensor.
b. Check and clean engine speed sensor and installation area, and check for damage, foreign matter or excessive movement, etc. that cause signal incorrectness.

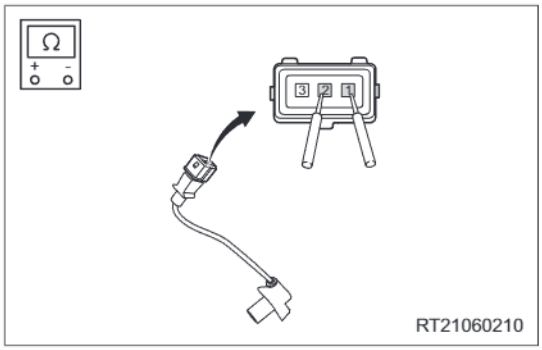
NG → Clean or replace engine speed sensor

OK

5	Check resistance of engine speed sensor

a. Check resistance between engine speed sensor terminals 1 and 2.

Normal resistance: 860 Ω ± 20% (at normal temperature)



NG → Replace engine speed sensor

OK

6	Check engine speed sensor circuit

a. Disconnect ECM connector E-035.

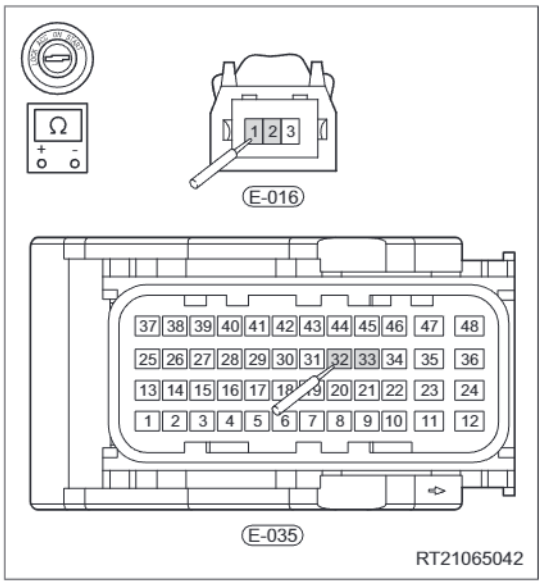
b. Check wire harness between engine speed sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-016 (1) - E-035 (32)	Always	Continuity
E-016 (2) - E-035 (33)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-016 (1) or E-035 (32) - Body ground	Always	No continuity
E-016 (1) or E-035 (32) - Battery positive		
E-016 (2) or E-035 (33) - Body ground		
E-016 (2) or E-035 (33) - Battery positive		



NG → Replace wire harness or connector (engine speed sensor - ECM)

OK

7	Install a normal engine speed sensor and observe signal waveform

a. Install a normal engine speed sensor.
b. Connect engine speed sensor connector.
c. Turn ignition switch to ON, start the engine and observe the signal waveform of the engine speed sensor with an oscilloscope.

OK → Replace engine speed sensor

NG

8	Check flywheel gear ring

a. Turn crankshaft, and check crankshaft and flywheel gear ring for damage and foreign matter, etc. that cause signal incorrectness.

NG → Clear off debris and clean flywheel gear ring. Replace flywheel if necessary (See page 07-42)

OK

9	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0322-00 still exists.

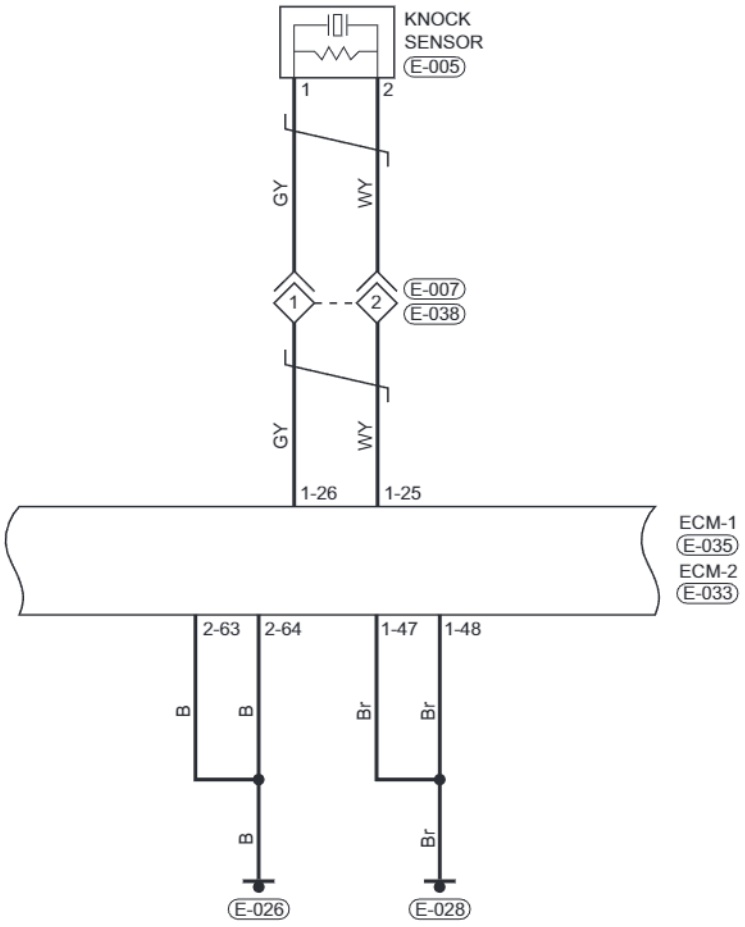
NG → Replace ECM

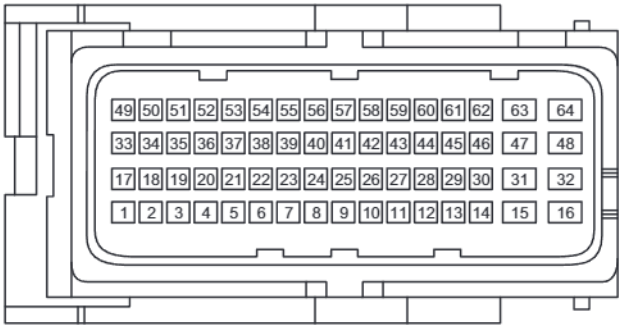
OK

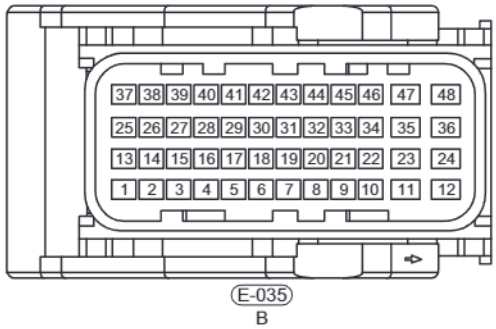
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0327-00	Knock Sensor 1 Circ. Low Input

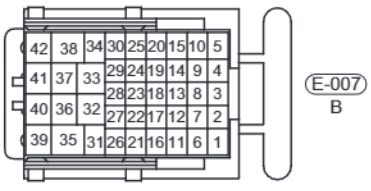
DTC	P0328-00	Knock Sensor 1 Circ. High Input


KNOCK
SENSOR
E-005
1
2
GY
WY
E-007
E-038
GY
WY
1-26
1-25
ECM-1
E-035
ECM-2
E-033
2-63
2-64
1-47
1-48
B
B
Br
Br
B
Br
E-026
E-028


49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B


37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B


1 2 3
E-005
B


42 38 34 30 25 20 15 10 5
41 37 33 29 24 19 14 9 4
40 36 32 28 23 18 13 8 3
39 35 31 27 22 17 12 7 2
26 21 16 11 6 1
E-007
B

ET21065011

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0327-00	Knock Sensor 1 Circ. Low Input	Engine running	• Knock sensor • Wire harness or connector • ECM
P0328-00	Knock Sensor 1 Circ. High Input		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

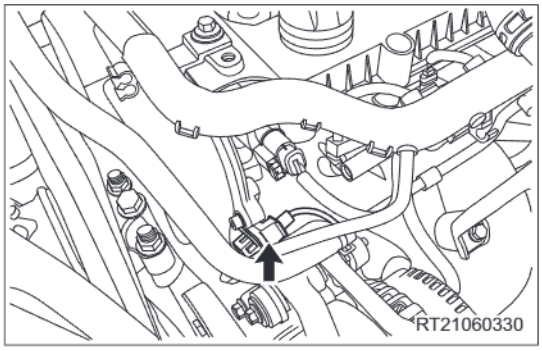
NG → **Repair or replace ground wire harness or ground point**

OK

2	Check knock sensor connector

a. Disconnect knock sensor connector E-005.
b. Check knock sensor connector.

NG → **Repair or replace connector**



OK

3	Check installation of knock sensor

a. Remove knock sensor.

b. Check installation area of knock sensor, and check for damage, foreign matter and excessive movement, etc. that cause signal incorrectness.

NG → **Clean installation area or replace knock sensor**

OK

4	Check resistance of knock sensor

a. Check resistance between knock sensor terminals 1 and 2.

OK: 4.9 ± 20% MΩ (at normal temperature)

NG → **Replace knock sensor**

OK

5	Check knock sensor signal circuit

a. Disconnect ECM wire harness connector E-035.

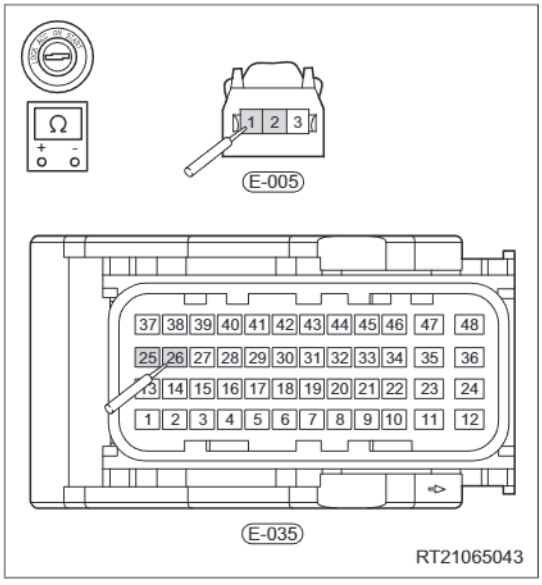
b. Check wire harness between terminals of connector E-035 and connector E-005.

Check for Open

Multimeter Connection	Specified Condition
E-035 (26) - E-005 (1)	Continuity
E-035 (25) - E-005 (2)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-035 (26) or E-005 (1) - Body ground	No continuity
E-035 (26) or E-005 (1) - Battery positive	No continuity
E-035 (25) or E-005 (2) - Body ground	No continuity
E-035 (25) or E-005 (2) - Battery positive	No continuity



NG → **Replace wire harness or connector (knock sensor - ECM)**

OK

6	Check knock sensor signal

a. Install knock sensor.
b. Slightly strike around the knock sensor with a rubber hammer, and measure if voltage is generated between the 2 terminals of knock sensor with multimeter at the same time.

NG → Replace knock sensor

OK

7	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0327-00 or P0328-00 still exists.

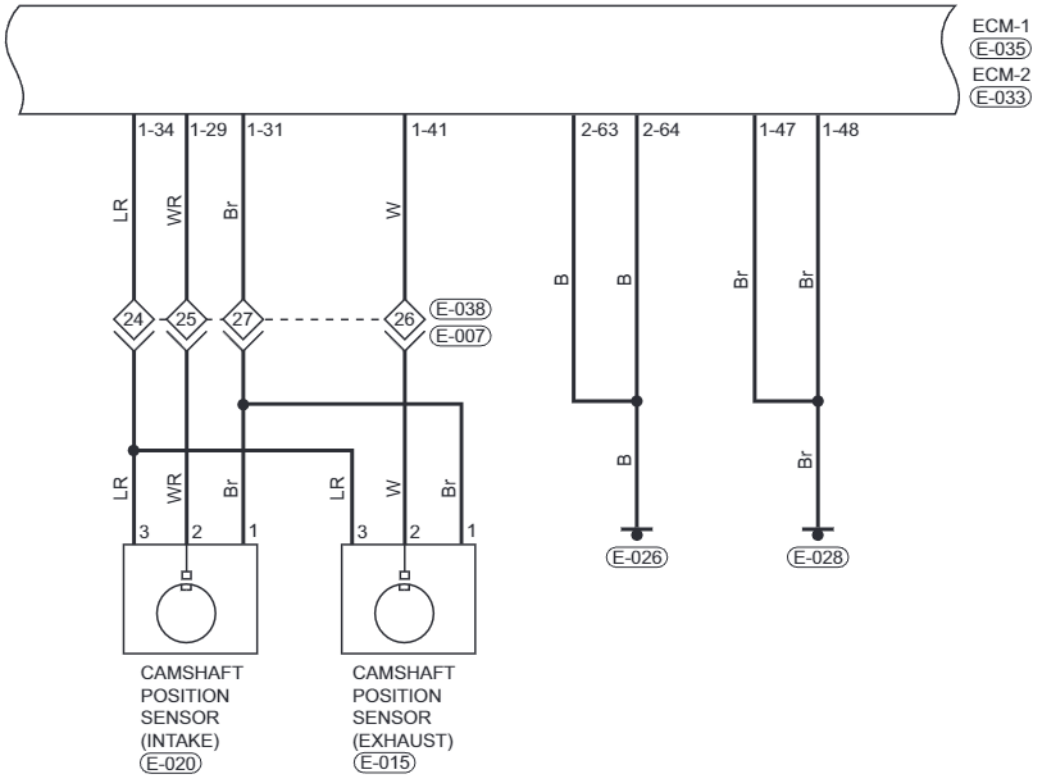
NG → Replace ECM

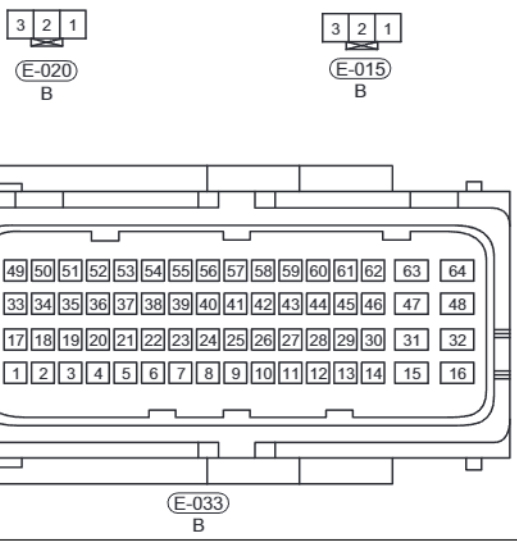
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0341-00	Camshaft Pos. Sensor Circ. Range/Performance

DTC	P0346-00	Camshaft Pos. Sensor Circ. Range/Performance (Bank2)





ET21065012

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0341-00	Camshaft Pos. Sensor Circ. Range/ Performance	Engine running	• Camshaft position sensor (intake) • Camshaft position sensor (exhaust) • Camshaft • Wire harness or connector • ECM
P0346-00	Camshaft Pos. Sensor Circ. Range/ Performance (Bank2)		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

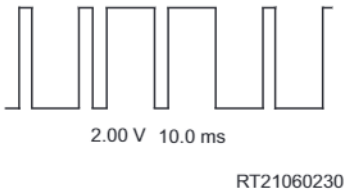
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check camshaft position sensor signal waveform

a. Turn ignition switch to ON, start the engine and observe the signal waveform of camshaft position sensor with an oscilloscope.

Oscilloscope	Normal Waveform
	

OK → Go to step 10

NG

3	Check camshaft position sensor connector

a. Turn ignition switch to LOCK.
b. Disconnect camshaft position sensor connectors E-020 and E-015.
c. Check camshaft position sensor connector.

NG → Repair or replace camshaft position sensor connector

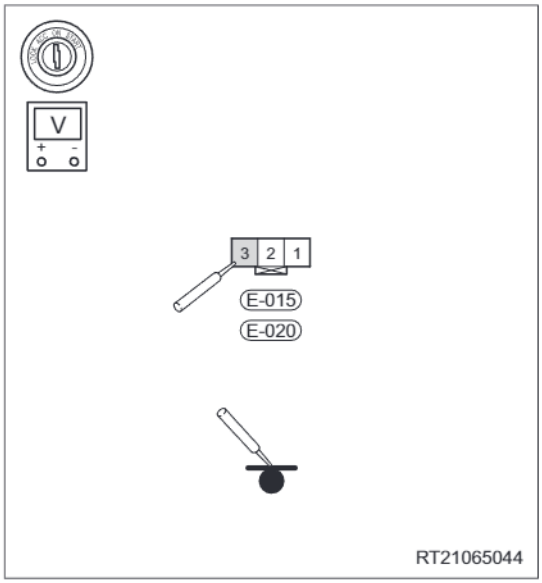
OK

4	Check camshaft position sensor power supply voltage

a. Turn ignition switch to ON.

b. Check voltage between terminal 3 of camshaft position sensor connector E-020 or E-015 and body ground.

Multimeter Connection	Condition	Specified Condition
E-020 (3) or E-015 (3) - Body ground	Ignition switch ON	5 V



OK → **Go to step 6**

NG

5	Check camshaft position sensor power supply circuit

a. Turn ignition switch to LOCK.

b. Disconnect ECM connector E-035.

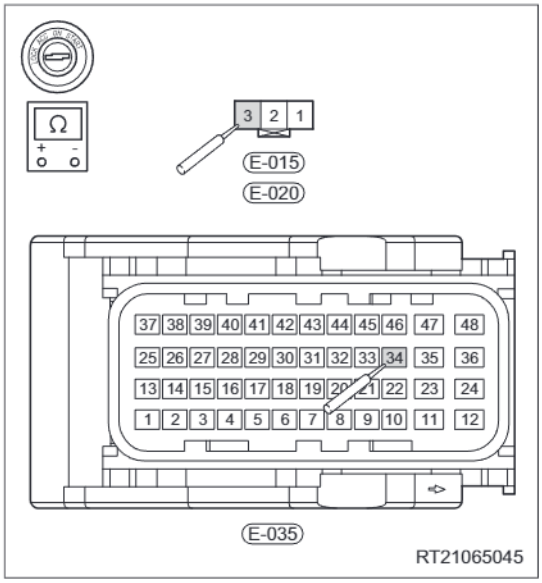
c. Check wire harness between camshaft position sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (3) - E-035 (34)	Always	Continuity
E-015 (3) - E-035 (34)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (3), E-015 (3) or E-035 (34) - Body ground	Always	No continuity
E-020 (3), E-015 (3) or E-035 (34) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (camshaft position sensor - ECM)**

OK

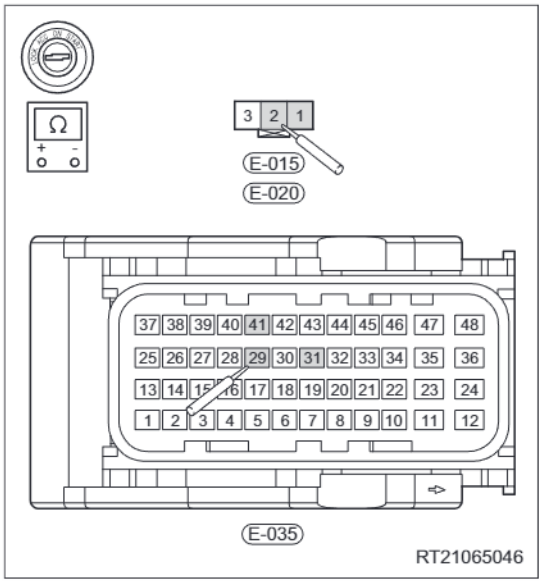
Replace ECM

6	Check camshaft position sensor signal circuit and ground circuit

a. Check wire harness between camshaft position sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (2) - E-035 (29)	Always	Continuity
E-015 (2) - E-035 (41)		
E-020 (1), E-015 (1) - E-035 (31)		



Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (2) or E-035 (29) - Body ground	Always	No continuity
E-020 (2) or E-035 (29) - Battery positive		
E-015 (2) or E-035 (41) - Body ground		
E-015 (2) or E-035 (41) - Battery positive		
E-020 (1), E-015 (1) or E-035 (31) - Body ground		
E-020 (1), E-015 (1) or E-035 (31) - Battery positive		

NG → **Replace wire harness or connector (camshaft position sensor - ECM)**

OK

7	Check installation of camshaft position sensor

a. Remove camshaft position sensor.
b. Check and clean camshaft position sensor and installation area, and check for damage, foreign matter and excessive movement, etc. that cause signal incorrectness.

NG → **Clean installation area or replace camshaft position sensor**

OK ↓

8	Check camshaft gear ring

a. Check camshaft gear ring for damage and foreign matter (such as debris), etc. that cause signal incorrectness.

NG → **Clear off debris and clean camshaft gear ring or replace camshaft**

OK ↓

9	Install a normal camshaft position sensor and observe signal waveform

a. Install a normal camshaft position sensor.
b. Connect camshaft position sensor connector.
c. Turn ignition switch to ON, start the engine and observe the signal waveform of camshaft position sensor with an oscilloscope.

OK → **Replace camshaft position sensor**

NG ↓

10	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0341-00 or P0346-00 still exists.

NG → **Replace ECM**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0420-00	Catalyst System, Bank1 Efficiency Below Threshold

DTC Code	DTC Definitions	DTC Detection Conditions	Possible Cause
P0420-00	Catalyst System, Bank1 Efficiency Below Threshold	Engine running	• Three-way catalytic converter • Leakage in exhaust system • Upstream oxygen sensor • Downstream oxygen sensor • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

Diagnosis Procedure

1	Check for any other DTCs output (in addition to DTC P0420-00)

a. Connect X-431 3G diagnostic tester to Data Link Connector (DLC).

b. Turn ignition switch to ON. Start the engine and warm it up to normal operating temperature, and then select Read Code.

Display (DTC Output)	Proceed to
DTC P0420-00	A
DTC P0420-00 and other DTCs	B

B → **Go to DTC chart, and perform troubleshooting for other DTCs first**

A

2	Read datastream

a. Read datastream using diagnostic tester.
b. Check datastream below.

Item	OK (Idling)	If it is NG, proceed to
Upstream Oxygen Sensor Voltage	Quickly fluctuates between 0.1 to 0.9 V	A
Downstream Oxygen Sensor Voltage	Fluctuates slightly at about 0.45 V	B
Average Injection Pulse Width	1.5 - 2.9 ms	C

A → **Replace upstream oxygen sensor**

C → **Check injector, fuel pressure and other causes for abnormal injection pulse width**

B

3	Check exhaust system

a. Turn ignition switch to ON and start the engine.
b. Check exhaust system for leakage.

NG → **Repair or replace related exhaust system components**

OK

4	Check downstream oxygen sensor

NG → **Replace downstream oxygen sensor**

OK

Replace three-way catalytic converter, and go to step 5

5	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0420-00 still exists.

NG → **Replace ECM**

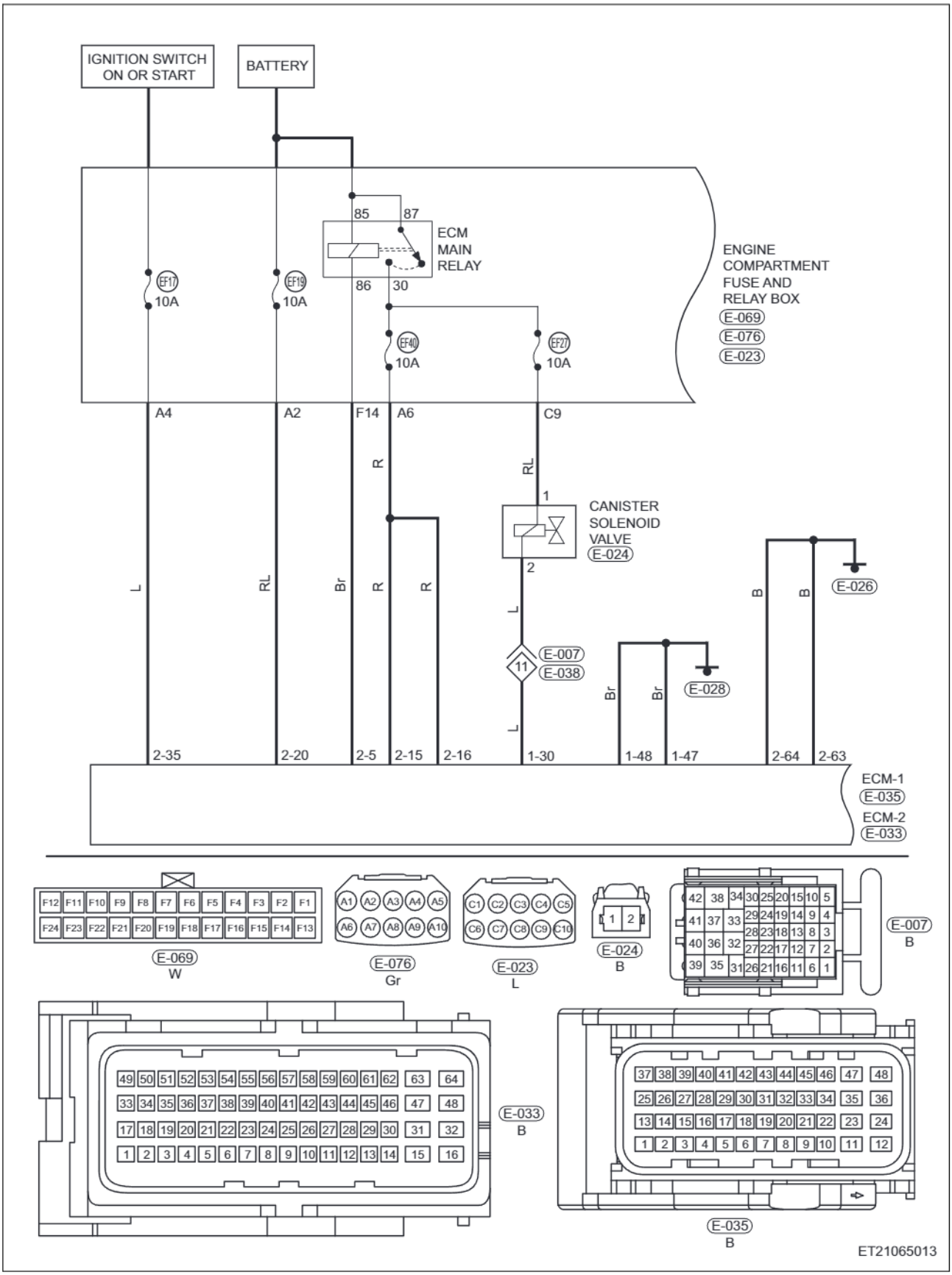
OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0444-00	Evaporative Emiss. System Purge Control Valve Circ. Open

DTC	P0458-00	Evaporative Emission System Purge Control Valve Circuit Low

DTC	P0459-00	Evaporative Emission System Purge Control Valve Circuit High


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
EF27
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
E-023
A4
A2
F14
A6
C9
L
RL
Br
R
R
R
RL
1
2
CANISTER SOLENOID VALVE
E-024
L
11
E-007
E-038
L
Br
Br
E-028
B
B
E-026
2-35
2-20
2-5
2-15
2-16
1-30
1-48
1-47
2-64
2-63
ECM-1
E-035
ECM-2
E-033
E-069
W
E-076
Gr
E-023
L
E-024
B
E-007
B
E-033
B
E-035
B
ET21065013

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0444-00	Evaporative Emiss. System Purge Control Valve Circ. Open	Engine running	• Canister solenoid valve • Wire harness or connector • ECM
P0458-00	Evaporative Emission System Purge Control Valve Circuit Low		
P0459-00	Evaporative Emission System Purge Control Valve Circuit High		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	**Check ECM ground point**

a. Turn ignition switch to LOCK.

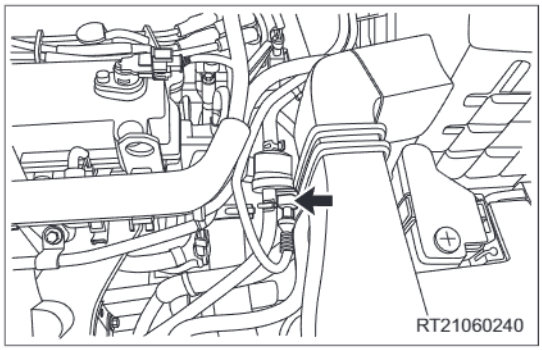
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK →

2	Check canister solenoid valve connector

a. Disconnect canister solenoid valve connector E-024.
b. Check canister solenoid valve connector.



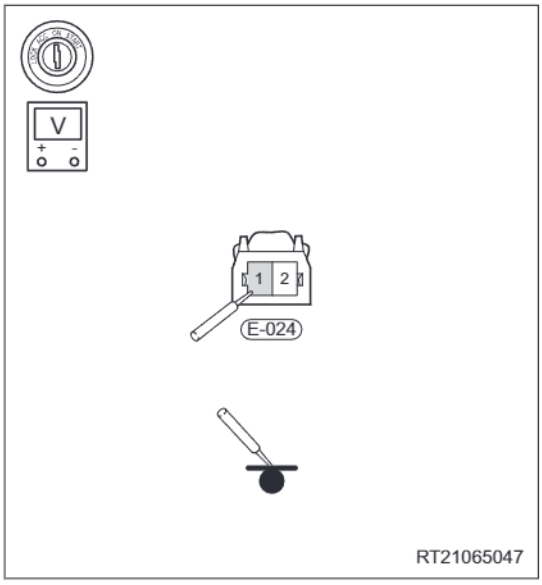
NG → Repair or replace connector

OK

3	Check canister solenoid valve power supply voltage

a. Turn ignition switch to ON.
b. Measure voltage between canister solenoid valve connector terminal and body ground.

Multimeter Connection	Condition	Specified Condition
E-024 (1) - Body ground	Ignition switch ON	11 to 14 V



OK → Go to step 5

NG

4	Check canister solenoid valve power supply circuit

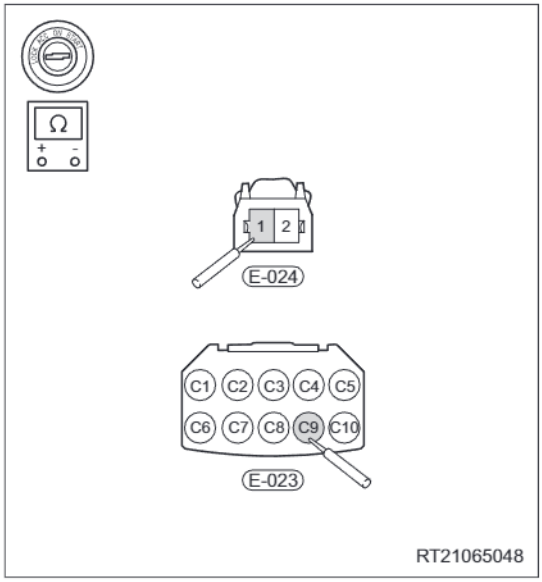
a. Turn ignition switch to LOCK.
b. Check fuse EF27 and main relay.
c. Disconnect engine compartment fuse and relay box connector E-023.
d. Check wire harness between canister solenoid valve connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-024 (1) - E-023 (C9)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-024 (1) or E-023 (C9) - Body ground	Always	No continuity
E-024 (1) or E-023 (C9) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (canister solenoid valve - engine compartment fuse and relay box)**

OK →

5	Check canister solenoid valve control circuit

a. Disconnect ECM connector E-035.

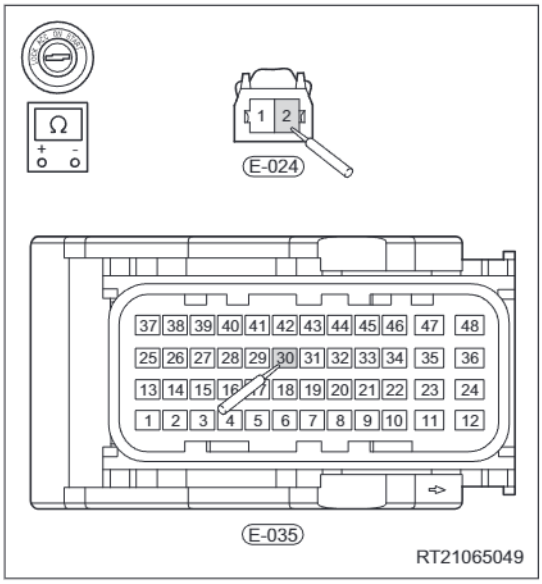
b. Check wire harness between canister solenoid valve connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-024 (2) - E-035 (30)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-024 (2) or E-035 (30) - Body ground	Always	No continuity
E-024 (2) or E-035 (30) - Battery positive		



NG → **Repair or replace wire harness or connector (canister solenoid valve - ECM)**

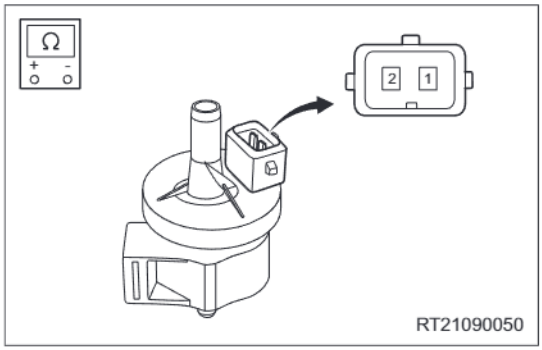
OK

6	Check canister solenoid valve

a. Check resistance of canister solenoid valve.

Multimeter Connection	Specified Condition
1 - 2	26 ± 4 Ω (20°C)

b. With battery voltage applied between terminals 1 and 2, the valve should open when air is sucked into the valve. With battery voltage not applied, the valve should close when air is sucked into the valve.



NG → **Replace canister solenoid valve**

OK

7	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.

b. Refer to "DTC Confirmation Procedure".

c. Check if DTC P0444-00, P0458-00 or P0459-00 still exists.

NG → Replace ECM

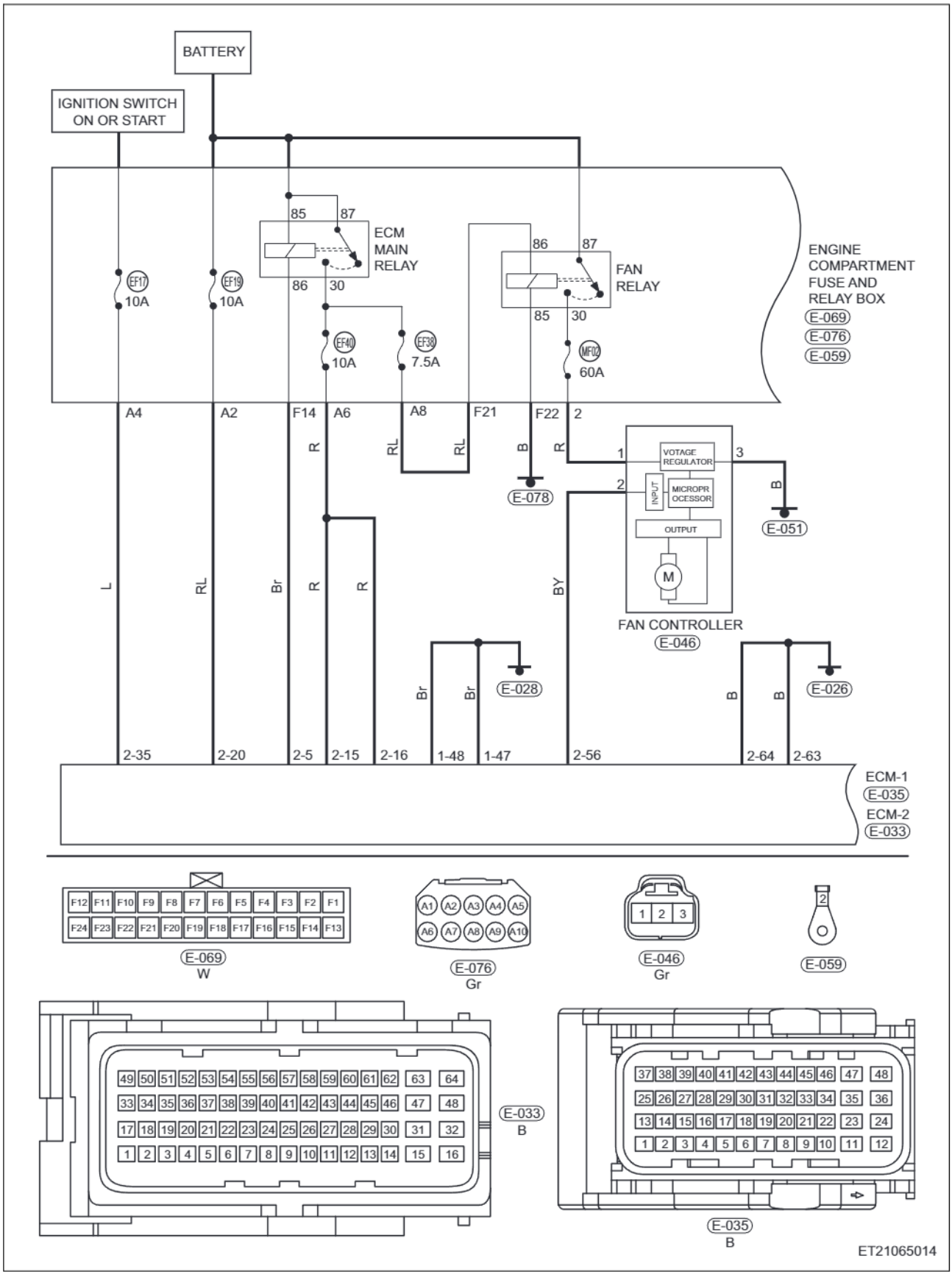
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0480-00	Cooling Fan 1 Control Circuit

DTC	P0481-00	Cooling Fan 2 Control Circuit

DTC	P0691-00	Cooling Fan 1 Control Circuit Low


BATTERY
IGNITION SWITCH ON OR START
85
87
86
30
ECM MAIN RELAY
86
87
85
30
FAN RELAY
EF17
10A
EF19
10A
EF40
10A
EF38
7.5A
MF02
60A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
E-059
A4
A2
F14
A6
A8
F21
F22
2
L
RL
Br
R
R
RL
RL
B
R
E-078
1
2
3
VOTAGE REGULATOR
INPUT
MICROPR OCESSOR
OUTPUT
M
B
E-051
BY
FAN CONTROLLER
E-046
Br
Br
E-028
B
B
E-026
2-35
2-20
2-5
2-15
2-16
1-48
1-47
2-56
2-64
2-63
ECM-1
E-035
ECM-2
E-033
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
1 2 3
E-046
Gr
2
E-059
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B
ET21065014

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0480-00	Cooling Fan 1 Control Circuit	Ignition switch ON	• Cooling fan relay • Cooling fan controller • Fuse • Wire harness or connector • ECM
P0481-00	Cooling Fan 2 Control Circuit		
P0691-00	Cooling Fan 1 Control Circuit Low		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check cooling fan controller connector

a. Disconnect cooling fan controller connector E-046.
b. Check cooling fan controller connector.

NG → Repair or replace connector

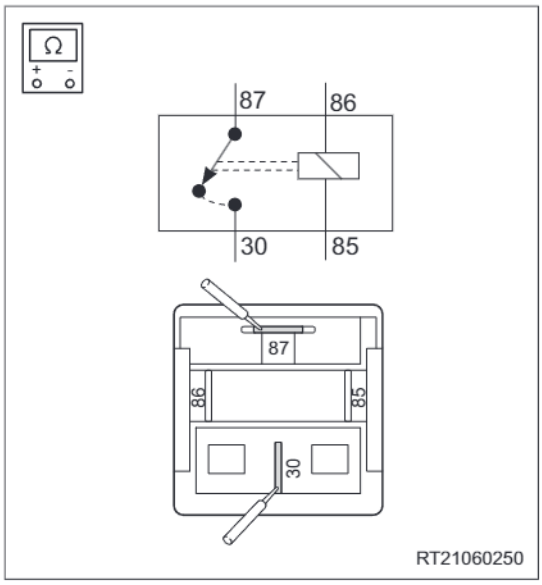
OK

3	Check cooling fan fuse and relay

a. Unplug cooling fan fuse and relay from engine compartment fuse and relay box.
b. Check if fuse is normal.
c. Check cooling fan relay.

Multimeter Connection	Specified Condition
30 - 87	No continuity
30 - 87	Continuity (when battery voltage is applied between terminals 85 and 86)

NG → Replace fuse or relay

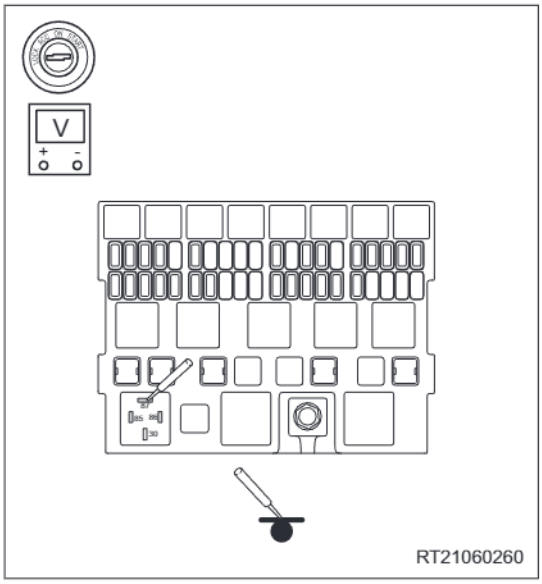


OK

4	Check cooling fan relay circuit voltage

a. Check terminal voltage of cooling fan relay (engine compartment fuse and relay box side).

Multimeter Connection	Condition	Specified Condition
Terminal 87 - Body ground	Always	11 to 14 V
Terminal 86 - Body ground	Ignition switch ON	11 to 14 V
Terminal 85 - Body ground	Always	0 V



NG → **Check engine compartment fuse and relay box, repair or replace wire harness or connector (fan relay - battery)**

OK

5	Check wire harness and connector

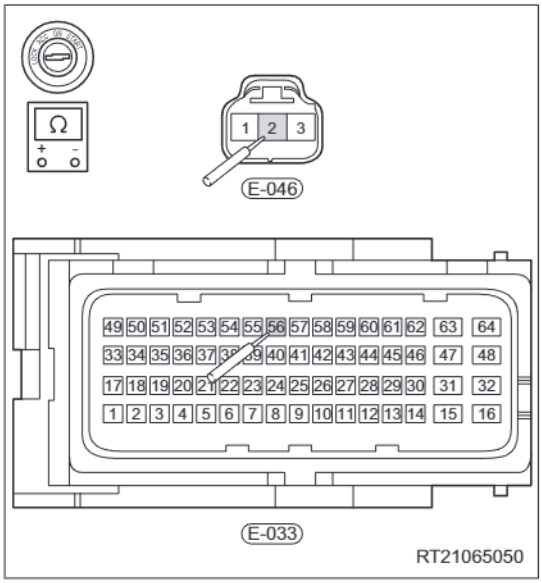
a. Disconnect fuse and relay box connector E-059.
b. Disconnect ECM connector E-033.
c. Check wire harness between fan controller connector and ECM connector, engine compartment fuse and relay box connector and body ground.

Check for Open

Multimeter Connection	Specified Condition
E-033 (56) - E-046 (2)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (56) or E-046 (2) - Body ground	No continuity
E-033 (56) or E-046 (2) - Battery positive	No continuity

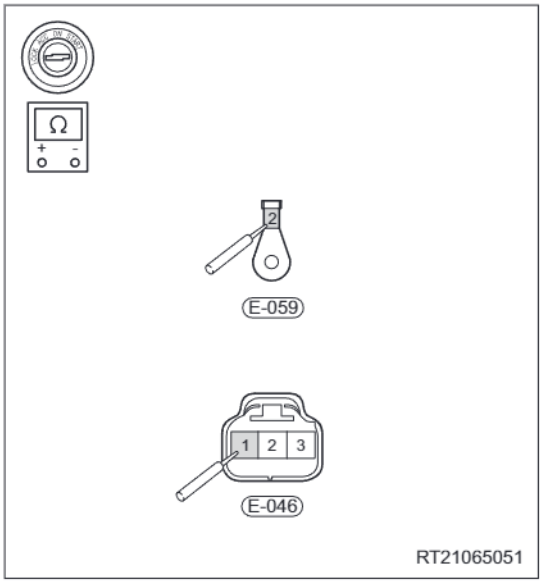


Check for Open

Multimeter Connection	Specified Condition
E-059 (2) - E-046 (1)	Continuity
E-046 (3) - Body ground	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-059 (2) or E-046 (1) - Body ground	No continuity
E-059 (2) or E-046 (1) - Battery positive	No continuity



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

OK

Replace cooling fan controller, and go to step 6

6	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0480-00, P0481-00 or P0691-00 still exists.

NG → **Replace ECM**

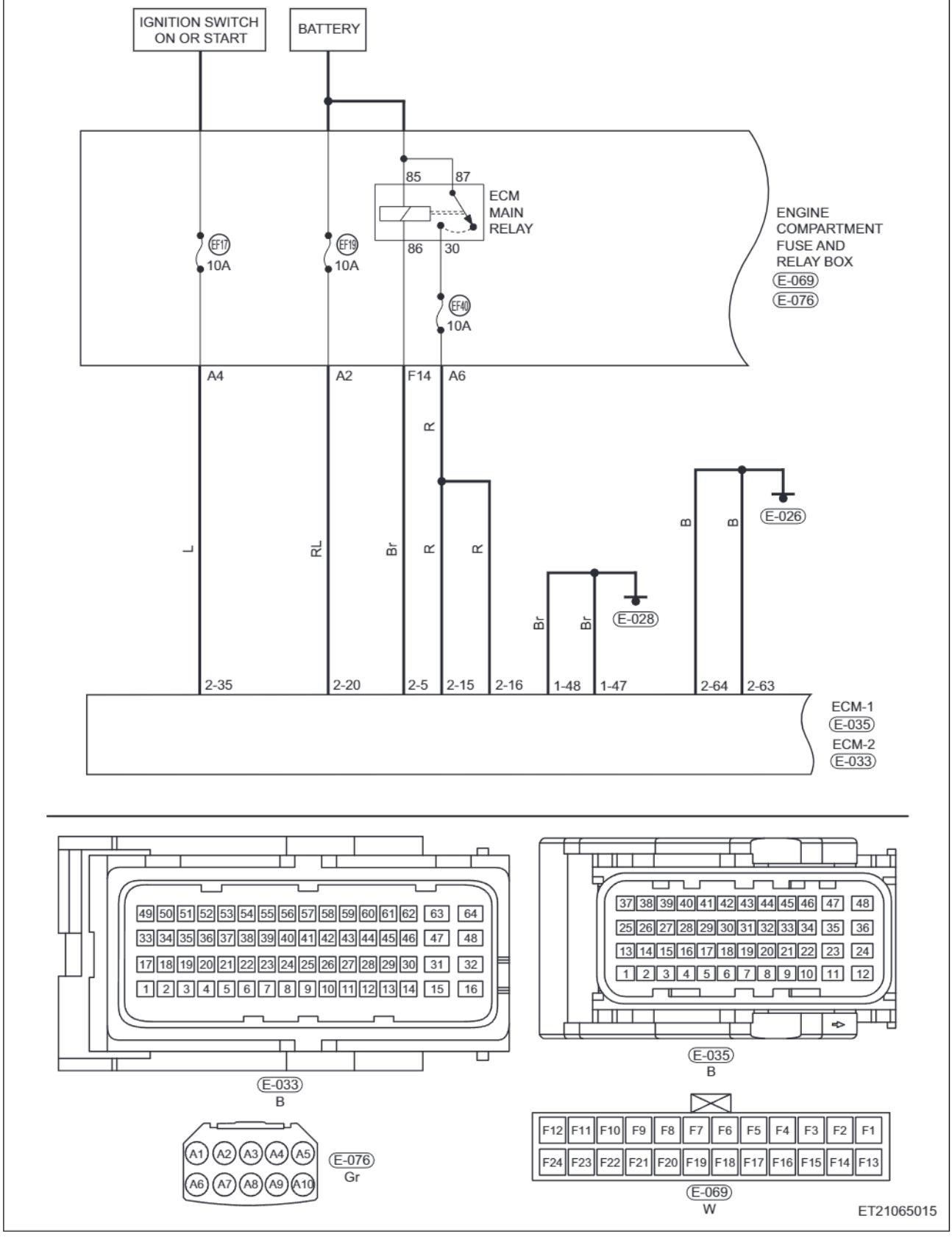
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0560-00	System Voltage Malfunction

DTC	P0562-00	System Voltage Low Voltage

DTC	P0563-00	System Voltage High Voltage


IGNITION SWITCH ON OR START
BATTERY
85
87
ECM MAIN RELAY
86
30
EF17
10A
EF19
10A
EF40
10A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
A4
A2
F14
A6
L
RL
Br
R
R
R
B
B
E-026
Br
Br
E-028
2-35
2-20
2-5
2-15
2-16
1-48
1-47
2-64
2-63
ECM-1
E-035
ECM-2
E-033
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
ET21065015

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0560-00	System Voltage Malfunction	Ignition switch ON	• Fuse • Wire harness or connector • Battery • Battery terminal • ECM
P0562-00	System Voltage Low Voltage		
P0563-00	System Voltage High Voltage		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check battery

a. Check if battery voltage is normal.

NG → Recharge or replace battery

OK

2	Check battery terminals

a. Check if battery terminals are loose or corroded.

NG → Tighten or replace battery terminals

OK

3	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK ↓

4	Check ECM connector

a. Disconnect ECM connector E-033 and E-035.
b. Check ECM connector.

NG → **Repair or replace ECM connector**

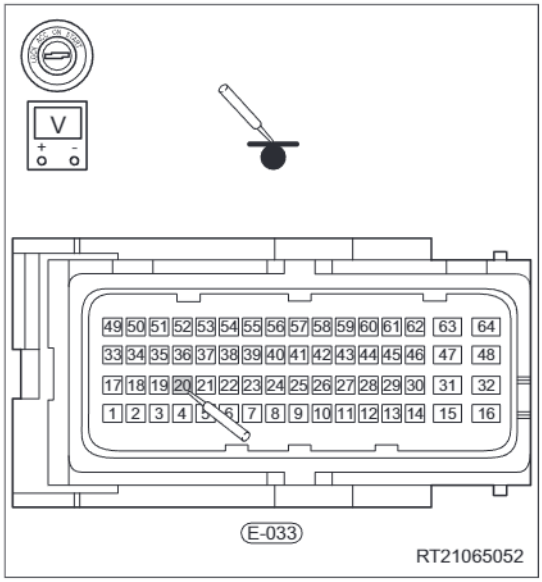
OK ↓

5	Check ECM power supply voltage (battery voltage)

a. Measure voltage between ECM connector E-033 terminal and body ground.

Multimeter Connection	Condition	Specified Condition
E-033 (20) - Body ground	Always	11 to 14 V

OK → **Go to step 8**



NG ↓

6	Check ECM fuse

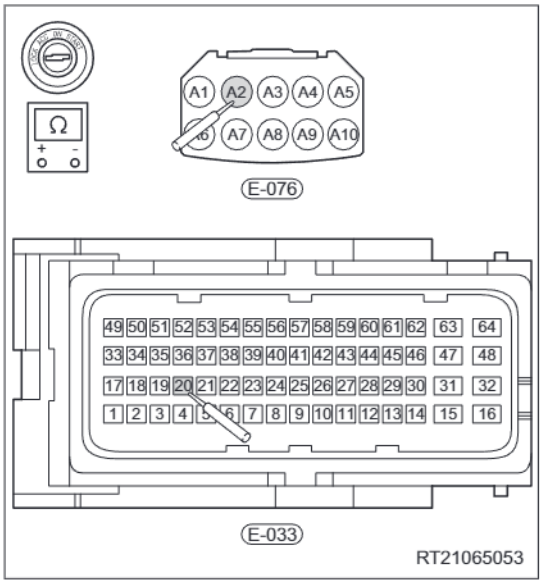
a. Unplug ECM fuse EF19 (10 A) from engine compartment fuse and relay box.
b. Check resistance of fuse EF19.
Standard resistance: less than 1 Ω

NG → **Replace ECM fuse**

OK

7	Check wire harness and connector (ECM - engine compartment fuse and relay box)

a. Disconnect engine compartment fuse and relay box connector E-076.
b. Check wire harness between connector terminals.



Check for Open

Multimeter Connection	Specified Condition
E-033 (20) - E-076 (A2)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (20) or E-076 (A2) - Body ground	No continuity
E-033 (20) or E-076 (A2) - Battery positive	No continuity

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

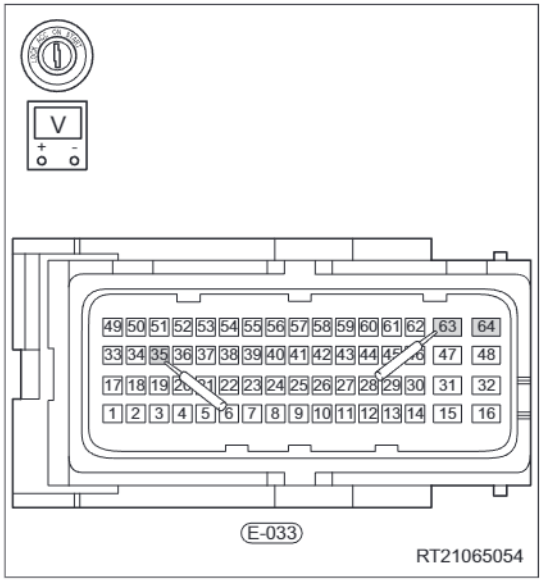
OK

Repair or replace engine compartment fuse and relay box or wire harness (engine compartment fuse and relay box - battery)

8	Check ECM power supply voltage (ignition switch voltage)

a. Connect engine compartment fuse and relay box connector E-076.
b. Turn ignition switch to ON.
c. Check voltage between terminals of ECM connector E-033.

Multimeter Connection	Condition	Specified Condition
E-033 (35) - E-033 (63) or E-033 (64)	Ignition switch ON	11 to 14 V



OK → Go to step 12

NG

9	Check ECM fuse

a. Unplug fuse EF17 (10 A) from engine compartment fuse and relay box.
b. Check resistance of fuse EF17.
Standard resistance: less than 1 Ω

NG → Replace fuse

OK

10	Check wire harness and connector (ECM - engine compartment fuse and relay box)

a. Disconnect engine compartment fuse and relay box connector E-076.

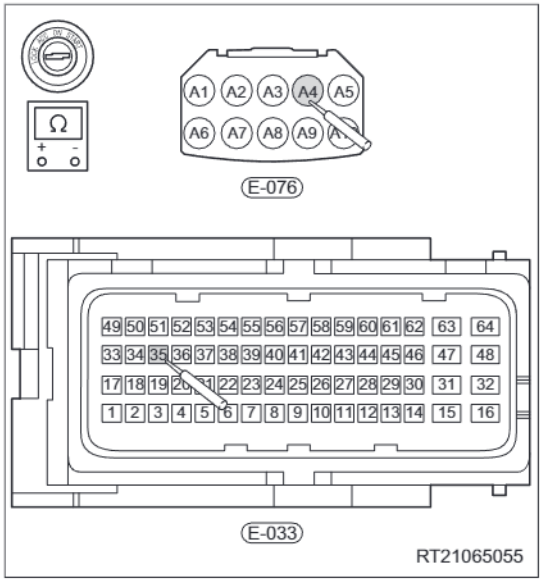
b. Check wire harness between ECM connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Specified Condition
E-033 (35) - E-076 (A4)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (35) or E-076 (A4) - Body ground	No continuity
E-033 (35) or E-076 (A4) - Battery positive	No continuity



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

OK

11	Check ignition switch assembly (See page 15-67)

NG → **Replace ignition switch assembly**

OK

Repair or replace engine compartment fuse and relay box or wire harness (engine compartment fuse and relay box - ignition switch)

12	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.

b. Refer to "DTC Confirmation Procedure".

c. Check if DTC P0560-00, P0562-00 or P0563-00 still exists.

NG → **Replace ECM**

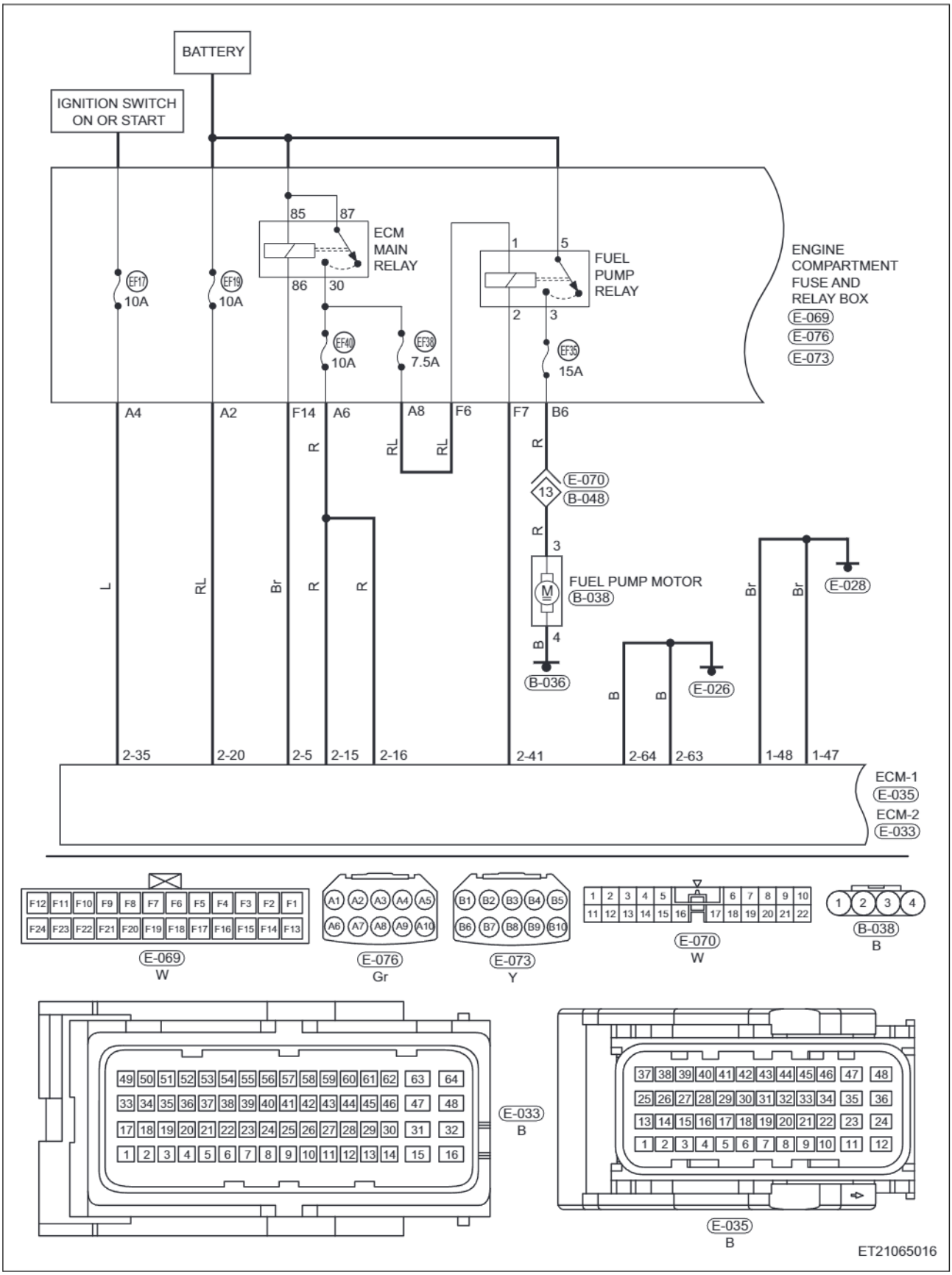
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0627-00	Fuel Pump "A" Control Circuit/Open

DTC	P0628-00	Fuel Pump "A" Control Circuit Low

DTC	P0629-00	Fuel Pump "A" Control Circuit High


BATTERY
IGNITION SWITCH ON OR START
85
87
86
30
ECM MAIN RELAY
1
5
2
3
FUEL PUMP RELAY
EF17
10A
EF19
10A
EF40
10A
EF38
7.5A
EF35
15A
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
E-073
A4
A2
F14
A6
A8
F6
F7
B6
R
RL
RL
R
13
E-070
B-048
3
FUEL PUMP MOTOR
B-038
4
B-036
E-026
E-028
L
RL
Br
R
R
B
B
Br
Br
2-35
2-20
2-5
2-15
2-16
2-41
2-64
2-63
1-48
1-47
ECM-1
E-035
ECM-2
E-033
E-069
W
E-076
Gr
E-073
Y
E-070
W
B-038
B
E-033
B
E-035
B
ET21065016

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0627-00	Fuel Pump "A" Control Circuit/Open	Ignition switch ON Engine running	• Fuel pump relay • Wire harness or connector • ECM • Engine compartment fuse and relay box
P0628-00	Fuel Pump "A" Control Circuit Low		
P0629-00	Fuel Pump "A" Control Circuit High		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

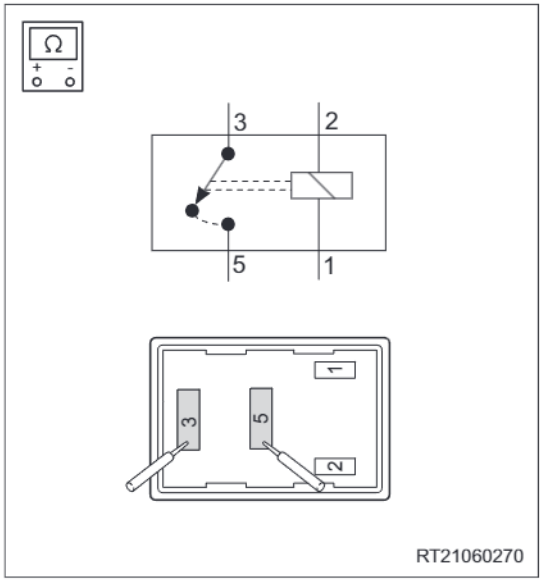
OK

2	Check fuel pump relay

a. Unplug fuel pump relay from engine compartment fuse and relay box.

b. Check fuel pump relay terminals.

Multimeter Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (when battery voltage is applied between terminals 1 and 2)



NG → **Replace fuel pump relay**

OK

3	Check fuel pump relay control circuit

a. Disconnect engine compartment fuse and relay box connector E-069.

b. Disconnect ECM connector E-033.

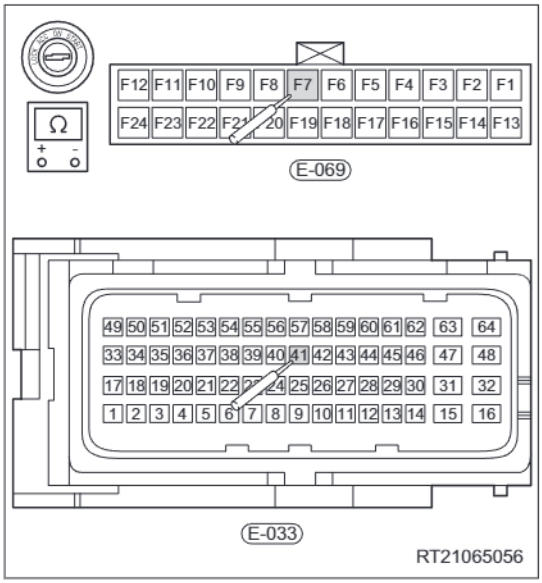
c. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Specified Condition
E-033 (41) - E-069 (F7)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (41) or E-069 (F7) - Body ground	No continuity
E-033 (41) or E-069 (F7) - Battery positive	No continuity



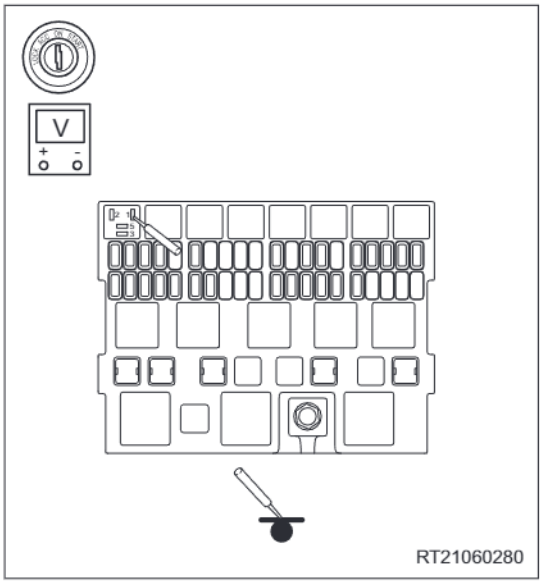
NG → **Repair or replace wire harness or connector (engine compartment fuse and relay box - ECM)**

OK

4	Check fuel pump relay terminal voltage

a. Turn ignition switch to ON.
b. Measure voltage between terminal of fuel pump relay and body ground.

Multimeter Connection	Condition	Specified Condition
Fuel pump relay terminal 1 (engine compartment fuse and relay box side) - Body ground	Ignition switch ON	11 to 14 V



OK → **Go to step 6**

NG

5	Check main relay and fuse EF38

NG → **Replace main relay or fuse**

OK

Repair or replace engine compartment fuse and relay box or wire harness (engine compartment fuse and relay box - battery)

6	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0627-00, P0628-00 or P0629-00 still exists.

NG → **Replace ECM**

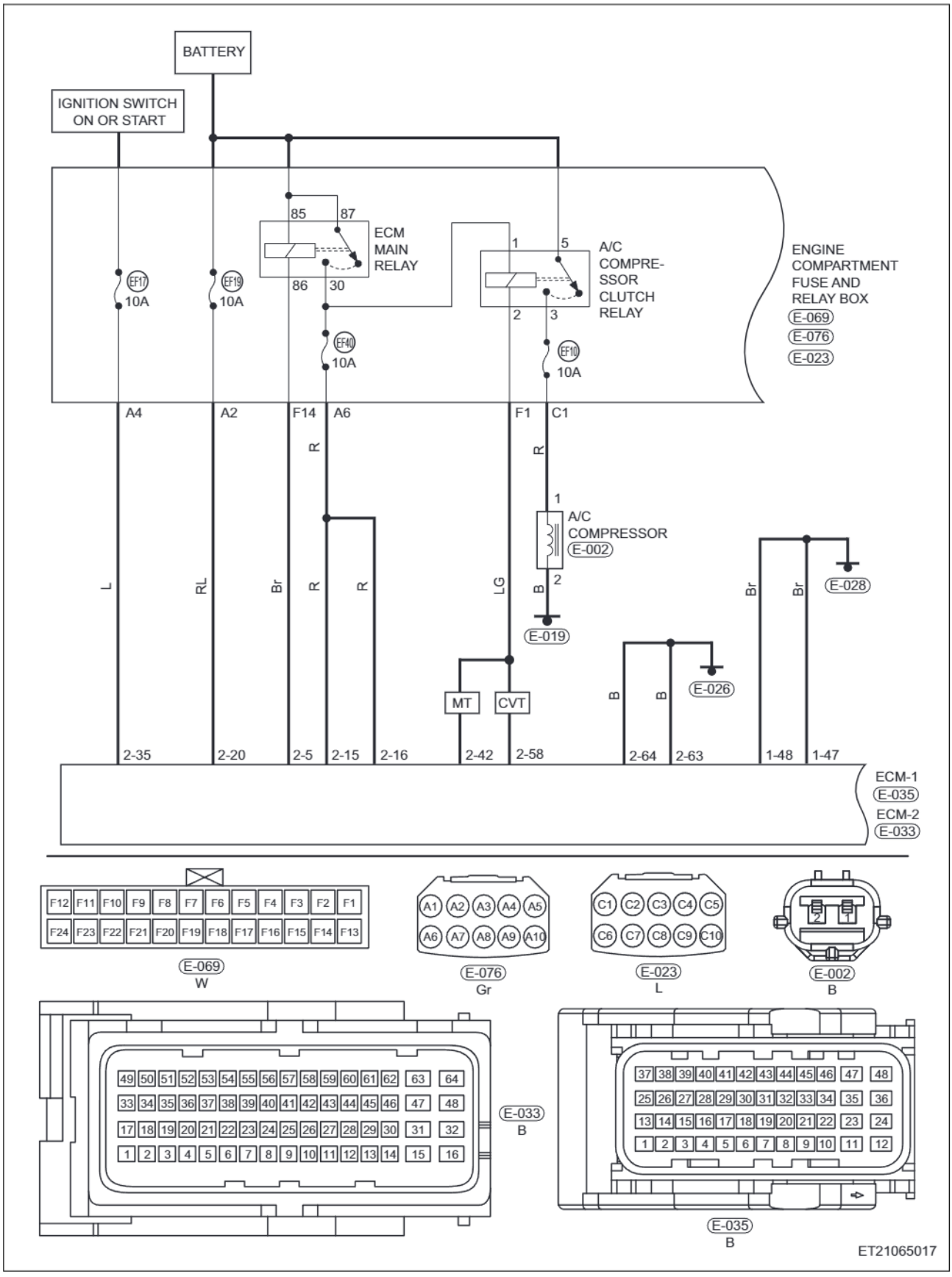
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0645-00	A/C Clutch Relay Circuit

DTC	P0646-00	A/C Clutch Relay Control Circuit Low

DTC	P0647-00	A/C Clutch Relay Control Circuit High


BATTERY
IGNITION SWITCH ON OR START
85
87
86
30
ECM MAIN RELAY
1
5
2
3
A/C COMPRE-SSOR CLUTCH RELAY
ENGINE COMPARTMENT FUSE AND RELAY BOX
E-069
E-076
E-023
EF17
10A
EF19
10A
EF40
10A
EF10
10A
A4
A2
F14
A6
F1
C1
R
R
1
A/C COMPRESSOR
E-002
2
B
E-019
L
RL
Br
R
R
LG
Br
Br
E-028
B
B
E-026
MT
CVT
2-35
2-20
2-5
2-15
2-16
2-42
2-58
2-64
2-63
1-48
1-47
ECM-1
E-035
ECM-2
E-033
F12 F11 F10 F9 F8 F7 F6 F5 F4 F3 F2 F1
F24 F23 F22 F21 F20 F19 F18 F17 F16 F15 F14 F13
E-069
W
A1 A2 A3 A4 A5
A6 A7 A8 A9 A10
E-076
Gr
C1 C2 C3 C4 C5
C6 C7 C8 C9 C10
E-023
L
2 1
E-002
B
49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64
33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48
17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
E-033
B
37 38 39 40 41 42 43 44 45 46 47 48
25 26 27 28 29 30 31 32 33 34 35 36
13 14 15 16 17 18 19 20 21 22 23 24
1 2 3 4 5 6 7 8 9 10 11 12
E-035
B
ET21065017

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0645-00	A/C Clutch Relay Circuit	Ignition switch ON Engine running	• A/C compressor relay • Wire harness or connector • ECM
P0646-00	A/C Clutch Relay Control Circuit Low		
P0647-00	A/C Clutch Relay Control Circuit High		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

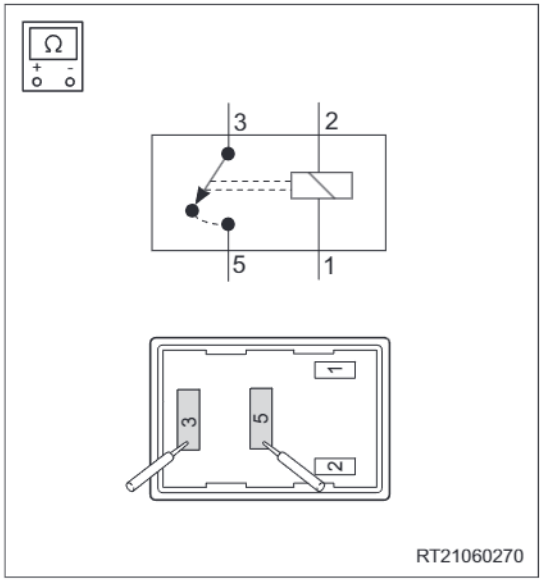
OK

2	Check A/C compressor relay

a. Unplug A/C compressor relay from engine compartment fuse and relay box.

b. Check A/C compressor relay terminals.

Multimeter Connection	Specified Condition
3 - 5	No continuity
3 - 5	Continuity (when battery voltage is applied between terminals 1 and 2)



NG → Replace A/C compressor relay

OK

3	Check A/C compressor relay control circuit

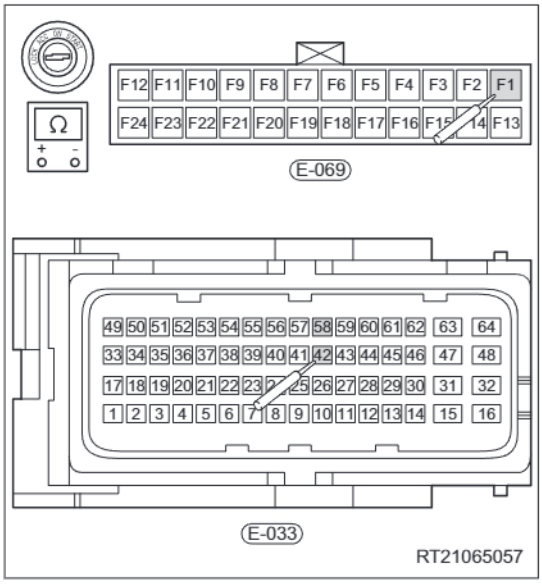
a. Disconnect engine compartment fuse and relay box connector E-069.

b. Disconnect ECM connector E-033.

c. Check wire harness between ECM connector terminals and engine compartment fuse and relay box connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-033 (42) (MT) or E-033 (58) (CVT) - E-069 (F1)	Always	Continuity



Check for Short

Multimeter Connection	Condition	Specified Condition
E-033 (42) (MT) or E-033 (58) (CVT) or E-069 (F1) - Body ground	Always	No continuity
E-033 (42) (MT) or E-033 (58) (CVT) or E-069 (F1) - Battery positive	Always	No continuity

NG → **Repair or replace wire harness or connector (ECM - engine compartment fuse and relay box)**

OK ↓

4	Check for DTCs

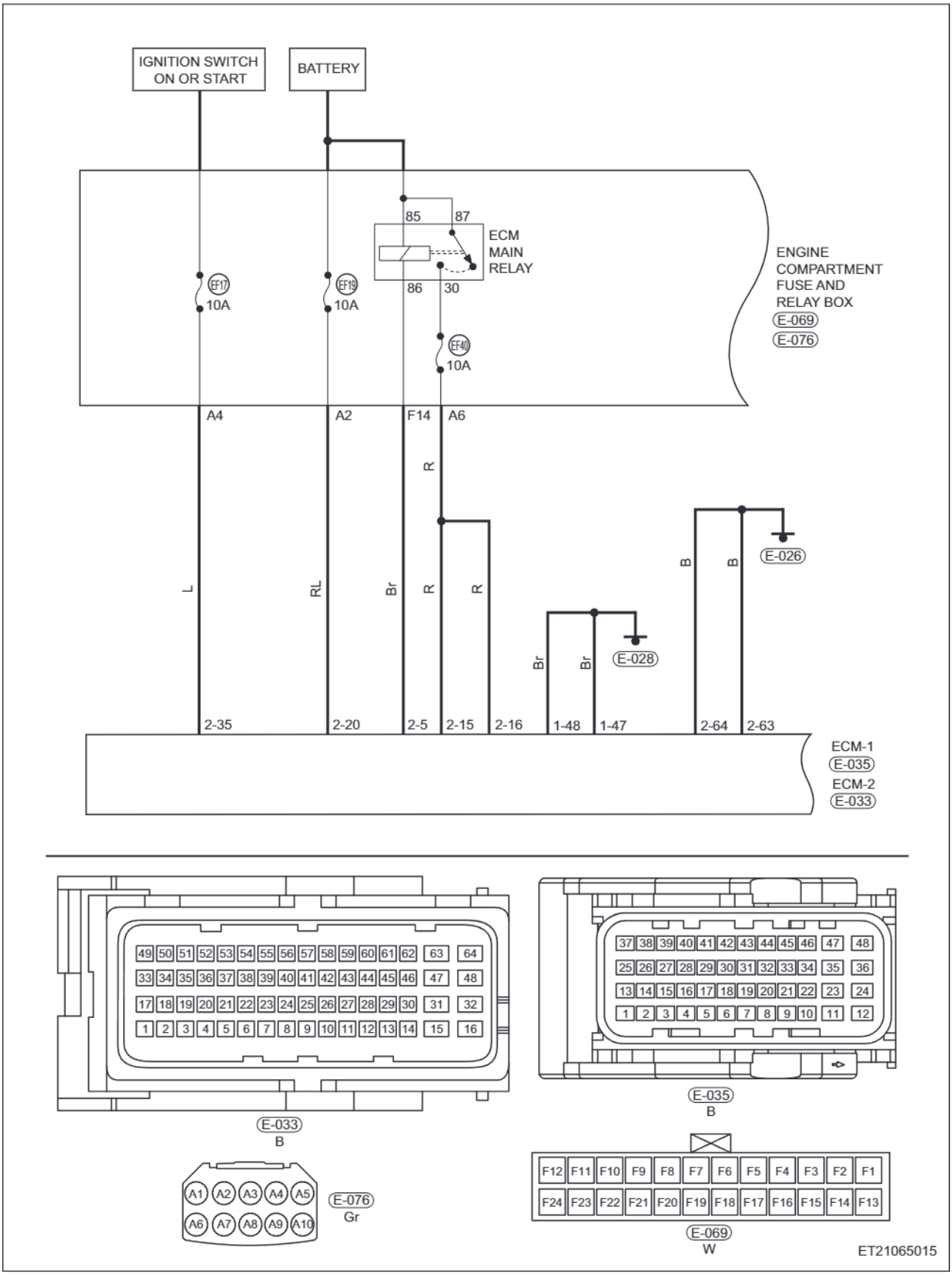
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0645-00, P0646-00 or P0647-00 still exists.

NG → **Replace ECM**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0688-00	EMC/PCM Power Relay Sense Circuit Open



DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0688-00	EMC/PCM Power Relay Sense Circuit Open	Ignition switch ON	• Main Relay • Wire harness or connector • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	**Check ECM ground point**

a. Turn ignition switch to LOCK.

b. Check ECM grounds E-026 and E-028 (See page 06-18).

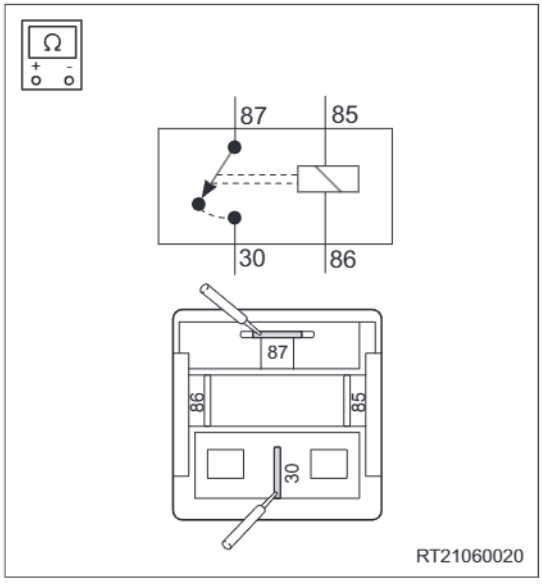
NG → **Repair or replace ground wire harness or ground point**

OK

2	Check main relay and fuse

a. Unplug main relay and fuse EF40 from engine compartment fuse and relay box.
b. Check if fuse EF40 is normal.
c. Check for continuity between terminals of main relay.

Multimeter Connection	Specified Condition
30 - 87	No continuity
30 - 87	Continuity (when battery voltage is applied between terminals 85 and 86)



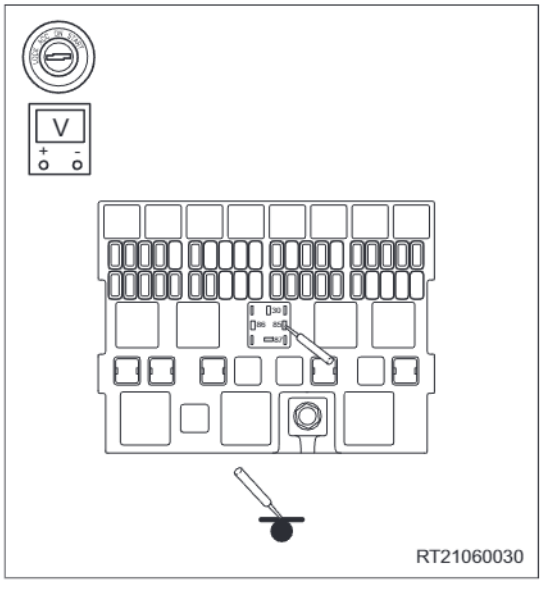
NG → Replace main relay

OK

3	Check main relay circuit voltage

a. Measure voltage between terminals of main relay (engine compartment fuse and relay box side) and body ground.

Multimeter Connection	Condition	Specified Condition
Main relay terminals 87 and 85 (engine compartment fuse and relay box side) - Body ground	Always	11 to 14 V



NG → Repair or replace wire harness or connector (main relay - battery)

OK

4	Check wire harness and connector (ECM - engine compartment fuse and relay box)

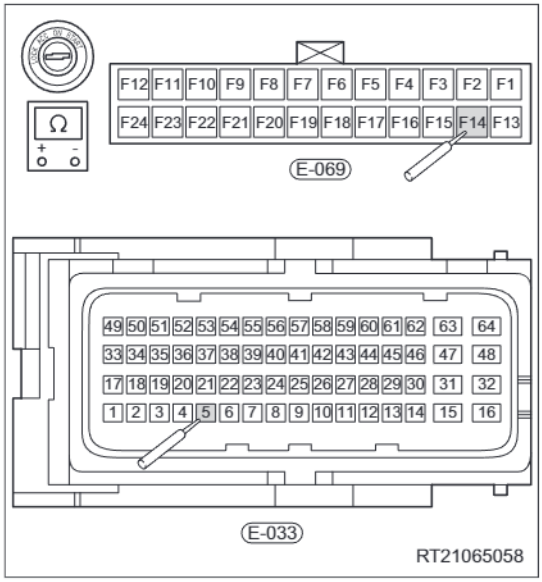
a. Disconnect fuse and relay box connectors E-069 and E-076.
b. Disconnect ECM connector E-033.
c. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Specified Condition
E-033 (5) - E-069 (F14)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (5) or E-069 (F14) - Body ground	No continuity
E-033 (5) or E-069 (F14) - Battery positive	No continuity

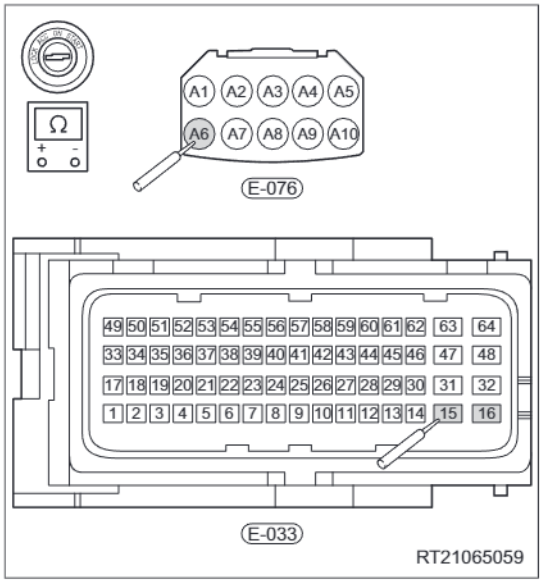


Check for Open

Multimeter Connection	Specified Condition
E-033 (15) - E-076 (A6)	Continuity
E-033 (16) - E-076 (A6)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (15, 16) or E-076 (A6) - Body ground	No continuity
E-033 (15, 16) or E-076 (A6) - Battery positive	No continuity



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

OK

5	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0688-00 still exists.

NG → **Replace ECM**

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0604-00	Internal Contr. Module Random Access Memory (RAM) Error

DTC	P0605-00	Internal Contr. Module ROM Test Error

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0604-00	Internal Contr. Module Random Access Memory (RAM) Error	Ignition switch ON	• Wire harness or connector • ECM
P0605-00	Internal Contr. Module ROM Test Error		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check ECM connector

a. Disconnect ECM connector E-033 and E-035.
b. Check if connector is normal.

NG → **Repair or replace connector**

OK

Replace ECM

DTC	P1619-00	ECM Not Programmed (Virgin State)

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P1619-00	ECM Not Programmed (Virgin State)	Ignition switch ON	• Wire harness or connector • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK ↓

2	Check ECM connector

a. Disconnect ECM connector E-033 and E-035.

b. Check if connector is normal.

NG → **Repair or replace connector**

OK ↓

3	**Use X-431 3G diagnostic tester to match ECM (See page 34-7), and check for DTCs**

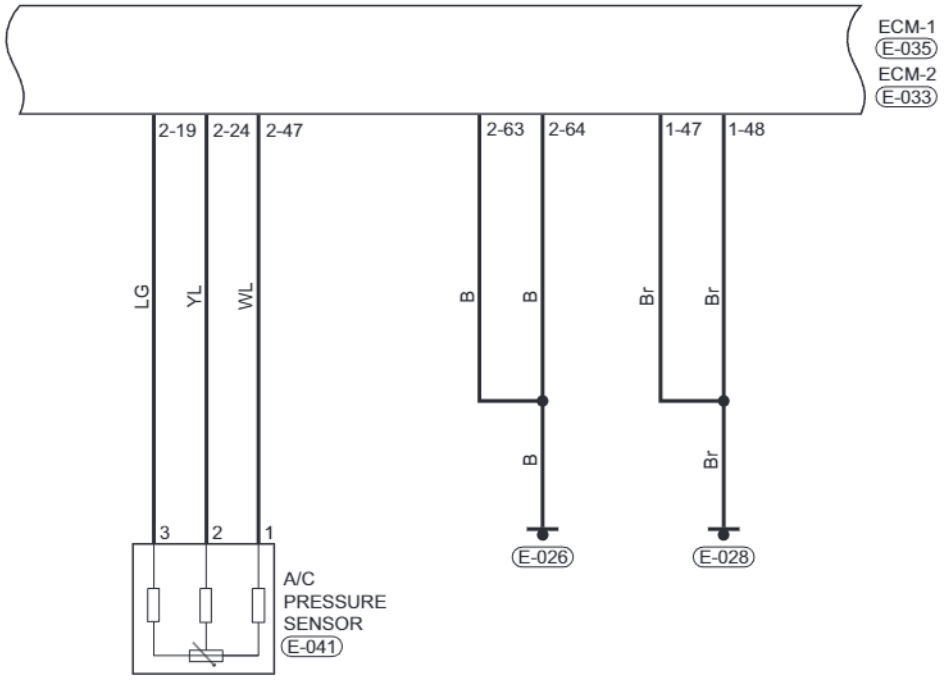
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P1619-00 still exists.

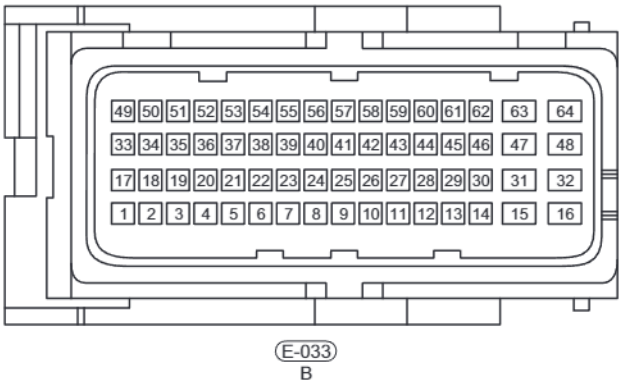
NG → **Replace ECM**

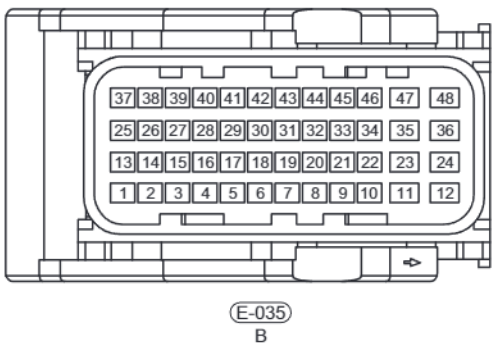
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0531-00	A/C Refrigerant Pressure Sensor "A" Circuit Range/ Performance









ET21065018

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0531-00	A/C Refrigerant Pressure Sensor "A" Circuit Range/ Performance	Ignition switch ON	• A/C pressure sensor • Wire harness or connector • ECM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

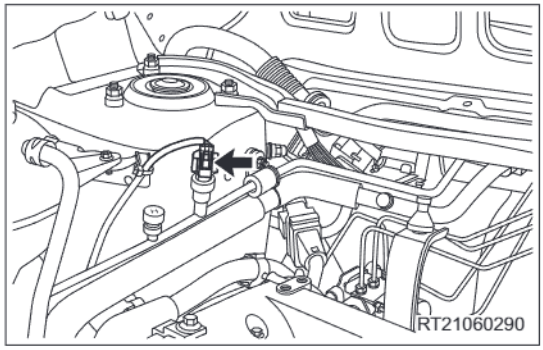
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK ↓

2	Check A/C pressure sensor connector

a. Disconnect A/C pressure sensor connector E-041.



b. Check A/C pressure sensor connector.

NG → Repair or replace connector

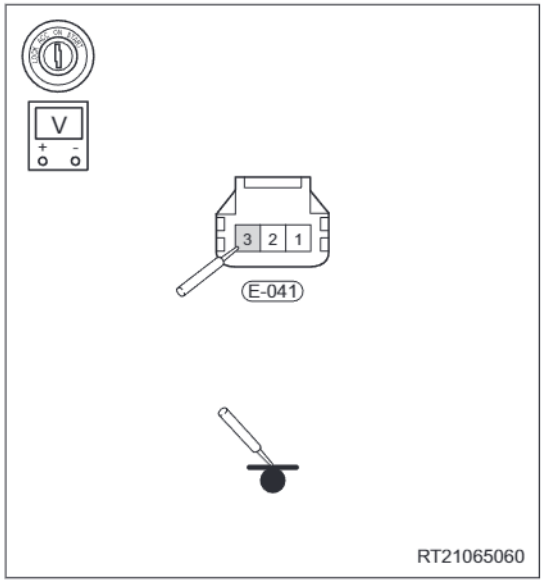
OK

3	Check A/C pressure sensor power supply voltage

a. Turn ignition switch to ON.

b. Check voltage between A/C pressure sensor connector terminal and body ground.

Multimeter Connection	Condition	Specified Condition
E-041 (3) - Body ground	Ignition switch ON	5 V



OK → Go to step 5

NG

4	Check A/C pressure sensor power supply circuit

a. Turn ignition switch to LOCK.

b. Disconnect ECM connector E-033.

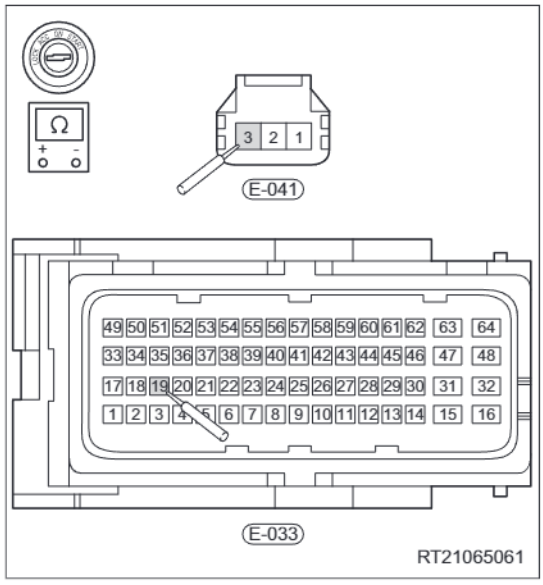
c. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-041 (3) - E-033 (19)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-041 (3) or E-033 (19) - Body ground	Always	No continuity
E-041 (3) or E-033 (19) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (A/C pressure sensor - ECM)**

OK

5	Check A/C pressure sensor signal circuit and ground circuit

a. Disconnect ECM connector E-033.

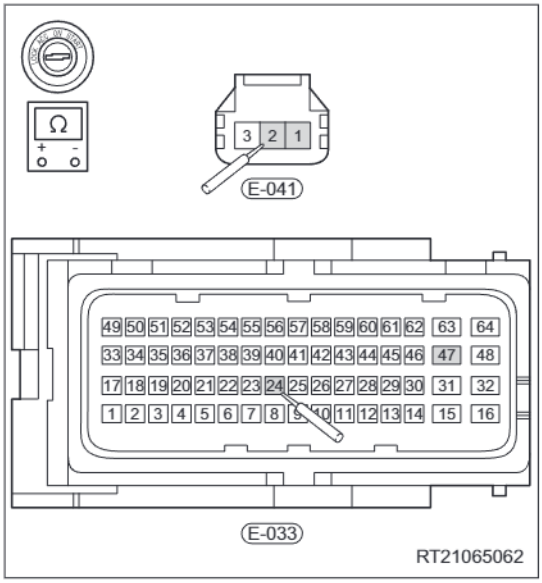
b. Check wire harness between A/C pressure sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-041 (2) - E-033 (24)	Always	Continuity
E-041 (1) - E-033 (47)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-041 (2) or E-033 (24) - Body ground	Always	No continuity
E-041 (2) or E-033 (24) - Battery positive	Always	No continuity
E-041 (1) or E-033 (47) - Body ground	Always	No continuity
E-041 (1) or E-033 (47) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (A/C pressure sensor - ECM)**

OK

6	Replace A/C pressure sensor, and check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.

b. Refer to "DTC Confirmation Procedure".

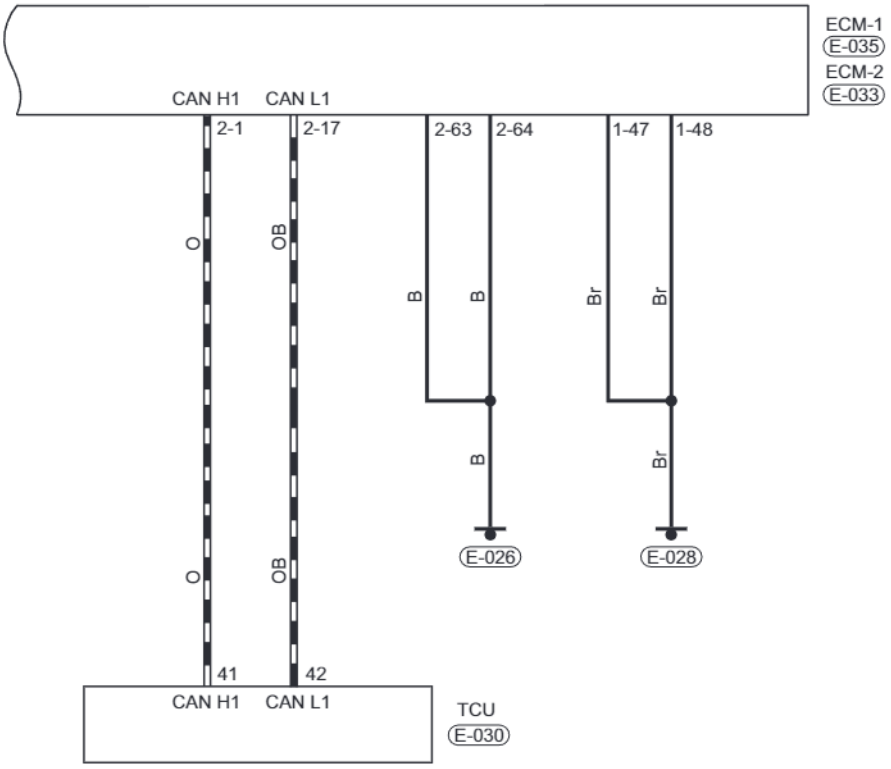
c. Check if DTC P0531-00 still exists.

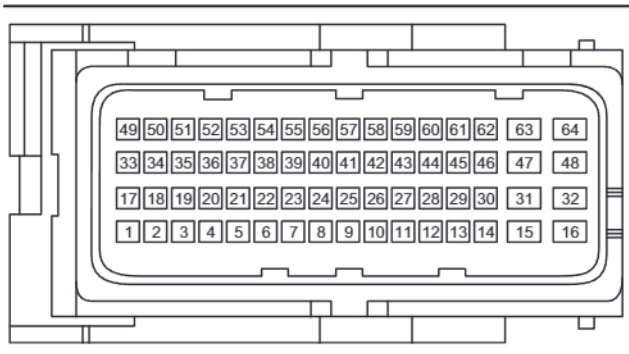
NG → **Replace ECM**

OK

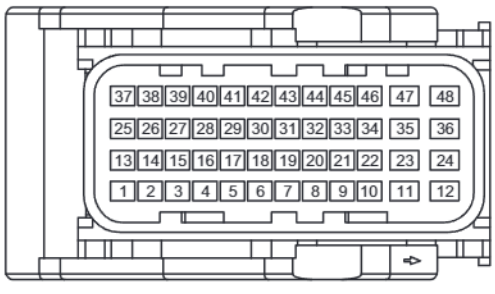
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	U0101-87	Lost Communication With TCM (CVT only)

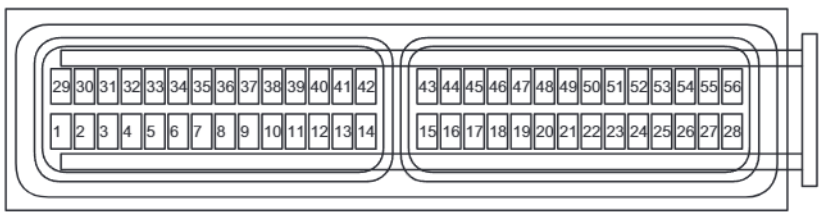




E-033
B



E-035
B



E-030
B

ET21065019

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
U0101-87	Lost Communication With TCM (CVT only)	Ignition switch ON Engine running	• CAN line or connector • ECM • TCM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check ECM connector and TCM connector

a. Disconnect ECM connector E-033.
b. Disconnect TCU connector E-030.
c. Check if connectors are normal.

NG → **Repair or replace connector**

OK

3	Check CAN line

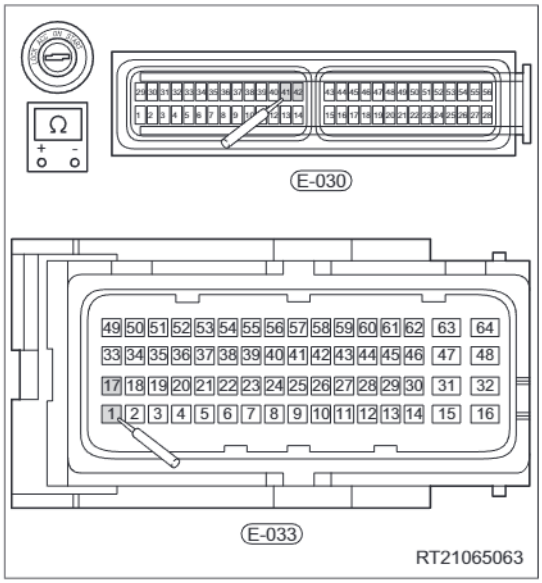
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
E-033 (1) - E-030 (41)	Continuity
E-033 (17) - E-030 (42)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (1) or E-030 (41) - Body ground	No continuity
E-033 (1) or E-030 (41) - Battery positive	No continuity
E-033 (17) or E-030 (42) - Body ground	No continuity
E-033 (17) or E-030 (42)- Battery positive	No continuity



NG → **Repair or replace CAN line**

OK

4	Replace ECM, and check for DTCs

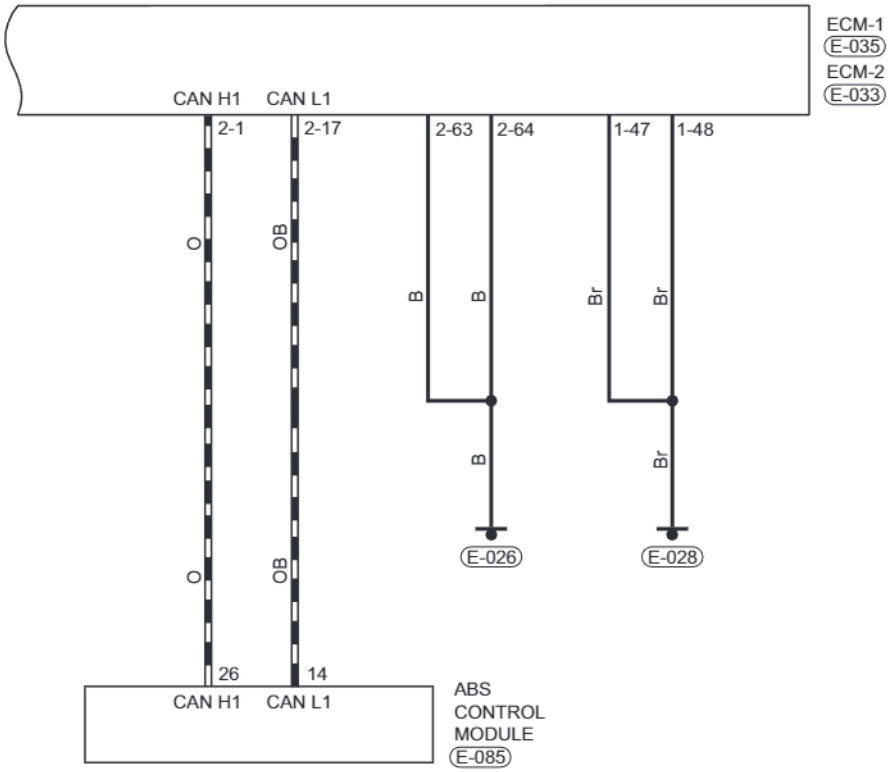
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC U0101-87 still exists.

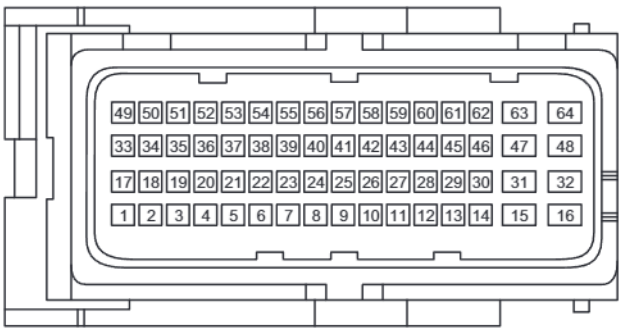
NG → **Replace TCU**

OK

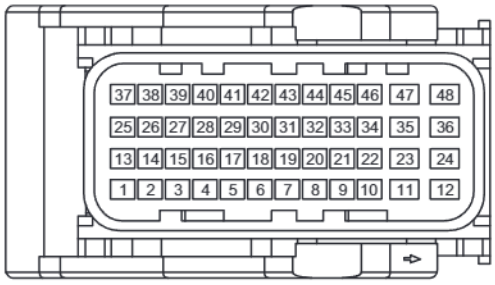
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	U0129-87	Lost Communication With BSM

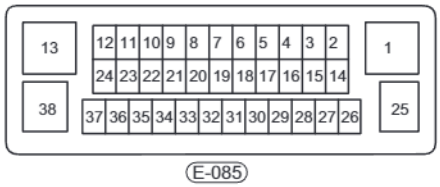




E-033
B



E-035
B



E-085
B

ET21065020

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
U0129-87	Lost Communication With BSM	Ignition switch ON Engine running	• CAN line or connector • ECM • ABS

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK ↓

2	Check ECM connector and ABS connector

a. Disconnect ECM connector E-033.
b. Disconnect ABS connector E-085.
c. Check if connectors are normal.

NG → **Repair or replace connector**

OK ↓

3	Check CAN line

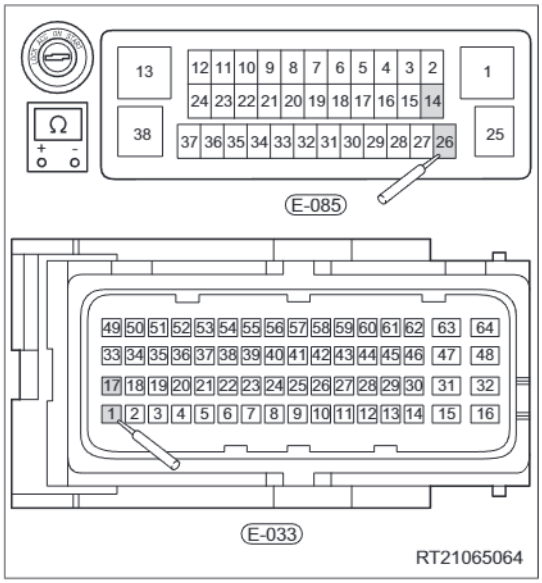
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
E-033 (1) - E-085 (26)	Continuity
E-033 (17) - E-085 (14)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (1) or E-085 (26) - Body ground	No continuity
E-033 (1) or E-085 (26) - Battery positive	No continuity
E-033 (17) or E-085 (14) - Body ground	No continuity
E-033 (17) or E-085 (14) - Battery positive	No continuity



NG → **Repair or replace CAN line**

OK ↓

4	Replace ECM, and check for DTCs

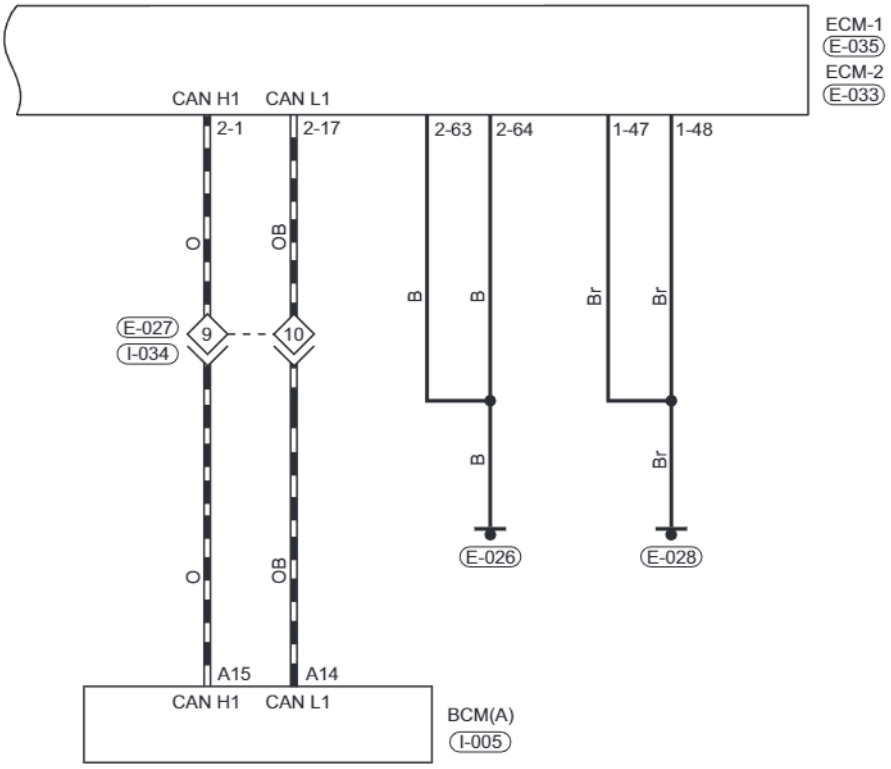
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC U0129-87 still exists.

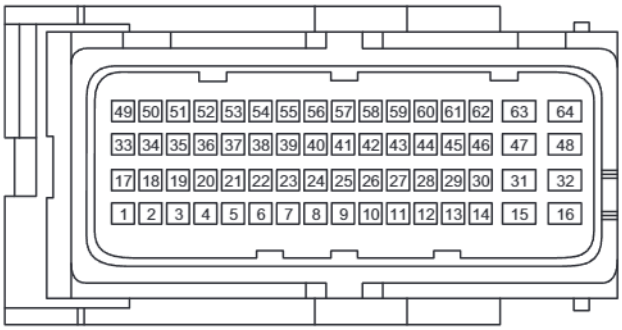
NG → **Replace ABS control module**

OK ↓

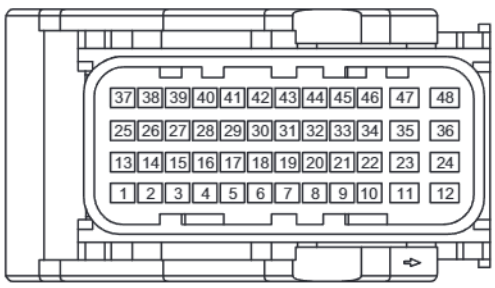
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	U0140-87	Lost Communication With BCM

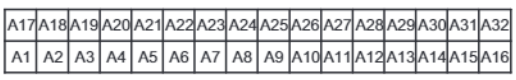




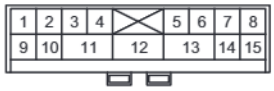
E-033
B



E-035
B



I-005
L



E-027
W

ET21065021

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
U0140-87	Lost Communication With BCM	Ignition switch ON Engine running	• CAN line or connector • ECM • BCM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check ECM connector and BCM connector

a. Disconnect ECM connector E-033.
b. Disconnect BCM connector I-005.
c. Check if connectors are normal.

NG → **Repair or replace connectors**

OK

3	Check CAN line

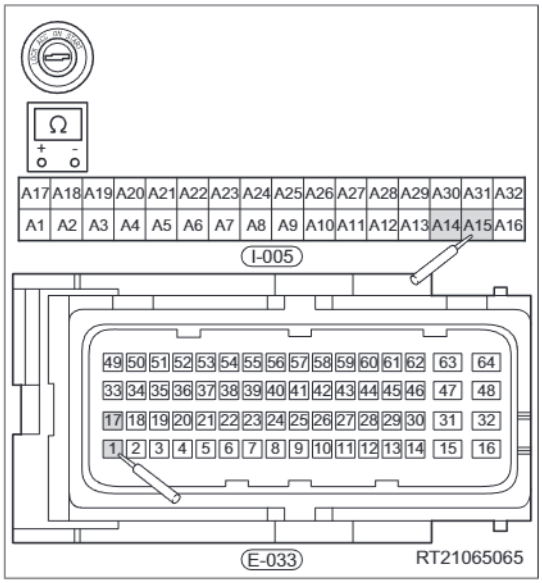
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
E-033 (1) - I-005 (A15)	Continuity
E-033 (17) - I-005 (A14)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (1) or I-005 (A15) - Body ground	No continuity
E-033 (1) or I-005 (A15) - Battery positive	No continuity
E-033 (17) or I-005 (A14) - Body ground	No continuity
E-033 (17) or I-005 (A14) - Battery positive	No continuity



NG → **Repair or replace CAN line**

OK

4	Replace ECM, and check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.

b. Refer to "DTC Confirmation Procedure".

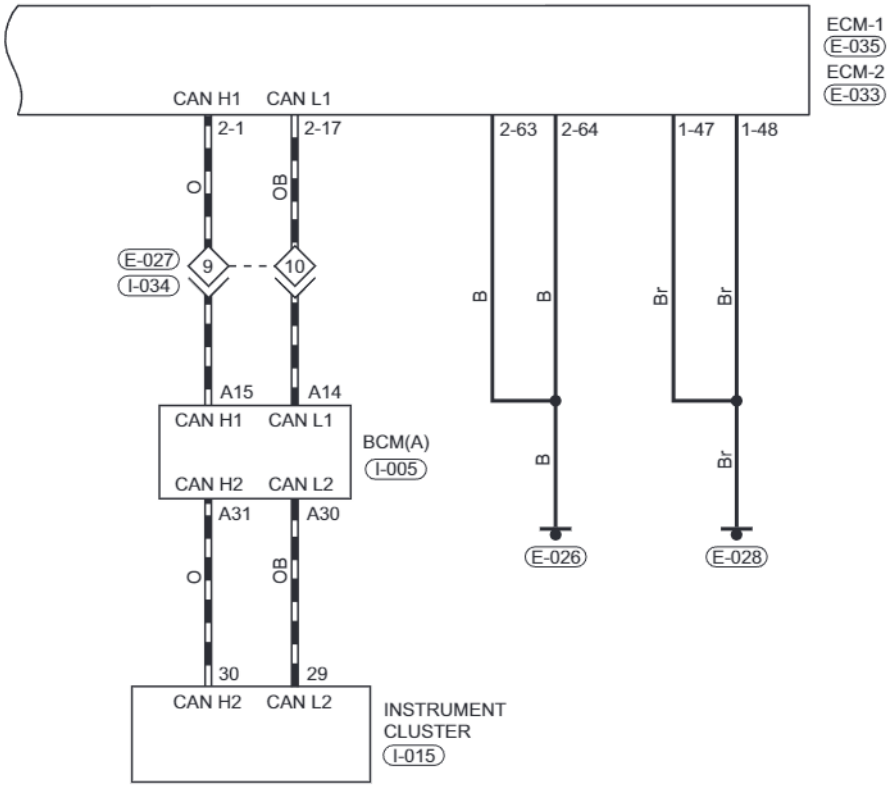
c. Check if DTC U0140-87 still exists.

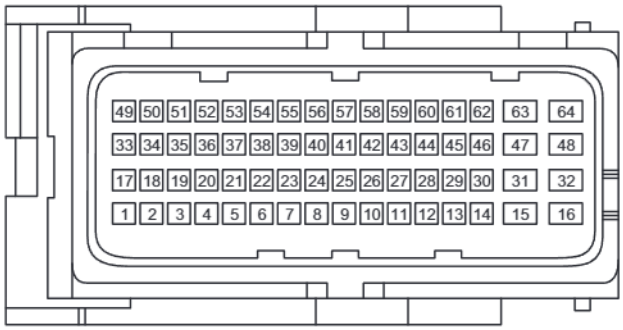
NG → **Replace BCM**

OK

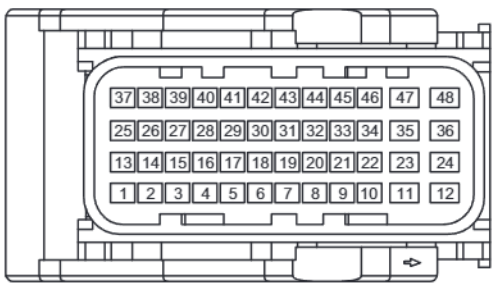
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	U0155-87	Lost Communication With ICM

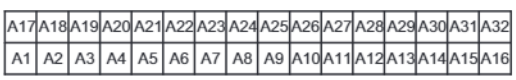




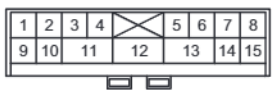
E-033
B



E-035
B



I-005
L



E-027
W



I-015
L

ET21065022

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
U0155-87	Lost Communication With ICM	Ignition switch ON Engine running	• CAN line or connector • ECM • ICM • BCM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → Repair or replace ground wire harness or ground point

OK ↓

2	Check ECM connector, instrument cluster connector and BCM connector

a. Disconnect ECM connector E-033.
b. Disconnect instrument cluster connector I-015.
c. Disconnect BCM connector I-005.
d. Check if connectors are normal.

NG → Repair or replace connectors

OK ↓

3	Check CAN line (ECM - BCM)

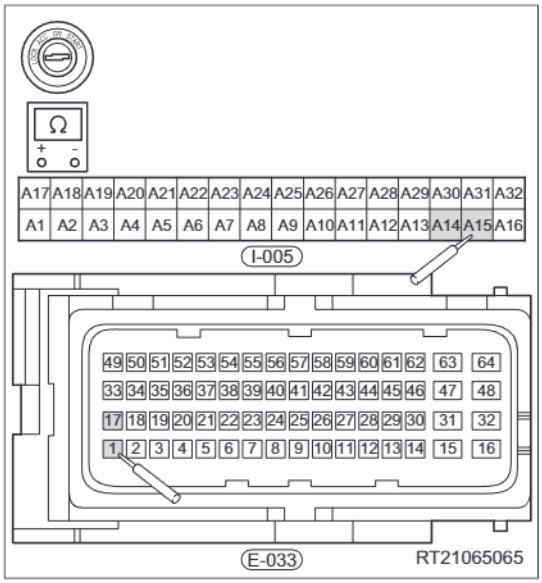
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
E-033 (1) - I-005 (A15)	Continuity
E-033 (17) - I-005 (A14)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (1) or I-005 (A15) - Body ground	No continuity
E-033 (1) or I-005 (A15) - Battery positive	No continuity
E-033 (17) or I-005 (A14) - Body ground	No continuity
E-033 (17) or I-005 (A14) - Battery positive	No continuity



NG → Repair or replace CAN line

OK →

4	Check CAN line (BCM - ICM)

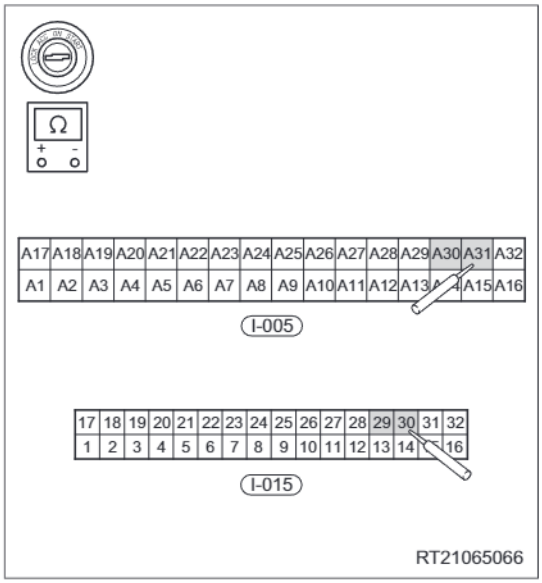
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
I-015 (30) - I-005 (A31)	Continuity
I-015 (29) - I-005 (A30)	Continuity

Check for Short

Multimeter Connection	Specified Condition
I-015 (30) or I-005 (A31) - Body ground	No continuity
I-015 (30) or I-005 (A31) - Battery positive	No continuity
I-015 (29) or I-005 (A30) - Body ground	No continuity
I-015 (29) or I-005 (A30) - Battery positive	No continuity



NG → **Repair or replace CAN line**

OK ↓

5	Replace ECM, and check for DTCs

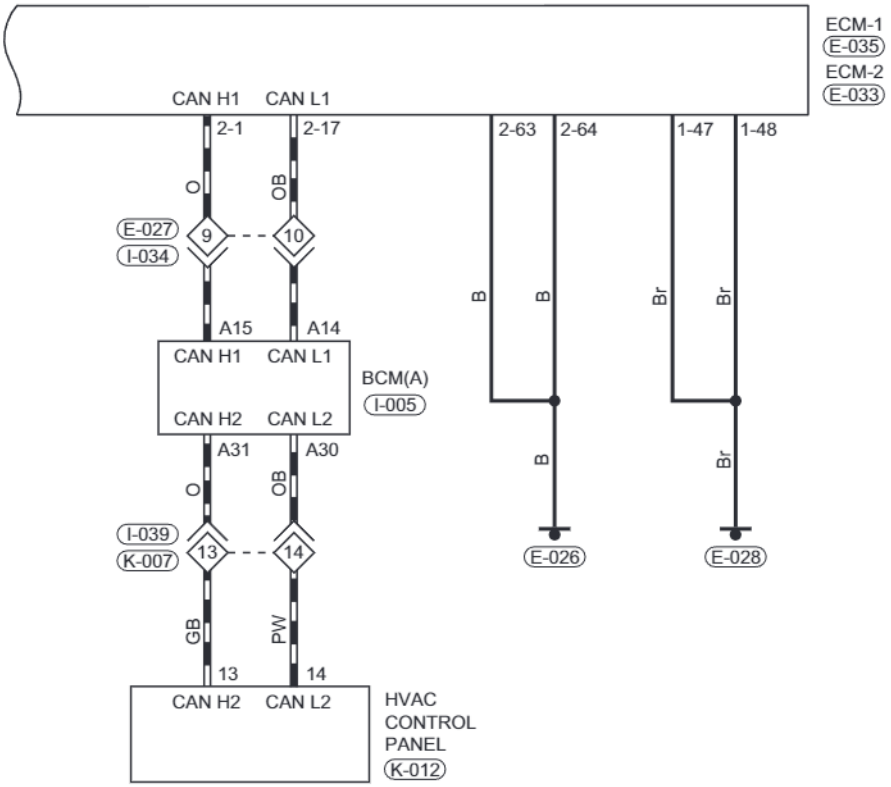
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC U0155-87 still exists.

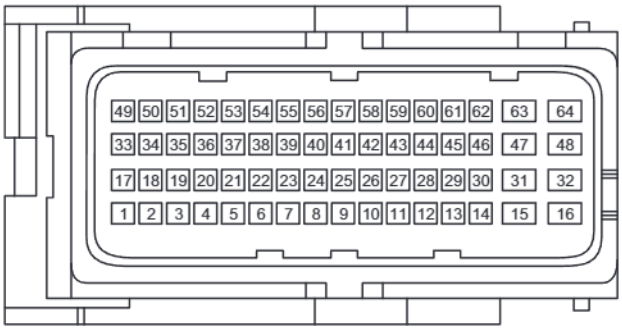
NG → **Check or replace BCM and ICM**

OK ↓

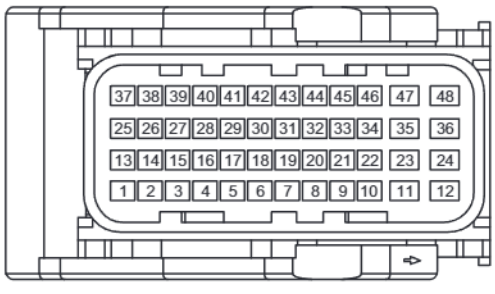
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	U0164-87	Lost Communication With CLM

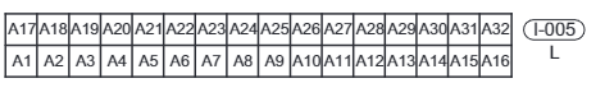




E-033
B



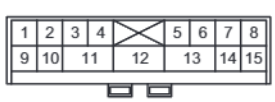
E-035
B



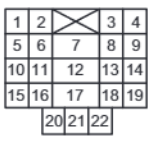
I-005
L



K-012
W



E-027
W



K-007
W

ET21065023

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
U0164-87	Lost Communication With CLM	Ignition switch ON Engine running	• CAN line or connector • ECM • CLM (A/C control module) • BCM

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → Repair or replace ground wire harness or ground point

OK ↓

2	Check ECM connector, A/C control panel connector and BCM connector

a. Disconnect ECM connector E-033.
b. Disconnect A/C control panel connector K-012.
c. Disconnect BCM connector I-005.
d. Check if connectors are normal.

NG → Repair or replace connectors

OK ↓

3	Check CAN line (ECM - BCM)

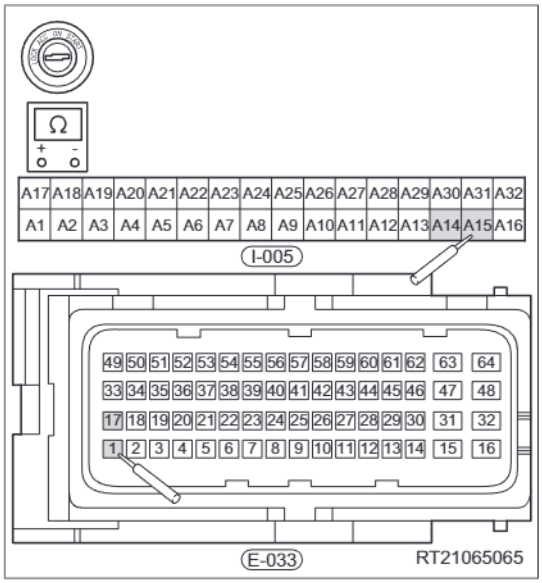
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
E-033 (1) - I-005 (A15)	Continuity
E-033 (17) - I-005 (A14)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (1) or I-005 (A15) - Body ground	No continuity
E-033 (1) or I-005 (A15) - Battery positive	No continuity
E-033 (17) or I-005 (A14) - Body ground	No continuity
E-033 (17) or I-005 (A14) - Battery positive	No continuity



NG → Repair or replace CAN line

OK →

4	Check CAN line (BCM - A/C control panel)

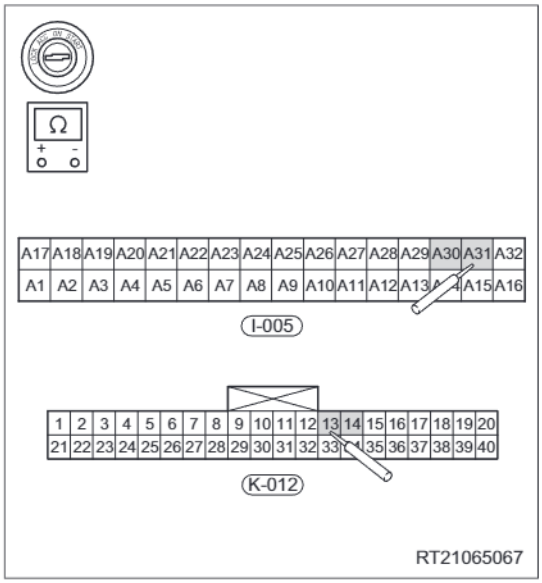
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
K-012 (13) - I-005 (A31)	Continuity
K-012 (14) - I-005 (A30)	Continuity

Check for Short

Multimeter Connection	Specified Condition
K-012 (13) or I-005 (A31) - Body ground	No continuity
K-012 (13) or I-005 (A31) - Battery positive	No continuity
K-012 (14) or I-005 (A30) - Body ground	No continuity
K-012 (14) or I-005 (A30) - Battery positive	No continuity



NG → **Repair or replace CAN line**

OK

5	Replace ECM, and check for DTCs

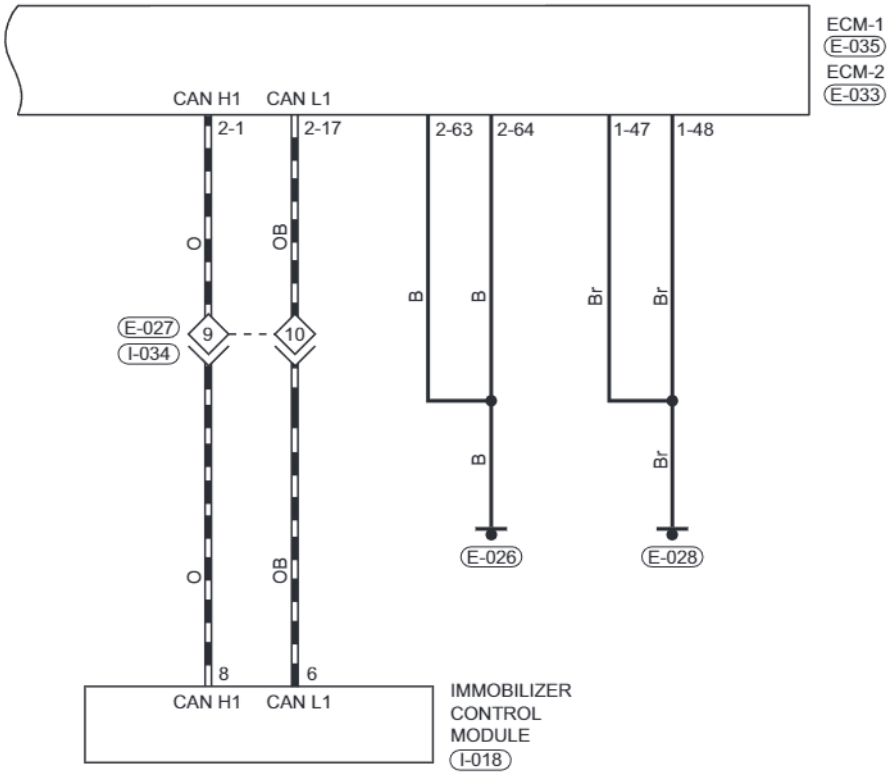
a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC U0164-87 still exists.

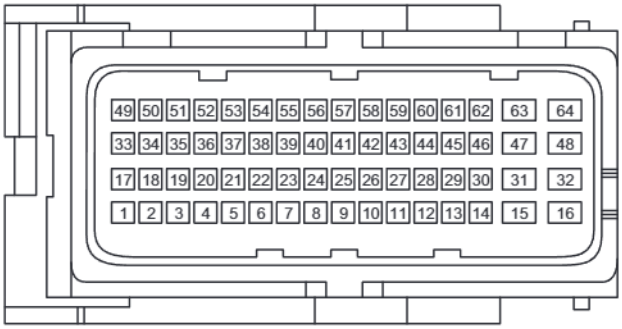
NG → **Check or replace BCM and A/C control panel**

OK

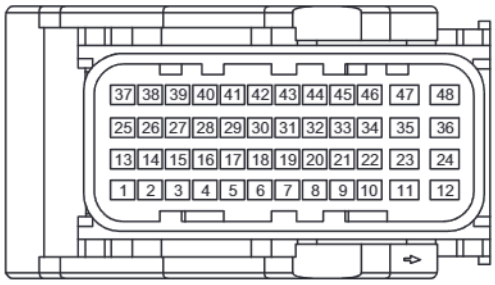
System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	U0167-87	Lost Communication With IMMO

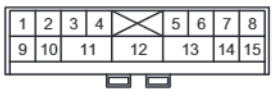




E-033
B



E-035
B



E-027
W



I-018
B

ET21065024

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
U0167-87	Lost Communication With IMMO	Ignition switch ON	• CAN line or connector • ECM • Engine immobilizer module

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

OK

2	Check ECM connector and engine immobilizer module connector

a. Disconnect ECM connector E-033.
b. Disconnect engine immobilizer module connector I-018.
c. Check if connectors are normal.

NG → **Repair or replace connectors**

OK

3	Check CAN line (ECM - engine immobilizer module)

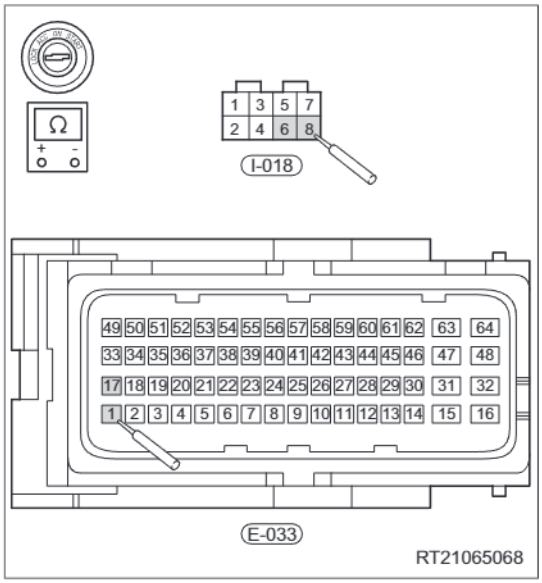
a. Check CAN line.

Check for Open

Multimeter Connection	Specified Condition
E-033 (1) - I-018 (8)	Continuity
E-033 (17) - I-018 (6)	Continuity

Check for Short

Multimeter Connection	Specified Condition
E-033 (1) or I-018 (8) - Body ground	No continuity
E-033 (1) or I-018 (8) - Battery positive	No continuity
E-033 (17) or I-018 (6) - Body ground	No continuity
E-033 (17) or I-018 (6) - Battery positive	No continuity



NG → **Repair or replace CAN line**

OK ↓

4	Replace ECM, and check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC U0167-87 still exists.

NG → **Replace engine immobilizer module**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P000A-00	"A" Camshaft Position Slow Response

DTC	P000B-00	"B" Camshaft Position Slow Response

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P000A-00	"A" Camshaft Position Slow Response	Ignition switch ON Engine running	• Camshaft phaser • VVT control valve • Wire harness or connector • ECM
P000B-00	"B" Camshaft Position Slow Response		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

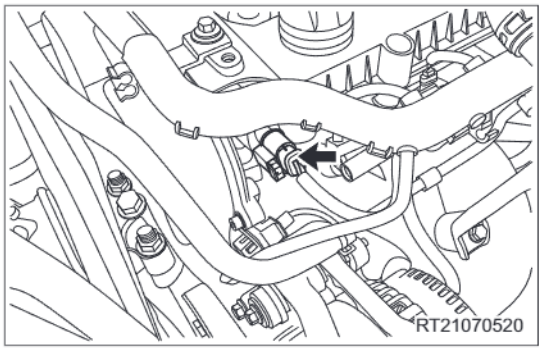
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

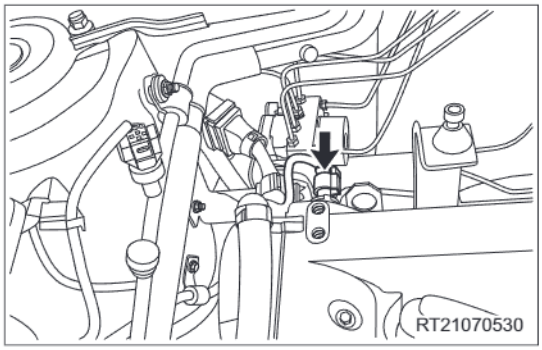
OK

2	Check VVT control valve connector

a. Disconnect intake VVT control valve connector E-006.



b. Disconnect exhaust VVT control valve connector E-008.
c. Check VVT control valve connectors.



NG → **Repair or replace connector**

OK

3	Check intake/exhaust camshaft phaser

a. Check if intake/exhaust camshaft phaser is blocked or stuck.

NG → **Replace intake/exhaust camshaft phaser**

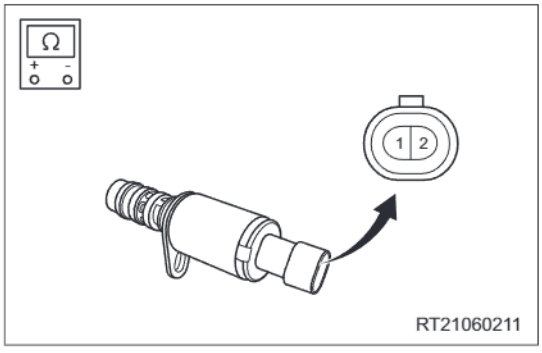
OK

4	Check intake/exhaust VVT control valve

a. Turn ignition switch to LOCK.
b. Remove intake/exhaust VVT control valves.
c. Check intake/exhaust VVT control valves.

Multimeter Connection	Specified Condition
Terminal 1 - Terminal 2	8 Ω

d. When battery voltage is applied between terminals 1 and 2, control valve should move quickly.



NG → **Replace intake/exhaust VVT control valve**

OK

5	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P000A-00 or P000B-00 still exists.

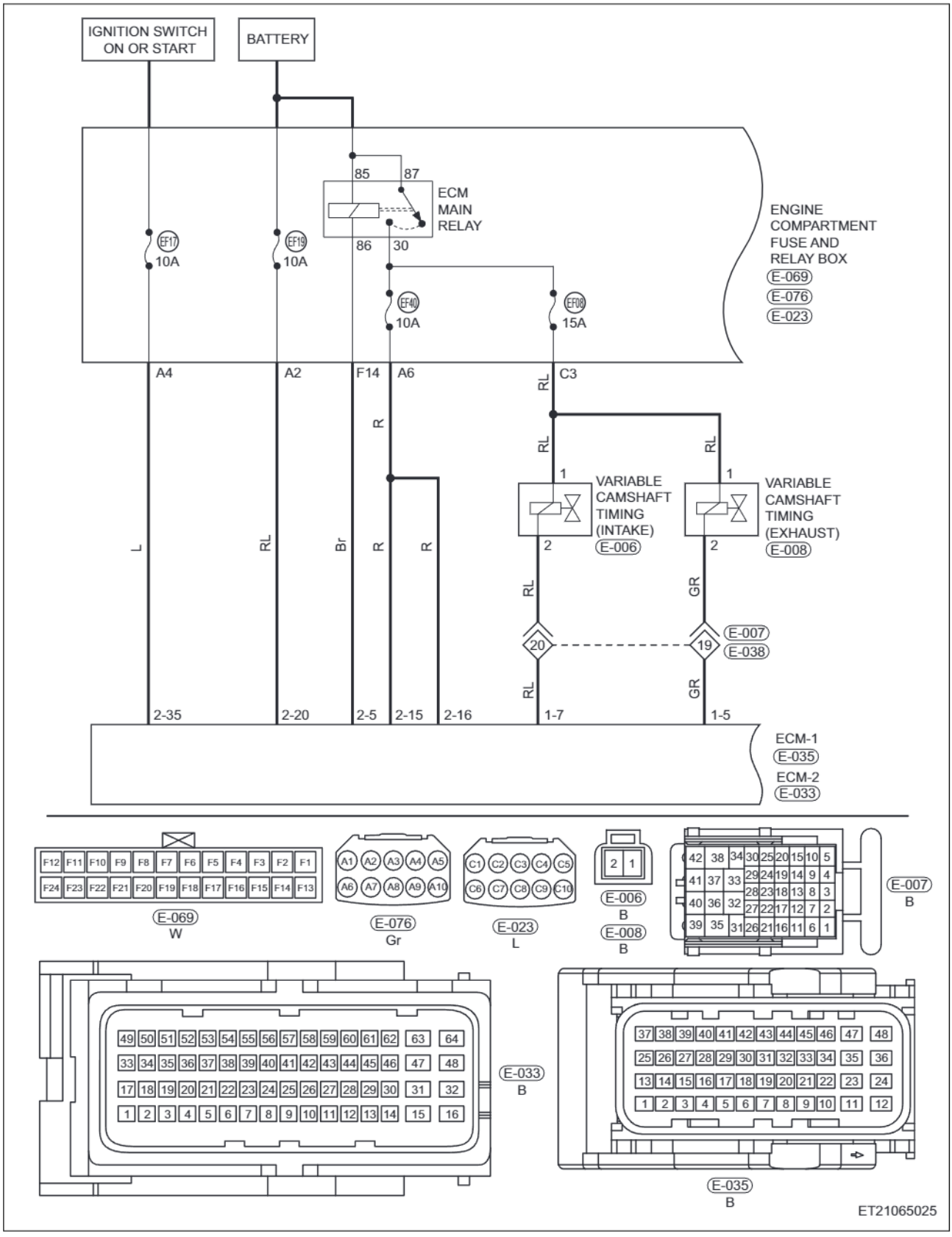
NG → Replace ECM

OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0010-00	"A" Camshaft Position Actuator Circuit/Open

DTC	P0013-00	"B" Camshaft Position Actuator Circuit/Open



DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0010-00	"A" Camshaft Position Actuator Circuit/Open	Ignition switch ON Engine running	• VVT control valve • Wire harness or connector • ECM
P0013-00	"B" Camshaft Position Actuator Circuit/Open		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

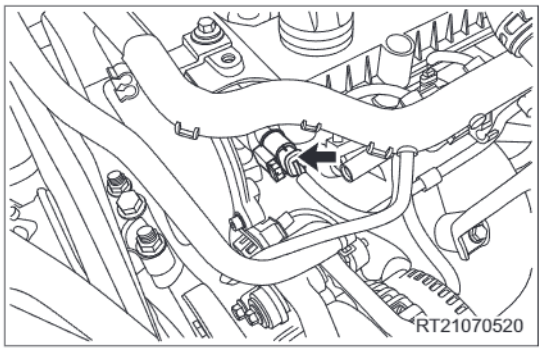
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

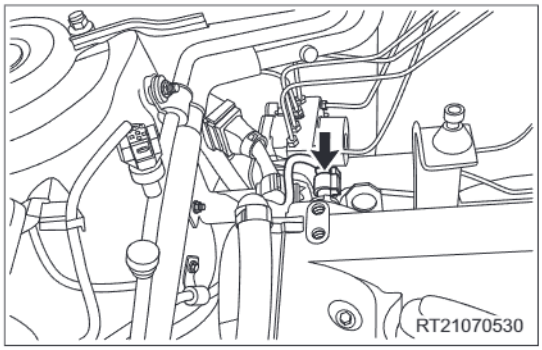
OK

2	Check VVT control valve connector

a. Disconnect intake VVT control valve connector E-006.



b. Disconnect exhaust VVT control valve connector E-008.
c. Check VVT control valve connectors.



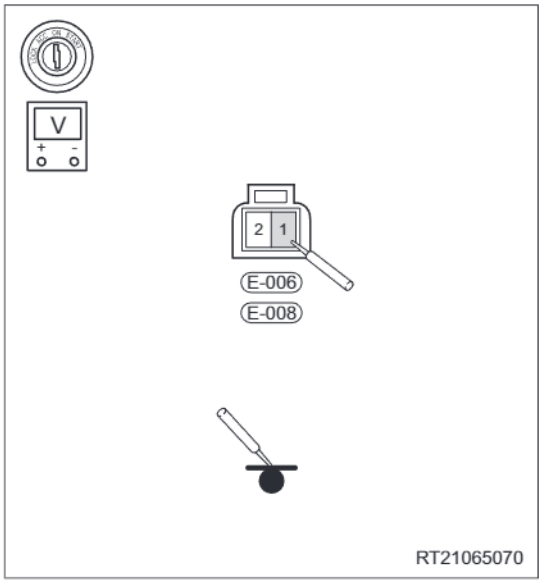
NG → Repair or replace connector

OK

3	Check VVT control valve power supply voltage

a. Turn ignition switch to ON.
b. Check voltage between connector terminals and body ground.

Multimeter Connection	Condition	Specified Condition
E-006 (1) - Body ground	Ignition switch ON	11 to 14 V
E-008 (1) - Body ground		

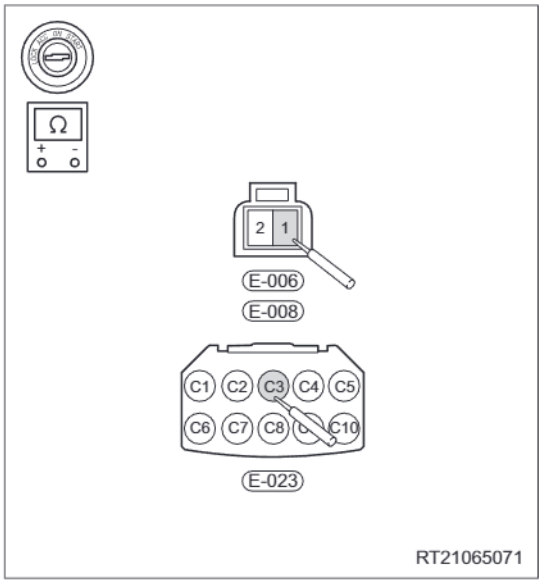


OK → Go to step 5

NG

4	Check VVT control valve power supply circuit and fuse EF08

a. Turn ignition switch to LOCK.
b. Check if fuse EF08 is normal.
c. Disconnect engine compartment fuse and relay box connector E-023.
d. Check wire harness between connector terminals.



Check for Open

Multimeter Connection	Condition	Specified Condition
E-006 (1) - E-023 (C3)	Always	Continuity
E-008 (1) - E-023 (C3)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-006 (1), E-008 (1) or E-023 (C3) - Body ground	Always	No continuity
E-006 (1), E-008 (1) or E-023 (C3) - Battery positive	Always	No continuity

NG → **Repair or replace wire harness or connector (VVT control valve - engine compartment fuse and relay box)**

OK →

5	Check VVT control valve control circuit

a. Disconnect ECM connector E-035.

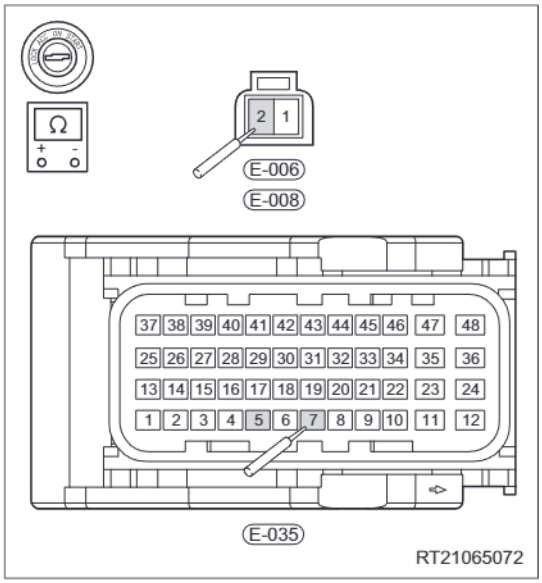
b. Check wire harness between connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-006 (2) - E-035 (7)	Always	Continuity
E-008 (2) - E-035 (5)		

Check for Short

Multimeter Connection	Condition	Specified Condition
E-006 (2) or E-035 (7) - Body ground	Always	No continuity
E-006 (2) or E-035 (7) - Battery positive	Always	No continuity
E-008 (2) or E-035 (5) - Body ground	Always	No continuity
E-008 (2) or E-035 (5) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (VVT control valve - ECM)**

OK

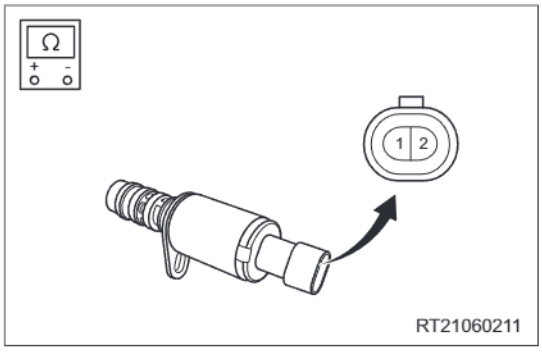
6	Check intake/exhaust VVT control valve

a. Remove intake/exhaust VVT control valves.

b. Check intake/exhaust VVT control valves.

Multimeter Connection	Specified Condition
Terminal 1 - Terminal 2	8 Ω

c. When battery voltage is applied between terminals 1 and 2, control valve should move quickly.



NG → **Replace intake/exhaust VVT control valve**

OK

7	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0010-00 or P0013-00 still exists.

NG → **Replace ECM**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0012-00	"A" Camshaft Position - Timing Over-Retarded

DTC	P0015-00	"B" Camshaft Position - Timing Over-Retarded

DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0012-00	"A" Camshaft Position - Timing Over-Retarded	Ignition switch ON Engine running	• Camshaft phaser • Wire harness or connector • ECM
P0015-00	"B" Camshaft Position - Timing Over-Retarded		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Start the engine and warm it up to normal operating temperature, and then select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

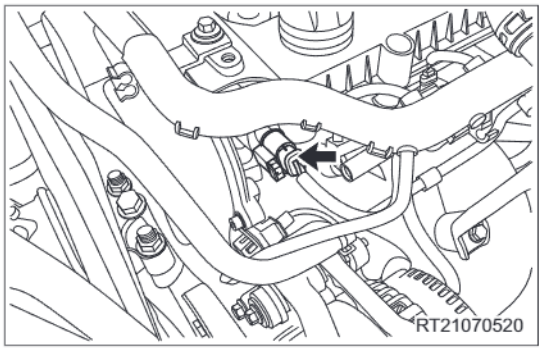
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → **Repair or replace ground wire harness or ground point**

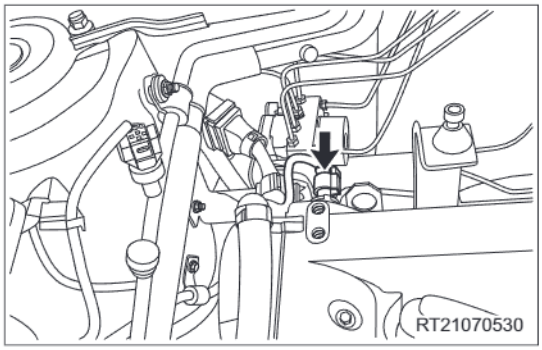
OK

2	Check VVT control valve connector

a. Disconnect intake VVT control valve connector E-006.



b. Disconnect exhaust VVT control valve connector E-008.
c. Check VVT control valve connectors.



NG → **Repair or replace connector**

OK

3	Check intake/exhaust camshaft phaser

a. Check if intake/exhaust camshaft phaser is blocked or stuck.

NG → **Replace intake/exhaust camshaft phaser**

OK

4	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0012-00 or P0015-00 still exists.

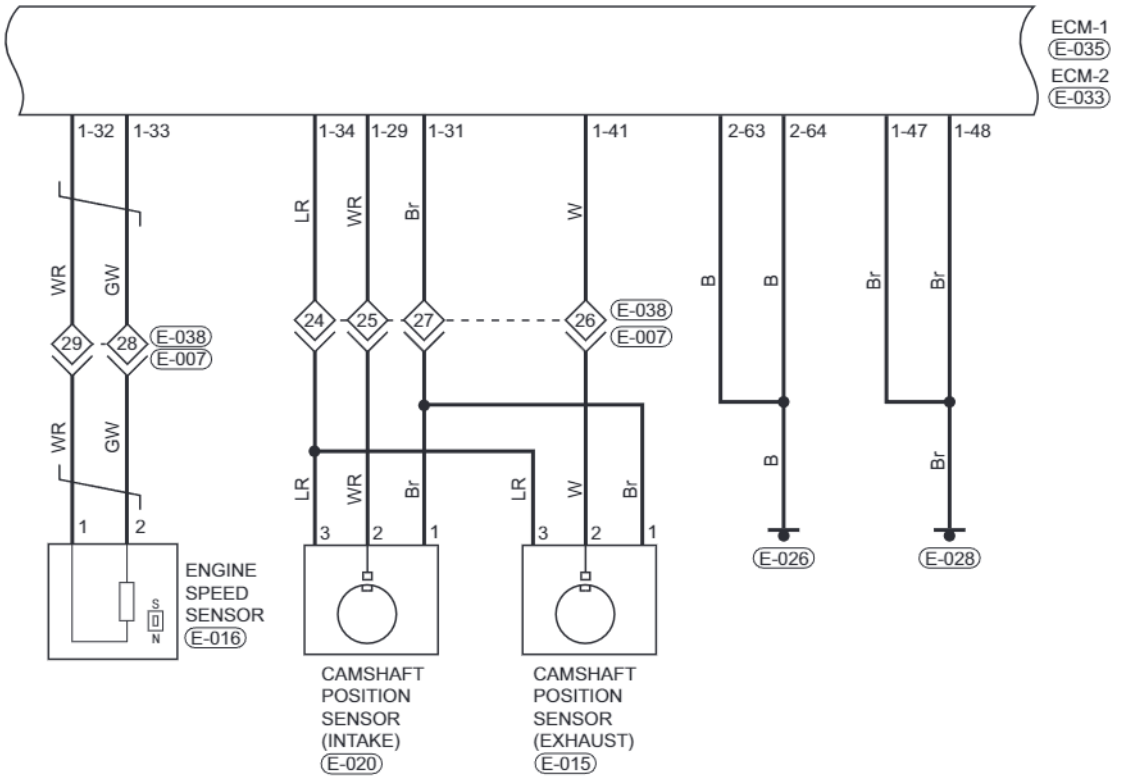
NG → **Replace ECM**

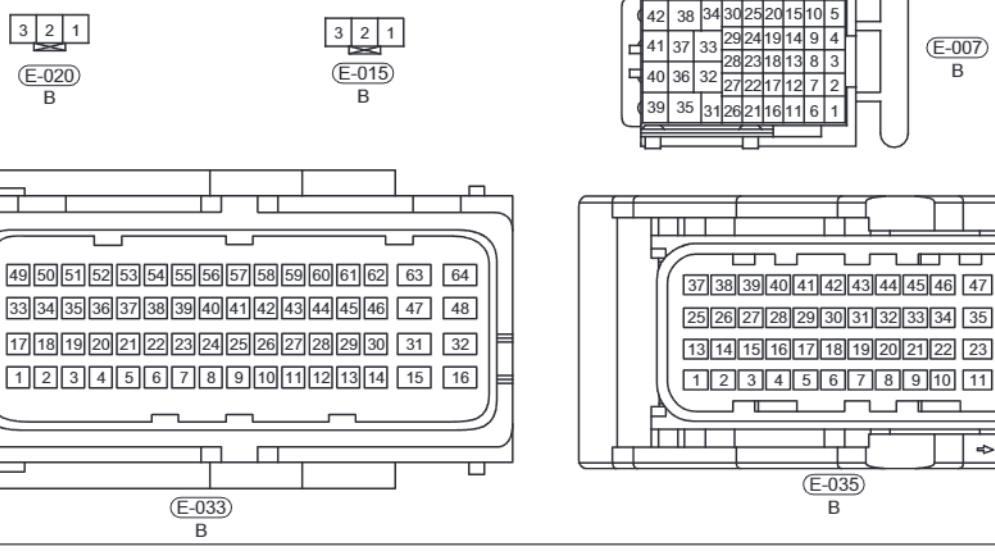
OK

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

DTC	P0016-00	Crankshaft Position-Camshaft Position Correlation Bank 1 Sensor A

DTC	P0018-00	Crankshaft Position-Camshaft Position Correlation Bank 2 Sensor A





DTC Code	DTC Definition	DTC Detection Condition	Possible Cause
P0016-00	Crankshaft Position-Camshaft Position Correlation Bank 1 Sensor A	Ignition switch ON Engine running	• Camshaft position sensor • Crankshaft position sensor • Wire harness or connector • Flywheel gear ring • Camshaft gear ring • ECM
P0018-00	Crankshaft Position-Camshaft Position Correlation Bank 2 Sensor A		

DTC Confirmation Procedure

Confirm that battery voltage is over 12 V before performing the following procedures.

- Turn ignition switch to LOCK.
- Connect X-431 3G diagnostic tester (the latest software) to Data Link Connector (DLC).
- Turn ignition switch to ON.
- Use X-431 3G diagnostic tester to record and clear the DTCs stored in the ECM.
- Select Read Code.
- If the DTC is detected, the malfunction indicated by the DTC is current. Go to the diagnosis procedure - Step 1.
- If DTC is not detected, the malfunction indicated by the DTC is intermittent (See page 06-18).

CAUTION

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

Diagnosis Procedure

1	Check ECM ground point

a. Turn ignition switch to LOCK.

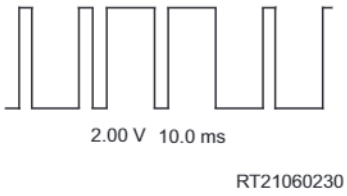
b. Check ECM grounds E-026 and E-028 (See page 06-18).

NG → Repair or replace ground wire harness or ground point

OK

2	Check camshaft position sensor signal waveform

a. Turn ignition switch to ON, start the engine and observe the signal waveform of camshaft position sensor with an oscilloscope.

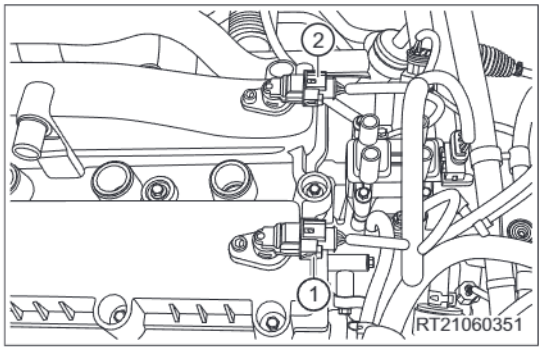
	Normal Waveform
Oscilloscope	

OK → Go to step 8

NG

3	Check camshaft position sensor connector

a. Disconnect intake camshaft position sensor connector E-020 (1).
b. Disconnect exhaust camshaft position sensor connector E-015 (2).
c. Check camshaft position sensor connectors.



NG → Repair or replace connector

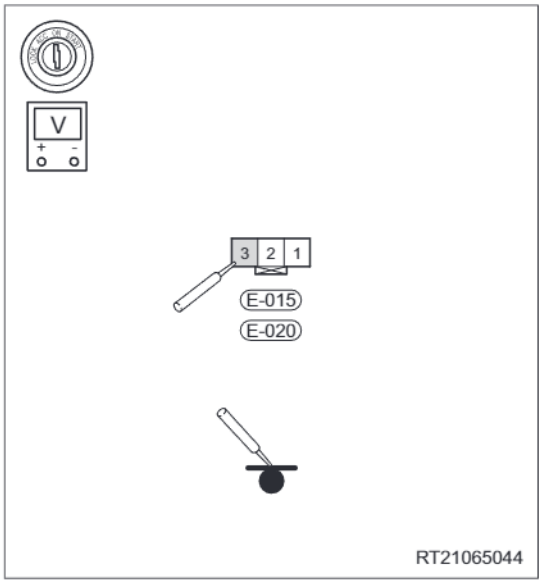
OK

4	Check camshaft position sensor power supply voltage

a. Turn ignition switch to ON.

b. Check voltage between terminal 3 of camshaft position sensor connector E-020 or E-015 and body ground.

Multimeter Connection	Condition	Specified Condition
E-020 (3) or E-015 (3) - Body ground	Ignition switch ON	5 V



OK → **Go to step 6**

NG

5	Check camshaft position sensor power supply circuit

a. Turn ignition switch to LOCK.

b. Disconnect ECM connector E-035.

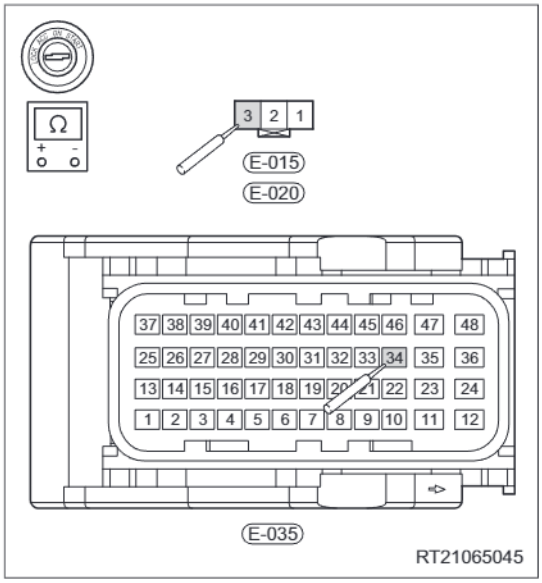
c. Check wire harness between camshaft position sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (3) - E-035 (34)	Always	Continuity
E-015 (3) - E-035 (34)	Always	Continuity

Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (3), E-015 (3) or E-035 (34) - Body ground	Always	No continuity
E-020 (3), E-015 (3) or E-035 (34) - Battery positive	Always	No continuity



NG → **Repair or replace wire harness or connector (camshaft position sensor - ECM)**

OK

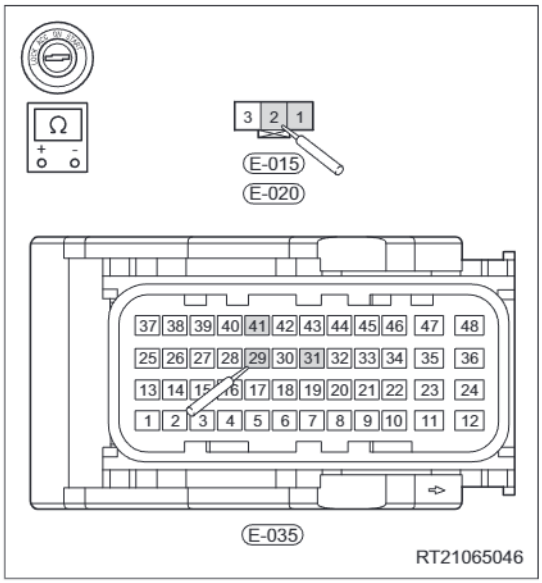
Replace ECM

6	Check camshaft position sensor signal circuit and ground circuit

a. Check wire harness between camshaft position sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-020 (2) - E-035 (29)	Always	Continuity
E-015 (2) - E-035 (41)		
E-020 (1), E-015 (1) - E-035 (31)		



Check for Short

Multimeter Connection	Condition	Specified Condition
E-020 (2) or E-035 (29) - Body ground	Always	No continuity
E-020 (2) or E-035 (29) - Battery positive		
E-015 (2) or E-035 (41) - Body ground		
E-015 (2) or E-035 (41) - Battery positive		
E-020 (1), E-015 (1) or E-035 (31) - Body ground		
E-020 (1), E-015 (1) or E-035 (31) - Battery positive		

NG → **Replace wire harness or connector (camshaft position sensor - ECM)**

OK

7	Check camshaft position sensor

a. Remove camshaft position sensor.
b. Check and clean camshaft position sensor and installation area, and check for damage, foreign matter and excessive movement, etc. that cause signal incorrectness.

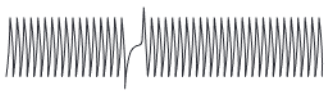
NG → **Clean installation area or replace camshaft position sensor**

OK ↓

Replace ECM

8	Check engine speed sensor signal waveform

a. Turn ignition switch to ON, start the engine and observe the signal waveform of engine speed sensor with an oscilloscope.

	Normal Waveform of Engine Speed Senor Signal
Oscilloscope	 RT21060200

OK → **Go to step 15**

NG ↓

9	Check engine speed sensor connector

a. Turn ignition switch to LOCK.
b. Disconnect engine speed sensor connector E-016.
c. Check engine speed sensor connector.

NG → **Repair or replace engine speed sensor connector**

OK ↓

10	Check installation of engine speed sensor

a. Remove engine speed sensor.

b. Check and clean engine speed sensor and installation area, and check for damage, foreign matter or excessive movement, etc. that cause signal incorrectness.

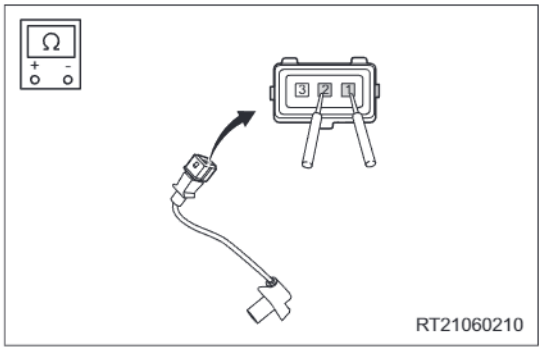
NG → Clean or replace engine speed sensor

OK

11	Check resistance of engine speed sensor

a. Check resistance between engine speed sensor terminals 1 and 2.
Normal resistance: 860 Ω ± 20% (at normal temperature)

NG → Replace engine speed sensor



OK

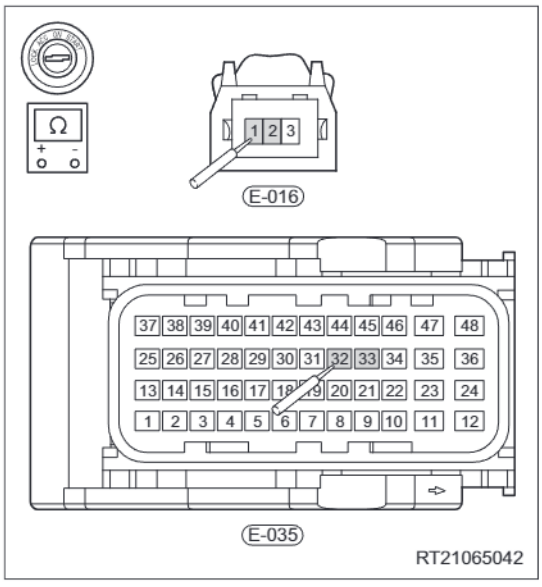
12	Check engine speed sensor circuit

a. Disconnect ECM connector E-035.

b. Check wire harness between engine speed sensor connector terminals and ECM connector terminals.

Check for Open

Multimeter Connection	Condition	Specified Condition
E-016 (1) - E-035 (32)	Always	Continuity
E-016 (2) - E-035 (33)		



Check for Short

Multimeter Connection	Condition	Specified Condition
E-016 (1) or E-035 (32) - Body ground	Always	No continuity
E-016 (1) or E-035 (32) - Battery positive		
E-016 (2) or E-035 (33) - Body ground		
E-016 (2) or E-035 (33) - Battery positive		

NG → **Replace wire harness or connector (engine speed sensor - ECM)**

OK ↓

13	Check crankshaft and flywheel gear ring

a. Rotate crankshaft, and check crankshaft and flywheel gear ring for damage, foreign matter, etc. that cause signal incorrectness.

NG → **Clear off debris and clean flywheel gear ring. Replace flywheel if necessary (See page 07-42)**

OK ↓

14	Check engine timing

a. Check for timing deviation.

NG → **Correct engine timing**

OK ↓

15	Check for DTCs

a. Use X-431 3G diagnostic tester to read the ECM DTC.
b. Refer to "DTC Confirmation Procedure".
c. Check if DTC P0016-00 or P0018-00 still exists.

NG → **Replace ECM**

OK ↓

System is operating normally.
Reassemble vehicle and perform a road test to confirm that malfunction reported by customer has been repaired.

Engine Problem Symptom Diagnosis

Perform primary inspection first before performing malfunction diagnosis procedures:

1. Confirm that engine malfunction indicator operates normally;
2. Using diagnostic tester, check that no error messages are recorded;
3. Confirm that malfunction complained by customer is present, and confirm the condition under which the malfunction occurs.

Then, perform appearance inspection:

1. Check fuel line for leakage;
2. Check if vacuum line is broken or twisted, and if connection is correct;
3. Check intake line for blockage, air leakage, crush or damage;
4. Check if high-voltage cable of ignition system is broken or deteriorated, and if ignition sequence is correct;
5. Check if wire harness ground points are clean and secure;
6. Check each sensor or actuator connector for looseness or poor contact.

HINT:
If above conditions exist, repair the trouble areas first. Otherwise, it will affect the repair work for the following trouble diagnosis.

Diagnostic Help

1. Confirm that there are no trouble records for engine;
2. Confirm that complained trouble symptoms are present;
3. There are no abnormal conditions after performing the inspection according to above procedures;
4. During servicing, do not ignore vehicle maintenance condition, cylinder pressure, mechanical ignition timing and fuel condition, etc. that can affect the system;
5. Replace ECM, and perform a test. If the trouble can be eliminated, the trouble area is in ECM; if the trouble symptom still exists, reuse the original ECM, repeat the procedures, and perform service again.

Problem Symptoms Table

Symptom	Suspected Area	See page
Engine does not crank or cranks slowly while starting	Battery	06-212
	Starter motor	
	Wire harness or ignition switch	
	Engine mechanical	
Engine cranks normally but cannot start successfully while starting	No fuel in tank	06-214
	Fuel pump	
	Engine speed sensor	
	Ignition coil	
	Engine mechanical	
Difficult to start with hot engine	Water in fuel	06-216
	Fuel pump	
	Coolant temperature sensor	
	Fuel pressure regulator	
	Ignition coil	

Symptom	Suspected Area	See page
Difficult to start with cold engine	Water in fuel	06-218
	Fuel pump	
	Coolant temperature sensor	
	Injector	
	Ignition coil	
	Throttle	
	Engine mechanical	
Engine speed is normal, but it is difficult to start at anytime	Water in fuel	06-220
	Fuel pump	
	Coolant temperature sensor	
	Injector	
	Ignition coil	
	Throttle	
	Intake pipe	
	Ignition timing	
	Spark plug	
	Engine mechanical	
Engine starts normally, but idles roughly at anytime	Water in fuel	06-223
	Injector	
	Spark plug	
	Throttle	
	Intake pipe	
	Ignition timing	
	Engine mechanical	
Engine starts normally, but idles roughly during warming up	Water in fuel	06-225
	Coolant temperature sensor	
	Spark plug	
	Throttle	
	Intake pipe	
	Engine mechanical	
Engine starts normally, but idles roughly after warming up	Water in fuel	06-227
	Coolant temperature sensor	
	Spark plug	
	Throttle body	
	Intake pipe	
	Engine mechanical	

Symptom	Suspected Area	See page
Engine starts normally, but idles roughly or stalls with part load (for example, A/C is ON)	Air conditioning system	06-229
	Injector	
Engine starts normally, but idle speed is too high	Throttle	06-231
	Vacuum pipe	
	Coolant temperature sensor	
	Ignition timing	
Low engine speed or stalls when accelerating	Water in fuel	06-233
	Air flow meter and throttle position sensor	
	Spark plug	
	Throttle	
	Intake pipe	
	Injector	
	Ignition timing	
	Exhaust pipe	
Slow response when accelerating	Water in fuel	06-236
	Air flow meter and throttle position sensor	
	Spark plug	
	Throttle inlet pipe	
	Injector	
	Ignition timing	
	Exhaust pipe	
Lack of power and poor performance when accelerating	Water in fuel	06-239
	Air flow meter and throttle position sensor	
	Spark plug	
	Ignition coil	
	Throttle	
	Intake pipe	
	Injector	
	Ignition timing	
	Exhaust pipe	

Engine does not crank or cranks slowly while starting

Diagnosis Procedure

1	Check voltage between two battery posts when engine starts

OK: Voltage is 8 to 12 V.

NG → Replace battery

OK ↓

2	Check voltage of positive post of starter motor

a. The ignition switch remains in START position and check voltage of positive post of starter motor.
OK: Voltage is 8 to 12 V.

NG → Repair or replace wire harness

OK ↓

3	Check operation of starter motor

a. Remove starter motor.
b. Check if there is an open circuit or if it is stuck due to poor lubrication.

NG → Repair or replace starter

OK ↓

4	Check engine lubricant and gear oil

a. If malfunction only occurs in winter, Check if starter motor resistance is too strong because of improper engine lubricant and gear oil selection.

NG → Replace lubricant with appropriate number

OK ↓

5	Check engine internal mechanical resistance

a. Check if engine internal mechanical resistance is too strong, causing starter motor not to run or run slowly.

NG → Check and repair engine internal resistance

OK

Go to Diagnostic Help

Engine cranks normally but cannot start successfully while starting

Diagnosis Procedure

1	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → **Repair or replace fuel system**

OK ↓

2	Using diagnostic tester, observe if any speed signal is output

a. Connect diagnostic tester, start the engine and select Read Datastream.

b. Observe if any speed signal is output.

NG → **Check and repair crankshaft position sensor wire harness**

OK ↓

3	Check spark

a. Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start the engine, and check if spark is generated.

OK: Spark is generated.

NG → **Check and repair ignition system**

OK ↓

4	Check pressure of cylinder

a. Measure compression of misfiring cylinder (See page 07-20).

NG → **Check engine to confirm cause of low compression**

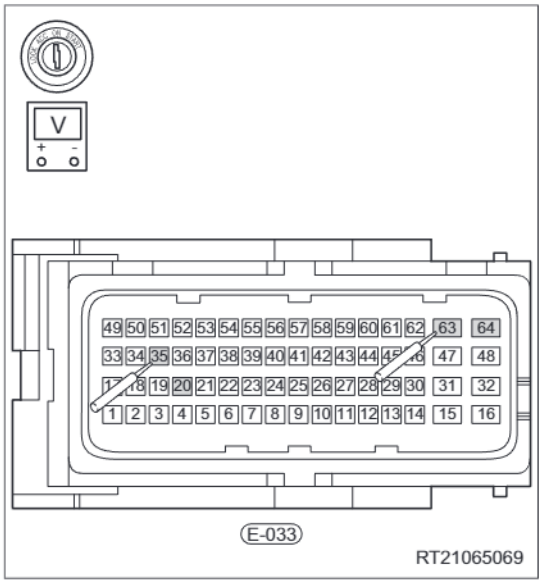
OK ↓

5	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



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

OK

Go to Diagnostic Help

Difficult to start with hot engine

Diagnosis Procedure

1	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → Repair or replace fuel system

OK ↓

2	Check spark

a. Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start the engine, and check if spark is generated.

OK: Spark is generated.

NG → Check and repair ignition system

OK ↓

3	Disconnect coolant temperature sensor connector, start engine and observe if engine starts successfully at this time

OK → Check and repair wire harness or replace sensor

NG ↓

4	Check fuel pressure regulator

NG → Replace fuel pressure regulator

OK ↓

5	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → **Replace fuel**

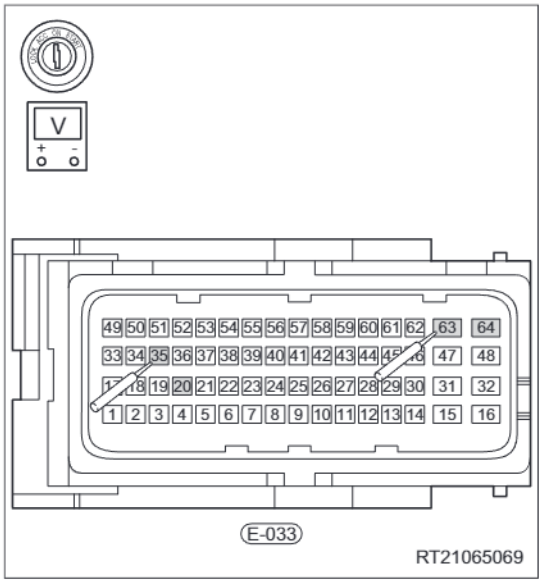
OK

6	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



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

OK

Go to Diagnostic Help

Difficult to start with cold engine

Diagnosis Procedure

1	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → **Repair or replace fuel system**

OK ↓

2	Check spark

a. Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start the engine, and check if spark is generated.

OK: Spark is generated.

NG → **Check and repair ignition system**

OK ↓

3	Disconnect coolant temperature sensor connector, start engine and observe if engine starts successfully at this time

OK → **Check and repair wire harness or replace sensor**

NG ↓

4	Depress accelerator pedal slightly, and observe if it is easy to start

OK → **Clean throttle**

NG ↓

5	Check injector for leakage or blockage

NG → Clean or replace injector

OK ↓

6	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK ↓

7	Check pressure of cylinder

a. Measure compression of misfiring cylinder (See page 07-20).

NG → Check engine to confirm cause of low compression

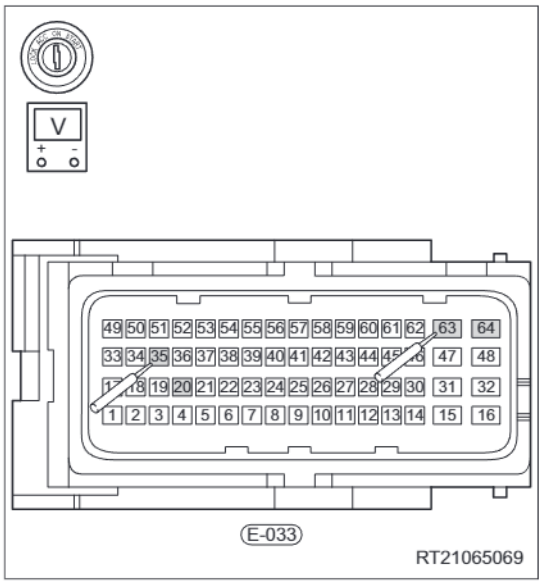
OK ↓

8	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



NG → Repair or replace related wire harness

OK ↓

Go to Diagnostic Help

Engine speed is normal, but it is difficult to start at anytime

Diagnosis Procedure

1	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

2	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → Repair or replace fuel system

OK ↓

3	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

4	Check spark

a. Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start the engine, and check if spark is generated.

OK: Spark is generated.

NG → Check and repair ignition system

OK ↓

5	Disconnect coolant temperature sensor connector, start engine and observe if engine starts successfully at this time

OK → Check and repair wire harness or replace sensor

NG ↓

6	Depress accelerator pedal slightly, and observe if it is easy to start

OK → Clean throttle

NG ↓

7	Check injector for leakage or blockage

NG → Clean or replace injector

OK ↓

8	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK ↓

9	Check pressure of cylinder

a. Measure compression of misfiring cylinder (See page 07-20).

NG → Check engine to confirm cause of low compression

OK ↓

10	Check engine ignition sequence and ignition timing

a. Check if engine ignition sequence and ignition timing are as specified.

NG → Check and repair ignition timing

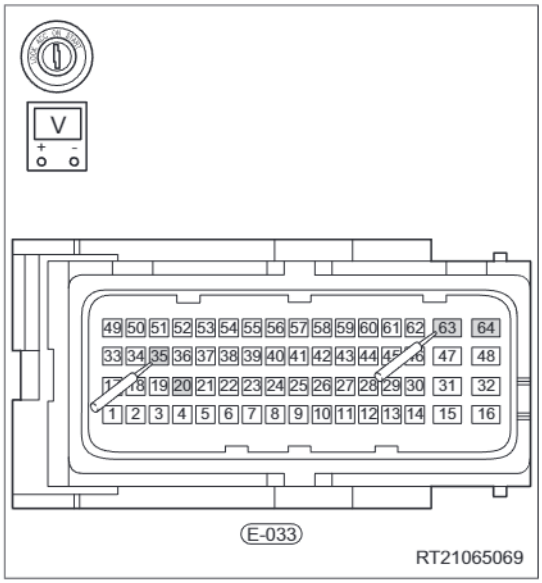
OK ↓

11	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



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

OK

Go to Diagnostic Help

Engine starts normally, but idles roughly at anytime

Diagnosis Procedure

1	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

2	Check if throttle is stuck

NG → Repair or replace throttle

OK ↓

3	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

4	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

5	Check injector for leakage or blockage

NG → Clean or replace injector

OK ↓

6	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK ↓

7	Check pressure of cylinder

a. Measure compression of misfiring cylinder (See page 07-20).

NG → Check engine to confirm cause of low compression

OK ↓

8	Check engine ignition sequence and ignition timing

a. Check if engine ignition sequence and ignition timing are as specified.

NG → Check and repair ignition timing

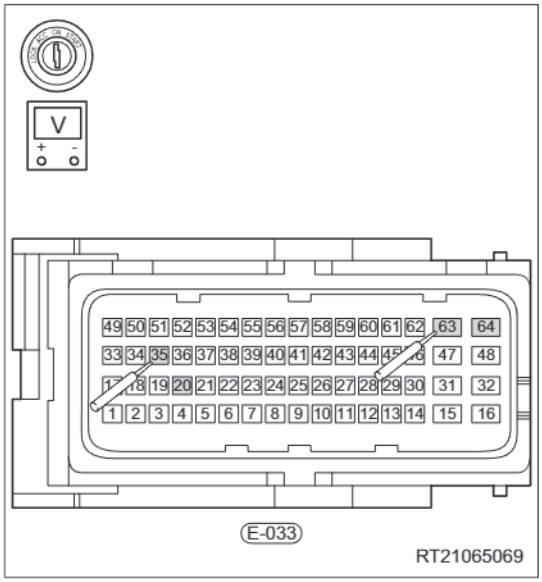
OK ↓

9	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



NG → Repair or replace related wire harness

OK ↓

Go to Diagnostic Help

Engine starts normally, but idles roughly during warming up

Diagnosis Procedure

1	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

2	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

3	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

4	Unplug coolant temperature sensor connector, start engine and observe if engine idles normally during warming up

OK → Check and repair wire harness or replace sensor

NG ↓

5	Check injector for leakage or blockage

NG → Clean or replace injector

OK ↓

6	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK

7	Check pressure of cylinder

a. Measure compression of misfiring cylinder (See page 07-20).

NG → Check engine to confirm cause of low compression

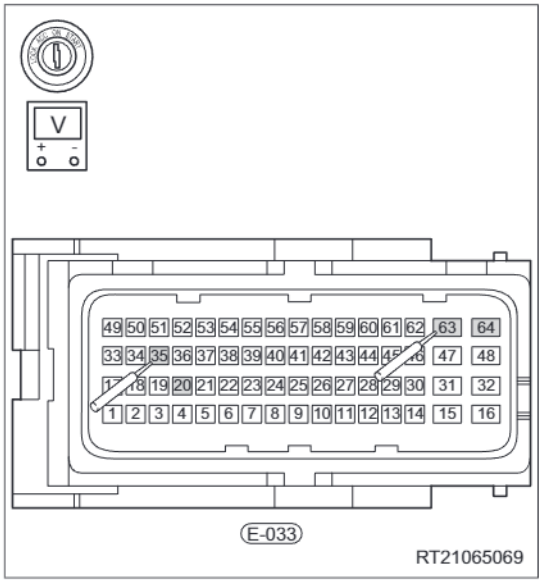
OK

8	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



NG → Repair or replace related wire harness

OK

Go to Diagnostic Help

Engine starts normally, but idles roughly after warming up

Diagnosis Procedure

1	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

2	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

3	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

4	Unplug coolant temperature sensor connector, start engine and observe if engine idles normally during warming up

OK → Check and repair wire harness or replace sensor

NG ↓

5	Check injector for leakage or blockage

NG → Clean or replace injector

OK ↓

6	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK

7	Check pressure of cylinder

a. Measure compression of misfiring cylinder (See page 07-20).

NG → Check engine to confirm cause of low compression

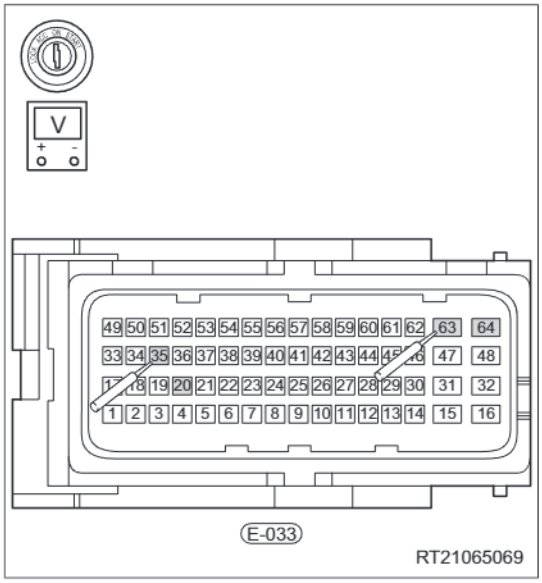
OK

8	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



NG → Repair or replace related wire harness

OK

Go to Diagnostic Help

Engine starts normally, but idles roughly or stalls with part load (for example, A/C is ON)

Diagnosis Procedure

1	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

2	Observe if engine output increases when A/C is turned on. This means that observe changes of ignition advance angle, injection pulse width and intake air volume using diagnostic tester

OK → Go to step 4

NG ↓

3	Connect ECM adapter, and disconnect pin cable of ECM corresponding terminal. Check if wire harness side is HIGH-level signal with A/C ON

NG → Check and repair A/C system

OK ↓

4	Check if A/C system pressure, compressor magnetic clutch and A/C compressor pump are normal

NG → Check and repair A/C system

OK ↓

5	Check injector for leakage or blockage

NG → Clean or replace injector

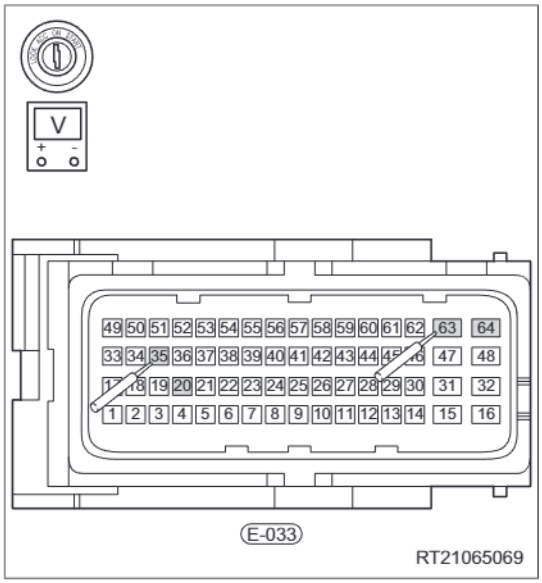
OK ↓

6	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



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

OK

Go to Diagnostic Help

Engine starts normally, but idle speed is too high

Diagnosis Procedure

1	Check if accelerator pedal is stuck

NG → Adjust or replace accelerator pedal

OK ↓

2	Check intake system and connected vacuum pipe for air leakage

NG → Check and repair intake system

OK ↓

3	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

4	Disconnect coolant temperature sensor connector, start engine and observe if engine idles normally at this time

OK → Check and repair wire harness or replace sensor

NG ↓

5	Check engine ignition timing

a. Check if engine ignition timing is as specified.

NG → Check and repair ignition timing

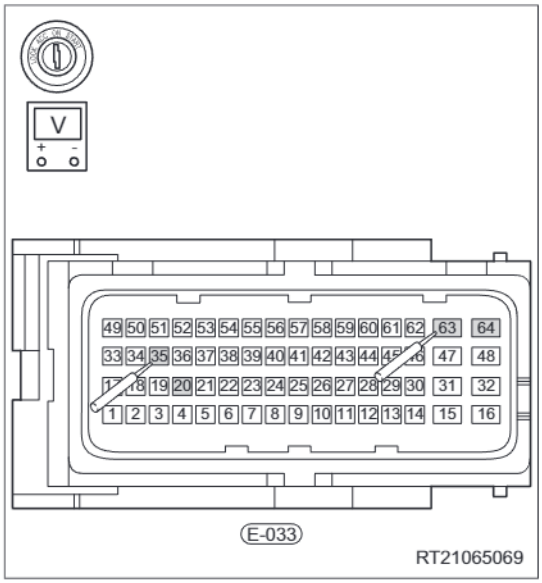
OK ↓

6	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



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

OK

Go to Diagnostic Help

Low engine speed or stalls when accelerating

Diagnosis Procedure

1	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

2	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → Repair or replace fuel system

OK ↓

3	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

4	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

5	Check air flow meter and throttle position sensor and wire harness

NG → Check and repair wire harness or replace sensor

OK

6	Check injector for leakage or blockage

NG → Clean or replace injector

OK

7	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK

8	Check engine ignition sequence and ignition timing

a. Check if engine ignition sequence and ignition timing are as specified.

NG → Check and repair ignition timing

OK

9	Check exhaust system

a. Check exhaust system for leakage or blockage.

NG → Repair or replace related exhaust system components

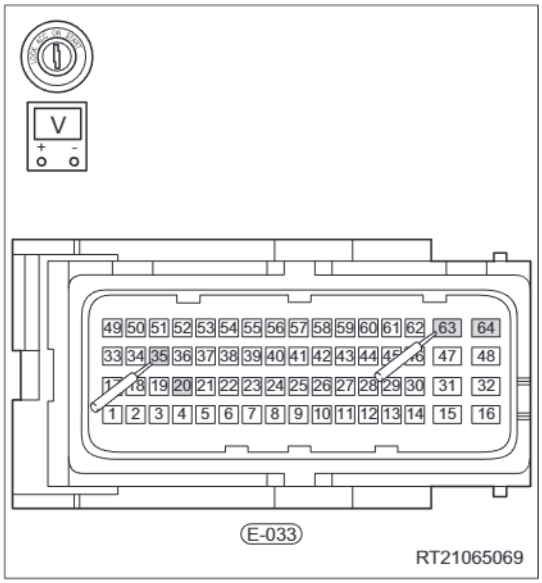
OK

10	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



NG → Repair or replace related wire harness

OK

Go to Diagnostic Help

Slow response when accelerating

Diagnosis Procedure

1	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

2	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → Repair or replace fuel system

OK ↓

3	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

4	Check throttle for carbon deposits

NG → Clean throttle

OK ↓

5	Check air flow meter and throttle position sensor and wire harness

NG → Check and repair wire harness or replace sensor

OK

6	Check injector for leakage or blockage

NG → Clean or replace injector

OK

7	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK

8	Check engine ignition sequence and ignition timing

a. Check if engine ignition sequence and ignition timing are as specified.

NG → Check and repair ignition timing

OK

9	Check exhaust system

a. Check exhaust system for leakage or blockage.

NG → Repair or replace related exhaust system components

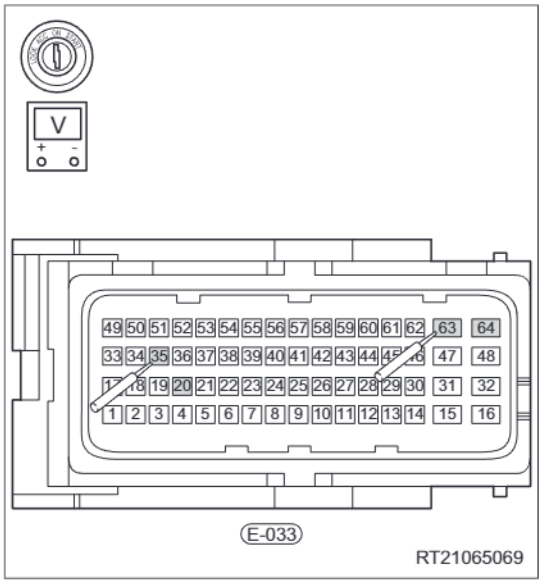
OK

10	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V



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

OK

Go to Diagnostic Help

Lack of power and poor performance when accelerating

Diagnosis Procedure

1	Check if malfunctions that clutch slipping, low tire inflation pressure, brake dragging, incorrect tire size, and incorrect four-wheel alignment are present

NG → Check and repair malfunctioning component

OK ↓

2	Check air filter for blockage, and intake pipe for air leakage

NG → Check and repair intake system

OK ↓

3	Check fuel pressure

a. Using a fuel pressure gauge, check fuel pressure (See page 08-11).

Standard Fuel Pressure

Condition	Fuel System Pressure (kPa)
Key ON	400
Engine Idling	400
Key LOCK	400

NG → Repair or replace fuel system

OK ↓

4	Check spark plug

a. Check spark plug of each cylinder, and observe if the type and gap are as specified.

NG → Replace spark plug

OK ↓

5	Check spark

a. Remove ignition coil and spark plug of one cylinder, and ground spark plug housing. Start the engine, and check if spark is generated.

OK: Spark is generated.

NG → Check and repair ignition system

OK

6	Check throttle for carbon deposits

NG → Clean throttle

OK

7	Check air flow meter and throttle position sensor and wire harness

NG → Check and repair wire harness or replace sensor

OK

8	Check injector for leakage or blockage

NG → Clean or replace injector

OK

9	Check fuel condition

a. Observe if trouble occurs just after fuel is filled.

NG → Replace fuel

OK

10	Check engine ignition sequence and ignition timing

a. Check if engine ignition sequence and ignition timing are as specified.

NG → Check and repair ignition timing

OK

11	Check exhaust system

a. Check exhaust system for leakage or blockage.

NG → Repair or replace related exhaust system components

OK

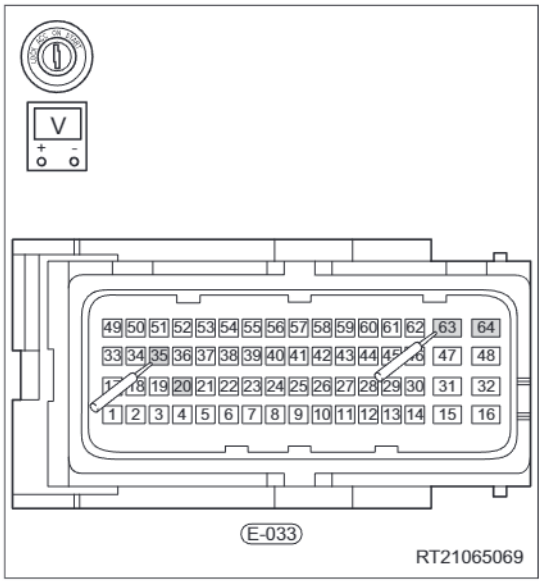
12	Check ECM power supply and ground

a. Disconnect ECM connector E-033.

b. Turn ignition switch to ON and check ECM connector terminals.

Multimeter Connection	Condition	Specified Condition
E-033 (35, 20) - E-033 (63 or 64)	Ignition switch ON	11 to 14 V

NG → Repair or replace related wire harness



OK

Go to Diagnostic Help

ON-VEHICLE SERVICE

Intake/Exhaust VVT Control Valve

Description

There are two VVT control valves, which are located on intake side and exhaust side respectively.

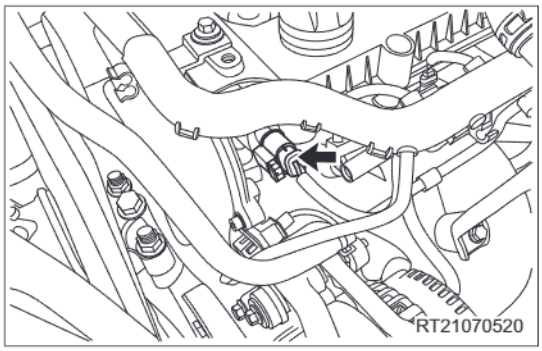
Operation

ECM controls the VVT control valve depending on the engine condition, changes the flowing direction of oil in the phasers to advance or retard intake/exhaust camshaft, thus changing the timing of intake valve and exhaust valve.

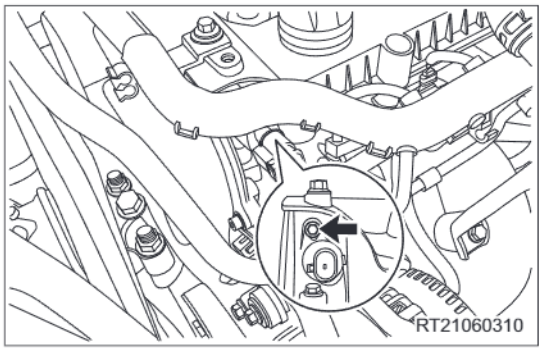
Removal

Use the same procedures of removal for exhaust VVT control valve and intake VVT control valve. The procedures listed below are for the intake VVT control valve.

1. Turn off all electrical equipment and ignition switch.
2. Disconnect negative battery cable.
3. Remove engine trim cover.
4. Remove intake VVT control valve.
   a. Disconnect intake VVT control valve connector.



   b. Remove intake VVT control valve fixing bolt and intake VVT control valve.
   (Tightening torque: 8 ± 2 N·m)



Installation

Installation is in the reverse order of removal.

Coolant Temperature Sensor

Description

The coolant temperature sensor is a negative temperature coefficient sensor, which is installed into the mounting hole in thermostat holder.

Operation

The coolant temperature sensor provides an input signal for Engine Control Module (ECM). As temperature increases, the resistance of sensor decreases. As coolant temperature changes, resistance of coolant temperature sensor varies accordingly, resulting in a change in voltage of coolant temperature sensor signal circuit. The ECM uses input signal to control air-fuel mixture, ignition timing, A/C compressor and radiator fan on/off timing.

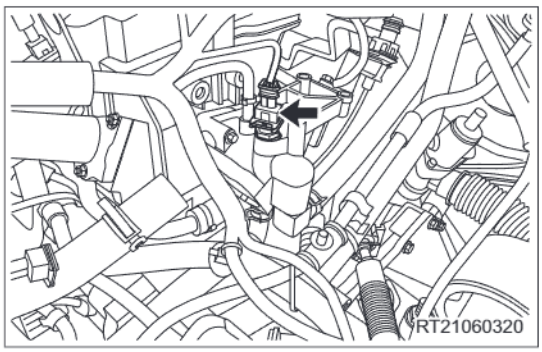
Removal

1. Turn off all electrical equipment and ignition switch.
2. Disconnect negative battery cable.
3. Drain coolant (See page 12-13).

⚠ WARNING

- Make sure engine is in low temperature before operating cooling system. Never open the expansion tank cover and remove the drain cock plug when engine is operating or cooling system is in high temperature. High-pressurized hot engine coolant and steam may flow out and cause serious injury.

4. Remove engine trim cover.
5. Remove coolant temperature sensor.
   a. Disconnect coolant temperature sensor connector and remove coolant temperature sensor. (Tightening torque: 11 - 16 N·m)



⚠ WARNING

- Remove the coolant temperature sensor when engine cools down to avoid scalding injury.

Installation

Installation is in the reverse order of removal.

CAUTION

- Perform sealing with anaerobic seal gum.
- Confirm that the sensor is tightened fully during installation.
- After installing engine coolant temperature sensor, add coolant and check coolant level.

Knock Sensor

Description

The knock sensor is installed on cylinder block, and used to detect engine vibration caused by detonation.

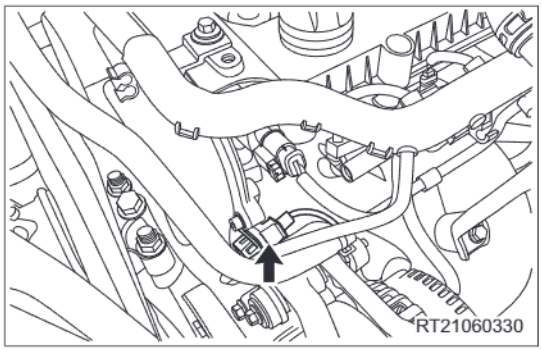
Operation

The sensitive element of knock sensor is a piezoelectric ceramic. Vibration of engine cylinder block is transferred to the piezoelectric ceramic through a mass block in knock sensor. Due to the pressure generated by vibration of mass block, the piezoelectric ceramic generates a voltage at both electrode faces, and converts the vibration signal to an AC voltage signal to output it. As intensity of vibration increases, knock sensor output voltage increases accordingly.

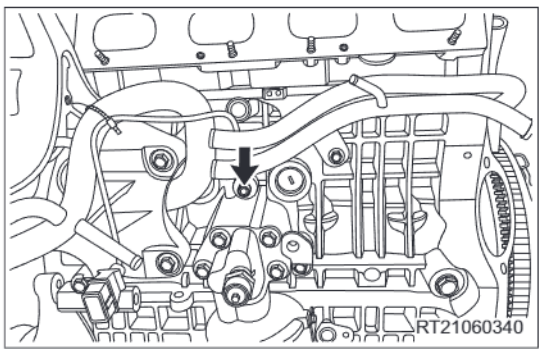
Because frequency of vibration signal caused by engine knocking is far more than that of normal engine vibration signal, Engine Control Module (ECM) can distinguish between knock or non-knock signals by processing these signals from knock sensor.

Removal

1. Turn off all electrical equipment and ignition switch.
2. Disconnect negative battery cable.
3. Remove engine trim cover.
4. Remove knock sensor.
   a. Disconnect knock sensor connector, and move away the knock sensor cable from bracket.



   b. Remove intake manifold assembly (See page 10-24).
   c. Remove knock sensor fixing bolt and knock sensor. (Tightening torque: 20 ± 5 N·m)



Installation

Installation is in the reverse order of removal.

CAUTION

- Never allow any kinds of gasket and washer between sensor and engine block. Only the metal part of sensor can contact with the engine block directly.
- DO NOT apply lubricant, grease or seal gum when installing knock sensor. Keep engine block clean and dry, and never allow any foreign matter (such as oil) on the installation area of knock sensor.
- Never tap knock sensor when installing it.

Oxygen Sensor

Description

This vehicle is equipped with two oxygen sensors (upstream oxygen sensor and downstream oxygen sensor). Oxygen sensors continually monitor the oxygen concentration in exhaust gas.

Operation

The oxygen sensor generates voltage depending on the oxygen content in exhaust gas. The sensor generates low voltage when oxygen content is high, and high voltage when oxygen content is low. Therefore, the sensor acts as a rich-lean switch.

The oxygen sensor is equipped with a heating element that keeps sensor at proper operating temperature under all operating conditions.

Upstream Oxygen Sensor

The input signal from upstream heated oxygen sensor informs Engine Control Module (ECM) of the oxygen content in exhaust gas. Based on this input signal, Engine Control Module (ECM) adjusts air-fuel ratio finely by adjusting injector pulse width.

Downstream Oxygen Sensor

The downstream heated oxygen sensor signal is used to detect the catalytic converter deterioration. As converter deteriorates, the signal from downstream oxygen sensor begins to match upstream oxygen sensor signal except for a slight time delay. By comparing the signal from upstream heated oxygen sensor to the signal from downstream oxygen sensor, Engine Control Module (ECM) calculates the efficiency of catalytic converter.

Removal & Installation - Upstream Oxygen Sensor

(See page 09-13)

Removal & Installation - Downstream Oxygen Sensor

(See page 09-15)

Camshaft Position Sensor

Description

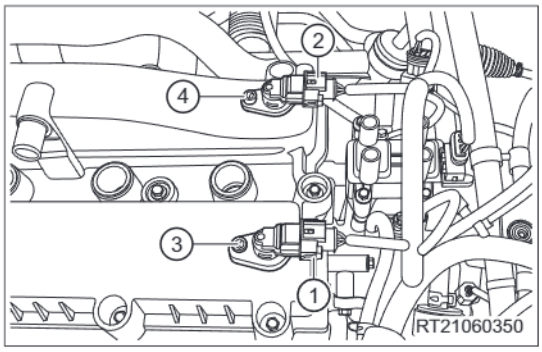
This vehicle is equipped with an intake camshaft position sensor and an exhaust camshaft position sensor, which are installed on cylinder head cover.

Operation

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

Removal

1. Turn off all electrical equipment and ignition switch.
2. Disconnect negative battery cable.
3. Remove engine trim cover.
4. Remove camshaft position sensor.
   a. Disconnect intake camshaft position sensor connector (1) and exhaust camshaft position sensor connector (2).
   b. Remove intake camshaft position sensor fixing bolt (3) and exhaust camshaft position sensor fixing bolt (4). (Tightening torque: 8 ± 0.5 N·m)



   c. Remove intake camshaft position sensor and exhaust camshaft position sensor.

Installation

Installation is in the reverse order of removal.

CAUTION

- The sensor should be pressed into mounting hole. Never use tools (such as a hammer) to strike the sensor into mounting hole forcibly.

Engine Speed Sensor

Description

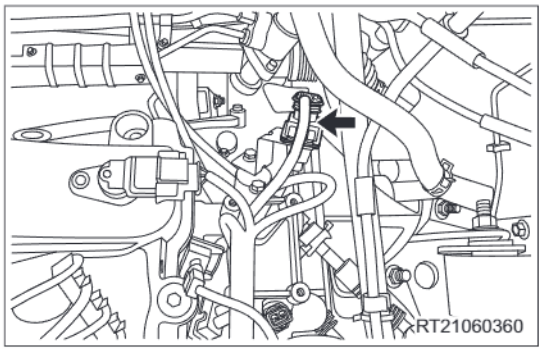
The engine speed sensor is installed on clutch case, against flywheel teeth. It is used to detect the speed and position of crankshaft.

Operation

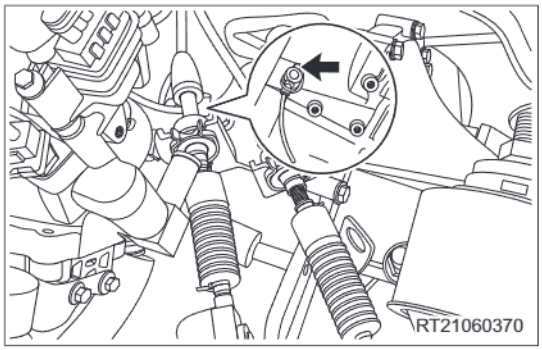
The engine speed sensor operates by using magnetoelectric effect. When crankshaft rotates, it drives flywheel to rotate. The flywheel teeth will cut the magnetic line of sensor, and change of magnetic flux causes both ends of sensor coil to generate output voltage with a certain frequency that is sent to Engine Control Module (ECM). And the output signal can indicate the speed and position of crankshaft.

Removal

1. Turn off all electrical equipment and ignition switch.
2. Disconnect negative battery cable.
3. Remove engine trim cover.
4. Remove engine speed sensor.
   a. Disconnect engine speed sensor connector (arrow), and move away the engine speed sensor cable from bracket.



   b. Remove engine speed sensor fixing bolt and engine speed sensor.
   (Tightening torque: 8 ± 2 N·m)



Installation

Installation is in the reverse order of removal.

CAUTION

- Press in the engine speed sensor rather than tap when installing it.

Air Flow Meter

Description

The air flow meter is installed on the air inlet pipe behind air filter, which is used to measure mass of air passing through.

Operation

When there is no mass flow, the electrical axle maintains a balance. The control circuit outputs a certain heating current to hot-wire resistance RH. When there is mass flow, the electrical axle is out of balance due to change of RH resistance (cooling of RH resulting from surrounding air absorbing RH's heat). The current passing through hot-wire resistance IH must increase to keep hot-wire resistance and temperature difference of air sucked invariant and at a fixed value. Therefore, hot-wire current IH is function of air mass flow.

Removal & Installation

(See page 10-13)

Ignition Coil

Description

The ignition coil converts the low voltage of primary winding into the high voltage of secondary winding, and discharges spark plug electrode to produce sparks which will ignite the combustible air-fuel mixture in cylinder.

Operation

An ignition coil consists of primary winding, secondary winding, iron core and housing etc. The primary and secondary windings form an induced circuit. An instant induced voltage generated by turning primary circuit switch on and off and an instant high voltage generated by secondary circuit will cause spark plugs to discharge, thus igniting the combustible air-fuel mixture. The primary winding will recharge when its ground passage is on through an Engine Control Module (ECM) signal. If Engine Control Module (ECM) cuts off the control signal to primary winding circuit, it will stop charging and a high voltage will be induced in the secondary winding.

Removal & Installation

(See page 14-10)

Electric Fuel Pump

Description

The electric fuel pump consists of DC motor, vane pump and end cover (integrated with check valve, pressure regulator and anti-electromagnetic interference element) etc. The pump and motor are installed coaxially, and sealed in the same housing. Fuel is filled around the pump and motor in the housing and used for heat dissipation and lubrication.

Operation

The battery supplies power to electric fuel pump via electric fuel pump relay, which can turn on electric fuel pump circuit only when starting and engine running. When engine stops running because of an accident, the fuel pump stops running automatically. The maximum pressure at electric fuel pump outlet is adjusted by pressure regulator to keep the whole fuel system pressure at 400 kPa.

Removal & Installation

(See page 08-14)

Fuel Injector

Description

The fuel injector is located on the cylinder head near to intake valve, and the nozzle end is located directly above the intake port.

Operation

The Engine Control Module (ECM) sends electric pulse to injector coil, forming magnetic field force. When magnetic field force increases enough to overcome the resultant force from return spring pressure, needle gravity and friction force, the needle begins to rise up and injector starts to inject fuel. The pressure of return spring forces the needle to close again when injection pulse stops.

Removal & Installation

(See page 08-26)

Electronic Throttle Assembly

Description

The electronic throttle assembly is located on intake manifold assembly.

Operation

The electronic throttle assembly is a critical part for engine intake system. Its main function is to adjust intake passage area according to driver's driving intention, and control intake air volume to meet the intake requirement for engine in different operating conditions, and send back the position signals of throttle valve plate to control unit to achieve accurate control. The throttle valve plate will stop at the limp home position (NLP) determined in a mechanical way when a malfunction occurs.

The electronic throttle assembly consists of four parts: drive module, train module, executive module and feedback module, and all components are integrated into the same throttle valve housing.

Removal & Installation

(See page 10-20)

Canister Solenoid Valve

Description

The canister solenoid valve opens when power is on, and closes when power is off.

Operation

The canister solenoid valve consists of solenoid coil, magnet armature, valve, etc. The air volume through canister solenoid valve depends on electric pulse duty ratio that outputs from Engine Control Module (ECM) and pressure difference between canister inlet and outlet. When there is no electric pulse, the canister solenoid valve closes.

Removal & Installation

(See page 09-7)

Engine Control Module (ECM)

Description

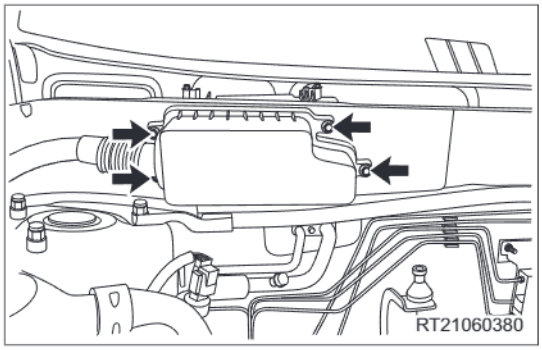
The Engine Control Module (ECM), mounted on the lower right side of engine compartment rain gutter front end panel assembly, can be removed only as a unit for replacement.

Operation

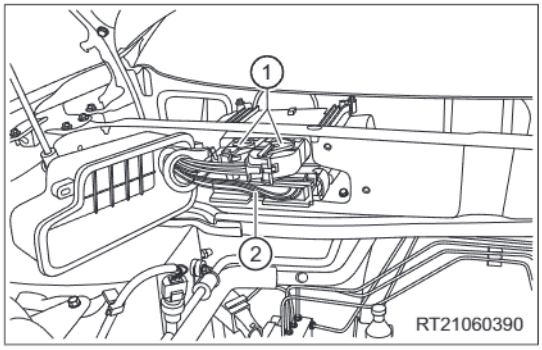
The Engine Control Module (ECM) is a pre-programmed microprocessor digital computer, which is used to adjust ignition timing, air-fuel ratio, emission control, speed control, A/C compressor and idle speed etc. The Engine Control Module (ECM) enables the program to suit ever-changing operation conditions.

Removal

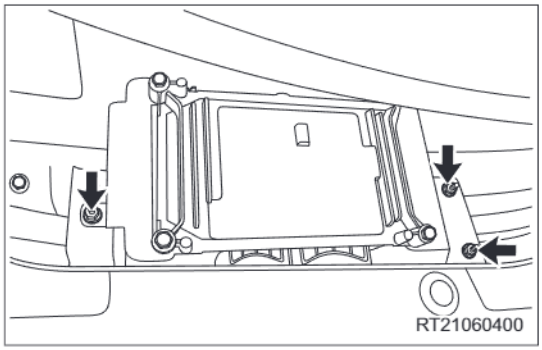
1. Turn off all electrical equipment and ignition switch.
2. Disconnect negative battery cable.
3. Remove front wiper arm assembly (See page 36-24).
4. Remove front windshield lower garnish assembly (See page 48-39).
5. Remove Engine Control Module (ECM).
   a. Remove ECM connector protection cover bolts.



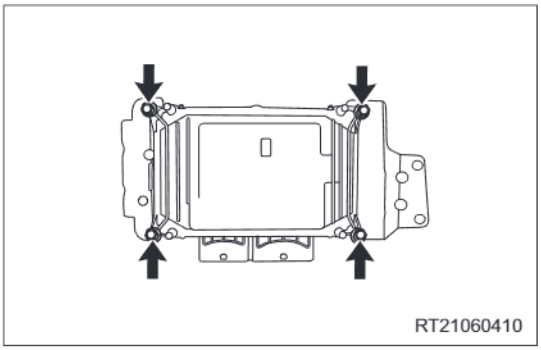
   b. For MT model, disconnect 2 ECM connectors (1).
   For CVT model, disconnect 2 ECM connector (1) and TCU connector (2).



   c. Remove ECM bracket fixing nuts (arrow).
   (Tightening torque: 7 ± 1 N·m)



d. Remove the Engine Control Module (ECM) from bracket.



Installation

Installation is in the reverse order of removal.

CAUTION

- Pay attention to static electricity protection when installing.
- Take care to protect connector pins.
- To prevent water droplets from accumulating on connector joint, face it down.