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SECTION **EC**

ENGINE CONTROL SYSTEM

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PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000012524193

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

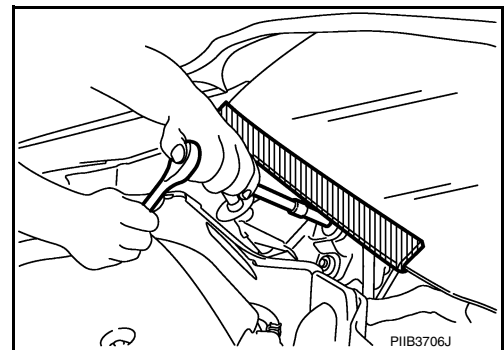
WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery and wait at least three minutes before performing any service.

Precaution for Procedure without Cowl Top Cover

INFOID:000000012524194

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



On Board Diagnostic (OBD) System of Engine and A/T

INFOID:000000012524195

The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:

- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)

PRECAUTIONS

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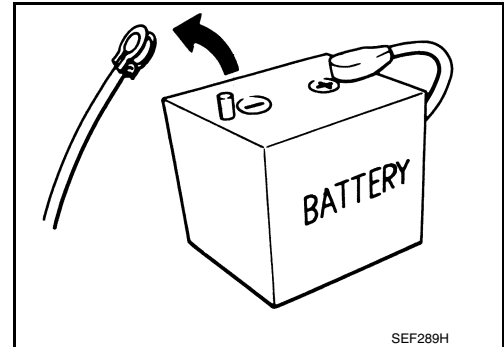
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- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to [PG-7, "Harness Connector"](#).
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

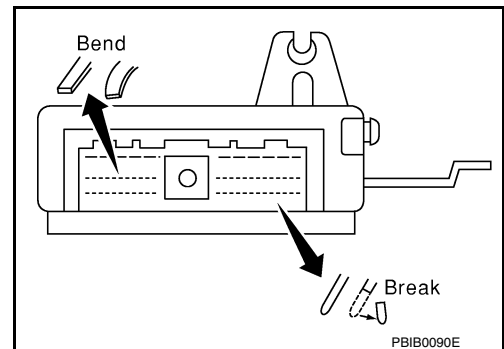
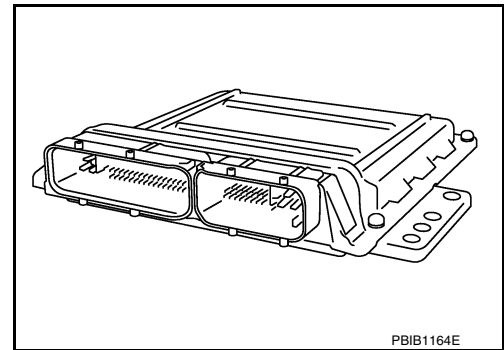
General Precautions

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- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect negative battery cable.



- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.
The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- If the battery is disconnected, the following emission-related diagnostic information will be cleared within 24 hours.
 - Diagnostic trouble codes
 - 1st trip diagnostic trouble codes
 - Freeze frame data
 - 1st trip freeze frame data
 - System readiness test (SRT) codes
 - Test values
- When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break). Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors.
A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.

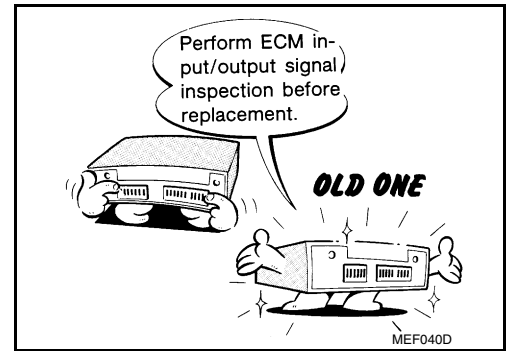


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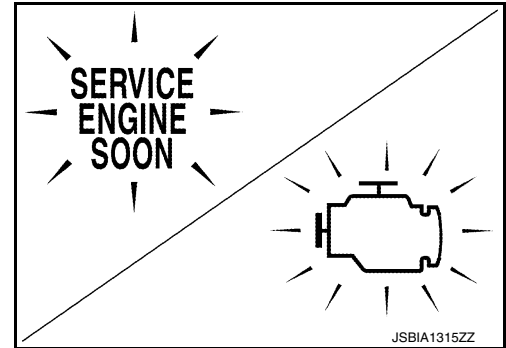
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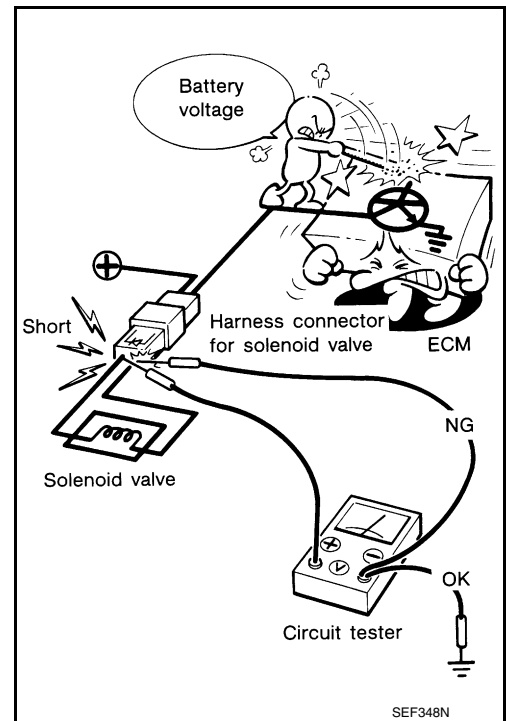
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to **EC-78, "Reference Value"**.
- Handle mass air flow sensor carefully to avoid damage.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leak in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).



- After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.



- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

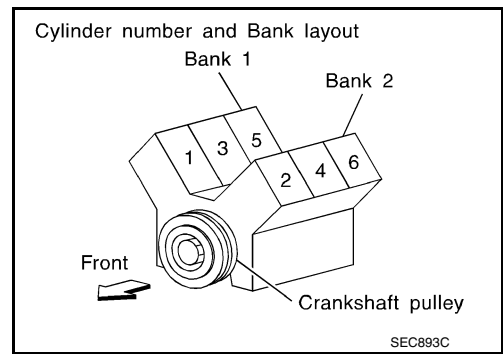


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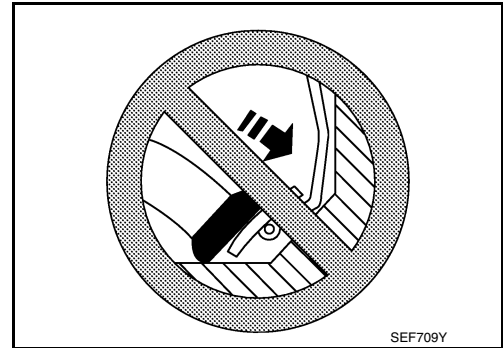
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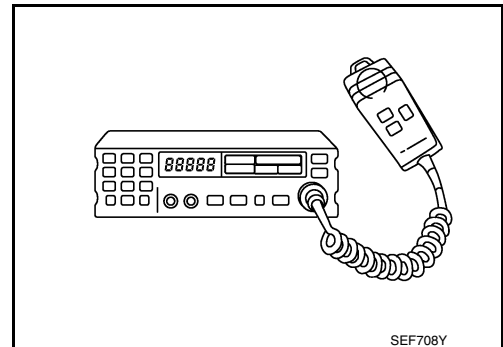
- B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.
- Never operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque.



- Never depress accelerator pedal when starting.
- Immediately after starting, never rev up engine unnecessarily.
- Never rev up engine just prior to shutdown.



- When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.
 - Keep the antenna as far as possible from the electronic control units.
 - Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls. Never let them run parallel for a long distance.
 - Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - Be sure to ground the radio to vehicle body.



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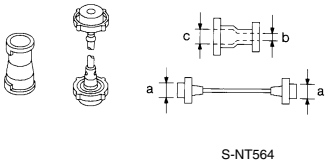
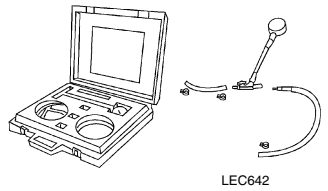
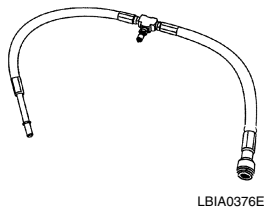
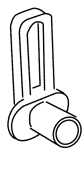
PREPARATION

PREPARATION

Special Service Tool

INFOID:000000012524197

The actual shapes of TechMate tools may differ from those of special service tools illustrated here.

| Tool number (TechMate No.) Tool name | Description |
|--|---|
| <p>EG17650301 (J-33984-A) Radiator cap tester adapter</p>  <p style="text-align: center;">S-NT564</p> | <p>Adapts radiator cap tester to radiator cap and radiator filler neck a: 28 (1.10) dia. b: 31.4 (1.236) dia. c: 41.3 (1.626) dia. Unit: mm (in)</p> |
| <p>(J-44321) Fuel pressure gauge kit</p>  <p style="text-align: center;">LEC642</p> | <p>Checks fuel pressure</p> |
| <p>(J-44321-6) Fuel pressure adapter</p>  <p style="text-align: center;">LBIA0376E</p> | <p>Connects fuel pressure gauge to quick connector type fuel lines.</p> |
| <p>(J-45488) Quick connector re- lease</p>  <p style="text-align: center;">PBIC0198E</p> | <p>Removes fuel tube quick connectors in engine room</p> |

PREPARATION

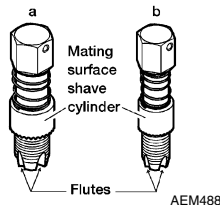
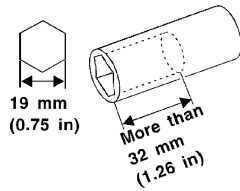
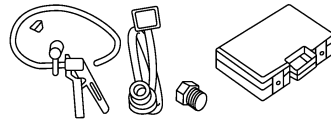
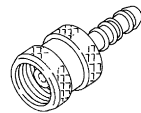
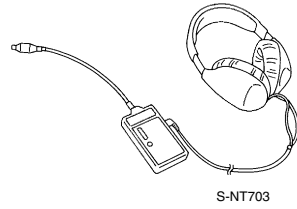
< PREPARATION >

[VQ40DE]

Commercial Service Tool

INFOID:000000012524198

| Tool name (TechMate No.) | Description |
|---|--|
| Leak detector i.e.: (J-41416) | Locates the EVAP leak |
| EVAP service port adapter i.e.: (J-41413-OBD) | Applies positive pressure through EVAP service port |
| Fuel filler cap adapter i.e.: (J-42909) | Checks fuel tank vacuum relief valve opening pressure |
| Socket wrench | Removes and installs engine coolant temperature sensor |
| Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12) | Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Titanium Oxygen Sensor |
| Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907) | Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads. |



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COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]

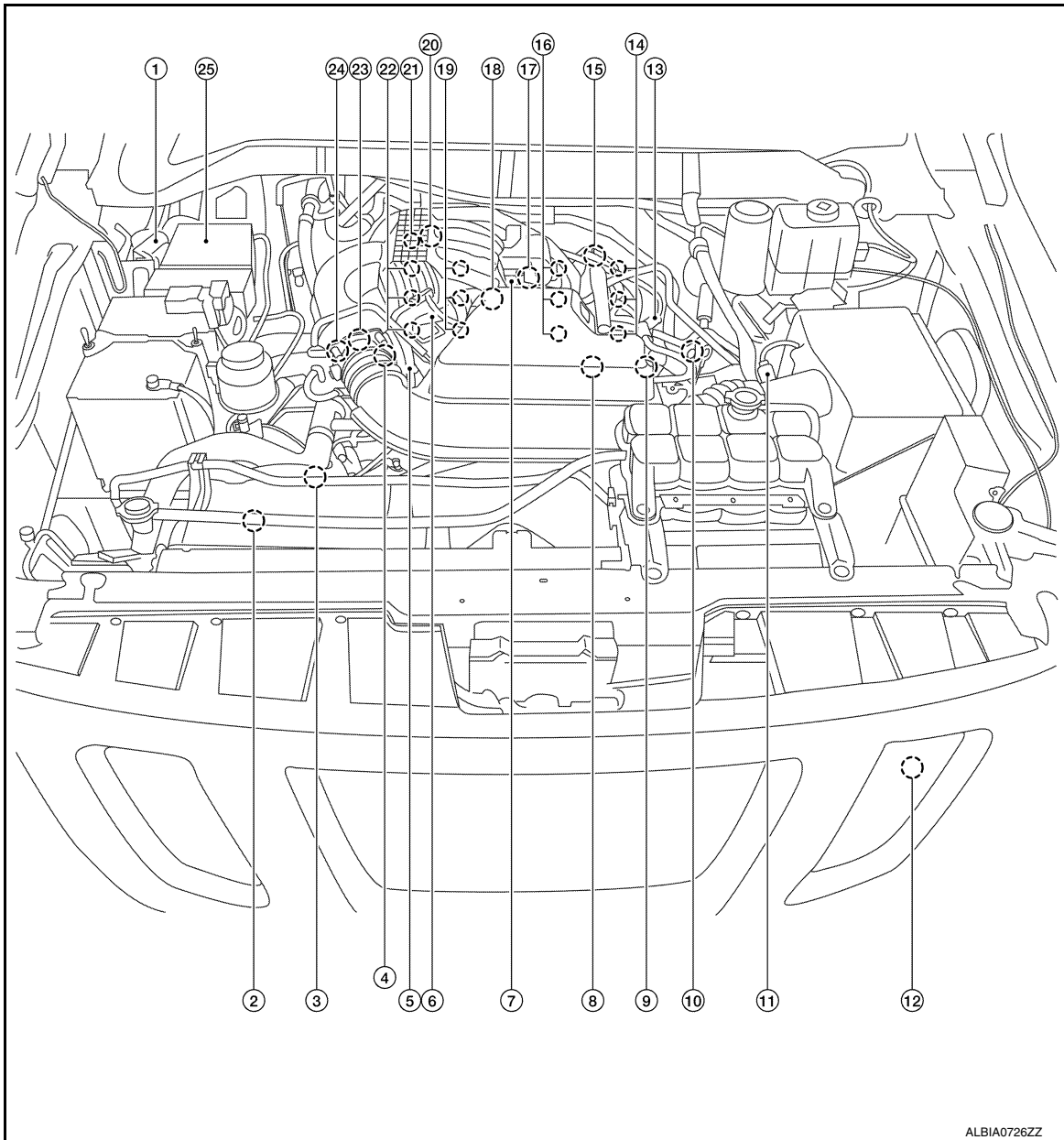
SYSTEM DESCRIPTION

COMPONENT PARTS

ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : Component Parts Location

INFOID:000000012524199



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- | | | |
|--|---|--|
| 1. ECM | 2. Cooling fan motor | 3. Power steering pressure sensor |
| 4. Intake valve timing control solenoid valve (bank 1) | 5. Electric throttle control actuator | 6. Power valve actuator |
| 7. VIAS control solenoid valve | 8. EVAP canister purge volume control solenoid valve | 9. Intake valve timing control solenoid valve (bank 2) |
| 10. Air fuel ratio (A/F) sensor 1 (bank 2) | 11. Mass air flow sensor (with intake air temperature sensor) | 12. Refrigerant pressure sensor |
| 13. EVAP service port | 14. Ignition coil (with power transistor) and spark plug (bank 2) | 15. Camshaft position sensor (PHASE) (bank 2) |
| 16. Fuel injector (bank 2) | 17. Knock sensor (bank 2) | 18. Knock sensor (bank 1) |

COMPONENT PARTS

[VQ40DE]

< SYSTEM DESCRIPTION >

- | | | |
|---|---------------------------------------|---|
| 19. Fuel injector (bank 1) | 20. Engine coolant temperature sensor | 21. Camshaft position sensor (PHASE) (bank 1) |
| 22. Ignition coil (with power transistor) and spark plug (bank 1) | 23. Crankshaft position sensor (POS) | 24. Air fuel ratio (A/F) sensor 1 (bank 1) |
| 25. IPDM E/R | | |

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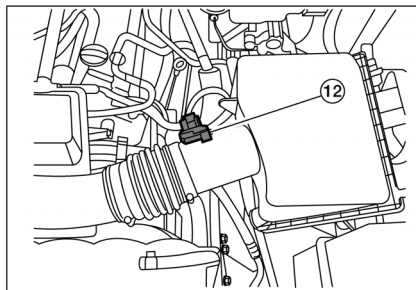
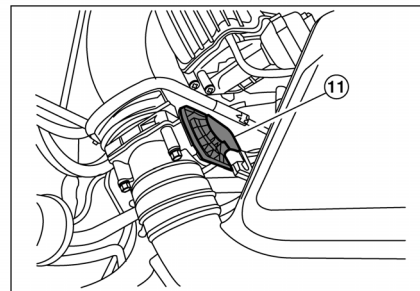
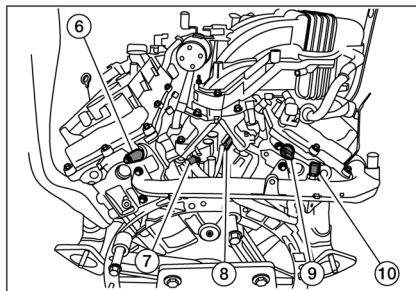
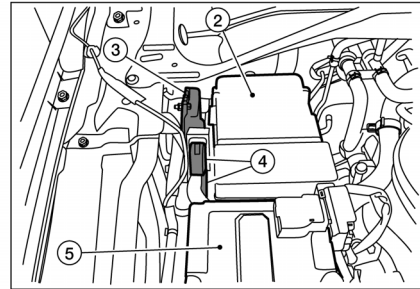
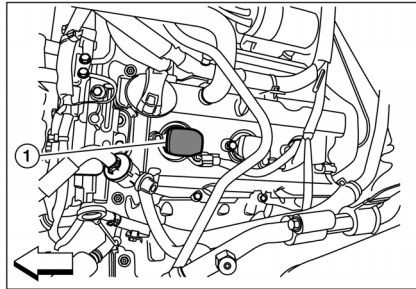
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|--|--|---|
| 1. Ignition coil (with power transistor) and spark plug (bank 2) | 2. IPDM E/R | 3. ECM |
| 4. ECM connector | 5. Battery | 6. Camshaft position sensor (PHASE) (bank 2) (view with engine removed) |
| 7. Knock sensor (bank 2) | 8. Knock sensor (bank 1) | 9. Camshaft position sensor (PHASE) (bank 1) |
| 10. Engine coolant temperature sensor | 11. Electric throttle control actuator | 12. Mass air flow sensor (with intake air temperature sensor) |

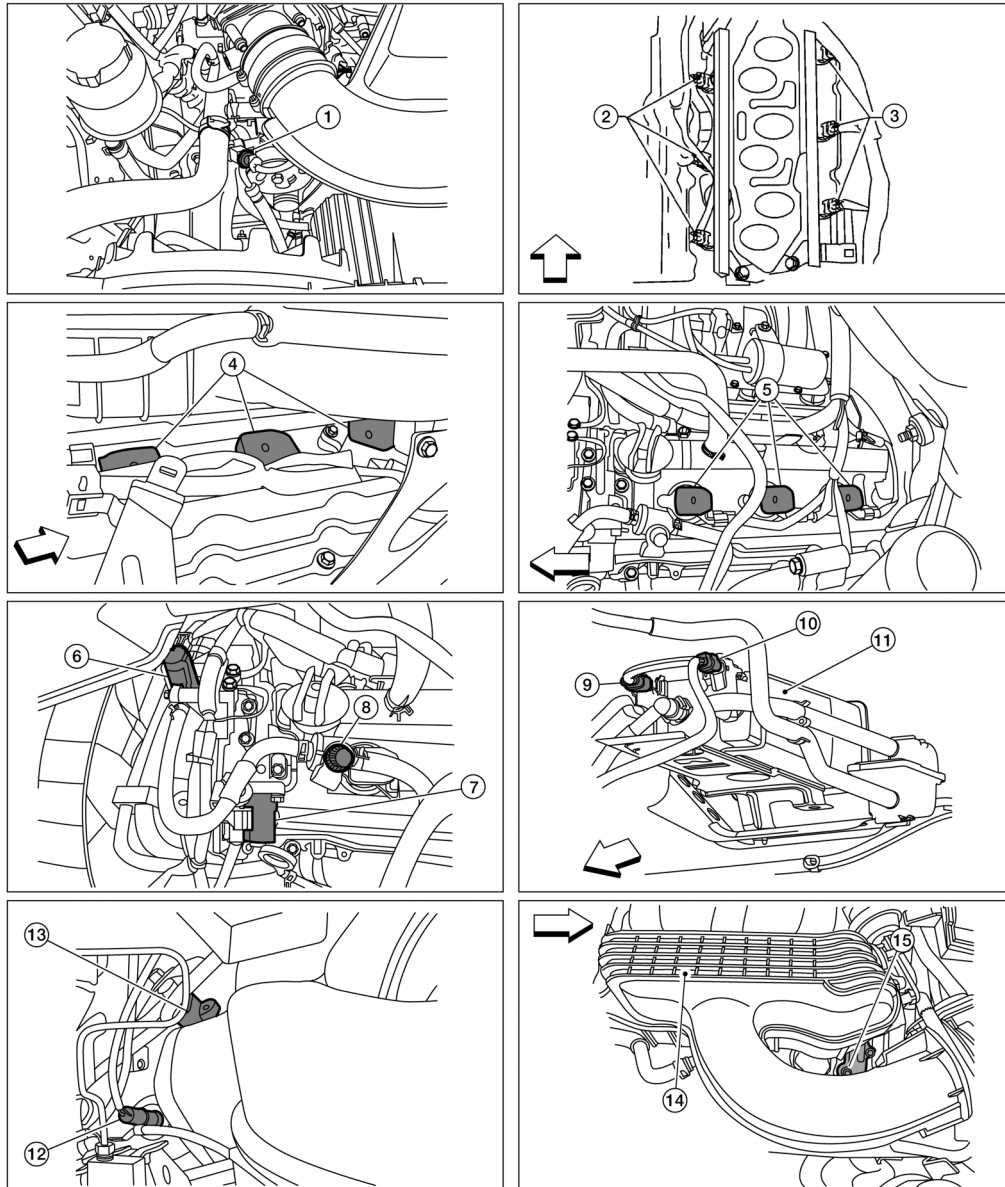
← : Vehicle front

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COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]



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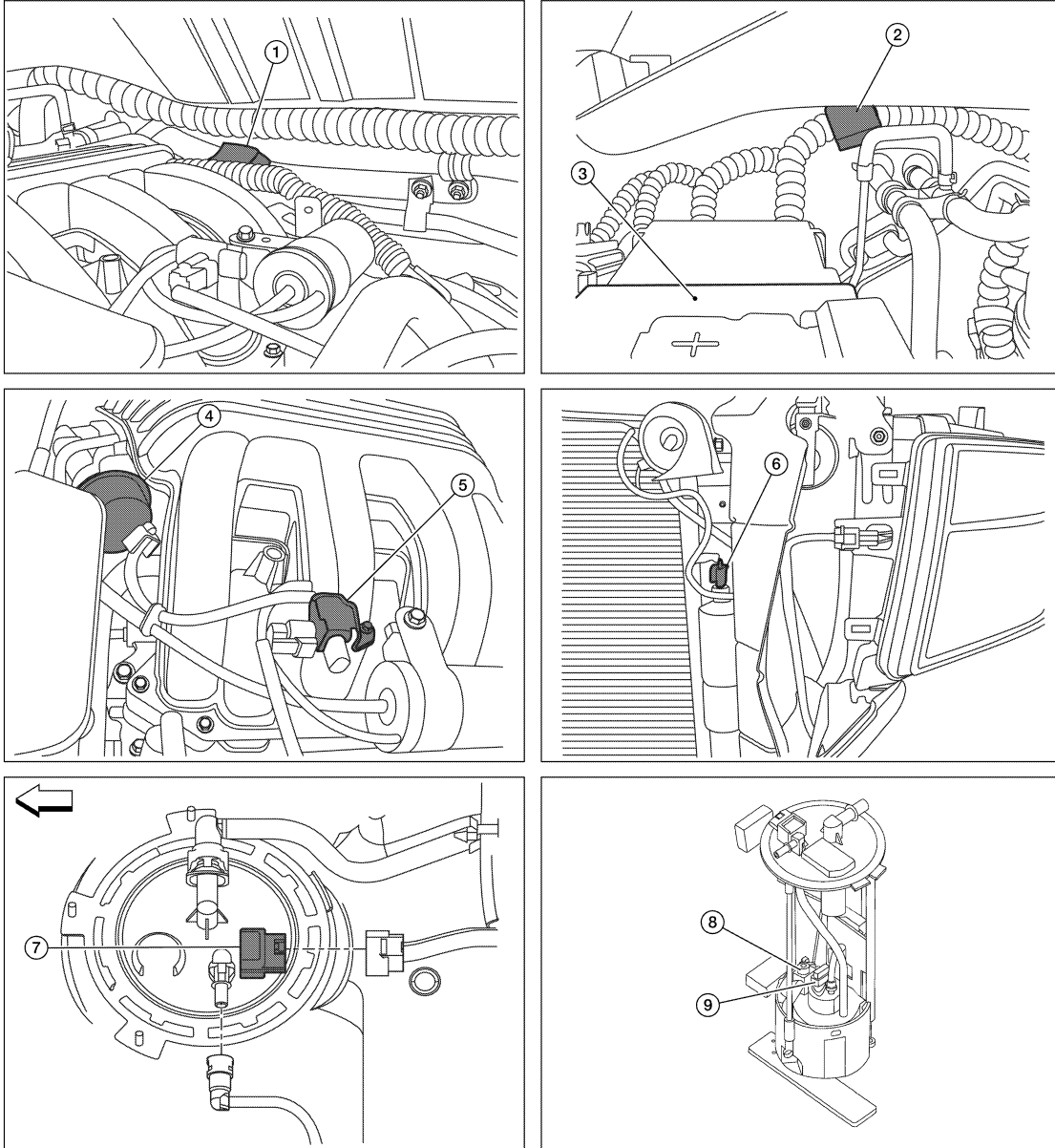
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|--|---|---|
| 1. Power steering pressure sensor | 2. Injector harness connector (bank 2) (view with intake manifold collector removed) | 3. Injector harness connector (bank 1) (view with intake manifold collector removed) |
| 4. Ignition coils (bank 1) (with power transistor) | 5. Ignition coils (bank 2) (with power transistor) | 6. EVAP canister purge volume control solenoid valve |
| 7. Intake valve timing control solenoid valve (bank 2) | 8. EVAP service port | 9. EVAP control system pressure sensor |
| 10. EVAP canister vent control valve | 11. EVAP canister | 12. Air fuel ratio (A/F) sensor (bank 1) (view through fender cover RH) |
| 13. Crankshaft position sensor (POS) | 14. Intake manifold collector | 15. Intake valve timing control solenoid valve (bank 1) |

↶ : Vehicle front

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]



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|---|--------------------------------|--|
| 1. Condenser-1 | 2. Condenser-2 | 3. Battery |
| 4. Power valve actuator | 5. VIAS control solenoid valve | 6. Refrigerant pressure sensor (view with front grille removed) |
| 7. Fuel level sensor unit and fuel pump harness connector (view with fuel tank removed) | 8. Fuel pressure regulator | 9. Fuel pump, fuel level sensor unit and fuel filter |

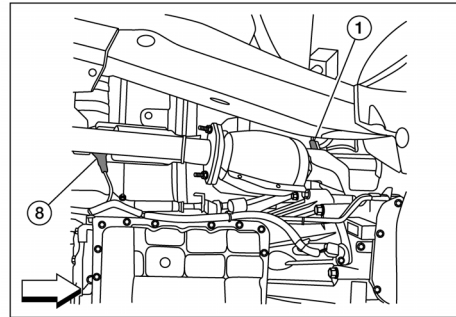
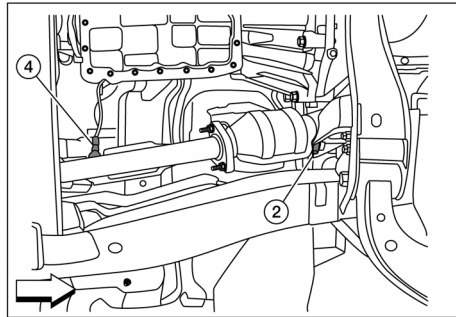
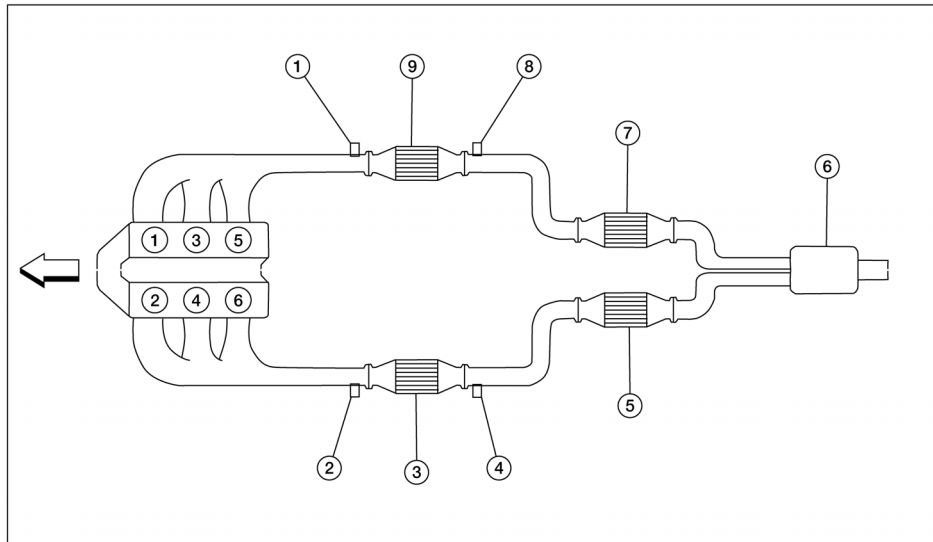
← : Vehicle front

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COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]



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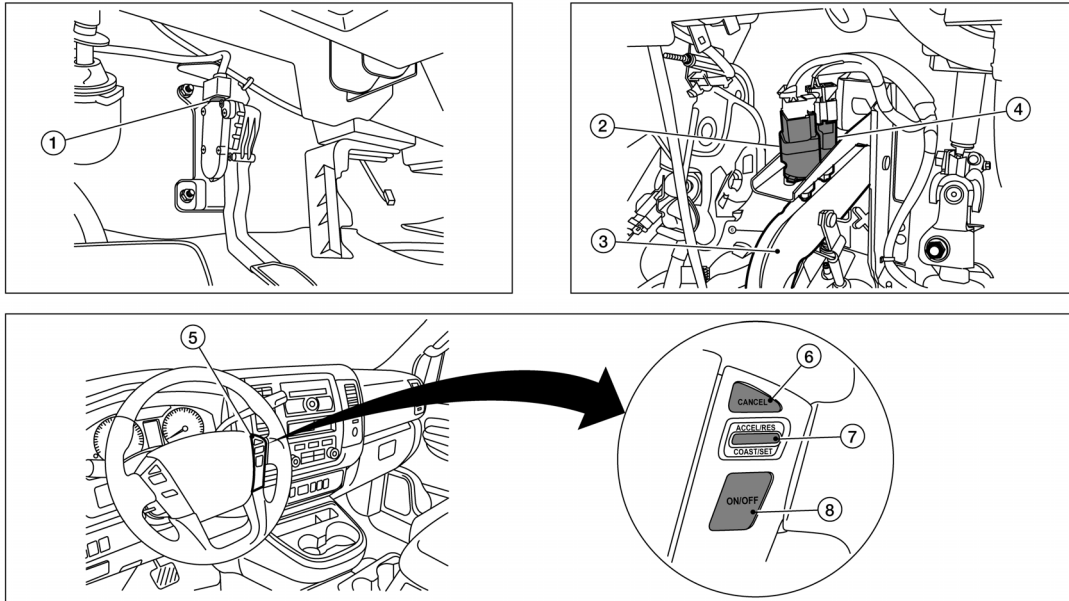
- | | | |
|--|--|---|
| 1. Air fuel ratio (A/F) sensor 1 (bank 1) | 2. Air fuel ratio (A/F) sensor 1 (bank 2) | 3. Three-way catalyst (manifold) (bank 2) |
| 4. Heated oxygen sensor 2 (bank 2) | 5. Three-way catalyst (under floor) (bank 2) | 6. Muffler |
| 7. Three-way catalyst (under floor) (bank 1) | 8. Heated oxygen sensor 2 (bank 1) | 9. Three-way catalyst (manifold) (bank 1) |

↶ : Vehicle front

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]



- | | | |
|---|-------------------------|------------------|
| 1. Accelerator pedal position sensor | 2. Stop lamp switch | 3. Brake pedal |
| 4. ASCD brake switch | 5. ASCD steering switch | 6. CANCEL switch |
| 7. • ACCEL/RES switch • COAST/SET switch | 8. MAIN switch | |

ALBIA0737ZZ

ENGINE CONTROL SYSTEM : Component Description

INFOID:000000012524200

| Component | Reference |
|---|--|
| A/F sensor 1 | EC-26. "Air Fuel Ratio Sensor 1" |
| A/F sensor 1 heater | EC-27. "Air Fuel Ratio Sensor 1 Heater" |
| Accelerator pedal position sensor | EC-26. "Accelerator Pedal Position Sensor" |
| ASCD brake switch | EC-374. "Description" |
| ASCD steering switch | EC-27. "ASCD Steering Switch" |
| Camshaft position sensor (PHASE) | EC-28. "Camshaft Position Sensor (PHASE)" |
| Cooling fan motor | EC-28. "Cooling Fan" |
| Crankshaft position sensor (POS) | EC-28. "Crankshaft Position Sensor (POS)" |
| Electric throttle control actuator | EC-29. "Electric Throttle Control Actuator" |
| Engine coolant temperature sensor | EC-29. "Engine Coolant Temperature Sensor" |
| EVAP canister purge volume control solenoid valve | EC-30. "EVAP Canister Purge Volume Control Solenoid Valve" |
| EVAP canister vent control valve | EC-30. "EVAP Canister Vent Control Valve" |
| EVAP control system pressure sensor | EC-30. "EVAP Control System Pressure Sensor" |
| Fuel injector | EC-30. "Fuel Injector" |
| Fuel level sensor | EC-30. "Fuel Level Sensor" |

COMPONENT PARTS

[VQ40DE]

< SYSTEM DESCRIPTION >

| Component | Reference |
|--|---|
| Fuel pump | EC-31, "Fuel Pump" |
| Fuel tank temperature sensor | EC-31, "Fuel Tank Temperature Sensor" |
| Heated oxygen sensor 2 | EC-31, "Heated Oxygen Sensor 2" |
| Heated oxygen sensor 2 heater | EC-32, "Heated Oxygen Sensor 2 Heater" |
| Ignition signal | EC-32, "Ignition Coil" |
| Intake air temperature sensor | EC-32, "Intake Air Temperature Sensor" |
| Intake valve timing control solenoid valve | EC-33, "Intake Valve Timing Control Solenoid Valve" |
| Knock sensor | EC-33, "Knock Sensor" |
| Mass air flow sensor | EC-33, "Mass Air Flow Sensor" |
| PCV valve | EC-35, "Positive Crankcase Ventilation" |
| Power steering pressure sensor | EC-33, "Power Steering Pressure Sensor" |
| Refrigerant pressure sensor | EC-34, "Refrigerant Pressure Sensor" |
| Stop lamp switch | EC-27, "Stop Lamp Switch" |
| Throttle control motor | EC-34, "Throttle Control Motor" |
| Throttle control motor relay | EC-34, "Throttle Control Motor Relay" |
| Throttle position sensor | EC-34, "Throttle Position Sensor" |

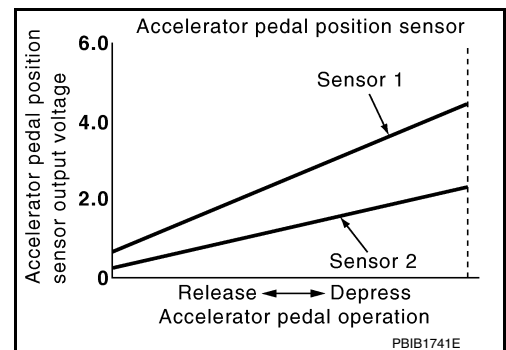
Accelerator Pedal Position Sensor

INFOID:0000000112524201

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator pedal position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



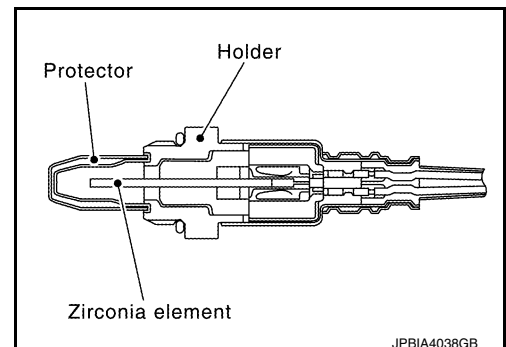
Air Fuel Ratio Sensor 1

INFOID:0000000112524202

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

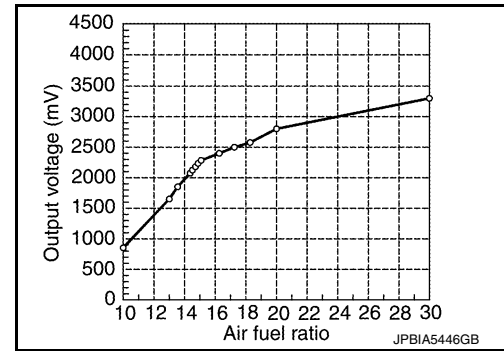


COMPONENT PARTS

[VQ40DE]

< SYSTEM DESCRIPTION >

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



Air Fuel Ratio Sensor 1 Heater

INFOID:0000000012524203

SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM function | Actuator |
|--|----------------------|---|---|
| Camshaft position sensor (PHASE) Crankshaft position sensor (POS) | Engine speed | Air fuel ratio (A/F) sensor 1 heater control | Air fuel ratio (A/F) sensor 1 heater |
| Mass air flow sensor | Amount of intake air | | |

The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element at the specified range.

ASCD Brake Switch

INFOID:0000000012524204

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).

Refer to [EC-43. "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for the ASCD function.

ASCD Indicator

INFOID:0000000012524205

ASCD operation status is indicated by two indicators (CRUISE and SET) and CRUISE lamp in combination meter.

CRUISE indicator is displayed to indicated that ASCD system is ready for operation when MAIN switch on ASCD steering switch is turned ON.

SET indicator is displayed when the following conditions are met.

- CRUISE indicator is displayed.
- COAST/SET switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET indicator is displayed during ASCD control.

Refer to [EC-43. "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for the ASCD function.

ASCD Steering Switch

INFOID:0000000012524206

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

Refer to [EC-43. "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for the ASCD function.

Stop Lamp Switch

INFOID:0000000012524207

Stop lamp switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]

Camshaft Position Sensor (PHASE)

INFOID:000000012524208

The camshaft position sensor (PHASE) senses the retraction of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

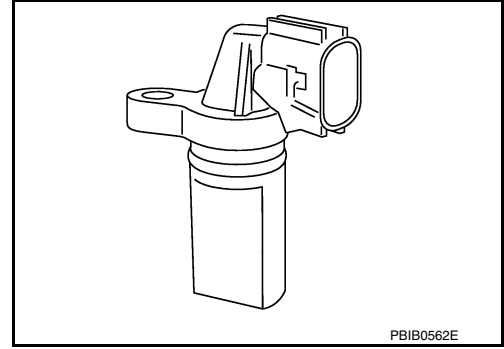
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

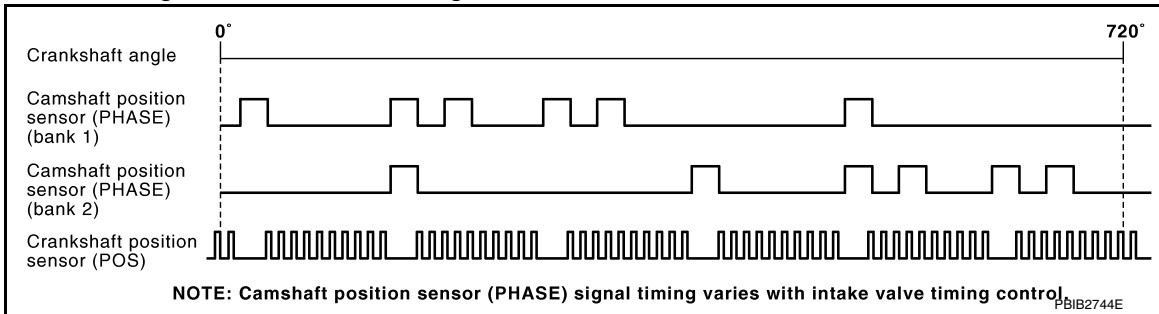
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes. ECM receives the signals as shown in the figure.



PBIB0562E



PBIB2744E

Cooling Fan

INFOID:000000012524209

COMPONENT DESCRIPTION

Cooling Fan Motor

The cooling fan operates at each speed when the current flows in the cooling fan motor as follows.

| Cooling fan speed | Cooling fan motor terminals | |
|-------------------|-----------------------------|---------|
| | (+) | (-) |
| Low (LOW) | 1 | 3 and 4 |
| | 2 | 3 and 4 |
| High (HI) | 1 and 2 | 3 and 4 |

Crankshaft Position Sensor (POS)

INFOID:000000012524210

The crankshaft position sensor (POS) is located on the cylinder block facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.

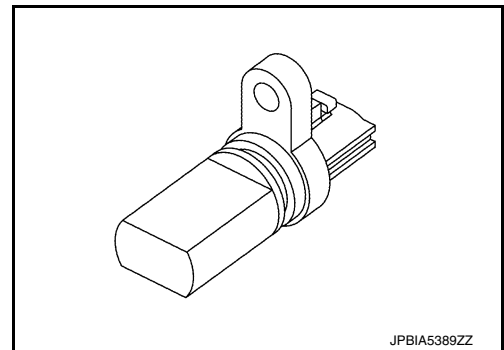
The sensor consists of a permanent magnet and Hall IC.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.



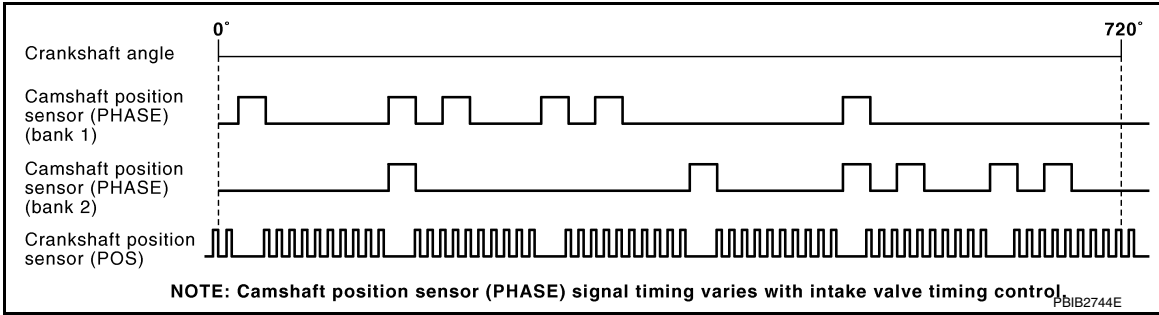
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COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]

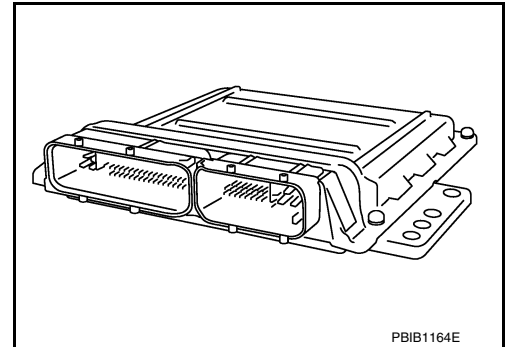
ECM receives the signals as shown in the figure.



ECM

INFOID:0000000012524211

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.



Electric Throttle Control Actuator

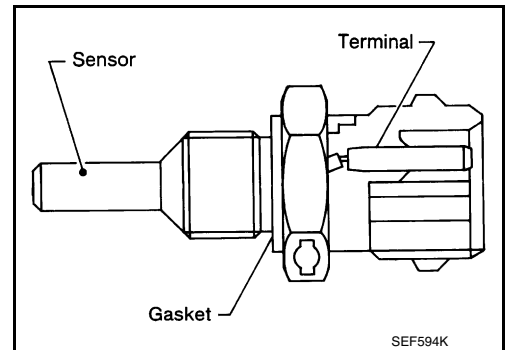
INFOID:0000000012524212

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The throttle position sensor detects the throttle valve position and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.

Engine Coolant Temperature Sensor

INFOID:0000000012524213

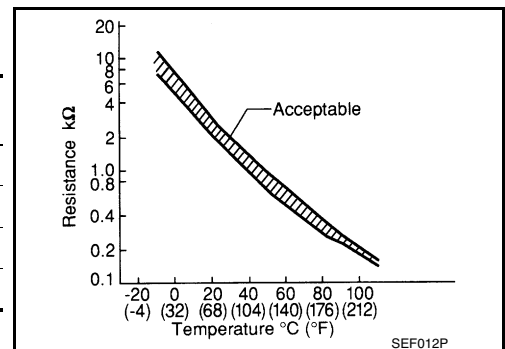
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

| Engine coolant temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|---|--------------|-----------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.10 - 2.90 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

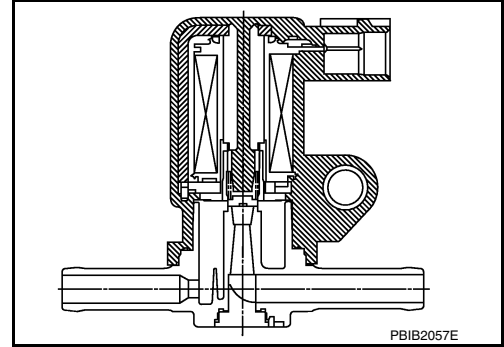
*: These data are reference values and are measured between ECM terminals.



EVAP Canister Purge Volume Control Solenoid Valve

INFOID:000000012524214

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



EVAP Canister Vent Control Valve

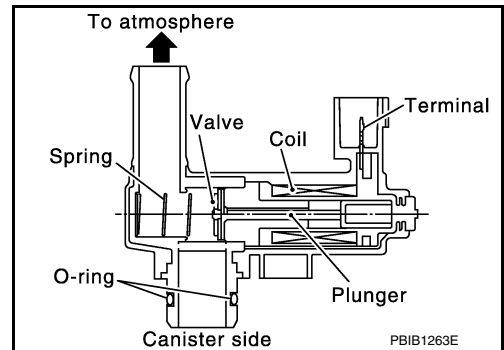
INFOID:000000012524215

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

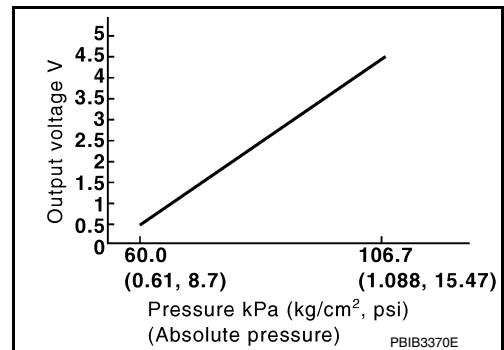
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



EVAP Control System Pressure Sensor

INFOID:000000012524216

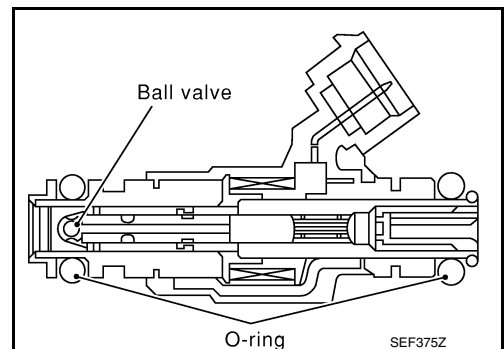
The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



Fuel Injector

INFOID:000000012524217

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



Fuel Level Sensor

INFOID:000000012524218

The fuel level sensor is mounted in the fuel level sensor unit.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]

The sensor detects a fuel level in the fuel tank and transmits a signal to the "A/C auto amp.". The "A/C auto amp." sends the fuel level sensor signal to the ECM via the CAN communication line. It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

Fuel Pump

INFOID:000000012524219

| Sensor | Input signal to ECM | ECM Function | Actuator |
|--|---------------------|-------------------|----------------------|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed* | Fuel pump control | Fuel pump relay ↓ |
| Battery | Battery voltage* | | Fuel pump |

*: ECM determines the start signal status by the signals of engine speed and battery voltage.

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation |
|----------------------------------|------------------------|
| Ignition switch is turned to ON. | Operates for 1 second. |
| Engine running and cranking | Operates. |
| When engine is stopped | Stops in 1.5 seconds. |
| Except as shown above | Stops. |

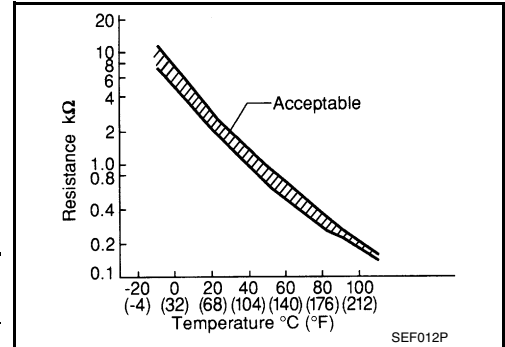
Fuel Tank Temperature Sensor

INFOID:000000012524220

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

| Fluid temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|--------------------------------|--------------|-----------------|
| 20 (68) | 3.5 | 2.3 - 2.7 |
| 50 (122) | 2.2 | 0.79 - 0.90 |



*: These data are reference values and are measured between ECM terminals.

Heated Oxygen Sensor 2

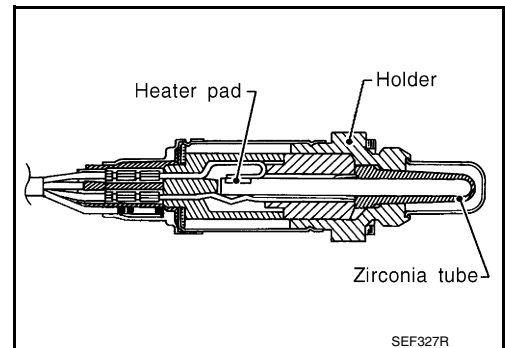
INFOID:000000012524221

The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VQ40DE]

Heated Oxygen Sensor 2 Heater

INFOID:000000012524223

SYSTEM DESCRIPTION

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|----------------------------|---------------------------------------|-------------------------------|
| Camshaft position sensor (PHASE) Crankshaft position sensor (POS) | Engine speed | Heated oxygen sensor 2 heater control | Heated oxygen sensor 2 heater |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Mass air flow sensor | Amount of intake air | | |

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

| Engine speed rpm | Heated oxygen sensor 2 heater |
|---|-------------------------------|
| Above 3,600 | OFF |
| Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> • Engine: After warming up • Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | ON |

Ignition Coil

INFOID:000000012524223

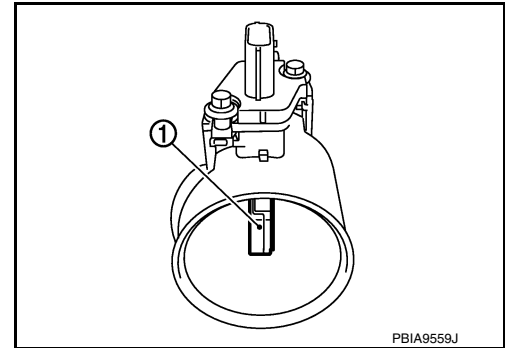
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

Intake Air Temperature Sensor

INFOID:000000012524224

The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

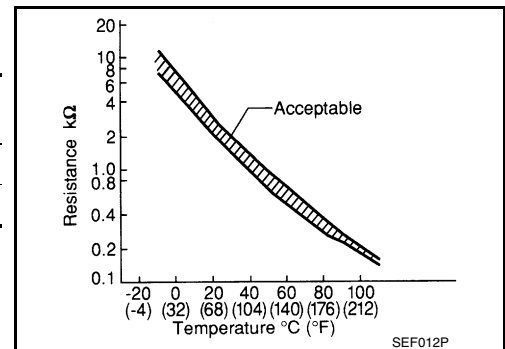
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<Reference data>

| Intake air temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|-------------------------------------|--------------|-----------------|
| 25 (77) | 3.3 | 1.800 - 2.200 |
| 80 (176) | 1.2 | 0.283 - 0.359 |

*: These data are reference values and are measured between ECM terminals.



Intake Valve Timing Control Solenoid Valve

INFOID:0000000012524225

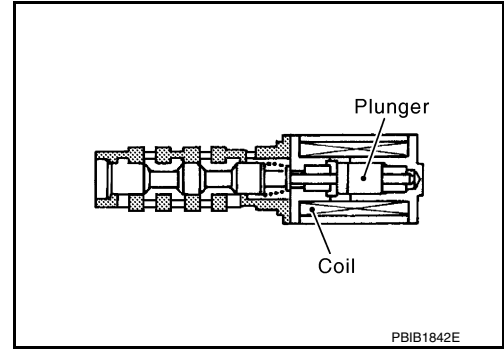
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



Knock Sensor

INFOID:0000000012524226

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

Malfunction Indicator Lamp

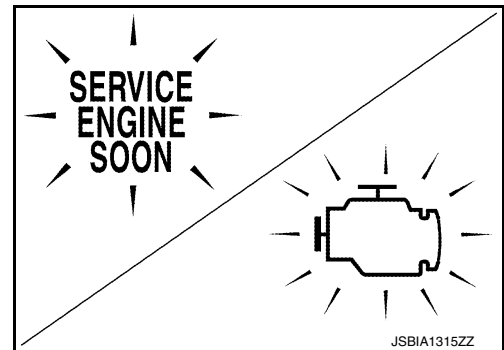
INFOID:0000000012524227

The Malfunction Indicator Lamp (MIL) is located on the combination meter.

The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.

When the engine is started, the MIL should turn off. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.

For details, refer to [EC-56. "Diagnosis Description"](#).

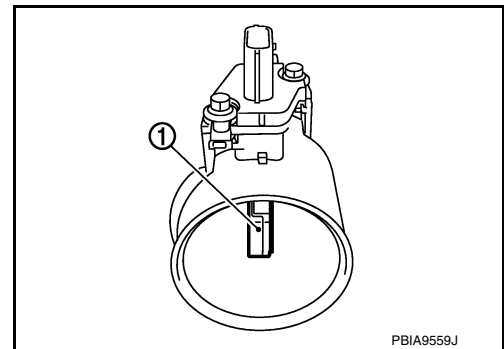


Mass Air Flow Sensor

INFOID:0000000012524228

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



Power Steering Pressure Sensor

INFOID:0000000012524229

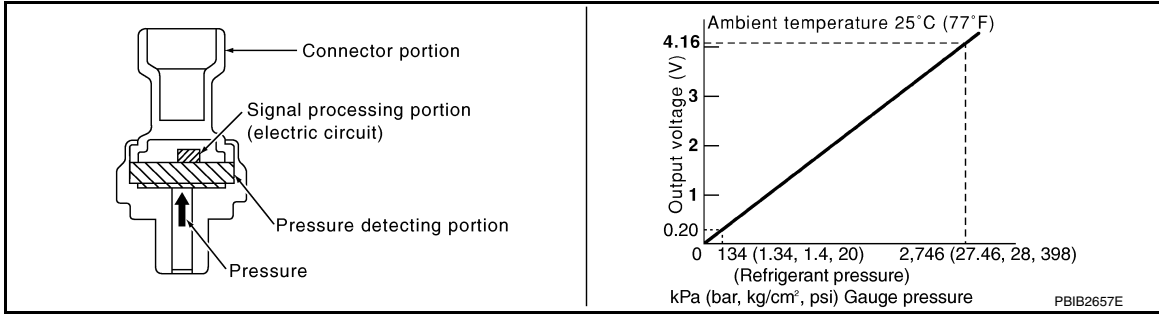
Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load.

This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

Refrigerant Pressure Sensor

INFOID:000000012524230

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Throttle Control Motor

INFOID:000000012524231

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

Throttle Control Motor Relay

INFOID:000000012524232

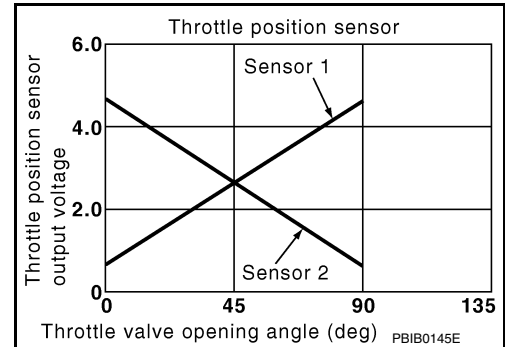
Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

Throttle Position Sensor

INFOID:000000012524233

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.



VIAS Control Solenoid Valve

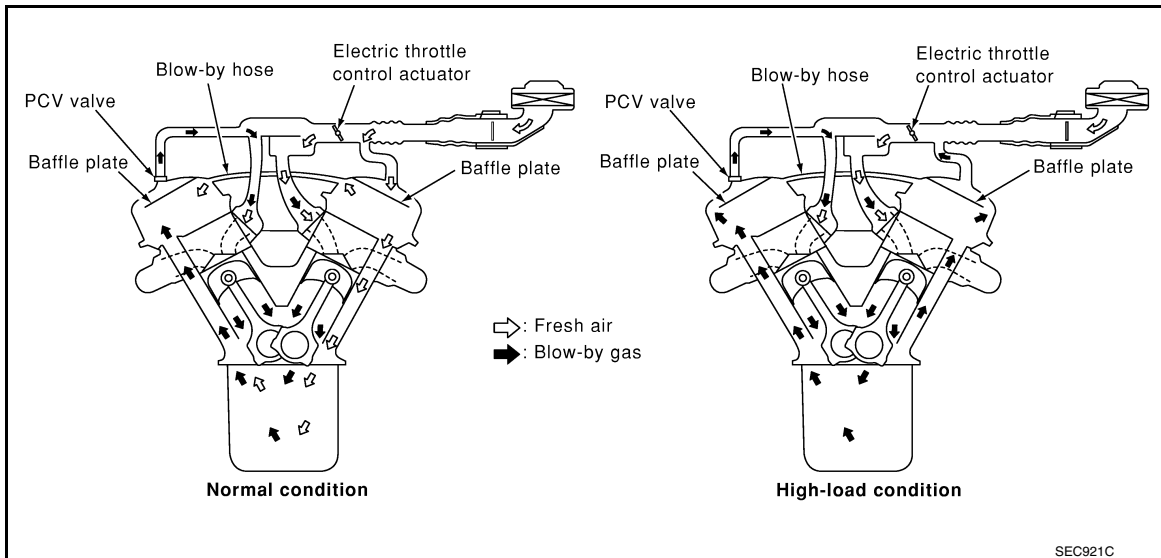
INFOID:000000012524234

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is OFF, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and sends the vacuum signal to the power valve actuator.

STRUCTURE AND OPERATION

Positive Crankcase Ventilation

INFOID:000000012524235



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

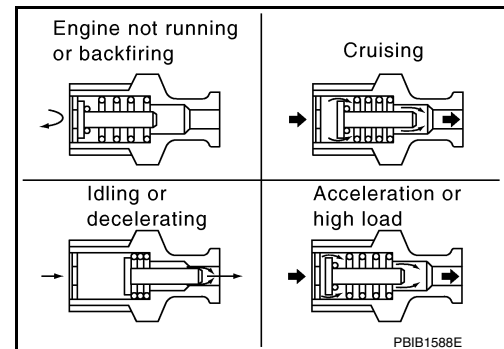
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



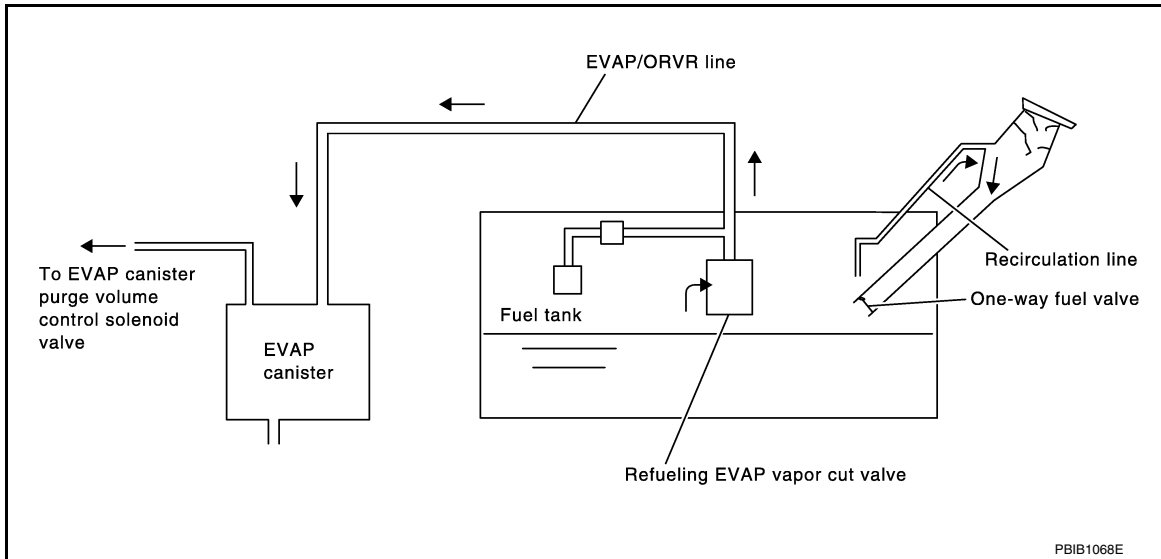
STRUCTURE AND OPERATION

< SYSTEM DESCRIPTION >

[VQ40DE]

On Board Refueling Vapor Recovery (ORVR)

INFOID:000000012524236



From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

WARNING:

When conducting inspections below, be sure to observe the following:

- Put a “CAUTION: FLAMMABLE” sign in workshop.
- Never smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Always furnish the workshop with a CO₂ fire extinguisher.

CAUTION:

- Before removing fuel line parts, carry out the following procedures:
 - Put drained fuel in an explosion-proof container and put lid on securely.
 - Release fuel pressure from fuel line. Refer to [EC-146. "Work Procedure"](#).
 - Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Never kink or twist hose and tube when they are installed.
- Never tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leaks at connections.
- Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

SYSTEM

ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : System Diagram

INFOID:000000012524237

A

EC

C

D

E

F

G

H

I

J

K

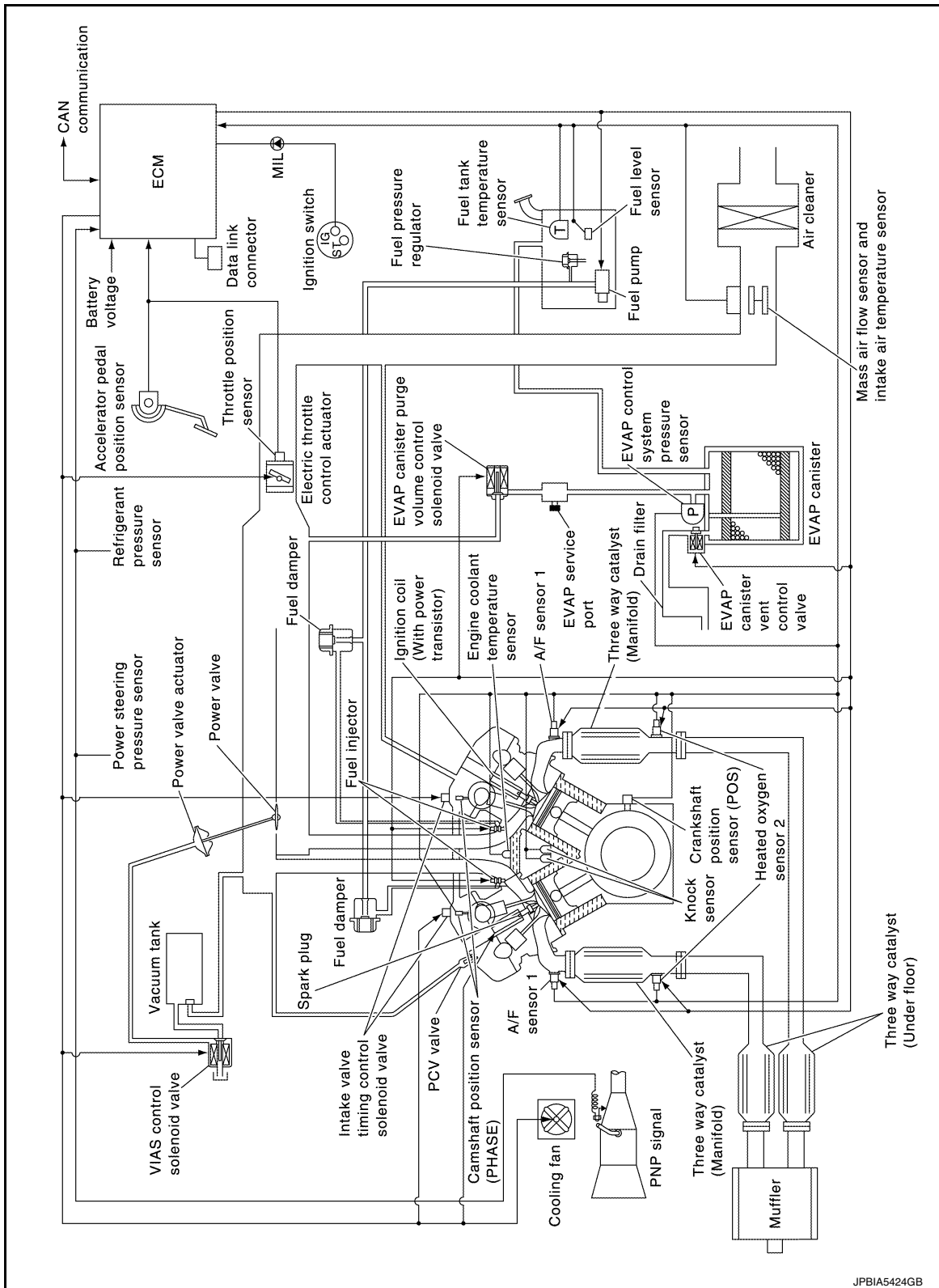
L

M

N

O

P



JPBIA5424GB

SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

ENGINE CONTROL SYSTEM : System Description

INFOID:000000012524238

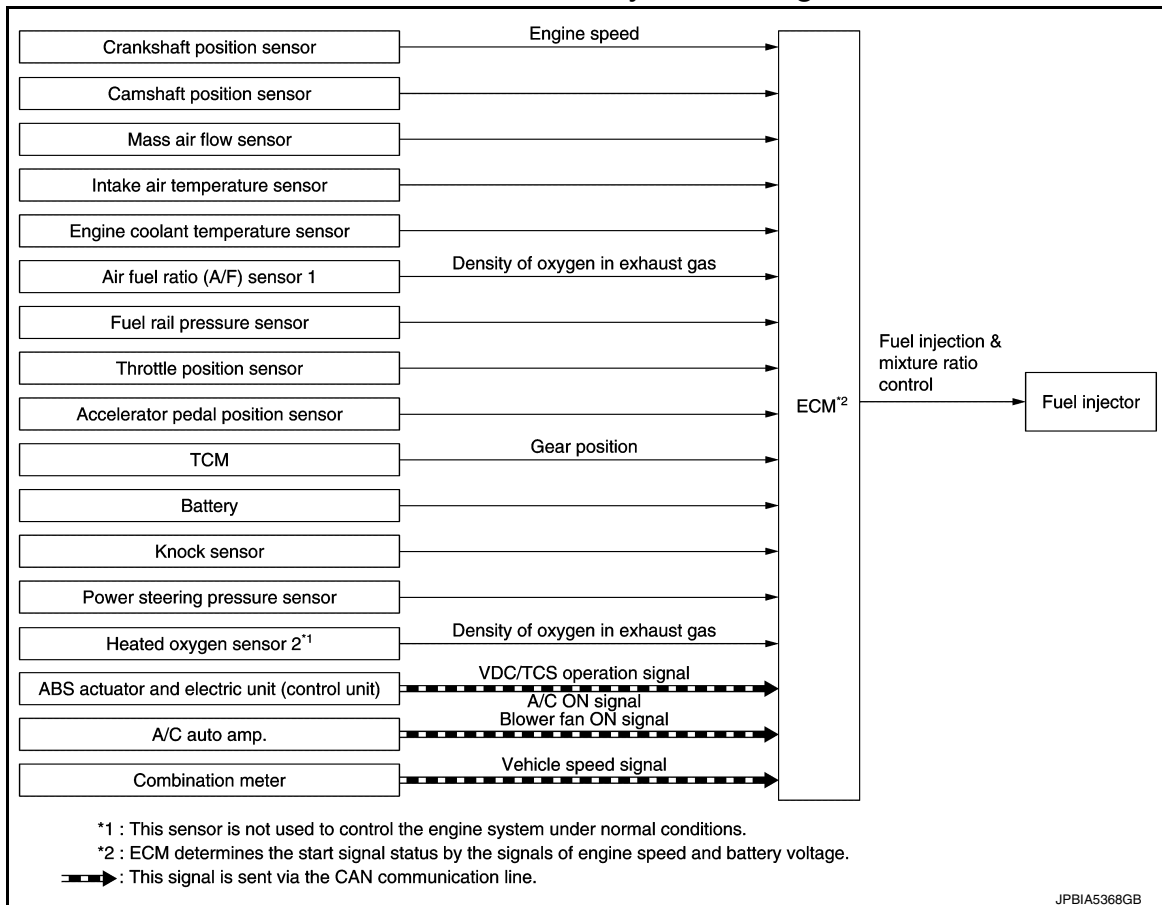
ECM controls the engine by various functions.

| Function | Reference |
|---------------------------------------|---|
| Multiport fuel injection system | EC-39. "MULTIPOINT FUEL INJECTION SYSTEM : System Description" |
| Electric ignition system | EC-41. "ELECTRIC IGNITION SYSTEM : System Description" |
| Air conditioning cut control | EC-42. "AIR CONDITIONING CUT CONTROL : System Description" |
| Automatic speed control device (ASCD) | EC-43. "AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description" |
| CAN communication | EC-45. "CAN COMMUNICATION : System Description" |
| Cooling fan control | EC-45. "COOLING FAN CONTROL : System Description" |
| Evaporative emission system | EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description" |
| Intake valve timing control | EC-48. "INTAKE VALVE TIMING CONTROL : System Description" |
| Variable induction air system | EC-48. "VARIABLE INDUCTION AIR SYSTEM : System Description" |
| Fuel filler cap warning system | EC-52. "FUEL FILLER CAP WARNING SYSTEM : System Description" |

MULTIPOINT FUEL INJECTION SYSTEM

MULTIPOINT FUEL INJECTION SYSTEM : System Diagram

INFOID:000000012524239



SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

MULTIPOINT FUEL INJECTION SYSTEM : System Description

INFOID:000000012524240

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator | EC |
|---|--|--|---------------|----|
| Crankshaft position sensor (POS) | Engine speed*3 Piston position | Fuel injection & mixture ratio control | Fuel injector | |
| Camshaft position sensor (PHASE) | | | | |
| Mass air flow sensor | Amount of intake air | | | |
| Intake air temperature sensor | Intake air temperature | | | |
| Engine coolant temperature sensor | Engine coolant temperature | | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas | | | |
| Throttle position sensor | Throttle position | | | |
| Accelerator pedal position sensor | Accelerator pedal position | | | |
| TCM | Gear position | | | |
| Battery | Battery voltage*3 | | | |
| Knock sensor | Engine knocking condition | | | |
| Power steering pressure sensor | Power steering operation | | | |
| Heated oxygen sensor 2*1 | Density of oxygen in exhaust gas | | | |
| ABS actuator and electric unit (control unit)*2 | VDC/TCS operation signal | | | |
| A/C auto amp. | A/C ON signal*2 Blower fan signal*2 | | | |
| Combination meter | Vehicle speed signal*2 | | | |

*1: This sensor is not used to control the engine system under normal conditions.

*2: This signal is sent to the ECM via the CAN communication line.

*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

<Fuel increase>

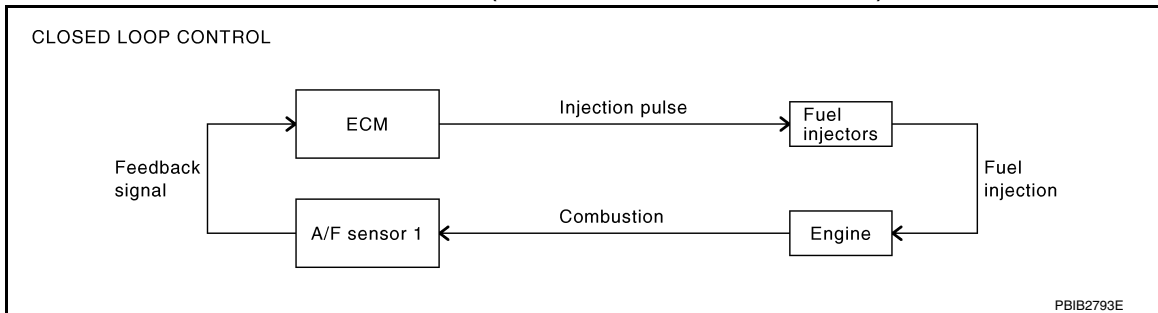
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from N to D
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

< SYSTEM DESCRIPTION >

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 1 can better reduce CO, HC and NO_x emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to [EC-26, "Air Fuel Ratio Sensor 1"](#). This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture). This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst 1. Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

- Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of A/F sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.

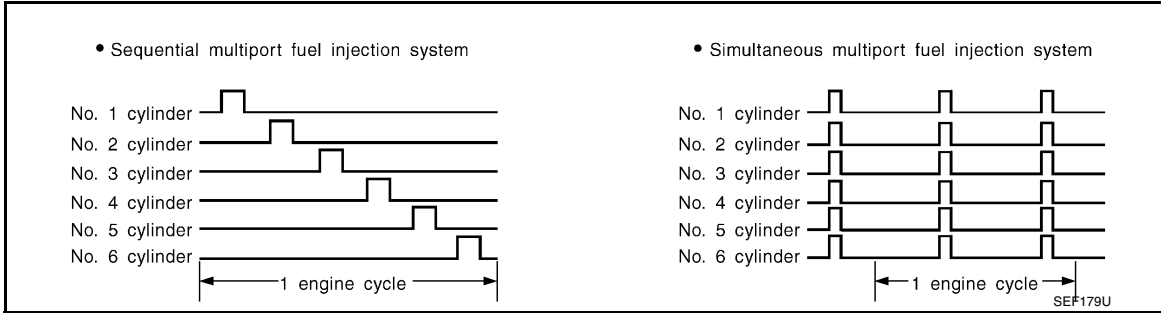
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short-term fuel trim and long-term fuel trim.

"Short-term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long-term fuel trim" is overall fuel compensation carried out over time to compensate for continual deviation of the short-term fuel trim from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

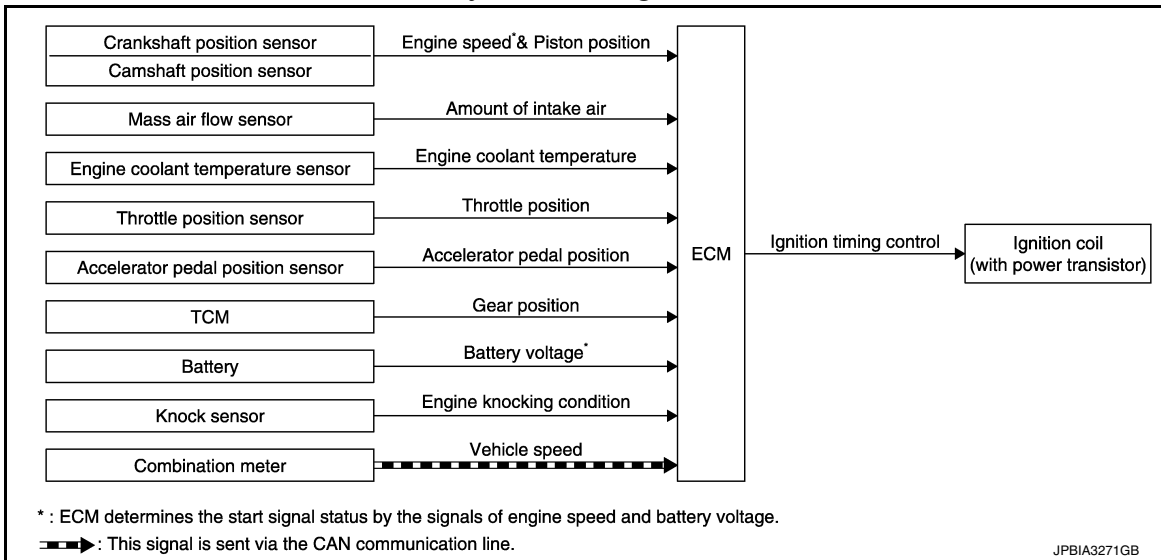
- Sequential Multiport Fuel Injection System
Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The six injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM : System Diagram



ELECTRIC IGNITION SYSTEM : System Description

INFOID:0000000012524242

INPUT/OUTPUT SIGNAL CHART

SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

| Sensor | Input Signal to ECM | ECM function | Actuator |
|-----------------------------------|---|-------------------------|---------------------------------------|
| Crankshaft position sensor (POS) | Engine speed* ² Piston position | Ignition timing control | Ignition coil (with power transistor) |
| Camshaft position sensor (PHASE) | | | |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| TCM | Gear position | | |
| Battery | Battery voltage* ² | | |
| Knock sensor | Engine knocking | | |
| Combination meter | Vehicle speed* ¹ | | |

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

Ignition order: 1 - 2 - 3 - 4 - 5 - 6

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

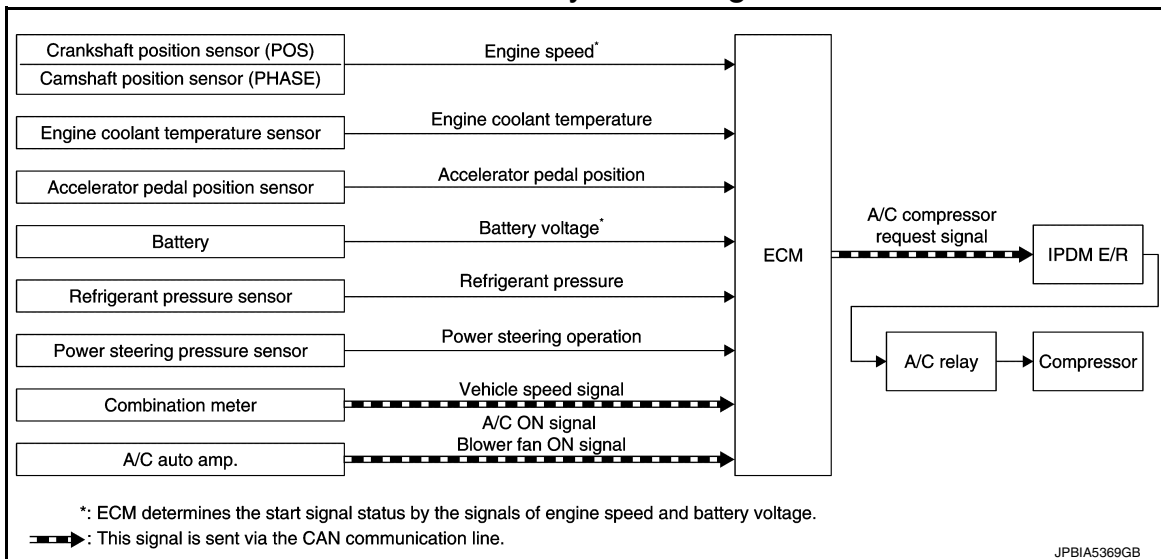
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

AIR CONDITIONING CUT CONTROL

AIR CONDITIONING CUT CONTROL : System Diagram

INFOID:000000012524243



AIR CONDITIONING CUT CONTROL : System Description

INFOID:000000012524244

INPUT/OUTPUT SIGNAL CHART

SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

| Sensor | Input Signal to ECM | ECM function | Actuator |
|--|---|-------------------------------|---|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*2 | A/C compressor request signal | IPDM E/R ↓ A/C relay ↓ Compressor |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage*2 | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Power steering pressure sensor | Power steering operation | | |
| Combination meter | Vehicle speed signal*1 | | |
| A/C auto amp. | <ul style="list-style-type: none"> • A/C ON signal*1 • Blower fun ON signal*1 | | |

*1: This signal is sent to the ECM via the CAN communication line.
 *2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

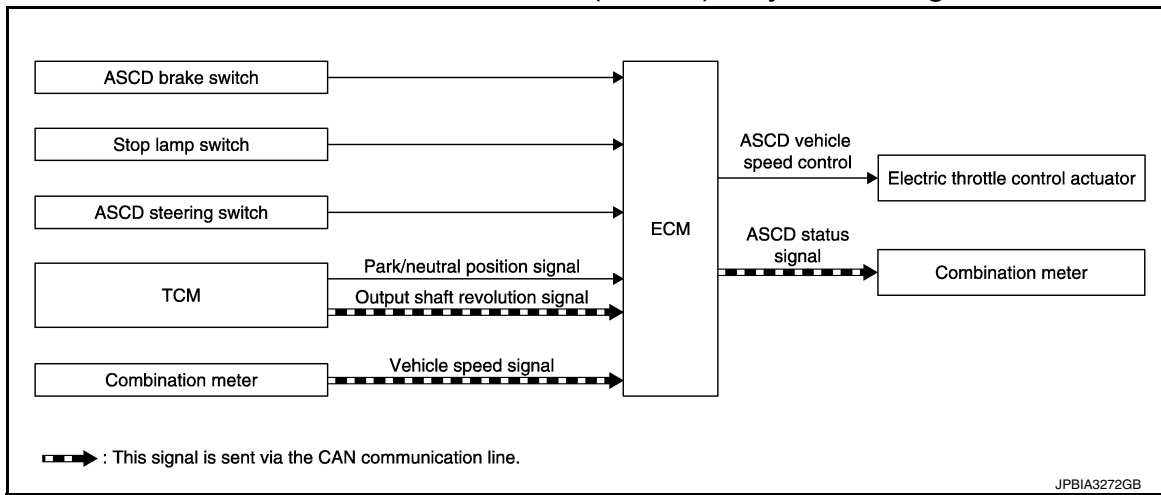
This system improves engine operation when the air conditioner is used. Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Diagram

INFOID:0000000012524245



AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description

INFOID:0000000012524246

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|----------------------|--------------------------------|----------------------------|------------------------------------|
| ASCD brake switch | Brake pedal operation | ASCD vehicle speed control | Electric throttle control actuator |
| Stop lamp switch | Brake pedal operation | | |
| ASCD steering switch | ASCD steering switch operation | | |

SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

| Sensor | Input signal to ECM | ECM function | Actuator |
|-------------------|---------------------------------|--------------------|-------------------|
| TCM | Park/neutral position signal | ASCD status signal | Combination meter |
| | Output shaft revolution signal* | | |
| Combination meter | Vehicle speed* | | |

*: This signal is sent to the ECM via the CAN communication line

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).

ECM controls throttle angle of electric throttle control actuator to regulate engine speed.

Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in the ASCD system, it automatically deactivates control.

NOTE:

Always drive vehicle in a safe manner according to traffic conditions and obey all traffic laws.

SET OPERATION

Press MAIN switch. (The CRUISE indicator in combination meter illuminates.)

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press COAST/SET switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

If the ACCEL/RES switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.

And then ASCD will maintain the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Selector lever is in the N, P or R position
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE lamp may blink slowly.

When the engine coolant temperature decreases to the normal operating temperature, CRUISE lamp will stop blinking and the cruise operation will be able to work by pressing COAST/SET switch or ACCEL/RES switch.

- Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

If MAIN switch is turned to OFF while ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the COAST/SET switch is pressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will maintain the new set speed.

RESUME OPERATION

When the ACCEL/RES switch is pressed after cancel operation other than pressing MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

- Brake pedal is released
- Selector lever is in the P and N positions
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

CAN COMMUNICATION

CAN COMMUNICATION : System Description

INFOID:000000012524247

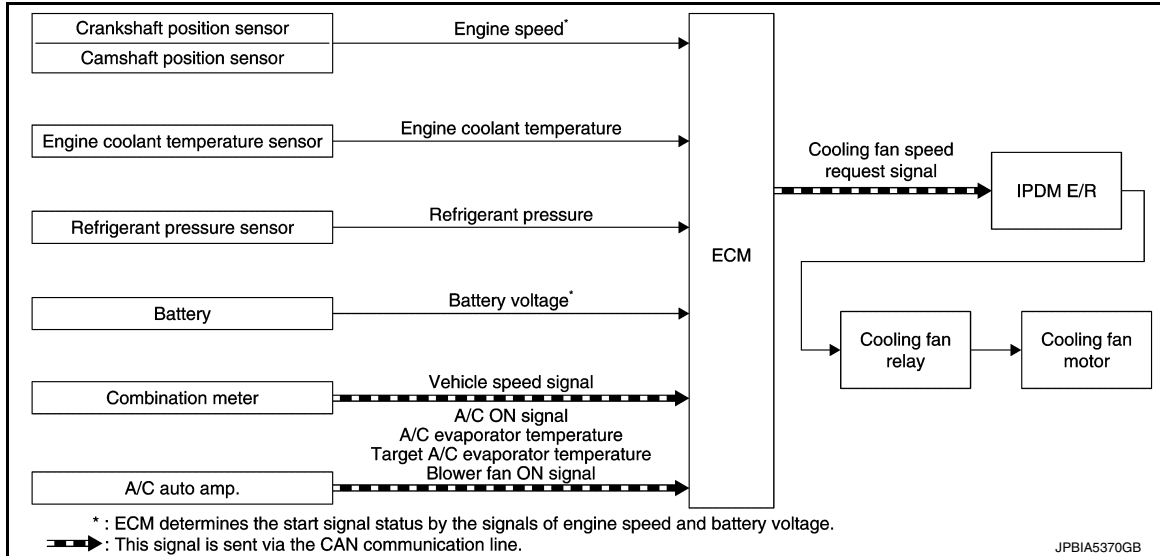
CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Refer to [LAN-30. "CAN COMMUNICATION SYSTEM : CAN Communication Signal Chart"](#), about CAN communication for detail.

COOLING FAN CONTROL

COOLING FAN CONTROL : System Diagram

INFOID:000000012524248



NOTE:

Cooling fan relay is not used

COOLING FAN CONTROL : System Description

INFOID:000000012524249

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|-------------------------------------|----------------------------------|------------------------------------|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*1 | Cooling fan speed request signal | IPDM E/R ↓ Cooling fan motor |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Battery | Battery voltage*1 | | |
| Combination meter | Vehicle speed signal*2 | | |
| A/C auto amp. | A/C ON signal*2 | | |
| | A/C evaporator temperature*2 | | |
| | Target A/C evaporator temperature*2 | | |
| | Blower fan ON signal*2 | | |

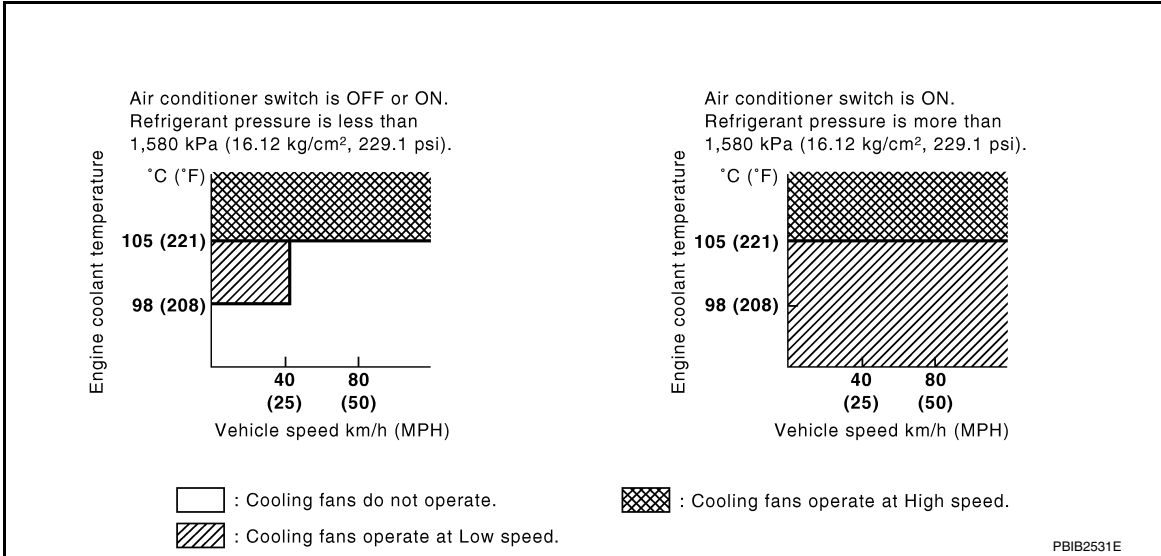
*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to ECM via the CAN communication line.

SYSTEM DESCRIPTION

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

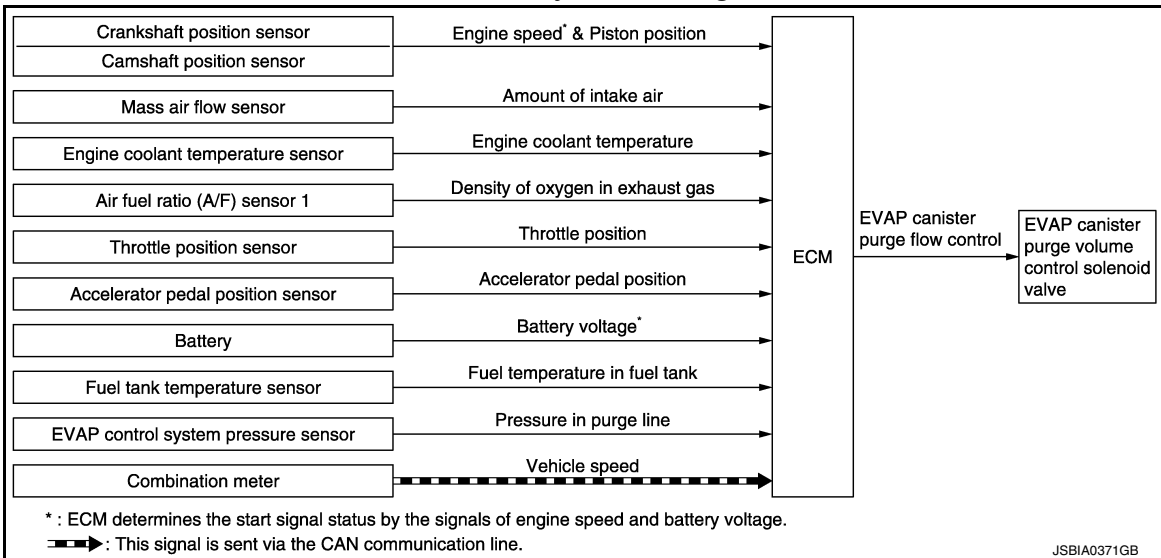
Cooling Fan Operation



EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM : System Diagram

INFOID:0000000012524250



EVAPORATIVE EMISSION SYSTEM : System Description

INFOID:0000000012524251

INPUT/OUTPUT SIGNAL CHART

SYSTEM

< SYSTEM DESCRIPTION >

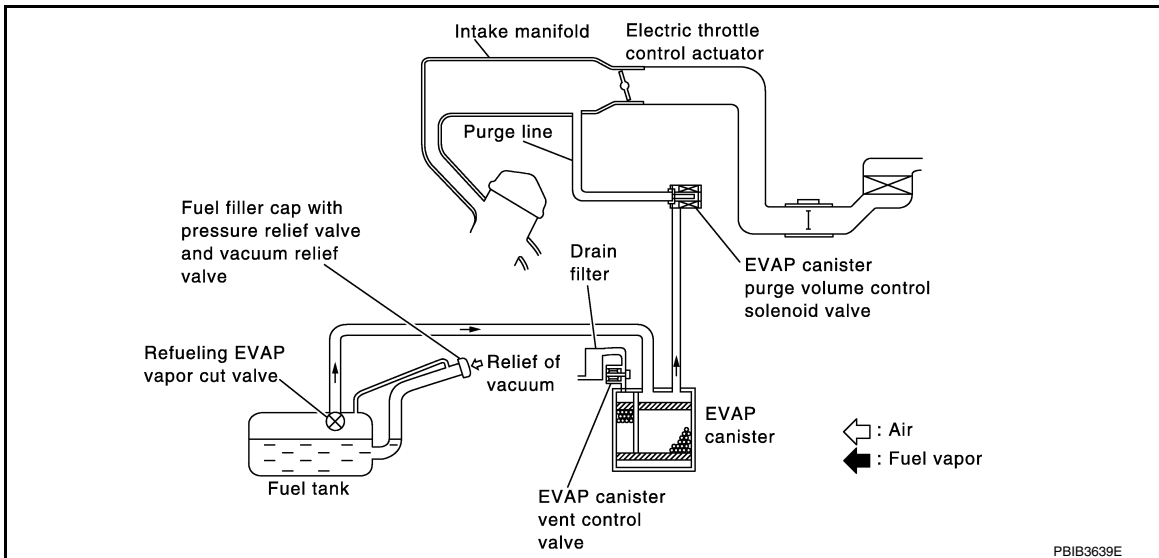
[VQ40DE]

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|---|-------------------------------------|--|
| Crankshaft position sensor Camshaft position sensor | Engine speed*1 | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Battery | Battery voltage*1 | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Fuel tank temperature sensor | Fuel temperature in fuel tank | | |
| EVAP control system pressure sensor | Pressure in purge line | | |
| Combination meter | Vehicle speed signal*2 | | |

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister. The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank. The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases. EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

INTAKE VALVE TIMING CONTROL

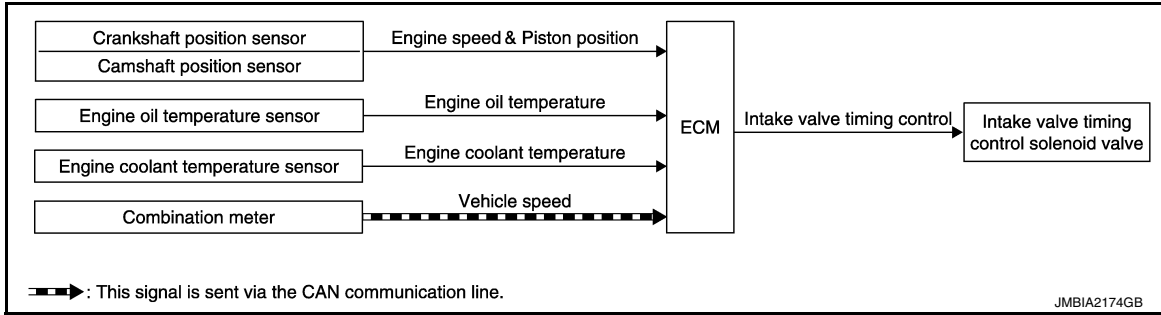
SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

INTAKE VALVE TIMING CONTROL : System Diagram

INFOID:000000012524252



INTAKE VALVE TIMING CONTROL : System Description

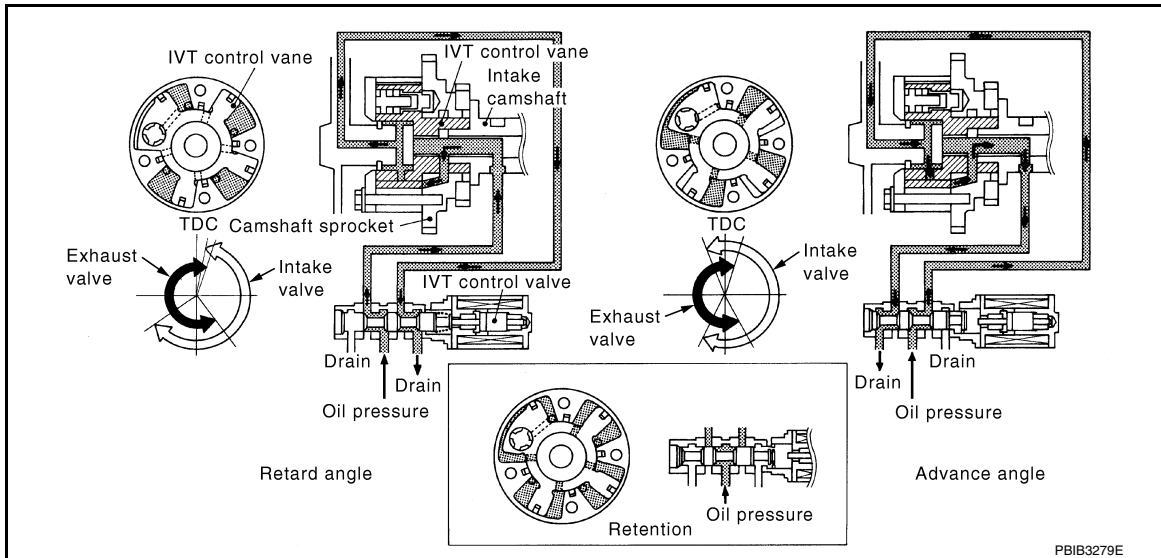
INFOID:000000012524253

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|-----------------------------------|----------------------------------|-----------------------------|--|
| Crankshaft position sensor (POS) | Engine speed and piston position | Intake valve timing control | Intake valve timing control solenoid valve |
| Camshaft position sensor (PHASE) | | | |
| Engine oil temperature sensor | Engine oil temperature | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Combination meter | Vehicle speed signal* | | |

*: This signal is sent to the ECM via the CAN communication line

SYSTEM DESCRIPTION



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

VARIABLE INDUCTION AIR SYSTEM

VARIABLE INDUCTION AIR SYSTEM : System Description

INFOID:000000012524254

SYSTEM DESCRIPTION

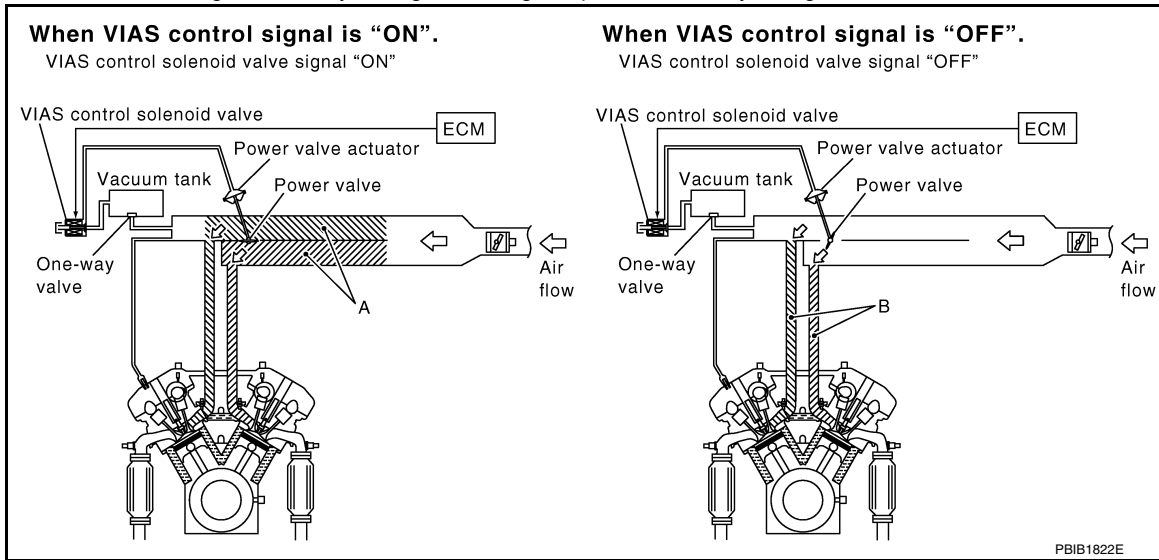
SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

| Sensor | Input Signal to ECM | ECM function | Actuator |
|--|----------------------------|--------------|-----------------------------|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed* | VIAS control | VIAS control solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage* | | |

*: ECM determines the start signal status by the signals of engine speed and battery voltage.



When the engine is running at medium speed, the ECM sends the ON signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore closes the power valve.

Under this condition, the effective intake manifold length is equivalent to the total length of passage A and passage B. This long intake manifold provides increased amount of intake air, which results in improved suction efficiency and higher torque.

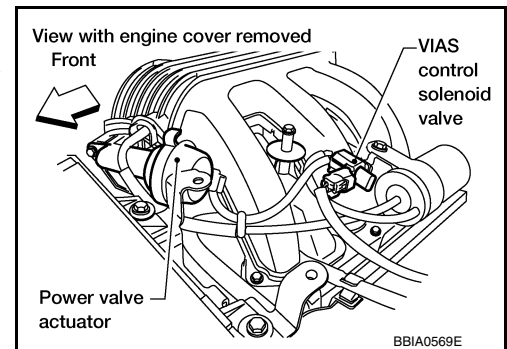
When engine is running at low or high speed, the ECM sends the OFF signal to the VIAS control solenoid valve and the power valve is opened.

Under this condition, the effective intake manifold length is equivalent to the length of passage B. This shortened intake manifold length results in enhanced engine output due to reduced suction resistance under high speeds.

COMPONENT DESCRIPTION

Power Valve

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.



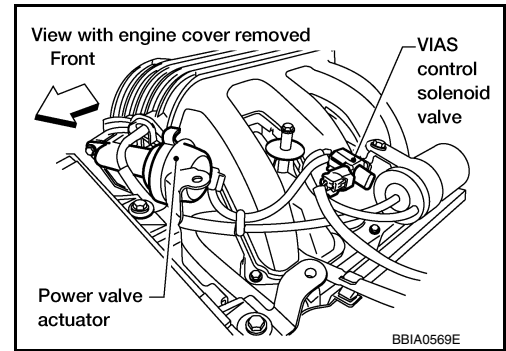
VIAS Control Solenoid Valve

SYSTEM

[VQ40DE]

< SYSTEM DESCRIPTION >

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.



SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

VARIABLE INDUCTION AIR SYSTEM : Vacuum Hose Drawing

INFOID:000000012524255

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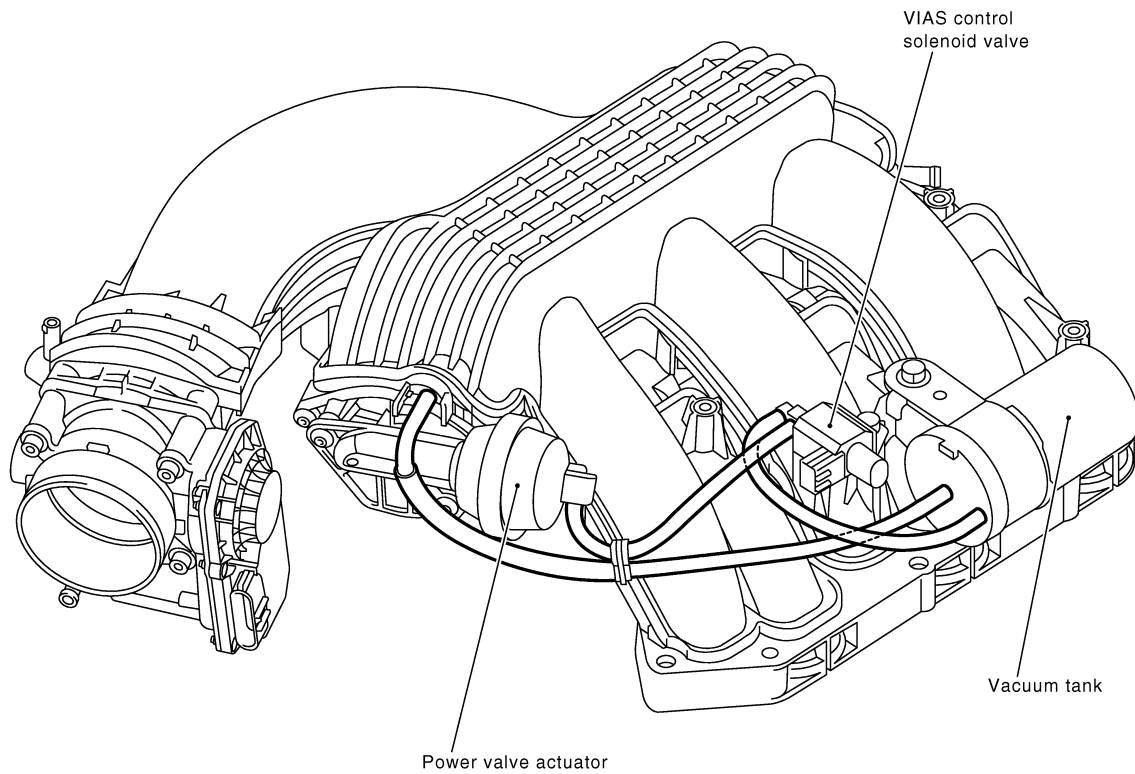
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NOTE: Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

Refer to [EC-37, "ENGINE CONTROL SYSTEM : System Diagram"](#) for Vacuum Control System.
FUEL FILLER CAP WARNING SYSTEM

PBIB2529E

SYSTEM

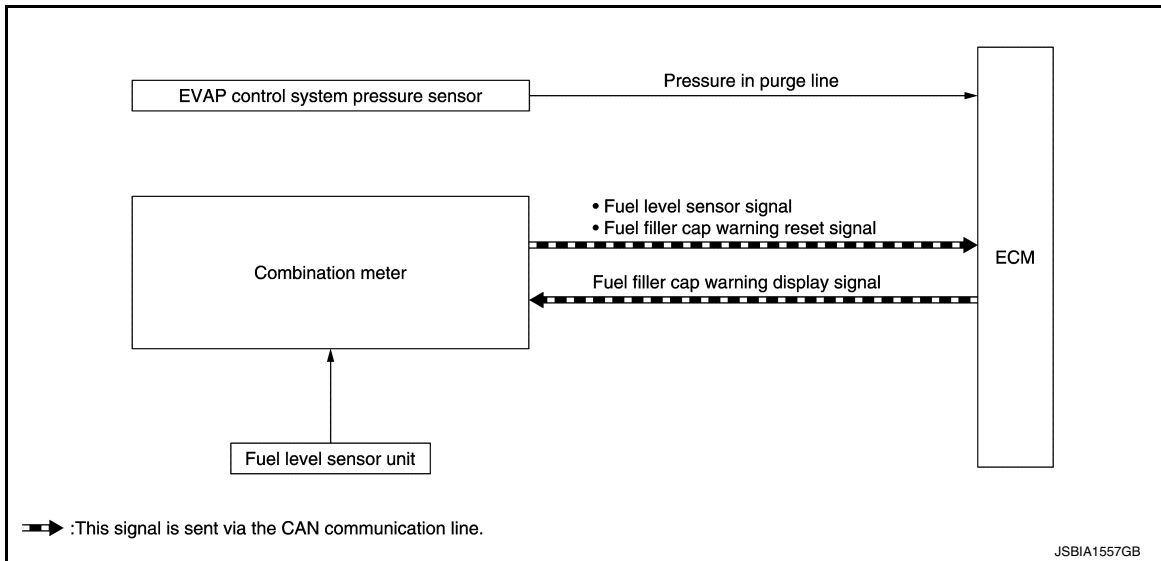
< SYSTEM DESCRIPTION >

[VQ40DE]

FUEL FILLER CAP WARNING SYSTEM : System Description

INFOID:000000012524256

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

Input

| Unit/Sensor | Input signal to ECM | ECM function |
|-------------------------------------|---------------------------------------|---------------------------------|
| EVAP control system pressure sensor | Pressure in purge line | Fuel filler cap warning control |
| Combination meter | Fuel level sensor signal* | |
| | Fuel filler cap warning reset signal* | |

*: This signal is sent to the ECM via the CAN communication line.

Output

| Unit | Output signal | Actuator |
|------|---|-------------------|
| ECM | Fuel filler cap warning display signal* | Combination meter |

*: This signal is sent to the combination meter via the CAN communication line.

SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.

ECM judges a refueled state, based on a fuel level sensor signal transmitted from the combination meter via CAN communication.

When a very small leak is detected through the EVAP leak diagnosis performed after judging the refueled state, ECM transmits a fuel filler cap warning display signal (request for display ON) to the combination meter via CAN communication.

When receiving the signal, the combination meter turns ON the fuel filler cap warning display.

CAUTION:

Check fuel filler cap installation condition when the fuel filler cap warning display turns ON.

Reset Operation

The fuel filler cap warning lamp turns OFF, according to any condition listed below:

- Reset operation is performed by operating the "INFO" switch on the combination meter.
- When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.
- DTC erased by using CONSULT.

NOTE:

SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

MIL turns ON if a malfunction is detected in leak diagnosis results again at the trip after the fuel filler cap warning display turns ON/OFF.

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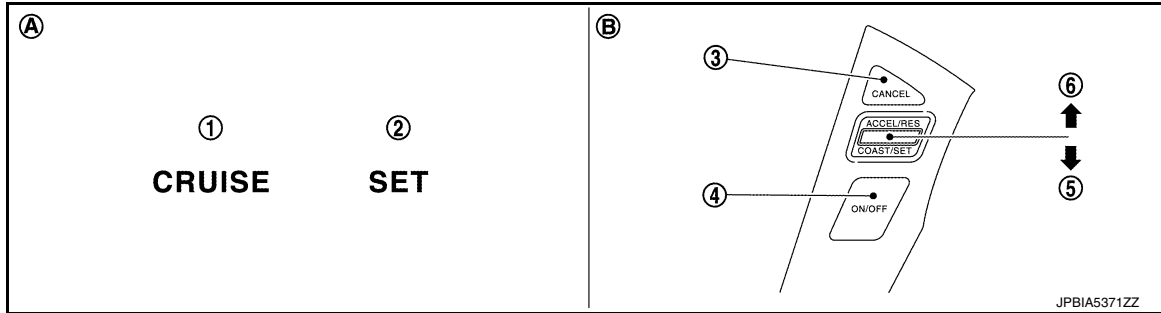
OPERATION

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

AUTOMATIC SPEED CONTROL DEVICE (ASCD) : Switch Name and Function

INFOID:000000012524257

SWITCHES AND INDICATORS



- | | | |
|---------------------|---------------------|--|
| 1. CRUISE indicator | 2. SET indicator | 3. CANCEL switch |
| 4. ASCD MAIN switch | 5. COAST/SET switch | 6. ACCEL/RES switch (ACCELERATE/RESUME) |
- A. On the combination meter
B. On the steering wheel

SET SPEED RANGE

ASCD system can be set the following vehicle speed.

| | |
|-------------------------|-------------------------|
| Minimum speed (Approx.) | Maximum speed (Approx.) |
| 40 km/h (25 MPH) | 144 km/h (89 MPH) |

SWITCH OPERATION

| Item | Function |
|---|--|
| CANCEL switch | Cancels the cruise control driving. |
| ACCEL/RES switch (RESUME/ACCELERATE) | <ul style="list-style-type: none"> Resumes the set speed. Increases speed incrementally during cruise control driving. |
| COAST/SET switch | <ul style="list-style-type: none"> Sets desired cruise speed. Decreases speed incrementally during cruise control driving. |
| ASCD MAIN switch | Master switch to activate the ASCD system. |

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- ASCD MAIN switch pressed (Set speed is cleared)
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Selector lever position is changed to N, P or R
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE indicator may blink slowly.
When the engine coolant temperature decreases to the normal operating temperature, CRUISE indicator will stop blinking and the cruise operation will be able to work by pressing COAST/SET switch or ACCEL/RES switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

OPERATION

< SYSTEM DESCRIPTION >

[VQ40DE]

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

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ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

[VQ40DE]

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:000000012524258

This system is an on board diagnostic system that records exhaust emission-related diagnostic information and detects a sensors/actuator-related malfunction. A malfunction is indicated by the malfunction indicator lamp (MIL) and stored in ECU memory as a DTC. The diagnostic information can be obtained with the diagnostic tool (GST: Generic Scan Tool).

GST (Generic Scan Tool)

INFOID:000000012524259

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to [GI-51. "Description"](#).

NOTE:

Service \$0A is not applied for regions where it is not mandated.

DIAGNOSIS SYSTEM (ECM)

DIAGNOSIS DESCRIPTION

DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:000000012524260

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The "trip" in the "Two Trip Detection Logic" means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

| Items | MIL | | | | DTC | | 1st trip DTC | |
|---|----------|------------|----------|------------|---------------------|---------------------|---------------------|---------------------|
| | 1st trip | | 2nd trip | | 1st trip displaying | 2nd trip displaying | 1st trip displaying | 2nd trip displaying |
| | Blinking | Illuminate | Blinking | Illuminate | | | | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected | × | — | — | — | — | — | × | — |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected | — | — | × | — | — | × | — | — |
| One trip detection diagnoses (Refer to EC-94, "DTC Index" .) | — | × | — | — | × | — | — | — |
| Except above | — | — | — | × | — | × | × | — |

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:000000012524261

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is saved in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are saved in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

For malfunctions in which 1st trip DTCs are displayed, refer to [EC-94, "DTC Index"](#). These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

1st trip DTC is specified in Service \$07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to [EC-129, "Work Flow"](#). Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen.

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

| Priority | Items | |
|----------|----------------------------|--|
| 1 | Freeze frame data | Misfire — DTC: P0300 - P0306 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175 |
| 2 | | Except the above items |
| 3 | 1st trip freeze frame data | |

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was saved in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

DIAGNOSIS DESCRIPTION : Counter System

INFOID:000000012524262

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on.
- The MIL will turn OFF after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

COUNTER SYSTEM CHART

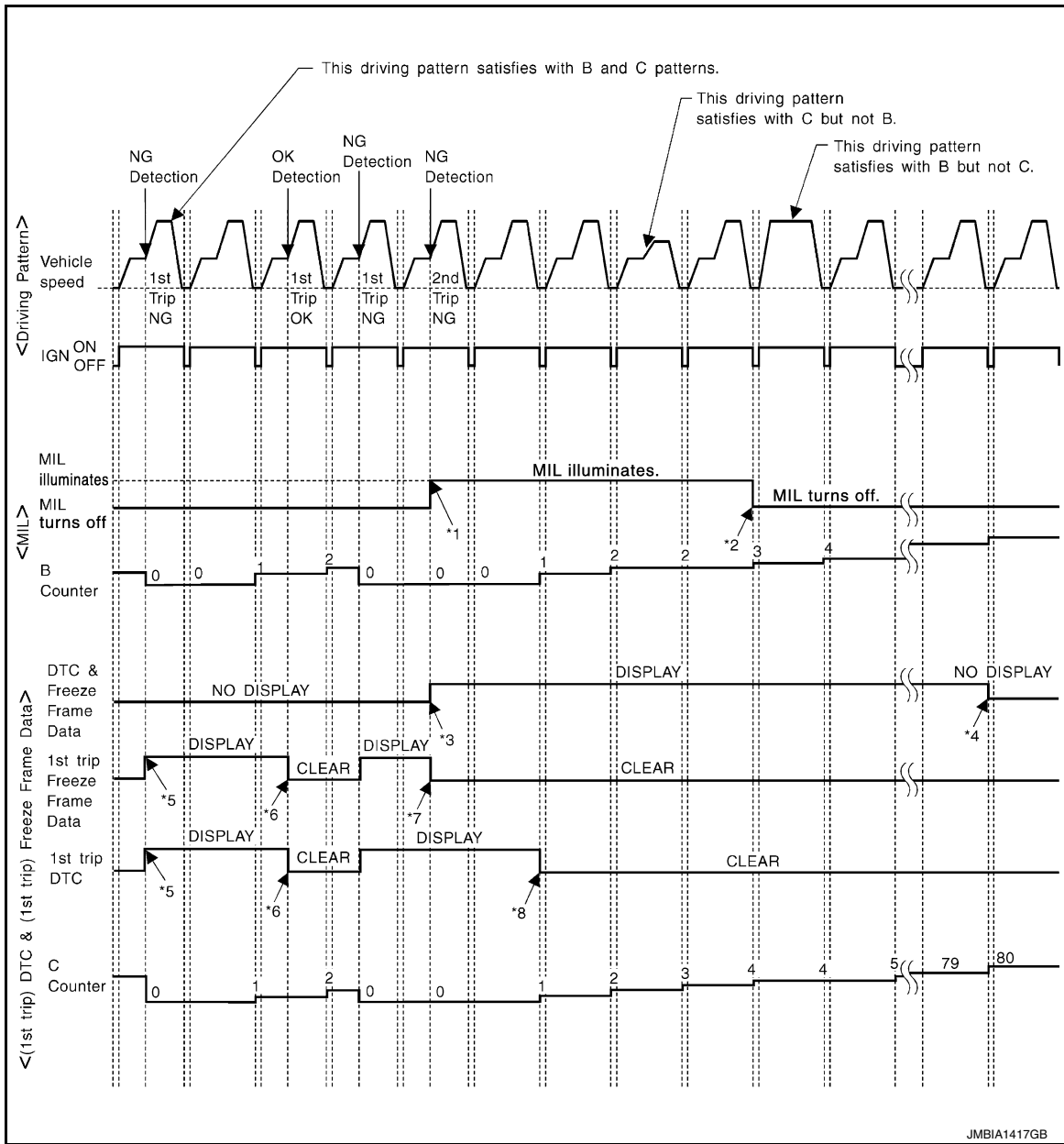
| Items | Fuel Injection System | Misfire | Other |
|-------------------------------------|-----------------------|-------------------|----------------|
| MIL (turns OFF) | 3 (pattern B) | 3 (pattern B) | 3 (pattern B) |
| DTC, Freeze Frame Data (no display) | 80 (pattern C) | 80 (pattern C) | 40 (pattern A) |
| 1st Trip DTC (clear) | 1 (pattern C), *1 | 1 (pattern C), *1 | 1 (pattern B) |
| 1st Trip Freeze Frame Data (clear) | *1, *2 | *1, *2 | 1 (pattern B) |

For details about patterns B and C under "Fuel Injection System" and "Misfire", see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM".

For details about patterns A and B under Other, see "EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM".

- *1: Clear timing is at the moment OK is detected.
- *2: Clear timing is when the same malfunction is detected in the 2nd trip.

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

Explanation for Driving Patterns for "Misfire <Exhaust Quality Deterioration>", "Fuel Injection System"

Driving Pattern B

Refer to [EC-62. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

< SYSTEM DESCRIPTION >

Driving Pattern C

Refer to [EC-62. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Example:

If the stored freeze frame data is as per the following:

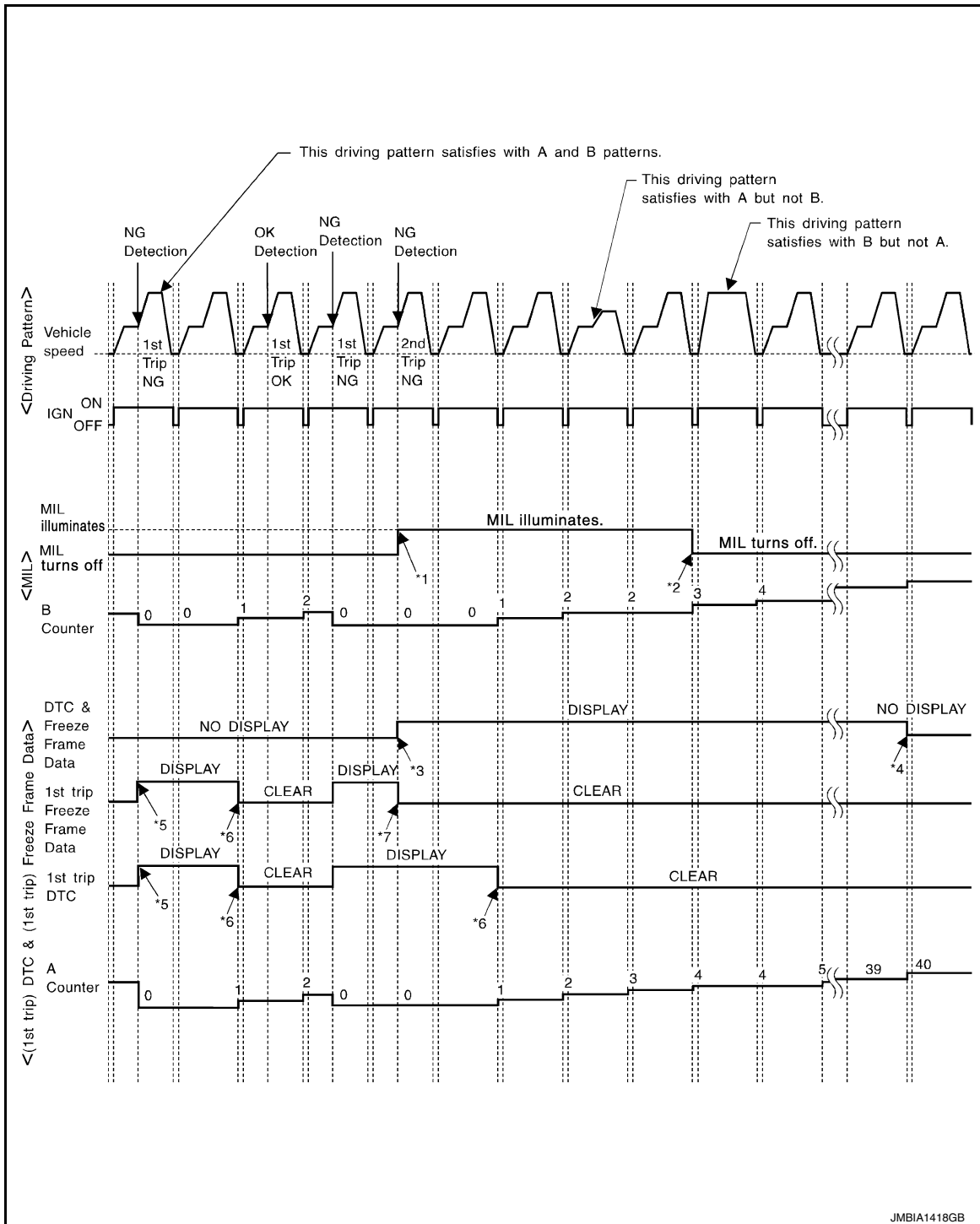
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above are satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns Except For “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”



*1: When the same malfunction is detected in two consecutive trips, MIL will light up.

*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

< SYSTEM DESCRIPTION >

- | | | |
|---|--|--|
| <p>*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)</p> | <p>*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.</p> | <p>*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.</p> |
| <p>*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.</p> | | |

Explanation for Driving Patterns Except for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”

Driving Pattern A

Refer to [EC-62, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Driving Pattern B

Refer to [EC-62, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:0000000012524263

CAUTION:

Always drive at a safe speed.

DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern A.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern A.

DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature reaches 70°C (158°F) or more.
- Vehicle speed of 70 – 120 km/h (44 – 75 MPH) is maintained for 60 seconds or more under the control of closed loop.
- Vehicle speed of 30 – 60 km/h (19 – 37 MPH) is maintained for 10 seconds or more under the control of closed loop.
- Under the closed loop control condition, the following state reaches 12 seconds or more in total: Vehicle speed of 4 km/h (2 MPH) or less with idling condition.
- The state of driving at 10 km/h (7 MPH) or more reaches 10 minutes or more in total.
- A lapse of 22 minutes or more after engine start.

NOTE:

- Drive the vehicle at a constant velocity.
- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern B.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern B.

DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:

The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data) ± 375 rpm

Calculated load value: (Calculated load value in the freeze frame data) $\times (1 \pm 0.1)$ [%]

Engine coolant temperature condition:

- When the freeze frame data shows lower than 70°C (158°F), engine coolant temperature should be lower than 70°C (158°F).

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< SYSTEM DESCRIPTION >

- When the freeze frame data shows higher than or equal to 70°C (158°F), engine coolant temperature should be higher than or equal to 70°C (158°F).

NOTE:

- When the same malfunction is detected regardless of the above vehicle conditions, reset the counter of driving pattern C.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern C.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.

- The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total.
- Idle speed lasts 30 seconds or more.
- A lapse of 600 seconds or more after engine start.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern D.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern D.

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:0000000012524264

System Readiness Test (SRT) code is specified in Service \$01 of SAE J1979/ISO 15031-5.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

NOTE:

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If permanent DTC is stored or MIL illuminates during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT"), DTC (No DTCs) and permanent DTC (NO permanent DTCs) before the inspection.

SRT SET TIMING

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

| Self-diagnosis result | | Example | | | | | | |
|-----------------------|--------|----------------|----------------|---------|--------------|------------------------|--------|-----|
| | | Diagnosis | Ignition cycle | | | | | |
| | | | ← ON → | OFF | ← ON → | OFF | ← ON → | OFF |
| All OK | Case 1 | P0400 | OK (1) | — (1) | OK (2) | — (2) | | |
| | | P0402 | OK (1) | — (1) | — (1) | OK (2) | | |
| | | P1402 | OK (1) | OK (2) | — (2) | — (2) | | |
| | | SRT of EGR | “CMPLT” | “CMPLT” | “CMPLT” | “CMPLT” | | |
| | Case 2 | P0400 | OK (1) | — (1) | — (1) | — (1) | | |
| | | P0402 | — (0) | — (0) | OK (1) | — (1) | | |
| | | P1402 | OK (1) | OK (2) | — (2) | — (2) | | |
| | | SRT of EGR | “INCMP” | “INCMP” | “CMPLT” | “CMPLT” | | |
| NG exists | Case 3 | P0400 | OK | OK | — | — | | |
| | | P0402 | — | — | — | — | | |
| | | P1402 | NG | — | NG | NG (Consecutive NG) | | |
| | | (1st trip) DTC | 1st trip DTC | — | 1st trip DTC | DTC (= MIL ON) | | |
| | | SRT of EGR | “INCMP” | “INCMP” | “INCMP” | “CMPLT” | | |

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is NG.

—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses show OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above

When all SRT related self-diagnoses show OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above

The table above shows that the minimum number of cycles for setting SRT as “INCMP” is the number one (1) for each self-diagnosis (Case 1 & 2) or the number two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- During SRT driving pattern, the 1st trip DTC (NG) is detected prior to “CMPLT” of SRT and the self-diagnosis memory must be erased from the ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:

SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)

INFOID:000000012524265

Permanent DTC is defined in SAE J1979/ISO 15031-5 Service \$0A.

ECM stores a DTC issuing a command of turning on MIL as a permanent DTC and keeps storing the DTC as a permanent DTC until ECM judges that there is no presence of malfunction.

Permanent DTCs cannot be erased by using the Erase function of CONSULT or Generic Scan Tool (GST) and by disconnecting the battery to shut off power to ECM. This prevents a vehicle from passing the state emission inspection without repairing a malfunctioning part.

When not passing the state emission inspection due to more than one permanent DTC, permanent DTCs should be erased, referring to this manual.

NOTE:

- The important items in state emission inspection are that MIL is not ON, SRT test items are set, and permanent DTCs are not included.
- Permanent DTCs do not apply for regions that permanent DTCs are not regulated by law.

< SYSTEM DESCRIPTION >

PERMANENT DTC SET TIMING

The setting timing of permanent DTC is stored in ECM with the lighting of MIL when a DTC is confirmed.

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:000000012524266

When emission related ECU detects a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions), it turns on/blinks MIL to inform the driver that a malfunction has been detected.

1. The MIL illuminates when ignition switch is turned ON (engine is not running).

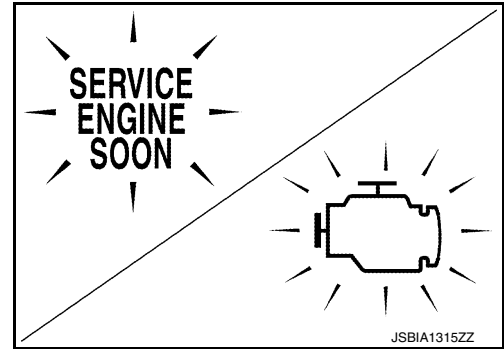
NOTE:

Check the MIL circuit if MIL does not illuminate. Refer to [EC-438. "Component Function Check"](#).

2. When the engine is started, the MIL should go off.

NOTE:

If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).



On Board Diagnosis Function

INFOID:000000012524267

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

| Diagnostic test mode | Function |
|--|---|
| Bulb check | MIL can be checked. |
| SRT status | ECM can read if SRT codes are set. |
| Malfunction warning | If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected. |
| Self-diagnostic results | DTCs or 1st trip DTCs stored in ECM can be read. |
| Accelerator pedal released position learning | ECM can learn the accelerator pedal released position. Refer to EC-137. "Description" . |
| Throttle valve closed position learning | ECM can learn the throttle valve closed position. Refer to EC-137. "Description" . |
| Idle air volume learning | ECM can learn the idle air volume. Refer to EC-139. "Description" . |

BULB CHECK MODE

Description

This function allows damage inspection in the MIL bulb (blown, open circuit, etc.).

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
If it remains OFF, check MIL circuit. Refer to [EC-438. "Diagnosis Procedure"](#).

SRT STATUS MODE

Description

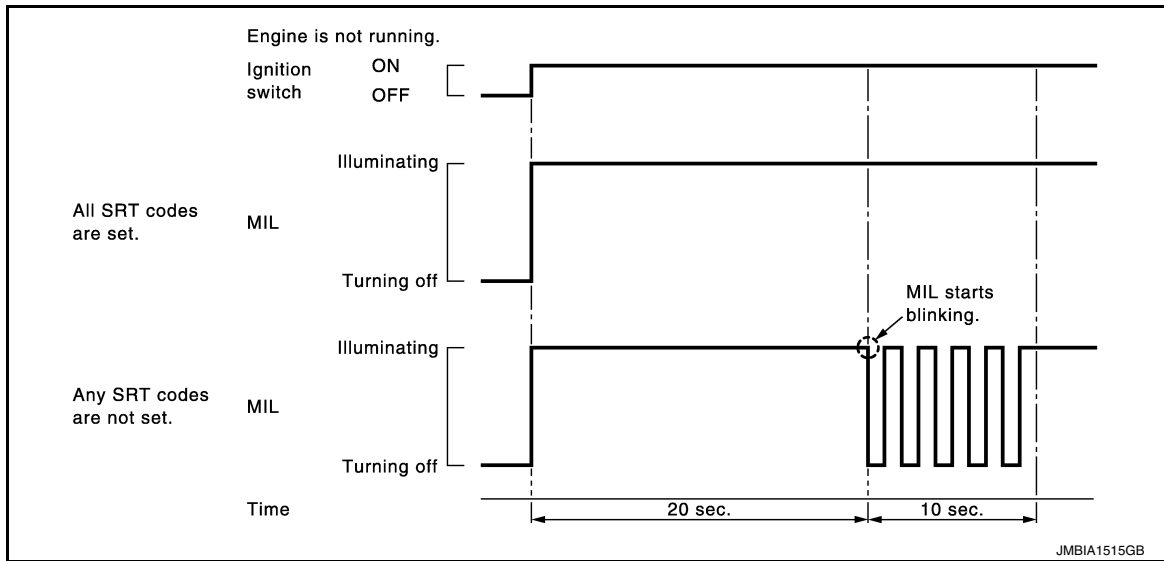
This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to [EC-63. "DIAGNOSIS DESCRIPTION : System Readiness Test \(SRT\) Code"](#).

Operation Procedure

1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown blow.
 - ECM continues to illuminate MIL if all SRT codes are set.

< SYSTEM DESCRIPTION >

- ECM blinks MIL for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

In this function ECM turns on or blinks MIL when it detects a malfunction in the emission control system components and/or the powertrain control components (which affect vehicle emissions) to inform the driver that a malfunction has been detected.

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
If it remains OFF, check MIL circuit. Refer to [EC-438, "Diagnosis Procedure"](#).
3. Start engine and let it idle.
 - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
 - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
 - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MIL is blinking.

How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
 - It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
 - After ignition switch is turned off, ECM is always released from the "self-diagnostic results" mode.
1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
 2. Repeat the following procedure quickly five times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.
 3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.

NOTE:

Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

4. Fully release the accelerator pedal.
ECM has entered to self-diagnostic results mode.

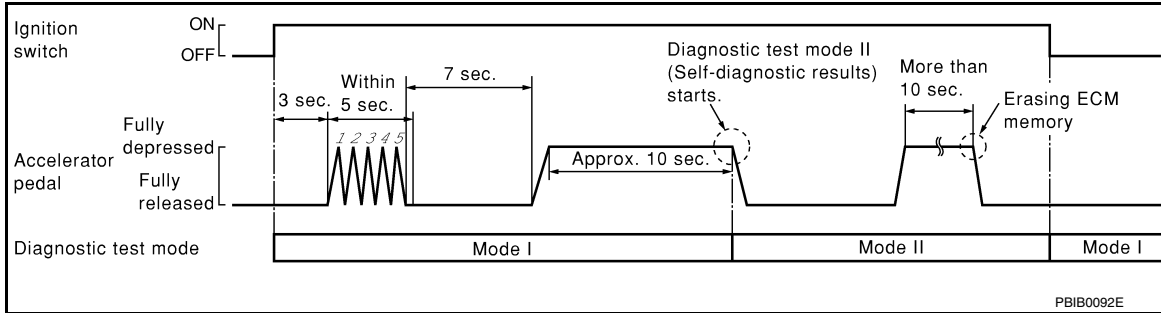
DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

NOTE:

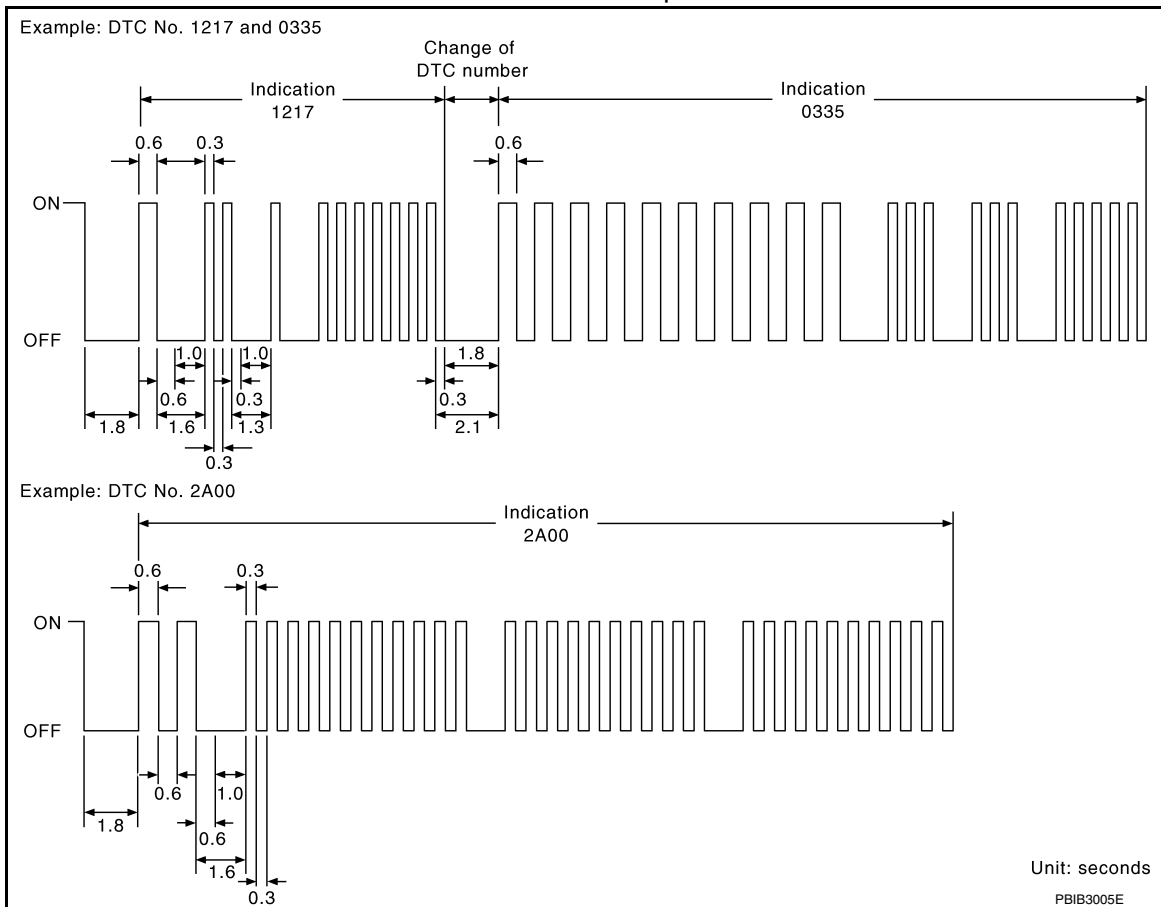
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

The DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in "malfunction warning" mode, it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes per the following.

| | | | | | | | | | | | | | | | | |
|---------|----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Number | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
| Flashes | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 11 | 12 | 13 | 14 | 15 | 16 |

The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-seconds) - OFF (0.6-seconds) cycle.

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle.

A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

A change from one trouble code to another occurs at an interval of 1.8-seconds OFF.

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to [EC-94, "DTC Index"](#).

How to Erase Self-diagnostic Results

By performing this procedure, ECM memory is erased and the following diagnostic information is erased as well.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

NOTE:

Also, if a battery terminal is disconnected, ECM memory is erased and the diagnostic information as listed above is erased. (The amount of time required for erasing may vary from a few seconds to several hours.)

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Set ECM in self-diagnostic results.
6. The diagnostic information has been erased from the backup memory in the ECM.
Fully depress the accelerator pedal and keep it depressed for more than 10 seconds.
7. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

CONSULT Function

INFOID:0000000012524268

FUNCTION

| Diagnostic test mode | Function |
|------------------------|---|
| Self Diagnostic Result | Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.* |
| Data Monitor | Input/Output data in the ECM can be read. |
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit. |
| Active Test | Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range. |
| ECU Identification | ECM part number can be read. |
| DTC Work Supprt | The status of system monitoring tests and the self-diagnosis status/results can be confirmed. |

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to [EC-94, "DTC Index"](#).

How to Read DTC and 1st Trip DTC

DTCs and 1st trip DTCs related to the malfunction are displayed in "Self-diag results".

- When ECM detects a 1st trip DTC, "1t" is displayed for "TIME".
- When ECM has detected a current DTC, "0" is displayed for "TIME".
- If "TIME" is neither "0" nor "1t", the DTC occurred in the past and ECM shows the number of times the vehicle has been driven since the last detection of the DTC.

How to Erase DTC and 1st Trip DTC

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see [EC-94](#)), skip step 1.
 1. Erase DTC in TCM. Refer to [TM-37, "OBD-II Diagnostic Trouble Code \(DTC\)"](#).
 2. Select "ENGINE" with CONSULT.
 3. Select "SELF-DIAG RESULTS".
 4. Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

| Freeze frame data item* | Description |
|------------------------------|---|
| DIAG TROUBLE CODE [PXXXX] | • The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to EC-94, "DTC Index" .) |
| CAL/LD VALUE [%] | • The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | • The engine coolant temperature at the moment a malfunction is detected is displayed. |
| L-FUEL TRM-B1 [%] | • "Long-term fuel trim" at the moment a malfunction is detected is displayed. |
| L-FUEL TRM-B2 [%] | • The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| S-FUEL TRM-B1 [%] | • "Short-term fuel trim" at the moment a malfunction is detected is displayed. |
| S-FUEL TRM-B2 [%] | • The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. |
| ENGINE SPEED [rpm] | • The engine speed at the moment a malfunction is detected is displayed |
| VEHICL SPEED [km/h] or [mph] | • The vehicle speed at the moment a malfunction is detected is displayed |
| INT MANI PRES [kPa or psi] | • These items are displayed but are not applicable to this model. |
| ABSOL TH-P/S [%] | • The throttle valve opening angle at the moment a malfunction is detected is displayed |
| B/FUEL SCHDL [msec] | • The base fuel schedule at the moment a malfunction is detected is displayed |
| INT/A TEMP SE [°C] or [°F] | • The intake air temperature at the moment a malfunction is detected is displayed |
| FUEL SYS-B1 | • "Fuel injection system status" at the moment a malfunction is detected is displayed. |
| FUEL SYS-B2 | • One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enrichment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop |
| COMBUST CONDITION | • These items are displayed but are not applicable to this model. |

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE

NOTE:

The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.

Monitored Item

For reference values of the following items, refer to [EC-78, "Reference Value"](#).

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

×: Applicable

| Monitored item | Unit | Description | Remarks |
|-----------------|-------------|---|---|
| ENG SPEED | rpm | <ul style="list-style-type: none"> Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). | <ul style="list-style-type: none"> Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated. |
| MAS A/F SE-B1 | V | <ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. When engine is running, specification range is indicated in "SPEC". |
| B/FUEL SCHDL | ms | <ul style="list-style-type: none"> "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | <ul style="list-style-type: none"> When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B1 | % | <ul style="list-style-type: none"> The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. This data also includes the data for the air-fuel ratio learning control. When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B2 | | | |
| COOLAN TEMP/S | °C or °F | <ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | <ul style="list-style-type: none"> When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed. |
| A/F SEN1 (B1) | V | <ul style="list-style-type: none"> The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed. | |
| HO2S2 (B1) | V | <ul style="list-style-type: none"> The signal voltage of the heated oxygen sensor 2 is displayed. | |
| HO2S2 (B2) | | | |
| HO2S2 MNTR (B1) | RICH/LEAN | <ul style="list-style-type: none"> Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| HO2S2 MNTR (B2) | | | |
| VHCL SPEED SE | km/h or mph | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | |
| BATTERY VOLT | V | <ul style="list-style-type: none"> The power supply voltage of ECM is displayed. | |
| ACCEL SEN 1 | V | <ul style="list-style-type: none"> The accelerator pedal position sensor signal voltage is displayed. | <ul style="list-style-type: none"> ACCEL SEN 2 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal. |
| ACCEL SEN 2 | | | |
| TP SEN 1-B1 | V | <ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. | <ul style="list-style-type: none"> TP SEN 2-B1 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal. |
| TP SEN 2-B1 | | | |
| FUEL T/TMP SE | °C or °F | <ul style="list-style-type: none"> The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed. | |
| EVAP SYS PRES | V | <ul style="list-style-type: none"> The signal voltage of EVAP control system pressure sensor is displayed. | |
| FUEL LEVEL SE | V | <ul style="list-style-type: none"> The signal voltage of the fuel level sensor is displayed. | |
| START SIGNAL | ON/OFF | <ul style="list-style-type: none"> Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. | <ul style="list-style-type: none"> After starting the engine, [OFF] is displayed regardless of the starter signal. |
| CLSD THL POS | ON/OFF | <ul style="list-style-type: none"> Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. | |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

| Monitored item | Unit | Description | Remarks |
|----------------|--------|--|--|
| AIR COND SIG | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| PW/ST SIGNAL | ON/OFF | <ul style="list-style-type: none"> [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated. | |
| LOAD SIGNAL | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF. | |
| IGNITION SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from ignition switch signal. | |
| HEATER FAN SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the heater fan switch signal. | |
| BRAKE SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the stop lamp switch signal. | |
| INJ PULSE-B1 | msec | <ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | <ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-B2 | | | |
| IGN TIMING | BTDC | <ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| CAL/LD VALUE | % | <ul style="list-style-type: none"> "Calculated load value" indicates the value of the current air flow divided by peak air flow. | |
| MASS AIRFLOW | g/s | <ul style="list-style-type: none"> Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor. | |
| PURG VOL C/V | % | <ul style="list-style-type: none"> Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. The opening becomes larger as the value increases. | |
| INT/V TIM (B1) | °CA | <ul style="list-style-type: none"> Indicates [°CA] of intake camshaft advance angle. | |
| INT/V TIM (B2) | | | |
| INT/V SOL (B1) | % | <ul style="list-style-type: none"> The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. | |
| INT/V SOL (B2) | | | |
| VIAS S/V-1 | ON/OFF | <ul style="list-style-type: none"> The control condition of the VIAS control solenoid valve (determined by ECM according to the input signals) is indicated. ON: VIAS control solenoid valve is operating. OFF: VIAS control solenoid valve is not operating. | |
| AIR COND RLY | ON/OFF | <ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. | |
| FUEL PUMP RLY | ON/OFF | <ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |
| VENT CONT/V | ON/OFF | <ul style="list-style-type: none"> The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open | |

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DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|-----------------|-------------|---|---------|
| THRTL RELAY | ON/OFF | <ul style="list-style-type: none"> Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. | |
| A/F S1 HTR (B2) | % | <ul style="list-style-type: none"> Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. | |
| COOLING FAN | HI/LOW/OFF | <ul style="list-style-type: none"> The control condition of the cooling fan (determined by ECM according to the input signals) is indicated. HI: High speed operation LOW: Low speed operation OFF: Stop | |
| HO2S2 HTR (B1) | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals. | |
| HO2S2 HTR (B2) | | | |
| I/P PULLY SPD | rpm | <ul style="list-style-type: none"> Indicates the engine speed computed from the input speed sensor signal. | |
| VEHICLE SPEED | km/h or mph | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from TCM is displayed. | |
| IDL A/V LEARN | YET/CMPLT | <ul style="list-style-type: none"> Displays the condition of Idle Air Volume Learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully. | |
| TRVL AFTER MIL | km or mile | <ul style="list-style-type: none"> Distance traveled while MIL is activated. | |
| A/F S1 HTR (B1) | % | <ul style="list-style-type: none"> Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. | |
| VHCL SPEED SE | km/h or mph | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | |
| SET VHCL SPD | km/h or mph | <ul style="list-style-type: none"> The preset vehicle speed is displayed. | |
| MAIN SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from MAIN switch signal. | |
| CANCEL SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from CANCEL switch signal. | |
| RESUME/ACC SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal. | |
| SET SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from COAST/SET switch signal. | |
| BRAKE SW1 | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from ASCD brake switch signal. | |
| BRAKE SW2 | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of stop lamp switch signal. | |
| VHCL SPD CUT | NON/CUT | <ul style="list-style-type: none"> Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed increased to excessively high compared with the ASCD set speed, and ASCD operation is cut off. | |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

| Monitored item | Unit | Description | Remarks |
|-------------------|--------------|--|---------|
| LO SPEED CUT | NON/CUT | <ul style="list-style-type: none"> Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off. | A EC |
| AT OD MONITOR | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM. | C |
| AT OD CANCEL | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of A/T O/D cancel signal sent from the TCM. | D |
| CRUISE LAMP | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals. | E |
| SET LAMP | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals. | F |
| A/F ADJ-B1 | — | <ul style="list-style-type: none"> Indicates the correction of factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal. | G |
| A/F ADJ-B2 | | | |
| P/N POSI SW | ON/OFF | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the park/neutral position (PNP) signal. | H |
| INT/A TEMP SE | °C or °F | <ul style="list-style-type: none"> The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated. | I |
| AC PRESS SEN | V | <ul style="list-style-type: none"> The signal voltage from the refrigerant pressure sensor is displayed. | J |
| A/F SEN1 (B2) | V | <ul style="list-style-type: none"> The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed. | K |
| HO2 S2 DIAG1 (B2) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | L |
| HO2 S2 DIAG2 (B2) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | M |
| HO2 S2 DIAG2 (B1) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | N |
| HO2 S2 DIAG1 (B1) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | O |
| EVAP LEAK DIAG | YET/CMPLT | <ul style="list-style-type: none"> Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully. | P |
| EVAP DIAG READY | ON/OFF | <ul style="list-style-type: none"> Indicates the ready condition of EVAP leak diagnosis. ON: EVAP leak diagnosis has been ready condition. OFF: EVAP leak diagnosis has not been ready condition. | |
| THRTL STK CNT B1 | — | <p>NOTE: The item is indicated, but not used.</p> | |

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|---------------------------|--------------|--|---------|
| A/F SEN1 DIAG1 (B1) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P015A or P015B self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG1 (B2) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P015C or P015D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG2 (B1) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P014C or P014D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG2 (B2) | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P014E or P014F self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | |
| A/F SEN1 DIAG3 (B1) | ABSNT/PRSNT | <ul style="list-style-type: none"> Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the diagnosis range. PRSNT: The vehicle condition is within the diagnosis range. | |
| A/F SEN1 DIAG3 (B2) | ABSNT/PRSNT | <ul style="list-style-type: none"> Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the diagnosis range. PRSNT: The vehicle condition is within the diagnosis range. | |
| A/F-S ATMSPHRC CRCT B1 | — | Displays a determined value of atmospheric correction factor necessary for correcting an A/F sensor signal input to ECM. The signal used for the correction is an A/F sensor signal transmitted while driving under atmospheric pressure. | |
| A/F-S ATMSPHRC CRCT B2 | — | Displays a determined value of atmospheric correction factor necessary for correcting an A/F sensor signal input to ECM. The signal used for the correction is an A/F sensor signal transmitted while driving under atmospheric pressure. | |
| A/F-S ATMSPHRC CRCT UP B1 | count | Displays the number of updates of the A/F sensor atmospheric correction factor. | |
| A/F-S ATMSPHRC CRCT UP B2 | count | Displays the number of updates of the A/F sensor atmospheric correction factor. | |
| SYSTEM 1 DIAGNOSIS A B2 | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P219B self-diagnosis condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete. | |
| SYSTEM 1 DIAGNOSIS A B1 | INCMP/CM-PLT | <ul style="list-style-type: none"> Indicates DTC P219A self-diagnosis condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete. | |
| SYSTEM 1 DIAGNOSIS B B2 | ABSNT/PRSNT | <ul style="list-style-type: none"> Indicates DTC P219B self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis | |
| SYSTEM 1 DIAGNOSIS B B1 | ABSNT/PRSNT | <ul style="list-style-type: none"> Indicates DTC P219A self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis | |

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

WORK SUPPORT MODE

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

Work Item

| Work item | Condition | Usage |
|----------------------------|---|---|
| IDLE AIR VOL LEARN | <ul style="list-style-type: none"> The idle air volume that keeps the engine within the specified range is memorized in ECM. | When learning the idle air volume |
| EVAP SYSTEM CLOSE | <p>Close the EVAP canister vent control valve in order to make EVAP system close under the following conditions.</p> <ul style="list-style-type: none"> Ignition switch ON Engine not running Ambient temperature is above 0°C (32°F). No vacuum and no high pressure in EVAP system Fuel tank temperature is more than 0°C (32°F). Within 10 minutes after starting "EVAP SYSTEM CLOSE" When trying to execute "EVAP SYSTEM CLOSE" UNDER <p>The condition except above, CONSULT will discontinue it and display appropriate instruction.</p> <p>NOTE: When starting engine, CONSULT may display "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", even when using a charged battery.</p> | When detecting EVAP vapor leak in the EVAP system |
| FUEL PRESSURE RELEASE | <ul style="list-style-type: none"> Fuel pump will stop by touching "START" during idling. Crank a few times after engine stalls. | When releasing fuel pressure from fuel line |
| SELF-LEARNING CONT | <ul style="list-style-type: none"> The coefficient of self-learning control mixture ratio returns to the original coefficient. | When clearing mixture ratio self-learning value |
| TARGET IGN TIM ADJ* | <ul style="list-style-type: none"> Idle condition | When adjusting target ignition timing |
| TARGET IDLE RPM ADJ* | <ul style="list-style-type: none"> Idle condition | When setting target idle speed |
| VIN REGISTRATION | <ul style="list-style-type: none"> In this mode, VIN is registered in ECM. | When registering VIN in ECM |
| CLSD THL POS LEARN | <ul style="list-style-type: none"> Ignition switch ON and engine stopped. | When learning the throttle valve closed position. |
| SAVING DATA FOR REPLC CPU | <ul style="list-style-type: none"> In this mode, save data that is in ECM. | When ECM is replaced. |
| WRITING DATA FOR REPLC CPU | <ul style="list-style-type: none"> In this mode, write data stored by "SAVE DATA FOR CPU REPLC" in work support mode to ECM. | When ECM is replaced. |

*: This function is not necessary in the usual service procedure.

ACTIVE TEST MODE

Test Item

| Test item | Condition | Judgement | Check item (Remedy) |
|------------------|--|--|--|
| VENT CONTROL/V | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> Harness and connectors Solenoid valve |
| ENG COOLANT TEMP | <ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT. | If trouble symptom disappears, see Check item. | <ul style="list-style-type: none"> Harness and connectors Engine coolant temperature sensor Fuel injector |
| FUEL INJECTION | <ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the amount of fuel injection using CONSULT. | If trouble symptom disappears, see Check item. | <ul style="list-style-type: none"> Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1 |
| FUEL/T TEMP SEN | <ul style="list-style-type: none"> Change the fuel tank temperature using CONSULT. | | |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ40DE]

| Test item | Condition | Judgement | Check item (Remedy) |
|------------------|--|--|---|
| PURG VOL CONT/V | <ul style="list-style-type: none"> Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | <ul style="list-style-type: none"> Harness and connectors Solenoid valve |
| FUEL PUMP RELAY | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the fuel pump relay ON and OFF using CONSULT and listen to operating sound. | Fuel pump relay makes the operating sound. | <ul style="list-style-type: none"> Harness and connectors Fuel pump relay |
| IGNITION TIMING | <ul style="list-style-type: none"> Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT. | If trouble symptom disappears, see Check item. | <ul style="list-style-type: none"> Perform Idle Air Volume Learning. |
| V/T ASSIGN ANGLE | <ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change intake valve timing using CONSULT. | If malfunctioning symptom disappears, see Check item. | <ul style="list-style-type: none"> Harness and connectors Intake valve timing control solenoid valve |
| VIAS S/V-1 | <ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve ON and OFF with CONSULT and listen for operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> Harness and connectors Solenoid valve |
| COOLING FAN* | <ul style="list-style-type: none"> Ignition switch: ON Turn the cooling fan HI, LOW and OFF using CONSULT. | Cooling fan moves and stops. | <ul style="list-style-type: none"> Harness and connectors Cooling fan motor IPDM E/R |
| POWER BALANCE | <ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch: OFF Shift lever: P or N Cut off each fuel injector signal one at a time using CONSULT. | Engine runs rough or stops. | <ul style="list-style-type: none"> Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil |

*: Leaving cooling fan OFF with CONSULT while engine is running may cause the engine to overheat.

DTC WORK SUPPORT MODE

Test Item

| Test mode | Test item | Corresponding DTC No. | Reference page |
|--------------------|---------------------------|-----------------------|------------------------|
| HO2S2 | HO2S2 (B1) P1146 | P0138 | EC-232 |
| | HO2S2 (B1) P1147 | P0137 | EC-226 |
| | HO2S2 (B1) P0139 | P0139 | EC-240 |
| | HO2S2 (B2) P1166 | P0158 | EC-232 |
| | HO2S2 (B2) P1167 | P0157 | EC-226 |
| | HO2S2 (B2) P0159 | P0159 | EC-240 |
| A/F SEN1 | A/F SEN1 (B1) P1278/P1279 | — | |
| | A/F SEN1 (B1) P1276 | P0130 | EC-216 |
| | A/F SEN1 (B2) P1288/P1289 | — | |
| | A/F SEN1 (B2) P1286 | P0150 | EC-216 |
| EVAPORATIVE SYSTEM | PURG VOL CN/V P1444 | P0443 | EC-296 |
| | PURG FLOW P0441 | P0441 | EC-291 |

SRT & P-DTC MODE

SRT STATUS Mode

DIAGNOSIS SYSTEM (ECM)

[VQ40DE]

< SYSTEM DESCRIPTION >

- For items whose SRT codes are set, “CMPLT” is displayed on the CONSULT screen; for items whose SRT codes are not set, “INCMP” is displayed.
- “SRT STATUS” provides the presence or absence of permanent DTCs stored in ECM memory.

PERMANENT DTC STATUS Mode

How to Display Permanent DTC Status

1. Turn ignition switch OFF and wait at 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at 10 seconds.
4. Turn ignition switch ON.
5. Select “PERMANENT DTC STATUS” in “DTC & SRT CONFIRMATION” mode with CONSULT.

NOTE:

Permanent DTCs stored in ECM memory are displayed on the CONSULT screen to show if a driving pattern required for erasing permanent DTCs is complete (CMPLT) or incomplete (INCMP).

CAUTION:

Since the “PERMANENT DTC STATUS” screen displays the previous trip information, repeat the following twice to update the information: “Ignition switch OFF”, “Wait for more than 10 seconds” and “Ignition switch ON”.

| PERMANENT DTC | DRIVING PATTERN B | DRIVING PATTERN D |
|---------------|-------------------|-------------------|
| XXXX | INCMP | INCMP |
| XXXX | CMPLT | INCMP |
| XXXX | INCMP | CMPLT |
| XXXX | CMPLT | INCMP |
| XXXX | INCMP | INCMP |
| XXXX | INCMP | INCMP |

The previous trip information is displayed. —↑

JSBIA0062GB

NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

SRT WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

PERMANENT DTC WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to complete the driving pattern that is required for erasing permanent DTC.

NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

INFOID:000000012524269

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- Numerical values in the following table are reference values.
- These values are input/output values that ECM receives/transmits and may differ from actual operations.

Example: The ignition timing shown by the timing light may differ from the ignition timing displayed on the data monitor. This occurs because the timing light shows a value calculated by ECM according to signals received from the cam shaft position sensor and other sensors related to ignition timing.

For outlines of following items, refer to [EC-68, "CONSULT Function"](#).

CONSULT MONITOR ITEM

| Monitor Item | Condition | | Values/Status |
|-----------------|--|---------------------------------------|--|
| ENG SPEED | • Run engine and compare CONSULT value with the tachometer indication. | | Almost the same speed as the tachometer indication |
| MAS A/F SE-B1 | See EC-160, "Description" . | | |
| B/FUEL SCHDL | See EC-160, "Description" . | | |
| A/F ALPHA-B1 | See EC-160, "Description" . | | |
| A/F ALPHA-B2 | See EC-160, "Description" . | | |
| COOLAN TEMP/S | • Ignition switch: ON | | Indicates engine coolant temperature |
| A/F SEN1 (B1) | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| HO2S2 (B1) | <ul style="list-style-type: none"> • Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | 0 - 0.3 V ↔ Approx. 0.6 - 1.0 V |
| HO2S2 (B2) | <ul style="list-style-type: none"> • Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | 0 - 0.3 V ↔ Approx. 0.6 - 1.0 V |
| HO2S2 MNTR (B1) | <ul style="list-style-type: none"> • Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | LEAN ↔ RICH |
| HO2S2 MNTR (B2) | <ul style="list-style-type: none"> • Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | LEAN ↔ RICH |
| VHCL SPEED SE | • Turn drive wheels and compare CONSULT value with the speedometer indication. | | Almost the same speed as speedometer indication |
| BATTERY VOLT | • Ignition switch: ON (Engine stopped) | | 11 - 14 V |
| ACCEL SEN 1 | • Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | 0.65 - 0.87 V |
| | | Accelerator pedal: Fully depressed | More than 4.3 V |
| ACCEL SEN 2*1 | • Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | 0.56 - 0.96 V |
| | | Accelerator pedal: Fully depressed | More than 4.0 V |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Monitor Item | Condition | | Values/Status |
|---------------|--|---|--------------------------------------|
| TP SEN 1-B1 | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Selector lever: D | Accelerator pedal: Fully released | More than 0.36 V |
| | | Accelerator pedal: Fully depressed | Less than 4.75 V |
| TP SEN 2-B1*1 | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Selector lever: D | Accelerator pedal: Fully released | More than 0.36 V |
| | | Accelerator pedal: Fully depressed | Less than 4.75 V |
| FUEL T/TMP SE | <ul style="list-style-type: none"> Ignition switch: ON | | Indicates fuel tank temperature |
| EVAP SYS PRES | <ul style="list-style-type: none"> Ignition switch: ON | | Approx. 1.8 - 4.8 V |
| FUEL LEVEL SE | <ul style="list-style-type: none"> Ignition switch: ON | | Depending on fuel level of fuel tank |
| START SIGNAL | <ul style="list-style-type: none"> Ignition switch: ON → START → ON | | OFF → ON → OFF |
| CLSD THL POS | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | ON |
| | | Accelerator pedal: Slightly depressed | OFF |
| AIR COND SIG | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Air conditioner switch: OFF | OFF |
| | | Air conditioner switch: ON (Compressor operates.) | ON |
| PW/ST SIGNAL | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Steering wheel: Not being turned | OFF |
| | | Steering wheel: Being turned | ON |
| LOAD SIGNAL | <ul style="list-style-type: none"> Ignition switch: ON | Rear window defogger switch: ON and/or Lighting switch: 2nd position | ON |
| | | Rear window defogger switch and lighting switch: OFF | OFF |
| IGNITION SW | <ul style="list-style-type: none"> Ignition switch: ON → OFF → ON | | ON → OFF → ON |
| HEATER FAN SW | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Heater fan switch: ON | ON |
| | | Heater fan switch: OFF | OFF |
| BRAKE SW | <ul style="list-style-type: none"> Ignition switch: ON | Brake pedal: Fully released | OFF |
| | | Brake pedal: Slightly depressed | ON |
| INJ PULSE-B1 | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 2.0 - 3.0 msec |
| | | 2,000 rpm | 1.9 - 2.9 msec |
| INJ PULSE-B2 | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 2.0 - 3.0 msec |
| | | 2,000 rpm | 1.9 - 2.9 msec |
| IGN TIMING | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 15° - 16° BTDC |
| | | 2,000 rpm | 20° - 21° BTDC |
| CAL/LD VALUE | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 5% - 35% |
| | | 2,500 rpm | 5% - 35% |
| MASS AIRFLOW | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 2.0 - 6.0 g/s |
| | | 2,500 rpm | 7.0 - 20.0 g/s |
| PURG VOL C/V | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle (Accelerator pedal: Not depressed even slightly, after engine starting.) | 0% |
| | | 2,000 rpm | — |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Monitor Item | Condition | | Values/Status |
|-----------------|--|--|---|
| INT/V TIM (B1) | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | - 5 - 5°C |
| | | 2,000 rpm | Approx. 0 - 30°C |
| INT/V TIM (B2) | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | - 5 - 5°C |
| | | 2,000 rpm | Approx. 0 - 30°C |
| INT/V SOL (B1) | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 0 - 2% |
| | | 2,000 rpm | Approx. 0 - 50% |
| INT/V SOL (B2) | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 0 - 2% |
| | | 2,000 rpm | Approx. 0 - 50% |
| VIAS S/V-1 | <ul style="list-style-type: none"> Engine: After warming up | 2,200 - 3,300 rpm | ON |
| | | Except above conditions | OFF |
| AIR COND RLY | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Air conditioner switch: OFF | OFF |
| | | Air conditioner switch: ON (Compressor operates) | ON |
| FUEL PUMP RLY | <ul style="list-style-type: none"> For 1 second after turning ignition switch: ON Engine running or cranking | | ON |
| | | Except above | OFF |
| VENT CONT/V | <ul style="list-style-type: none"> Ignition switch: ON | | OFF |
| THRTL RELAY | <ul style="list-style-type: none"> Ignition switch: ON | | ON |
| A/F S1 HTR (B2) | <ul style="list-style-type: none"> Engine: After warming up, idle the engine (More than 140 seconds after starting engine) | | 4 - 100% |
| COOLING FAN | <ul style="list-style-type: none"> Engine: After warming up, idle the engine Air conditioner switch: OFF | Engine coolant temperature: 97°C (207°F) or less | OFF |
| | | Engine coolant temperature: Between 98°C (208°F) and 104°C (219°F) | LOW |
| | | Engine coolant temperature: 105°C (221°F) or more | HI |
| HO2S2 HTR (B1) | <ul style="list-style-type: none"> Engine speed: Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load Engine speed: Above 3,600 rpm | | ON |
| | | | OFF |
| HO2S2 HTR (B2) | <ul style="list-style-type: none"> Engine speed: Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load Engine speed: Above 3,600 rpm | | ON |
| | | | OFF |
| I/P PULLY SPD | <ul style="list-style-type: none"> Vehicle speed: More than 20 km/h (12 MPH) | | Almost the same speed as the tachometer indication |
| VEHICLE SPEED | <ul style="list-style-type: none"> Turn drive wheels and compare CONSULT value with the speedometer indication. | | Almost the same speed as the speedometer indication |
| IDL A/V LEARN | <ul style="list-style-type: none"> Engine: Running | Idle air volume learning has not been performed yet. | YET |
| | | Idle air volume learning has already been performed successfully. | CMPLT |
| TRVL AFTER MIL | <ul style="list-style-type: none"> Ignition switch: ON | Vehicle has traveled after MIL has illuminated. | 0 - 65,535 km (0 - 40,723 miles) |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

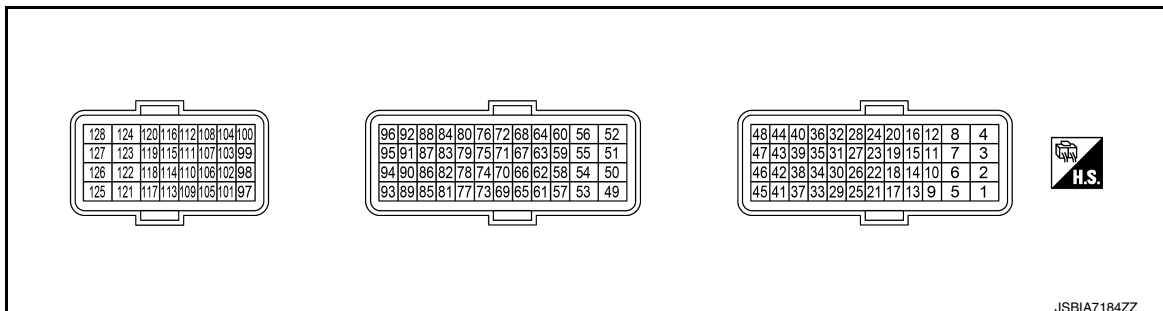
| Monitor Item | Condition | Values/Status | |
|----------------------------------|---|---|---|
| A/F S1 HTR (B1) | • Engine: After warming up, idle the engine (More than 140 seconds after starting engine) | 4 - 100% | |
| VHCL SPEED SE | • Turn drive wheels and compare CONSULT value with the speedometer indication. | Almost the same speed as the speedometer indication | |
| SET VHCL SPD | • Engine: Running | ASCD: Operating | |
| MAIN SW | • Ignition switch: ON | MAIN switch: Pressed | ON |
| | | MAIN switch: Released | OFF |
| CANCEL SW | • Ignition switch: ON | CANCEL switch: Pressed | ON |
| | | CANCEL switch: Released | OFF |
| RESUME/ACC SW | • Ignition switch: ON | ACCEL/RES switch: Pressed | ON |
| | | ACCEL/RES switch: Released | OFF |
| SET SW | • Ignition switch: ON | COAST/SET switch: Pressed | ON |
| | | COAST/SET switch: Released | OFF |
| BRAKE SW1 (ASCD brake switch) | • Ignition switch: ON | Brake pedal: Fully released | ON |
| | | Brake pedal: Slightly depressed | OFF |
| BRAKE SW2 (Stop lamp switch) | • Ignition switch: ON | Brake pedal: Fully released | OFF |
| | | Brake pedal: Slightly depressed | ON |
| VHCL SPD CUT | • Ignition switch: ON | NON | |
| LO SPEED CUT | • Ignition switch: ON | NON | |
| AT OD MONITOR | • Ignition switch: ON | OFF | |
| AT OD CANCEL | • Ignition switch: ON | OFF | |
| CRUISE LAMP | • Ignition switch: ON | MAIN switch: Pressed at the 1st time → at the 2nd time | ON → OFF |
| SET LAMP | • MAIN switch: ON • When vehicle speed is between 38km/h (24MPH) and 144km/h (89MPH) | ASCD: Operating | ON |
| | | ASCD: Not operating | OFF |
| A/F ADJ-B1 | • Engine: Running | | -0.330 - 0.330 |
| A/F ADJ-B2 | • Engine: Running | | -0.330 - 0.330 |
| P/N POSI SW | • Ignition switch: ON | Selector lever: P or N | ON |
| | | Selector lever: Except above | OFF |
| INT/A TEMP SE | • Ignition switch: ON | | Indicates intake air temperature |
| AC PRESS SEN | • Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates) | | 1.0 - 4.0 V |
| A/F SEN1 (B2) | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| HO2 S2 DIAG1 (B2) | DTC P0159 self-diagnosis (delayed response) is incomplete. | | INCMP |
| | DTC P0159 self-diagnosis (delayed response) is complete. | | CMPLT |
| HO2 S2 DIAG2 (B2) | DTC P0159 self-diagnosis (slow response) is incomplete. | | INCMP |
| | DTC P0159 self-diagnosis (slow response) is complete. | | CMPLT |
| HO2 S2 DIAG2 (B1) | DTC P0139 self-diagnosis (slow response) is incomplete. | | INCMP |
| | DTC P0139 self-diagnosis (slow response) is complete. | | CMPLT |
| HO2 S2 DIAG1 (B1) | DTC P0139 self-diagnosis (delayed response) is incomplete. | | INCMP |
| | DTC P0139 self-diagnosis (delayed response) is complete. | | CMPLT |
| EVAP LEAK DIAG | • Ignition switch: ON | | Indicates the condition of EVAP leak diagnosis. |

| Monitor Item | Condition | Values/Status |
|---------------------------|--|---|
| EVAP DIAG READY | • Ignition switch: ON | Indicates the ready condition of EVAP leak diagnosis. |
| THRTL STK CNT B1 | • This item is displayed but is not applicable to this model. | |
| A/F SEN1 DIAG1 (B1) | DTC P015A and P015B self-diagnosis incomplete. | INCMP |
| | DTC P015A and P015B self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG1 (B2) | DTC P015C and P015D self-diagnosis incomplete. | INCMP |
| | DTC P015C and P015D self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG2 (B1) | DTC P014C and P014D self-diagnosis incomplete. | INCMP |
| | DTC P014C and P014D self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG2 (B2) | DTC P014E and P014F self-diagnosis incomplete. | INCMP |
| | DTC P014E and P014F self-diagnosis is complete. | CMPLT |
| A/F SEN1 DIAG3 (B1) | The vehicle condition is not within the diagnosis range of DTC P014C, P014D, P015A or P015B. | ABSNT |
| | The vehicle condition is within the diagnosis range of DTC P014C, P014D, P015A or P015B. | PRSNT |
| A/F SEN1 DIAG3 (B2) | The vehicle condition is not within the diagnosis range of DTC P014E, P014F, P015C or P015D. | ABSNT |
| | The vehicle condition is within the diagnosis range of DTC P014E, P014F, P015C or P015D. | PRSNT |
| A/F-S ATMSPHRC CRCT B1 | Engine: After warming up, idle the engine | Varies depending on vehicle environment. |
| A/F-S ATMSPHRC CRCT B2 | Engine: After warming up, idle the engine | Varies depending on vehicle environment. |
| A/F-S ATMSPHRC CRCT UP B1 | Engine: Running | Varies depending on the number of updates. |
| A/F-S ATMSPHRC CRCT UP B2 | Engine: Running | Varies depending on the number of updates. |
| SYSTEM 1 DIAGNOSIS A B1 | DTC P219A self-diagnosis is incomplete. | INCMP |
| | DTC P219A self-diagnosis is complete. | CMPLT |
| SYSTEM 1 DIAGNOSIS A B2 | DTC P219B self-diagnosis is incomplete. | INCMP |
| | DTC P219B self-diagnosis is complete. | CMPLT |
| SYSTEM 1 DIAGNOSIS B B1 | DTC P219A self-diagnosis is on standby. | ABSENT |
| | DTC P219A self-diagnosis is under diagnosis. | PRSENT |
| SYSTEM 1 DIAGNOSIS B B2 | DTC P219B self-diagnosis is on standby. | ABSENT |
| | DTC P219B self-diagnosis is under diagnosis. | PRSENT |

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to [PG-86. "How to Handle Battery"](#).

TERMINAL LAYOUT



JSBIA7184ZZ

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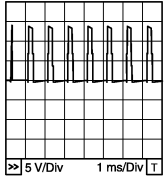
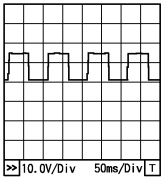
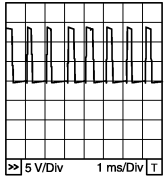
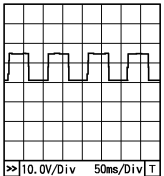
< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

PHYSICAL VALUES

NOTE:

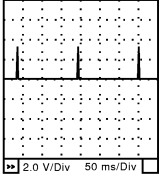
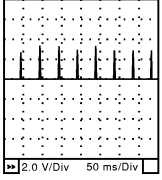
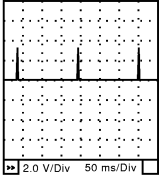
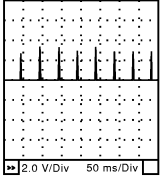
- ECM located in the engine room passenger side behind reservoir tank.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|--|------------------|---|--|
| + | - | Signal name | Input/ Output | | |
| 1 (L) | 128 (B) | Throttle control motor relay power supply | Input | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 2 (L/W) | 128 (B) | Throttle control motor (Close) | Output | [Ignition switch: ON] • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully released | 0 - 14 V★  PBIB1104E |
| 3 (BR) | 128 (B) | A/F sensor 1 heater (Bank 2) | Output | [Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★  PBIA8148J |
| 5 (L/B) | 128 (B) | Throttle control motor (Open) | Output | [Ignition switch: ON] • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully depressed | 0 - 14 V★  PBIB1105E |
| 6 (B) | 128 (B) | A/F sensor 1 heater (Bank 1) | Output | [Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★  PBIA8148J |

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< ECU DIAGNOSIS INFORMATION >

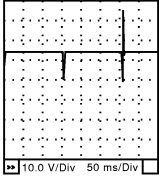
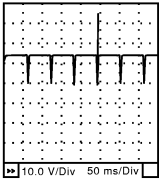
[VQ40DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|--|------------|---|------------------|--|---|
| + | - | Signal name | Input/ Output | | |
| 9 (L) 11 (Y) 14 (V) | 128 (B) | Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 5 | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.2 V★  |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm | 0.1 - 0.4 V★  |
| 10 (G) 13 (V) 15 (W) | 128 (B) | Ignition signal No. 2 Ignition signal No. 6 Ignition signal No. 4 | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.2 V★  |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm | 0.1 - 0.4 V★  |
| 12 (B) 16 (B) 123 (B) 124 (B) 127 (B) 128 (B) | — | ECM ground | — | [Engine is running] <ul style="list-style-type: none"> • Idle speed | Body ground |
| 19 (R) | — | Sensor ground (Throttle position sensor) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 22 (B) | 19 (R) | Throttle position sensor 1 | Input | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully released | More than 0.36 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully depressed | Less than 4.75 V |

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[VQ40DE]

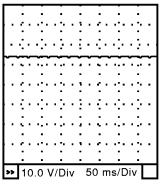
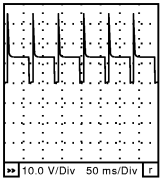
| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|-------------------------------------|------------|---|------------------|--|--|
| + | - | Signal name | Input/ Output | | |
| 23 (W) | 19 (R) | Throttle position sensor 2 | Input | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully released | Less than 4.75 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Shift lever: D • Accelerator pedal: Fully depressed | More than 0.36 V |
| 24 (W) | 19 (R) | Sensor power supply (Throttle position sensor) | — | [Ignition switch: ON] | 5 V |
| 26 (R) | 128 (B) | Power supply for ECM (Back-up) | Input | [Ignition switch: OFF] | Battery voltage (11 - 14 V) |
| 31 (W) | 128 (B) | ECM relay (Self shut-off) | Output | [Engine is running] [Ignition switch: OFF] <ul style="list-style-type: none"> • For a few seconds after turning ignition switch OFF | 0 - 1.5 V |
| | | | | [Ignition switch: OFF] <ul style="list-style-type: none"> • More than a few seconds after turning ignition switch OFF | Battery voltage (11 - 14 V) |
| 33 (G) 46 (L) 48 (V) | 128 (B) | Fuel injector No. 1 Fuel injector No. 5 Fuel injector No. 3 | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | Battery voltage (11 - 14 V)★  |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | Battery voltage (11 - 14 V)★  |
| 34 (O) | 128 (B) | Throttle control motor relay | Output | [Ignition switch: OFF] | Battery voltage (11 - 14 V) |
| | | | | [Ignition switch: ON] | 0 - 1.0 V |
| 37 (GR) | 128 (B) | Heated oxygen sensor 2 heater (Bank 1) | Output | [Engine is running] <ul style="list-style-type: none"> • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped [Engine is running] <ul style="list-style-type: none"> • Engine speed: Above 3,600 rpm | Battery voltage (11 - 14 V) |

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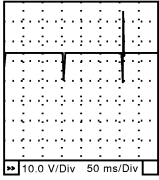
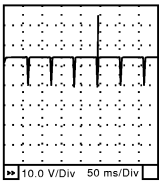
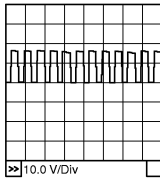
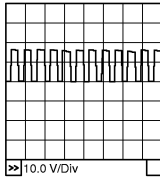
[VQ40DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|---|------------------|--|--|
| + | - | Signal name | Input/ Output | | |
| 39 (SB) | 128 (B) | VIAS control solenoid valve | Output | [Engine is running] <ul style="list-style-type: none"> Idle speed | Battery voltage (11 - 14 V) |
| | | | | [Engine is running] <ul style="list-style-type: none"> Engine speed: Between 2,200 and 3,300 rpm | 0 - 1.0 V |
| 41 (LG) | 128 (B) | Heated oxygen sensor 2 heater (Bank 2) | Output | [Engine is running] <ul style="list-style-type: none"> Engine speed is below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> Engine: Stopped [Engine is running] <ul style="list-style-type: none"> Engine speed: Above 3,600 rpm | Battery voltage (11 - 14 V) |
| 42 (SB) | 128 (B) | EVAP canister purge volume control solenoid valve | Output | [Engine is running] <ul style="list-style-type: none"> Idle speed Accelerator pedal is not depressed even slightly, after engine starting | Battery voltage (11 - 14 V)★  <small>10.0 V/Div 50 ms/Div</small> SEC990C |
| | | | | [Engine is running] <ul style="list-style-type: none"> Engine speed: About 2,000 rpm (More than 100 seconds after starting engine) | Battery voltage (11 - 14 V)★  <small>10.0 V/Div 50 ms/Div</small> SEC991C |
| 43 (GR) | 128 (B) | Fuel pump relay | Output | [Ignition switch: ON] <ul style="list-style-type: none"> For 1 second after turning ignition switch ON | 0 - 1.5 V |
| | | | | [Engine is running] <ul style="list-style-type: none"> More than 1 second after turning ignition switch ON | Battery voltage (11 - 14 V) |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|-------------------------------------|------------|---|------------------|--|--|
| + | - | Signal name | Input/ Output | | |
| 44 (L) 45 (Y) 47 (P) | 128 (B) | Fuel injector No. 2 Fuel injector No. 6 Fuel injector No. 4 | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | Battery voltage (11 - 14 V)★  |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | Battery voltage (11 - 14 V)★  |
| 55 (LG) | 128 (B) | Intake valve timing control solenoid valve (Bank 2) | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | Battery voltage (11 - 14 V) |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm | 7 - 12 V★  |
| 56 (W) | 128 (B) | Intake valve timing control solenoid valve (Bank 1) | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | Battery voltage (11 - 14 V) |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm | 7 - 12 V★  |
| 57 (R) | 59 (B) | Heated oxygen sensor 2 (Bank 1) | Input | [Engine is running] <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |

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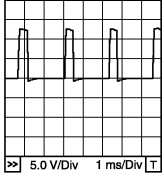
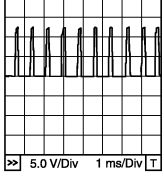
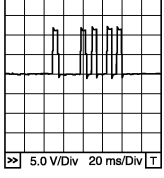
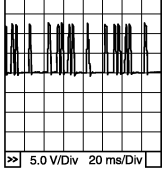
[VQ40DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|--|------------------|---|---|
| + | - | Signal name | Input/ Output | | |
| 58 (R) | 59 (B) | Heated oxygen sensor 2 (Bank 2) | Input | [Engine is running] <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| 59 (B) | — | Sensor ground (Heated oxygen sensor 2) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 63 (GR) | 64 (B) | Refrigerant pressure sensor | Input | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Both A/C switch and blower switch: ON (Compressor operates) | 1.0 - 4.0 V |
| 64 (B) | — | Sensor ground (Refrigerant pressure sensor) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 65 (R) | 72 (B) | Power steering pressure sensor | Input | [Engine is running] <ul style="list-style-type: none"> • Steering wheel: Being turned | 0.5 - 4.5 V |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Steering wheel: Not being turned | 0.4 - 0.8 V |
| 69 (O) | 128 (B) | A/F sensor 1 (Bank 1) | Input | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | 1.8 V Output voltage varies with air fuel ratio. |
| 70 (Y) | 76 (B) | Engine coolant temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine coolant temperature. |
| 72 (B) | — | Sensor ground (Power steering pressure sensor) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 73 (W) | 128 (B) | A/F sensor 1 (Bank 1) | Input | [Ignition switch: ON] | 2.2 V |
| 74 (V) | 64 (B) | Intake air temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with intake air temperature. |
| 76 (B) | — | Sensor ground (Engine coolant temperature sensor) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 77 (G) | 128 (B) | A/F sensor 1 (Bank 2) | Input | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | 1.8 V Output voltage varies with air fuel ratio. |
| 79 (SB) | 72 (B) | Sensor power supply (Power steering pressure sensor) | — | [Ignition switch: ON] | 5 V |
| 80 (B) | — | Sensor ground (Mass air flow sensor) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 81 (L) | 128 (B) | A/F sensor 1 (Bank 2) | Input | [Ignition switch: ON] | 2.2 V |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

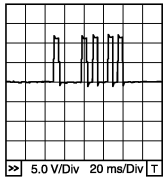
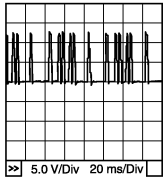
| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|--|------------------|---|--|
| + | - | Signal name | Input/ Output | | |
| 82 (W) | 80 (B) | Mass air flow sensor | Input | [Engine is running] • Warm-up condition • Idle speed | 0.9 - 1.2 V |
| | | | | [Engine is running] • Warm-up condition • Engine speed: 2,500 rpm | 1.5 - 1.8 V |
| 85 (W) | 128 (B) | Knock sensor (Bank 1) | Input | [Engine is running] • Idle speed | 2.5 V |
| 86 (W) | 128 (B) | Knock sensor (Bank 2) | Input | [Engine is running] • Idle speed | 2.5 V |
| 89 (O) | 128 (B) | Crankshaft position sensor (POS) | Input | [Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 10 V★  PBIB1041E |
| | | | | [Engine is running] • Engine speed: 2,000 rpm | 10 V★  PBIB1042E |
| 91 (B) | — | Sensor ground (Knock sensor 1 & 2) | — | [Engine is running] • Warm-up condition • Idle speed | 0 V |
| 93 (Y) | 128 (B) | Camshaft position sen- sor (PHASE) (Bank 2) | Input | [Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 1.0 - 4.0 V★  PBIB1039E |
| | | | | [Engine is running] • Engine speed: 2,000 rpm | 1.0 - 4.0 V★  PBIB1040E |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|---|------------------|---|--|
| + | - | Signal name | Input/ Output | | |
| 94 (L) | 128 (B) | Camshaft position sensor (PHASE) (Bank 1) | Input | [Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 1.0 - 4.0 V★  <small>5.0 V/Div 20 ms/Div</small> PBIB1039E |
| | | | | [Engine is running] • Engine speed: 2,000 rpm | 1.0 - 4.0 V★  <small>5.0 V/Div 20 ms/Div</small> PBIB1040E |
| 96 (O) | 64 (B) | Sensor power supply (Refrigerant pressure sensor/Intake air temperature sensor) | — | [Ignition switch: ON] | 5 V |
| 97 (BR) | 100 (R) | Accelerator pedal position sensor 1 | Input | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released | 0.65 - 0.87 V |
| | | | | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed | More than 4.3 V |
| 98 (LG) | 116 (Y) | Accelerator pedal position sensor 2 | Input | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released | 0.28 - 0.48 V |
| | | | | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed | More than 2.0 |
| 99 (L) | 100 (R) | Sensor power supply (APP sensor 1) | — | [Ignition switch: ON] | 5 V |
| 100 (R) | — | Sensor ground (APP sensor 1) | — | [Engine is running] • Warm-up condition • Idle speed | 0 V |
| 101 (R) | 108 (B) | ASCD steering switch | Input | [Ignition switch: ON] • ASCD steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| | | | | [Ignition switch: ON] • CANCEL switch: Pressed | 1 V |
| | | | | [Ignition switch: ON] • ACCEL/RES switch: Pressed | 3 V |
| | | | | [Ignition switch: ON] • COAST/SET switch: Pressed | 2 V |
| 102 (L) | 112 (B) | EVAP control system pressure sensor | Input | [Ignition switch: ON] | 1.8 - 4.8 V |
| 103 (W) | 116 (Y) | Sensor power supply (APP sensor 2) | — | [Ignition switch: ON] | 5 V |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|---|------------------|--|--|
| + | - | Signal name | Input/ Output | | |
| 104 (O) | — | Data link connector | — | [Ignition switch: ON] • CONSULT or GST: disconnected | 5 V - Battery voltage (11 - 14 V) |
| 106 (G) | 128 (B) | EVAP canister vent control valve | Output | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 107 (SB) | 112 (B) | Sensor power supply (EVAP control system pressure sensor) | — | [Ignition switch: ON] | 5 V |
| 108 (B) | — | Sensor ground (ASCD steering switch) | — | [Engine is running] • Warm-up condition • Idle speed | 0 V |
| 109 (W) | 128 (B) | Ignition switch | Input | [Ignition switch: OFF] | 0 V |
| | | | | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 111 (Y) | 128 (B) | Fuel tank temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with fuel tank temperature. |
| 112 (B) | — | Sensor ground (EVAP control system pressure sensor) | — | [Engine is running] • Warm-up condition • Idle speed | 0 V |
| 113 (P) | — | CAN communication line | — | — | — |
| 114 (L) | — | CAN communication line | — | — | — |
| 116 (Y) | — | Sensor ground (APP sensor 2) | — | [Engine is running] • Warm-up condition • Idle speed | 0 V |
| 118 (BR) | 128 (B) | PNP signal | Input | [Ignition switch: ON] • Shift lever: P or N | 0 V |
| | | | | [Ignition switch: ON] • Except above position | Battery voltage (11 - 14 V) |
| 121 (BR) | 128 (B) | Power supply for ECM | Input | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 122 (LG) | 128 (B) | Stop lamp switch | Input | [Ignition switch: OFF] • Brake pedal: Fully released | 0 V |
| | | | | [Ignition switch: OFF] • Brake pedal: Slightly depressed | Battery voltage (11 - 14 V) |
| 126 (BR) | 128 (B) | ASCD brake switch | Input | [Ignition switch: ON] • Brake pedal: Slightly depressed | 0 V |
| | | | | [Ignition switch: ON] • Brake pedal: Fully released | Battery voltage (11 - 14 V) |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

*1: This may vary depending on internal resistance of the tester.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to [PG-86, "How to Handle Battery"](#).

Fail safe

INFOID:000000012524270

| DTC No. | Detected items | Engine operating condition in fail-safe mode | | | | | | | | |
|---|--|---|-----------|--|---|--------------|---|--------------|-----------------------|--|
| P0101 P0102 P0103 | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | | | | | |
| P0117 P0118 | Engine coolant temperature sensor circuit | <p>Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM.</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>Engine coolant temperature decided (CONSULT display)</th> </tr> </thead> <tbody> <tr> <td>Just as ignition switch is turned ON or START</td> <td>40°C (104°F)</td> </tr> <tr> <td>Approx. 4 minutes after engine starting</td> <td>80°C (176°F)</td> </tr> <tr> <td>Except as shown above</td> <td>40 - 80°C (104 - 176°F) (Depends on the time)</td> </tr> </tbody> </table> <p>When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</p> | Condition | Engine coolant temperature decided (CONSULT display) | Just as ignition switch is turned ON or START | 40°C (104°F) | Approx. 4 minutes after engine starting | 80°C (176°F) | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) |
| Condition | Engine coolant temperature decided (CONSULT display) | | | | | | | | | |
| Just as ignition switch is turned ON or START | 40°C (104°F) | | | | | | | | | |
| Approx. 4 minutes after engine starting | 80°C (176°F) | | | | | | | | | |
| Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) | | | | | | | | | |
| P0122 P0123 P0222 P0223 P2135 | Throttle position sensor | <p>The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.</p> <p>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.</p> <p>Therefore, the acceleration will be poor.</p> | | | | | | | | |
| P0603 P0607 | ECM | Engine torque may be limited. | | | | | | | | |
| P0604 | ECM | <ul style="list-style-type: none"> ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve ASCD operation may be deactivated. | | | | | | | | |
| P0605 P0606 P060B | ECM | <p>NOTE:</p> <p>Fail-safe may not occur depending on malfunction type.</p> <ul style="list-style-type: none"> ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve ASCD operation may be deactivated. | | | | | | | | |
| P060A | ECM | <p>NOTE:</p> <p>Fail-safe may not occur depending on malfunction type.</p> <ul style="list-style-type: none"> ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve Engine torque may be limited. ASCD operation may be deactivated. | | | | | | | | |
| P0643 | Sensor power supply | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | | | |
| P2100 P2103 | Throttle control motor relay | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | | | |
| P2101 | Electric throttle control function | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | | | |
| P2118 | Throttle control motor | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | | | |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| DTC No. | Detected items | Engine operating condition in fail-safe mode |
|---|------------------------------------|---|
| P2119 | Electric throttle control actuator | (When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator because of regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm. |
| | | (When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less. |
| | | (When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more. |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor. |

DTC Inspection Priority Chart

INFOID:0000000012524271

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

| Priority | DTC | Detected items |
|-----------------------------------|---|------------------------------------|
| 1 | U0100, U0101, U1001 | CAN communication line |
| | P0101, P0102, P0103 | Mass air flow sensor |
| | P0111, P0112, P0113, P0127 | Intake air temperature sensor |
| | P0116, P0117, P0118, P0125 | Engine coolant temperature sensor |
| | P0122, P0123, P0222, P0223, P1225, P1226, P2135 | Throttle position sensor |
| | P0128 | Thermostat function |
| | P0181, P0182, P0183 | Fuel tank temperature sensor |
| | P0327, P0328, P0332, P0333 | Knock sensor |
| | P0335 | Crankshaft position sensor (POS) |
| | P0340, P0345 | Camshaft position sensor (PHASE) |
| | P0460, P0461, P0462, P0463 | Fuel level sensor |
| | P0500 | Vehicle speed sensor |
| | P0603, P0604, P0605, P0606, P0607, P060A, P060B | ECM |
| | P0643 | Sensor power supply |
| | P0705 | Transmissions range switch |
| | P0850 | Park/neutral position (PNP) switch |
| | P1610 - P1615 | NATS |
| P2122, P2123, P2127, P2128, P2138 | Accelerator pedal position sensor | |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Priority | DTC | Detected items |
|----------------------------|---|---|
| 2 | P0030, P0031, P0032, P0036, P0051, P0052 | Air fuel ratio (A/F) sensor 1 heater |
| | P0037, P0038, P0057, P0058 | Heated oxygen sensor 2 heater |
| | P0075, P0081 | Intake valve timing control solenoid valve |
| | P0130, P0131, P0132, P014C, P014D, P014E, P014F, P0150, P0151, P0152, P015A, P015B, P015C, P015D, P2096, P2097, P2098, P2099 | Air fuel ratio (A/F) sensor 1 |
| | P0137, P0138, P0139, P0157, P0158, P0159 | Heated oxygen sensor 2 |
| | P0441 | EVAP control system purge flow monitoring |
| | P0443, P0444, P0445 | EVAP canister purge volume control solenoid valve |
| | P0447, P0448 | EVAP canister vent control valve |
| | P0451, P0452, P0453 | EVAP control system pressure sensor |
| | P0550 | Power steering pressure sensor |
| | P0710, P0717, P0720, P0731, P0732, P0733, P0734, P0735, P0740, P0744, P0745, P1715, P1730, P1752, P1757, P1762, P1767, P1772, P1774 | A/T related sensors, solenoid valves and switches |
| | P1217 | Engine over temperature (OVERHEAT) |
| | P1800 | VIAS control solenoid valve |
| | P1805 | Brake switch |
| | P2100, P2103 | Throttle control motor relay |
| | P2101 | Electric throttle control function |
| | P2118 | Throttle control motor |
| | 3 | P0011, P0021 |
| P0171, P0172, P0174, P0175 | | Fuel injection system function |
| P0300 - P0306 | | Misfire |
| P0420, P0430 | | Three way catalyst function |
| P0456, P0455 | | EVAP control system (VERY SMALL LEAK) |
| P0506, P0507 | | Idle speed control system |
| P050A, P050E | | Cold start control |
| P1148, P1168 | | Closed loop control |
| P1212 | | TCS communication line |
| P1564 | | ASCD steering switch |
| P1572 | | Brake pedal position switch |
| P1574 | | ASCD vehicle speed sensor |
| P1715 | | Primary speed sensor |
| P2119 | | Electric throttle control actuator |
| P219A, P219B | | Air fuel ratio (A/F) sensor 1 |

DTC Index

INFOID:0000000012524272

×:Applicable —: Not applicable

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Reference page |
|------------------|--------|---------------------------------|-------------|------|-----|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| U0100 | 0100*5 | LOST COMM (ECM A) | — | 1 | × | B | IM-83 |
| U0101 | 0101*5 | CAN COMM CIRCUIT | — | 1 | × | B | EC-172 |
| U1001 | 1001*5 | CAN COMM CIRCUIT | — | 2 | — | — | EC-173 |

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| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Reference page | |
|------------------|-------------|---|-------------|------|-------------------|--------------------------|------------------------|-----------|
| CONSULT GST*2 | ECM*3 | | | | | | | |
| P0000 | 0000 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | — | — | Flashing*8 | — | — | EC |
| P0011 | 0011 | INT/V TIM CONT-B1 | x | 2 | x | B | EC-174 | C |
| P0021 | 0021 | INT/V TIM CONT-B2 | x | 2 | x | B | EC-174 | |
| P0030 | 0030 | A/F SEN1 HTR (B1) | — | 2 | x | B | EC-178 | D |
| P0031 | 0031 | A/F SEN1 HTR (B1) | — | 2 | x | B | EC-178 | |
| P0032 | 0032 | A/F SEN1 HTR (B1) | — | 2 | x | B | EC-178 | |
| P0036 | 0036 | A/F SEN1 HTR (B1) | — | 2 | x | B | EC-178 | E |
| P0037 | 0037 | HO2S2 HTR (B1) | — | 2 | x | B | EC-181 | |
| P0038 | 0038 | HO2S2 HTR (B1) | — | 2 | x | B | EC-181 | |
| P0051 | 0051 | A/F SEN1 HTR (B2) | — | 2 | x | B | EC-178 | F |
| P0052 | 0052 | A/F SEN1 HTR (B2) | — | 2 | x | B | EC-178 | |
| P0057 | 0057 | HO2S2 HTR (B2) | — | 2 | x | B | EC-181 | G |
| P0058 | 0058 | HO2S2 HTR (B2) | — | 2 | x | B | EC-181 | |
| P0075 | 0075 | INT/V TIM V/CIR-B1 | — | 2 | x | B | EC-184 | H |
| P0081 | 0081 | INT/V TIM V/CIR-B2 | — | 2 | x | B | EC-184 | |
| P0101 | 0101 | MAF SEN/CIRCUIT-B1 | — | 2 | x | B | EC-186 | I |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | — | 1 | x | B | EC-192 | |
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | — | 1 | x | B | EC-192 | J |
| P0111 | 0111 | IAT SENSOR 1 B1 | — | 2 | x | A | EC-197 | |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | — | 2 | x | B | EC-199 | K |
| P0113 | 0113 | IAT SEN/CIRCUIT-B1 | — | 2 | x | B | EC-199 | |
| P0116 | 0116 | ECT SEN/CIRC | — | 2 | x | A | EC-201 | L |
| P0117 | 0117 | ECT SEN/CIRC | — | 1 | x | B | EC-203 | |
| P0118 | 0118 | ECT SEN/CIRC | — | 1 | x | B | EC-203 | M |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | — | 1 | x | B | EC-205 | |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | — | 1 | x | B | EC-205 | N |
| P0125 | 0125 | ECT SENSOR | — | 2 | x | B | EC-209 | |
| P0127 | 0127 | IAT SENSOR-B1 | — | 2 | x | B | EC-211 | O |
| P0128 | 0128 | THERMSTAT FNCTN | — | 2 | x | A | EC-213 | |
| P0130 | 0130 | A/F SENSOR1 (B1) | x | 2 | x | A | EC-216 | P |
| P0131 | 0131 | A/F SENSOR1 (B1) | — | 2 | x | B | EC-220 | |
| P0132 | 0132 | A/F SENSOR1 (B1) | — | 2 | x | B | EC-223 | |
| P0137 | 0137 | HO2S2 (B1) | x | 2 | x | A | EC-226 | |
| P0138 | 0138 | HO2S2 (B1) | x | 2 | x | A | EC-232 | |
| P0139 | 0139 | HO2S2 (B1) | x | 2 | x | A | EC-240 | |
| P014C | 014C | A/F SENSOR1 (B1) | x | 2 | x | A | EC-247 | |
| P014D | 014D | A/F SENSOR1 (B1) | x | 2 | x | A | EC-247 | |
| P014E | 014E | A/F SENSOR1 (B1) | x | 2 | x | A | EC-247 | |
| P014F | 014F | A/F SENSOR1 (B1) | x | 2 | x | A | EC-247 | |
| P0150 | 0150 | A/F SENSOR1 (B2) | — | 2 | x | A | EC-216 | |
| P0151 | 0151 | A/F SENSOR1 (B2) | — | 2 | x | B | EC-220 | |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Reference page |
|------------------|-------|---------------------------------|-------------|--------|-----|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| P0152 | 0152 | A/F SENSOR1 (B2) | — | 2 | × | B | EC-223 |
| P0157 | 0157 | HO2S2 (B2) | × | 2 | × | A | EC-226 |
| P0158 | 0158 | HO2S2 (B2) | × | 2 | × | A | EC-232 |
| P0159 | 0159 | HO2S2 (B2) | × | 2 | × | A | EC-240 |
| P015A | 015A | A/F SENSOR1 (B2) | × | 2 | × | A | EC-247 |
| P015B | 015B | A/F SENSOR1 (B2) | × | 2 | × | A | EC-247 |
| P015C | 015C | A/F SENSOR1 (B2) | × | 2 | × | A | EC-247 |
| P015D | 015D | A/F SENSOR1 (B2) | × | 2 | × | A | EC-247 |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | — | 2 | × | B | EC-253 |
| P0172 | 0172 | FUEL SYS-RICH-B1 | — | 2 | × | B | EC-257 |
| P0174 | 0174 | FUEL SYS-LEAN-B2 | — | 2 | × | B | EC-253 |
| P0175 | 0175 | FUEL SYS-RICH-B2 | — | 2 | × | B | EC-257 |
| P0181 | 0181 | FTT SENSOR | — | 2 | × | A and B | EC-261 |
| P0182 | 0182 | FTT SEN/CIRCUIT | — | 2 | × | B | EC-265 |
| P0183 | 0183 | FTT SEN/CIRCUIT | — | 2 | × | B | EC-265 |
| P0222 | 0222 | TP SEN 1/CIRC-B1 | — | 1 | × | B | EC-268 |
| P0223 | 0223 | TP SEN 1/CIRC-B1 | — | 1 | × | B | EC-268 |
| P0300 | 0300 | MULTI CYL MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0301 | 0301 | CYL 1 MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0302 | 0302 | CYL 2 MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0303 | 0303 | CYL 3 MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0304 | 0304 | CYL 4 MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0305 | 0305 | CYL 5 MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0306 | 0306 | CYL 6 MISFIRE | — | 1 or 2 | × | B | EC-272 |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | — | 2 | — | — | EC-278 |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | — | 2 | — | — | EC-278 |
| P0332 | 0332 | KNOCK SEN/CIRC-B2 | — | 2 | — | — | EC-278 |
| P0333 | 0333 | KNOCK SEN/CIRC-B2 | — | 2 | — | — | EC-278 |
| P0335 | 0335 | CKP SEN/CIRCUIT | — | 2 | × | B | EC-280 |
| P0340 | 0340 | CMP SEN/CIRC-B1 | — | 2 | × | B | EC-283 |
| P0345 | 0345 | CMP SEN/CIRC-B2 | — | 2 | × | B | EC-283 |
| P0420 | 0420 | TW CATALYST SYS-B1 | × | 2 | × | A | EC-286 |
| P0430 | 0430 | TW CATALYST SYS-B2 | × | 2 | × | A | EC-286 |
| P0441 | 0441 | EVAP PURG FLOW/MON | × | 2 | × | A | EC-291 |
| P0443 | 0443 | PURG VOLUME CONT/V | — | 2 | × | A | EC-296 |
| P0444 | 0444 | PURG VOLUME CONT/V | — | 2 | × | B | EC-301 |
| P0445 | 0445 | PURG VOLUME CONT/V | — | 2 | × | B | EC-301 |
| P0447 | 0447 | VENT CONTROL VALVE | — | 2 | × | B | EC-304 |
| P0448 | 0448 | VENT CONTROL VALVE | — | 2 | × | B | EC-308 |
| P0451 | 0451 | EVAP SYS PRES SEN | — | 2 | × | A | EC-312 |
| P0452 | 0452 | EVAP SYS PRES SEN | — | 2 | × | B | EC-315 |
| P0453 | 0453 | EVAP SYS PRES SEN | — | 2 | × | B | EC-318 |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Reference page | |
|------------------|-------|---------------------------------|-------------|--------|--------|--------------------------|------------------------|----|
| CONSULT GST*2 | ECM*3 | | | | | | | |
| P0455 | 0455 | EVAP GROSS LEAK | — | 2 | × | A | EC-322 | A |
| P0456 | 0456 | EVAP VERY SML LEAK | x*7 | 2 | × | A | EC-328 | EC |
| P0460 | 0460 | FUEL LEV SEN SLOSH | — | 2 | × | A | EC-334 | |
| P0461 | 0461 | FUEL LEVEL SENSOR | — | 2 | × | B | EC-335 | C |
| P0462 | 0462 | FUEL LEVL SEN/CIRC | — | 2 | × | B | EC-337 | |
| P0463 | 0463 | FUEL LEVL SEN/CIRC | — | 2 | × | B | EC-337 | D |
| P0500 | 0500 | VEHICLE SPEED SENSOR A*6 | — | 2 | × | B | EC-338 | |
| P0506 | 0506 | ISC SYSTEM | — | 2 | × | B | EC-340 | E |
| P0507 | 0507 | ISC SYSTEM | — | 2 | × | B | EC-342 | |
| P050A | 050A | COLD START CONTROL | — | 2 | × | A | EC-344 | |
| P050E | 050E | COLD START CONTROL | — | 2 | × | A | EC-344 | F |
| P0550 | 0550 | PW ST P SEN/CIRC | — | 2 | — | — | EC-346 | |
| P0603 | 0603 | ECM BACK UP/CIRCUIT | — | 2 | × or — | B | EC-349 | |
| P0604 | 0604 | ECM | — | 2 | — | B | EC-351 | G |
| P0605 | 0605 | ECM | — | 1 or 2 | × or — | B | EC-352 | |
| P0606 | 0606 | CONTROL MODULE | — | 2 | — | B | EC-353 | H |
| P0607 | 0607 | ECM | — | 1 or 2 | × or — | B | EC-354 | |
| P060A | 060A | CONTROL MODULE | — | 1 or 2 | × | B | EC-355 | |
| P060B | 060B | CONTROL MODULE | — | 1 | × | B | EC-356 | I |
| P0643 | 0643 | SENSOR POWER/CIRC | — | 1 | × | B | EC-357 | |
| P0700 | 0700 | TRANSMISSION CONT | — | 1 | × | B | TM-87 | J |
| P0705 | 0705 | T/M RANGE SENSOR A | — | 2 | × | B | TM-88 | |
| P0710 | 0710 | FLUID TEMP SENSOR A*9 | — | 2 | × | B | TM-111 | |
| P0717 | 0717 | INPUT SPEED SENSOR A | — | 2 | × | B | TM-90 | K |
| P0720 | 0720 | OUTPUT SPEED SENSOR*6 | — | 2 | × | B | TM-92 | |
| P0731 | 0731 | 1GR INCORRECT RATIO*9 | — | 2 | × | B | TM-97 | L |
| P0732 | 0732 | 2GR INCORRECT RATIO*9 | — | 2 | × | B | TM-99 | |
| P0733 | 0733 | 3GR INCORRECT RATIO*9 | — | 2 | × | B | TM-101 | |
| P0734 | 0734 | 4GR INCORRECT RATIO*9 | — | 2 | × | B | TM-103 | M |
| P0735 | 0735 | 5GR INCORRECT RATIO*9 | — | 2 | × | B | TM-105 | |
| P0740 | 0740 | TORQUE CONVERTER | — | 2 | × | B | TM-107 | N |
| P0744 | 0744 | TORQUE CONVERTER | — | 2 | × | B | TM-108 | |
| P0745 | 0745 | PC SOLENOID A | — | 2 | × | B | TM-109 | O |
| P0850 | 0850 | P-N POS SW/CIRCUIT | — | 2 | × | B | EC-359 | |
| P1148 | 1148 | CLOSED LOOP-B1 | — | 1 | × | A | EC-362 | |
| P1168 | 1168 | CLOSED LOOP-B2 | — | 1 | × | A | EC-362 | P |
| P1212 | 1212 | TCS/CIRC | — | 2 | — | — | EC-364 | |
| P1217 | 1217 | ENG OVER TEMP | — | 1 | × | B | EC-365 | |
| P1225 | 1225 | CTP LEARNING-B1 | — | 2 | — | — | EC-369 | |
| P1226 | 1226 | CTP LEARNING-B1 | — | 2 | — | — | EC-370 | |
| P1564 | 1564 | ASCD SW | — | 1 | — | — | EC-371 | |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Reference page |
|------------------|-------|---------------------------------|-------------|------|-----|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| P1572 | 1572 | ASCD BRAKE SW | — | 1 | — | — | EC-374 |
| P1574 | 1574 | ASCD VHL SPD SEN | — | 1 | — | — | EC-379 |
| P1610 | 1610 | LOCK MODE | — | 2 | — | — | SEC-50 |
| P1611 | 1611 | ID DISCORD, IMM-ECM | — | 2 | — | — | SEC-51 |
| P1612 | 1612 | CHAIN OF ECM-IMMU | — | 2 | — | — | SEC-53 |
| P1614 | 1614 | CHAIN OF IMM-KEY | — | 2 | — | — | SEC-54 |
| P1615 | 1615 | DIFFERENCE OF KEY | — | 2 | — | — | SEC-56 |
| P1715 | 1715 | IN PULY SPEED | — | 2 | — | — | EC-381 |
| P1730 | 1730 | INTERLOCK | — | 1 | × | B | TM-116 |
| P1752 | 1752 | INPUT CLUTCH SOL | — | 1 | × | B | TM-119 |
| P1757 | 1757 | FR BRAKE SOLENOID | — | 1 | × | B | TM-120 |
| P1762 | 1762 | DRCT CLUTCH SOL | — | 1 | × | B | TM-121 |
| P1767 | 1767 | HLR CLUTCH SOLENOID | — | 1 | × | B | TM-123 |
| P1772 | 1772 | L C BRAKE SOLENOID | — | 1 | × | B | TM-124 |
| P1774 | 1774 | L C BRAKE SOLENOID | — | 1 | × | B | TM-125 |
| P1800 | 1800 | VIAS S/V-1 | — | 2 | — | — | EC-382 |
| P1805 | 1805 | BRAKE SW/CIRCUIT | — | 2 | — | — | EC-385 |
| P2096 | 2096 | POST CAT FUEL TRIM SYS B1 | — | 2 | × | A | EC-387 |
| P2097 | 2097 | POST CAT FUEL TRIM SYS B1 | — | 2 | × | A | EC-387 |
| P2098 | 2098 | POST CAT FUEL TRIM SYS B2 | — | 2 | × | A | EC-387 |
| P2099 | 2099 | POST CAT FUEL TRIM SYS B2 | — | 2 | × | A | EC-387 |
| P2100 | 2100 | ETC MOT PWR-B1 | — | 1 | × | B | EC-391 |
| P2101 | 2101 | ETC FNCTN/CIRC-B1 | — | 1 | × | B | EC-393 |
| P2103 | 2103 | ETC MOT PWR | — | 1 | × | B | EC-391 |
| P2118 | 2118 | ETC MOT-B1 | — | 1 | × | B | EC-396 |
| P2119 | 2119 | ETC ACTR-B1 | — | 1 | × | B | EC-398 |
| P2122 | 2122 | APP SEN 1/CIRC | — | 1 | × | B | EC-400 |
| P2123 | 2123 | APP SEN 1/CIRC | — | 1 | × | B | EC-400 |
| P2127 | 2127 | APP SEN 2/CIRC | — | 1 | × | B | EC-403 |
| P2128 | 2128 | APP SEN 2/CIRC | — | 1 | × | B | EC-403 |
| P2135 | 2135 | TP SENSOR-B1 | — | 1 | × | B | EC-407 |
| P2138 | 2138 | APP SENSOR | — | 1 | × | B | EC-411 |
| P219A | 219A | AIR FUEL RATIO IMBALANCE B1 | — | 2 | × | A | EC-416 |
| P219B | 219B | AIR FUEL RATIO IMBALANCE B2 | — | 2 | × | A | EC-416 |

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by SAE J2012/ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: Refer to [EC-154, "Description"](#).

*5: The troubleshooting for this DTC needs CONSULT.

*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

*7: SRT code will not be set if the self-diagnostic result is NG.

*8: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to [EC-63, "DIAGNOSIS DESCRIPTION : System Readiness Test \(SRT\) Code"](#).

*9: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:0000000012938751

The following is the information specified in Service \$06 of SAE J1979/ISO 15031-5.
 The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
 These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.
 The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------|---------|--|----------------|---|---------------------|---|
| | | | | TID | Unit and Scaling ID | |
| HO2S | 01H | Air fuel ratio (A/F) sensor 1 (Bank 1) | P0131 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0131 | 84H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0130 | 85H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0130 | 86H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0133 | 87H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0133 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2A00 or P2096 | 89H | 84H | The amount of shift in air fuel ratio (too lean) |
| | | | P2A00 or P2097 | 8AH | 84H | The amount of shift in air fuel ratio (too rich) |
| | | | P0130 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0133 | 8CH | 83H | Response gain at the limited frequency |
| | | | P014C | 8DH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014C | 8EH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014D | 8FH | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P014D | 90H | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P015A | 91H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015A | 92H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015B | 93H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P015B | 94H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P0133 | 95H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0133 | 96H | 84H | Response rate: Response ratio (rich to lean) |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------|---------|---|----------------|--|---------------------|---|
| | | | | TID | Unit and Scaling ID | |
| HO2S | 02H | Heated oxygen sensor 2 (Bank 1) | P0138 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0137 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0138 | 80H | 0CH | Sensor output voltage |
| | | | P0139 | 81H | 0CH | Difference in sensor output voltage |
| | | | P0139 | 82H | 11H | Rear O2 sensor delay response diagnosis |
| | 03H | Heated oxygen sensor 3 (Bank 1) | P0143 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0144 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0146 | 80H | 0CH | Sensor output voltage |
| | | | P0145 | 81H | 0CH | Difference in sensor output voltage |
| | 05H | Air fuel ratio (A/F) sensor 1 (Bank 2) | P0151 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0151 | 84H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0150 | 85H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0150 | 86H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0153 | 87H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0153 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2A03 or P2098 | 89H | 84H | The amount of shift in air fuel ratio (too lean) |
| | | | P2A03 or P2099 | 8AH | 84H | The amount of shift in air fuel ratio (too rich) |
| | | | P0150 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0153 | 8CH | 83H | Response gain at the limited frequency |
| | | | P014E | 8DH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 |
| | | | P014E | 8EH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 |
| | | | P014F | 8FH | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 |
| | | | P014F | 90H | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 |
| | | | P015C | 91H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 |
| | | | P015C | 92H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 |
| | | | P015D | 93H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------------|---------|--|-------|---|---------------------|--|
| | | | | TID | Unit and Scaling ID | |
| HO2S | 05H | Air fuel ratio (A/F) sensor 1 (Bank 2) | P015D | 94H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 |
| | | | P0153 | 95H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0153 | 96H | 84H | Response rate: Response ratio (rich to lean) |
| | 06H | Heated oxygen sensor 2 (Bank 2) | P0158 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0157 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0158 | 80H | 0CH | Sensor output voltage |
| | | | P0159 | 81H | 0CH | Difference in sensor output voltage |
| | | | P0159 | 82H | 11H | Rear O2 sensor delay response diagnosis |
| | 07H | Heated oxygen sensor 3 (Bank2) | P0163 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0164 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0166 | 80H | 0CH | Sensor output voltage |
| | | | P0165 | 81H | 0CH | Difference in sensor output voltage |
| CATALYST | 21H | Three way catalyst function (Bank1) | P0420 | 80H | 01H | O2 storage index |
| | | | P0420 | 82H | 01H | Switching time lag engine exhaust index value |
| | | | P2423 | 83H | 0CH | Difference in 3rd O2 sensor output voltage |
| | | | P2423 | 84H | 84H | O2 storage index in HC trap catalyst |
| | 22H | Three way catalyst function (Bank2) | P0430 | 80H | 01H | O2 storage index |
| | | | P0430 | 82H | 01H | Switching time lag engine exhaust index value |
| | | | P2424 | 83H | 0CH | Difference in 3rd O2 sensor output voltage |
| | | | P2424 | 84H | 84H | O2 storage index in HC trap catalyst |
| EGR SYSTEM | 31H | EGR function | P0400 | 80H | 96H | Low flow faults: EGR temp change rate (short term) |
| | | | P0400 | 81H | 96H | Low flow faults: EGR temp change rate (long term) |
| | | | P0400 | 82H | 96H | Low flow faults: Difference between max EGR temp and EGR temp under idling condition |
| | | | P0400 | 83H | 96H | Low flow faults: Max EGR temp |
| | | | P1402 | 84H | 96H | High Flow Faults: EGR temp increase rate |
| | | | P0402 | 85H | FCH | EGR differential pressure high flow |
| | | | P0401 | 86H | 37H | EGR differential pressure low flow |
| | | | P2457 | 87H | 96H | EGR temperature |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|-------------|-------------------|--|------------------------------------|---|---|---|
| | | | | TID | Unit and Scaling ID | |
| VVT SYSTEM | 35H | VVT Monitor (Bank1) | P0011 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | | | P0014 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | | | P0011 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0014 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | | | P100A | 84H | 10H | VEL slow response diagnosis |
| | | | P1090 | 85H | 10H | VEL servo system diagnosis |
| | | | P0011 | 86H | 9DH | VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis) |
| | | | Advanced: P052A Retarded: P052B | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis) |
| | 36H | VVT Monitor (Bank2) | P0021 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | | | P0024 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | | | P0021 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0024 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | | | P100B | 84H | 10H | VEL slow response diagnosis |
| | | | P1093 | 85H | 10H | VEL servo system diagnosis |
| P0021 | | | 86H | 9DH | VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis) | |
| | | Advanced: P052C Retarded: P052D | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis) | |
| EVAP SYSTEM | 39H | EVAP control system leak (Cap Off) | P0455 | 80H | 0CH | Difference in pressure sensor output voltage before and after pull down |
| | 3BH | EVAP control system leak (Small leak) | P0442 | 80H | 05H | Leak area index (for more than 0.04 inch) |
| | 3CH | EVAP control system leak (Very small leak) | P0456 | 80H | 05H | Leak area index (for more than 0.02 inch) |
| | | | P0456 | 81H | FDH | Maximum internal pressure of EVAP system during monitoring |
| | | | P0456 | 82H | FDH | Internal pressure of EVAP system at the end of monitoring |
| 3DH | Purge flow system | P0441 | 83H | 0CH | Difference in pressure sensor output voltage before and after vent control valve close | |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description | |
|------------------------------|---------------|--|---------------------------------------|---|---------------------|---|--|
| | | | | TID | Unit and Scaling ID | | |
| O2 SENSOR HEATER | 41H | A/F sensor 1 heater (Bank 1) | Low Input: P0031 High Input: P0032 | 81H | 0BH | Converted value of heater electric current to voltage | |
| | | | P0030 | 83H | 0BH | A/F sensor heater circuit malfunction | |
| | 42H | Heated oxygen sensor 2 heater (Bank 1) | Low Input: P0037 High Input: P0038 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | | | P0141 | 81H | 14H | Rear O2 sensor internal impedance | |
| | 43H | Heated oxygen sensor 3 heater (Bank 1) | P0043 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | 45H | A/F sensor 1 heater (Bank 2) | Low Input: P0051 High Input: P0052 | 81H | 0BH | Converted value of heater electric current to voltage | |
| | | | P0036 | 83H | 0BH | A/F sensor heater circuit malfunction | |
| | 46H | Heated oxygen sensor 2 heater (Bank 2) | Low Input: P0057 High Input: P0058 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | | | P0161 | 81H | 14CH | Rear O2 sensor internal impedance | |
| | 47H | Heated oxygen sensor 3 heater (Bank 2) | P0063 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | SECONDARY AIR | 71H | Secondary air system | P0411 | 80H | 01H | Secondary air injection system incorrect flow detected |
| | | | | Bank1: P0491 Bank2: P0492 | 81H | 01H | Secondary air injection system insufficient flow |
| P2445 | | | | 82H | 01H | Secondary air injection system pump stuck off | |
| P2448 | | | | 83H | 01H | Secondary air injection system high airflow | |
| Bank1: P2440 Bank2: P2442 | | | | 84H | 01H | Secondary air injection system switching valve stuck open | |
| P2440 | | | | 85H | 01H | Secondary air injection system switching valve stuck open | |
| P2444 | | | | 86H | 01H | Secondary air injection system pump stuck on | |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|-------------|---------|---|----------------|---|---------------------|---|
| | | | | TID | Unit and Scaling ID | |
| FUEL SYSTEM | 81H | Fuel injection system function (Bank 1) | P0171 or P0172 | 80H | 2FH | Long term fuel trim |
| | | | P0171 or P0172 | 81H | 24H | The number of lambda control clamped |
| | | | P117A / P219A | 82H | 03H | Cylinder A/F imbalance monitoring |
| | | | P219C | 83H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #1 cylinder parameter |
| | | | P219D | 84H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #2 cylinder parameter |
| | | | P219E | 85H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #3 cylinder parameter |
| | | | P219F | 86H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #4 cylinder parameter |
| | | | P21A0 | 87H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #5 cylinder parameter |
| | | | P21A2 | 89H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #7 cylinder parameter |
| | 82H | Fuel injection system function (Bank 2) | P0174 or P0175 | 80H | 2FH | Long term fuel trim |
| | | | P0174 or P0175 | 81H | 24H | The number of lambda control clamped |
| | | | P117B / P219B | 82H | 03H | Cylinder A/F imbalance monitoring |
| | | | P219D | 84H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #2 cylinder parameter |
| | | | P219F | 86H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #4 cylinder parameter |
| | | | P21A1 | 88H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #6 cylinder parameter |
| | | | P21A3 | 8AH | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #8 cylinder parameter |

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< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|---------|---------|----------------------------|-------|---|---------------------|--|
| | | | | TID | Unit and Scaling ID | |
| MISFIRE | A1H | Multiple cylinder misfires | P0301 | 80H | 24H | Misfiring counter at 1000 revolution of the first cylinder |
| | | | P0302 | 81H | 24H | Misfiring counter at 1000 revolution of the second cylinder |
| | | | P0303 | 82H | 24H | Misfiring counter at 1000 revolution of the third cylinder |
| | | | P0304 | 83H | 24H | Misfiring counter at 1000 revolution of the fourth cylinder |
| | | | P0305 | 84H | 24H | Misfiring counter at 1000 revolution of the fifth cylinder |
| | | | P0306 | 85H | 24H | Misfiring counter at 1000 revolution of the sixth cylinder |
| | | | P0307 | 86H | 24H | Misfiring counter at 1000 revolution of the seventh cylinder |
| | | | P0308 | 87H | 24H | Misfiring counter at 1000 revolution of the eighth cylinder |
| | | | P0300 | 88H | 24H | Misfiring counter at 1000 revolution of the multiple cylinders |
| | | | P0301 | 89H | 24H | Misfiring counter at 200 revolution of the first cylinder |
| | | | P0302 | 8AH | 24H | Misfiring counter at 200 revolution of the second cylinder |
| | | | P0303 | 8BH | 24H | Misfiring counter at 200 revolution of the third cylinder |
| | | | P0304 | 8CH | 24H | Misfiring counter at 200 revolution of the fourth cylinder |
| | | | P0305 | 8DH | 24H | Misfiring counter at 200 revolution of the fifth cylinder |
| | | | P0306 | 8EH | 24H | Misfiring counter at 200 revolution of the sixth cylinder |
| | | | P0307 | 8FH | 24H | Misfiring counter at 200 revolution of the seventh cylinder |
| | | | P0308 | 90H | 24H | Misfiring counter at 200 revolution of the eighth cylinder |
| | | | P0300 | 91H | 24H | Misfiring counter at 1000 revolution of the single cylinder |
| | | | P0300 | 92H | 24H | Misfiring counter at 200 revolution of the single cylinder |
| | | | P0300 | 93H | 24H | Misfiring counter at 200 revolution of the multiple cylinders |

ECM

< ECU DIAGNOSIS INFORMATION >

[VQ40DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|---------|---------|---------------------------|-------|---|---------------------|--|
| | | | | TID | Unit and Scaling ID | |
| MISFIRE | A2H | No. 1 cylinder misfire | P0301 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0301 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A3H | No. 2 cylinder misfire | P0302 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0302 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A4H | No. 3 cylinder misfire | P0303 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0303 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A5H | No. 4 cylinder misfire | P0304 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0304 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A6H | No. 5 cylinder misfire | P0305 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0305 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A7H | No. 6 cylinder misfire | P0306 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0306 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A8H | No. 7 cylinder misfire | P0307 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0307 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A9H | No. 8 cylinder misfire | P0308 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0308 | 0CH | 24H | Misfire counts for last/current driving cycles |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

WIRING DIAGRAM

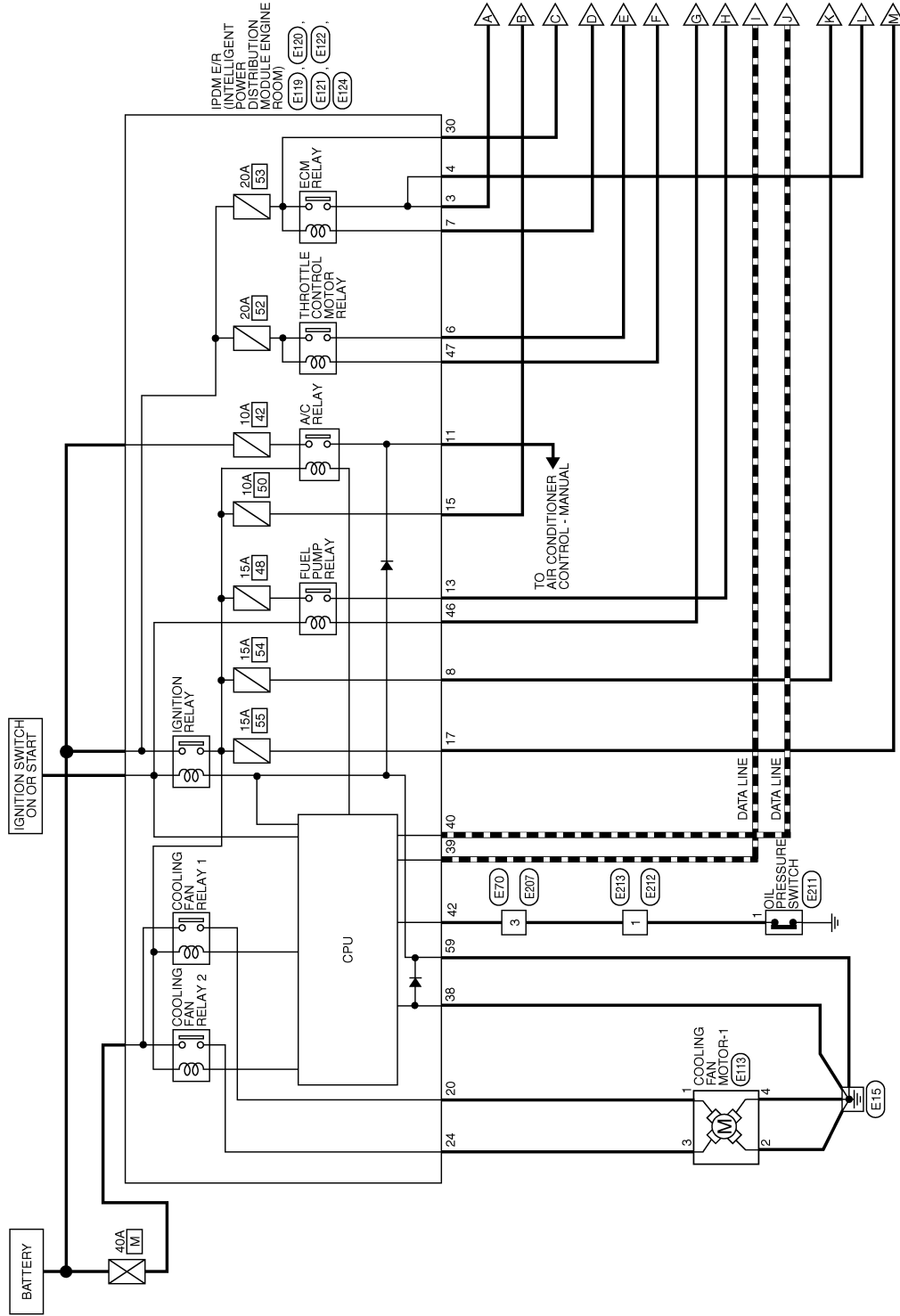
ENGINE CONTROL SYSTEM

Wiring Diagram

INFOID:000000012524274

Ⓜ: PASSENGER VAN

ENGINE CONTROL SYSTEM - VQ40DE

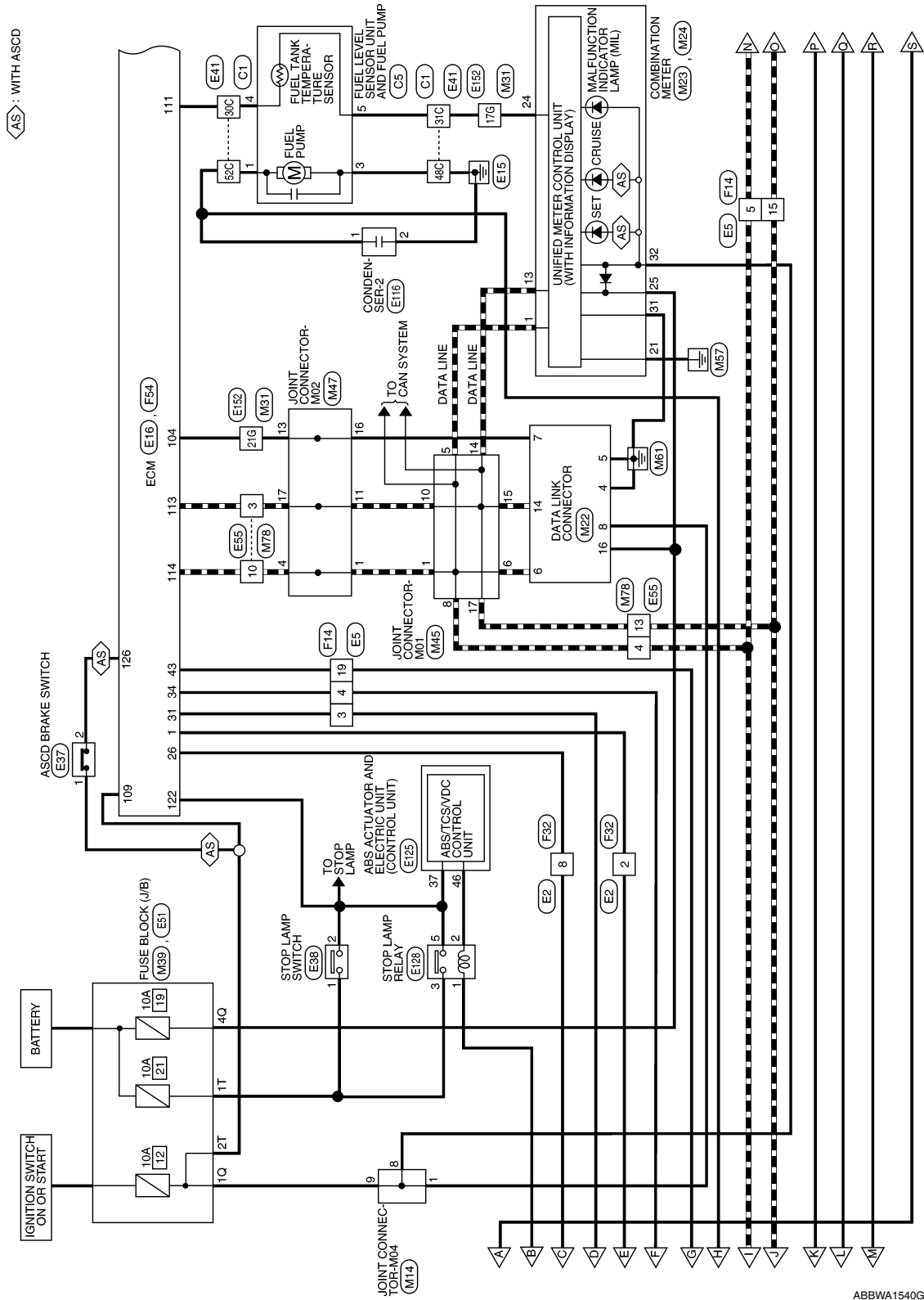


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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]



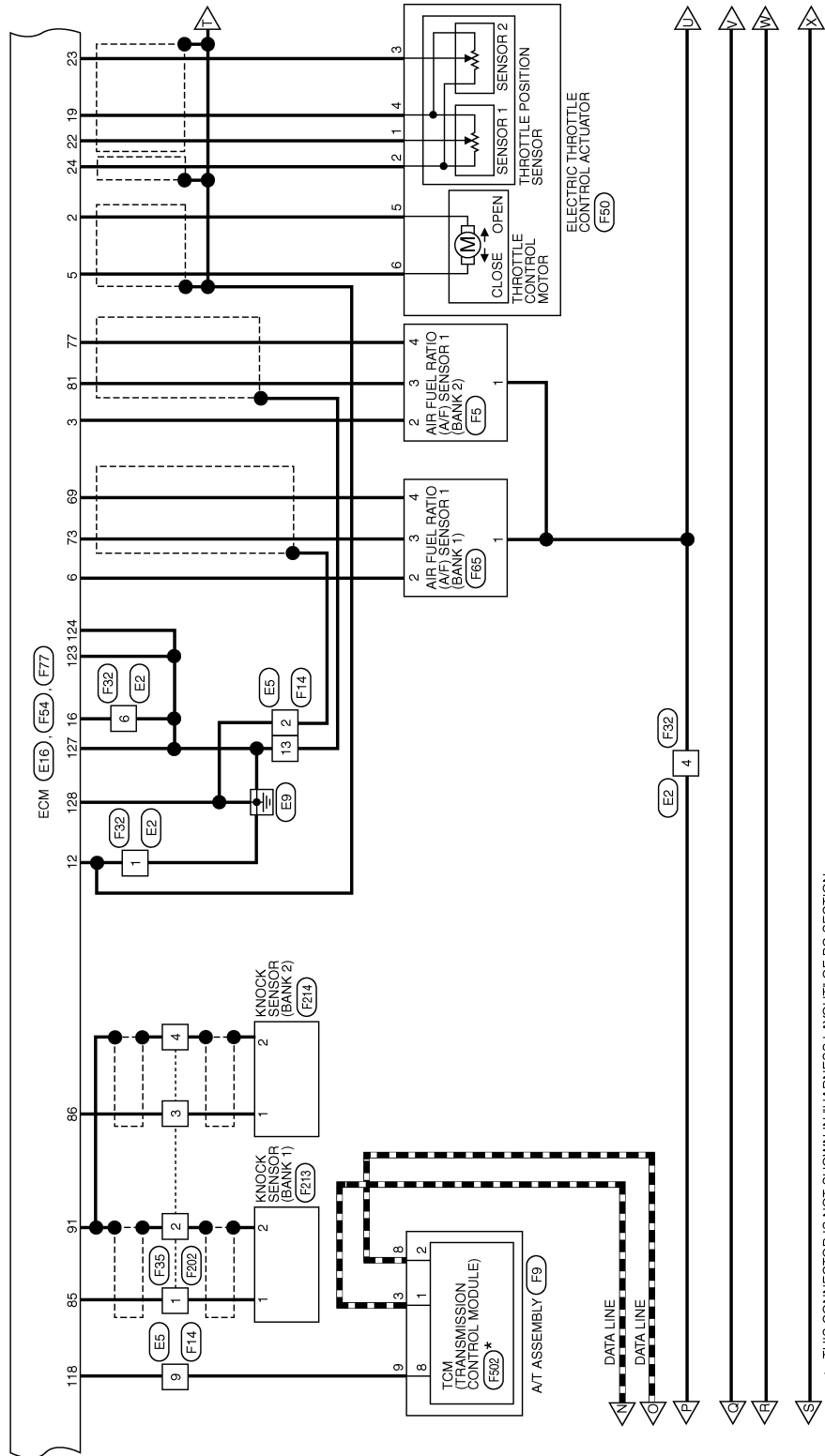
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]



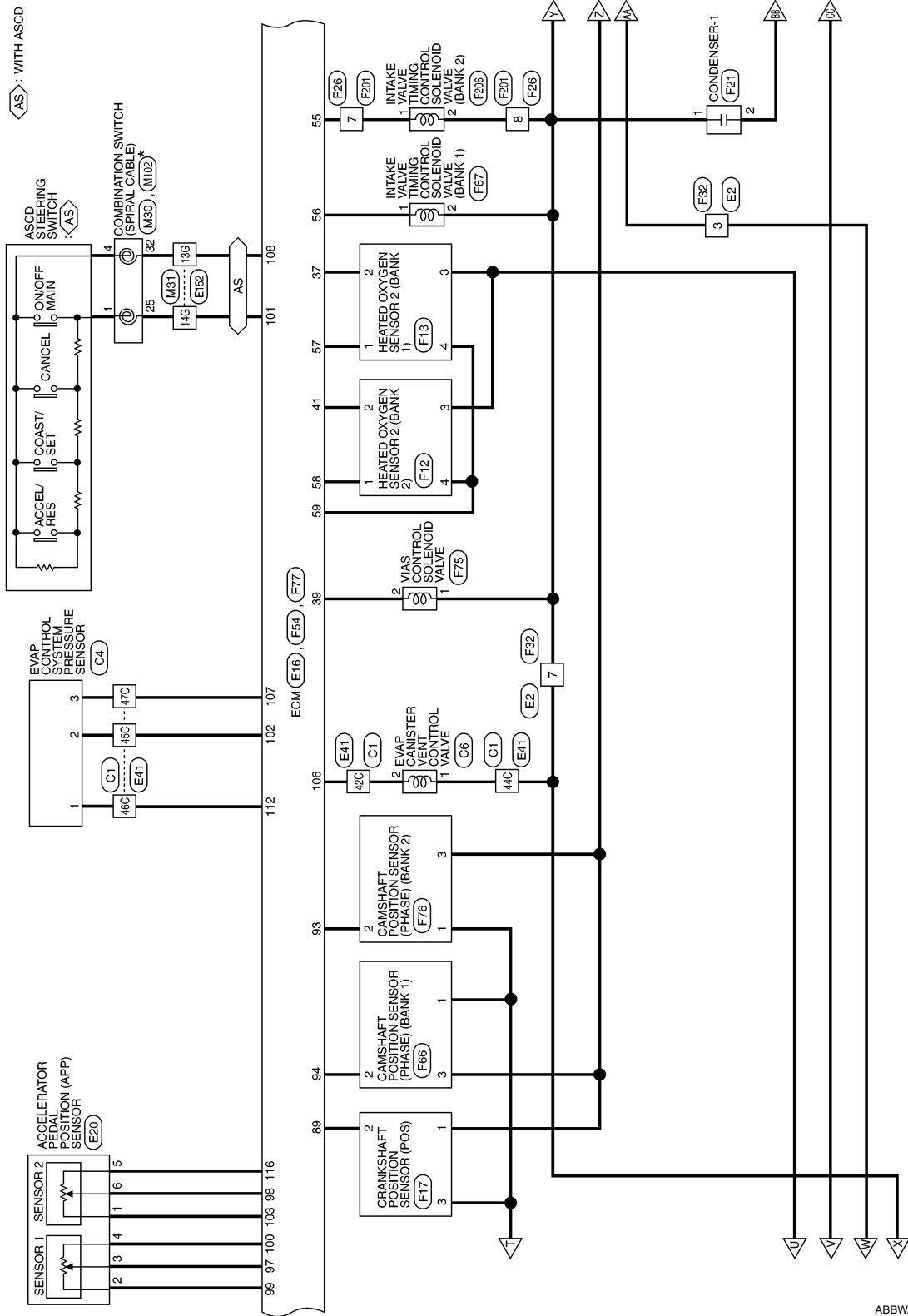
*: THIS CONNECTOR IS NOT SHOWN IN "HARNES LAYOUT" OF PG SECTION.

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]



* : THIS CONNECTOR IS NOT SHOWN IN "HARNES LAYOUT" OF PG SECTION.

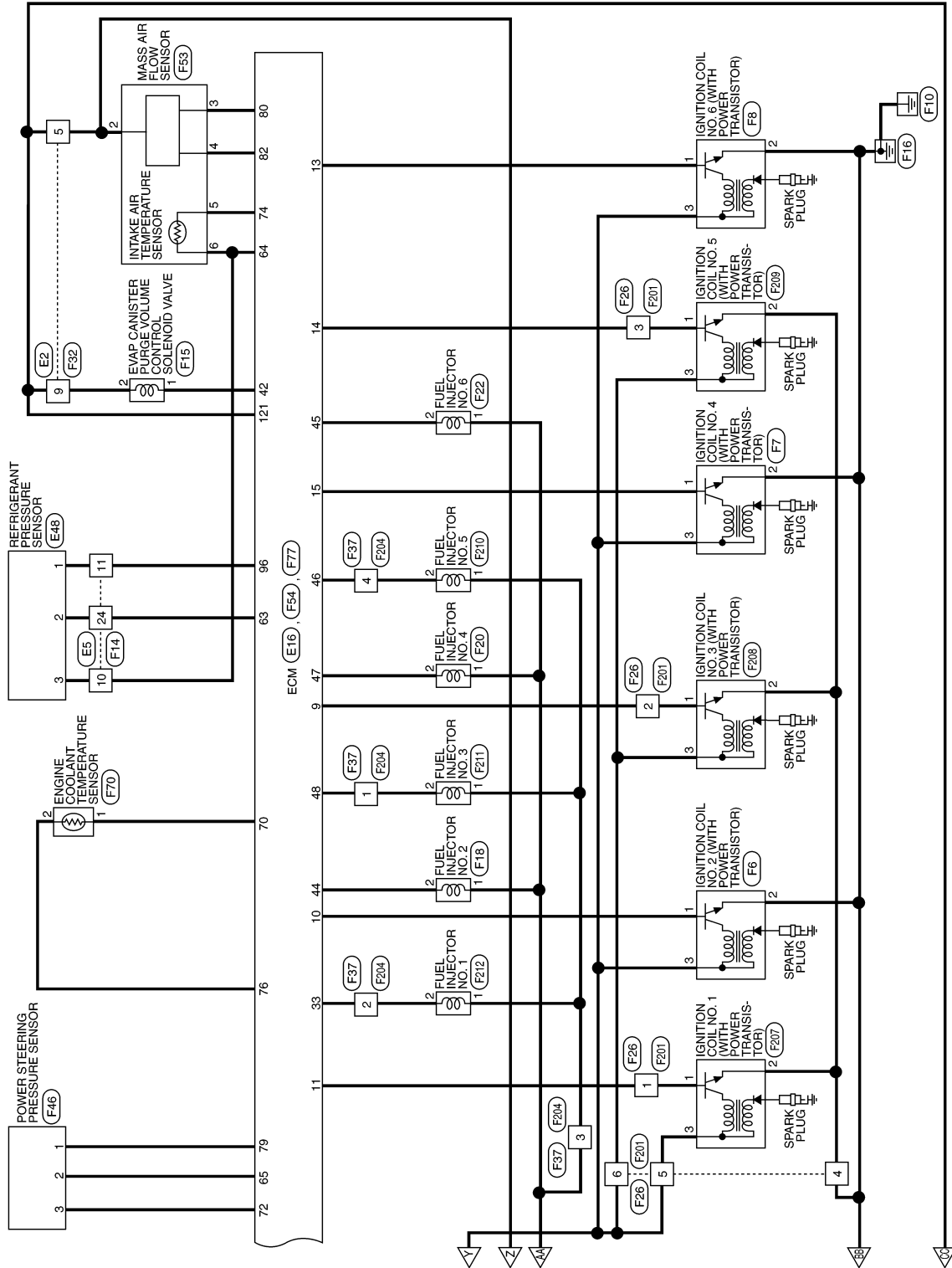
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

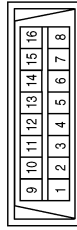
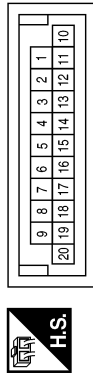
[VQ40DE]



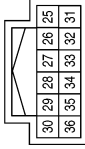
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ENGINE CONTROL SYSTEM CONNECTORS - VQ40DE

| | |
|-----------------|---------------------|
| Connector No. | M14 |
| Connector Name | JOINT CONNECTOR-M04 |
| Connector Color | BLUE |



| | |
|-----------------|---------------------|
| Connector No. | M22 |
| Connector Name | DATA LINK CONNECTOR |
| Connector Color | WHITE |



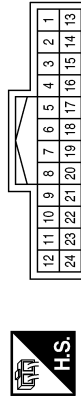
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|-----------------|-------------------|
| Connector No. | M23 |
| Connector Name | COMBINATION METER |
| Connector Color | WHITE |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 8 | R | - |
| 9 | R | - |

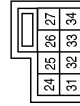
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 4 | B | - |
| 5 | B | - |
| 6 | L | - |
| 7 | O | - |
| 8 | R | - |
| 14 | P | - |
| 16 | Y | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 25 | Y | BATTERY |
| 31 | B | GND (POWER) |
| 32 | R | RUN START |

| | |
|-----------------|-------------------|
| Connector No. | M24 |
| Connector Name | COMBINATION METER |
| Connector Color | WHITE |



| | |
|-----------------|-----------------------------------|
| Connector No. | M30 |
| Connector Name | COMBINATION SWITCH (SPIRAL CABLE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------------|
| 1 | L | CAN-H |
| 13 | P | CAN-L |
| 21 | B | GND (ILL) |
| 24 | LG | FUEL LEVEL GROUND |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 25 | R | - |
| 32 | B | - |

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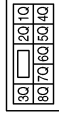
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

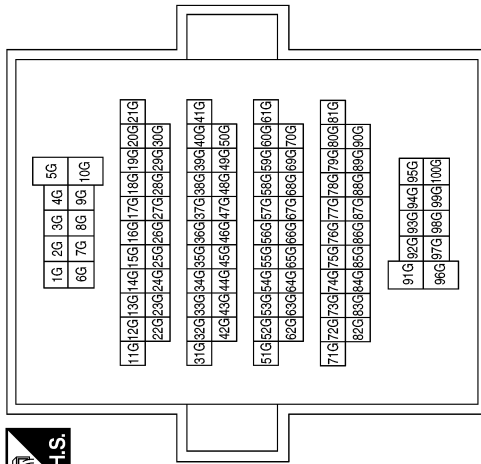
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| Connector No. | M39 |
| Connector Name | FUSE BLOCK (J/B) |
| Connector Color | WHITE |



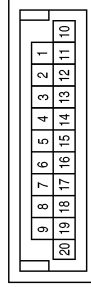
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|--------------|---------------|-------------|
| 1Q | R | - |
| 4Q | Y | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 13G | B | - |
| 14G | R | - |
| 17G | LG | - |
| 21G | O | - |

| | |
|-----------------|--------------|
| Connector No. | M31 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



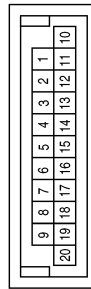
| | |
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| Connector No. | M47 |
| Connector Name | JOINT CONNECTOR-M02 |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | - |
| 4 | L | - |
| 11 | P | - |
| 13 | O | - |
| 16 | O | - |
| 17 | P | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | - |
| 5 | L | - |
| 6 | L | - |
| 8 | L | - |
| 10 | P | - |
| 14 | P | - |
| 15 | P | - |
| 17 | P | - |

| | |
|-----------------|---------------------|
| Connector No. | M45 |
| Connector Name | JOINT CONNECTOR-M01 |
| Connector Color | BLUE |



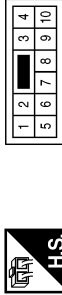
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

| | |
|-----------------|--------------|
| Connector No. | E2 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



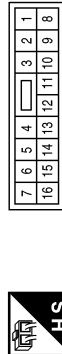
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | W | - |
| 4 | V | - |
| 5 | BR | - |
| 6 | B | - |
| 7 | O | - |
| 8 | R | - |
| 9 | BR | - |

| | |
|-----------------|-----------------------------------|
| Connector No. | M102 |
| Connector Name | COMBINATION SWITCH (SPIRAL CABLE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 4 | B | - |

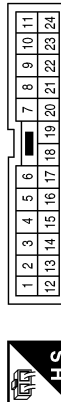
| | |
|-----------------|--------------|
| Connector No. | M78 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | P | - |
| 4 | L | - |
| 10 | L | - |
| 13 | P | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 11 | O | - |
| 13 | B | - |
| 15 | P | - |
| 19 | GR | - |
| 24 | GR | - |

| | |
|-----------------|--------------|
| Connector No. | E5 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 2 | B | - |
| 3 | W | - |
| 4 | O | - |
| 5 | L | - |
| 9 | BR | - |
| 10 | B | - |

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ENGINE CONTROL SYSTEM

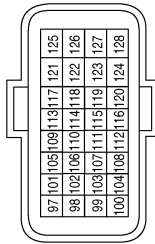
< WIRING DIAGRAM >

[VQ40DE]

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 121 | BR | VBR |
| 122 | LG | BRAKE |
| 123 | B | GND |
| 124 | B | GND |
| 125 | - | - |
| 126 | BR | BNC SW |
| 127 | B | GND |
| 128 | B | GND |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 104 | O | K-LINE |
| 105 | - | - |
| 106 | G | CDCV |
| 107 | SB | AVCC2-FTPRS |
| 108 | B | GND-ASCD |
| 109 | W | IGNSW |
| 110 | - | - |
| 111 | Y | TF |
| 112 | B | GND-FTPRS |
| 113 | P | CAN-L |
| 114 | L | CAN-H |
| 115 | - | - |
| 116 | Y | GND-A2 |
| 117 | - | - |
| 118 | BR | NEUT H |
| 119 | - | - |
| 120 | - | - |

| | |
|-----------------|-------------------|
| Connector No. | E16 |
| Connector Name | ECM (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 97 | BR | APS1 |
| 98 | LG | APS2 |
| 99 | L | AVCC |
| 100 | R | GND-A |
| 101 | R | ASCD SW |
| 102 | L | FTPRS |
| 103 | W | AVCC2 |

| | |
|-----------------|------------------|
| Connector No. | E38 |
| Connector Name | STOP LAMP SWITCH |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | LG | - |

| | |
|-----------------|-------------------|
| Connector No. | E37 |
| Connector Name | ASCD BRAKE SWITCH |
| Connector Color | BROWN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | BR | - |

| | |
|-----------------|---|
| Connector No. | E20 |
| Connector Name | ACCELERATOR PEDAL POSITION (APP) SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | L | - |
| 3 | BR | - |
| 4 | R | - |
| 5 | Y | - |
| 6 | LG | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

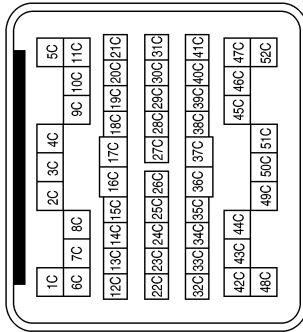
| | |
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| Connector No. | E48 |
| Connector Name | REFRIGERANT PRESSURE SENSOR |
| Connector Color | BLACK |



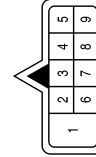
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | GR | - |
| 3 | B | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30C | Y | - |
| 31C | LG | - |
| 42C | G | - |
| 44C | O | - |
| 45C | L | - |
| 46C | B | - |
| 47C | SB | - |
| 48C | B | - |
| 52C | R | - |

| | |
|-----------------|--------------|
| Connector No. | E41 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GRAY |

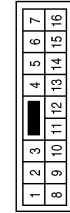


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| Connector No. | E70 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GRAY |



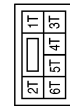
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | SB | - |

| | |
|-----------------|--------------|
| Connector No. | E55 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | P | - |
| 4 | L | - |
| 10 | L | - |
| 13 | P | - |

| | |
|-----------------|------------------|
| Connector No. | E51 |
| Connector Name | FUSE BLOCK (J/B) |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1T | O | - |
| 2T | W | - |

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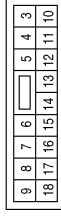
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

| | |
|-----------------|--|
| Connector No. | E119 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|---------------|
| 3 | O | IGN COIL |
| 4 | BR | ECM VB |
| 6 | L | ETC |
| 7 | W | ECM RLY CONT |
| 8 | V | O2 SENS IGN |
| 11 | W | A/C CLUTCH |
| 13 | R | FUEL PUMP MTR |
| 15 | GR | ABS ECU IGN |
| 17 | W | INJECTOR |

| | |
|-----------------|-------------|
| Connector No. | E116 |
| Connector Name | CONDENSER-2 |
| Connector Color | WHITE |



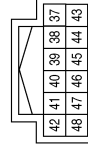
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 2 | B | - |

| | |
|-----------------|---------------------|
| Connector No. | E113 |
| Connector Name | COOLING FAN MOTOR-1 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | B | - |
| 3 | W | - |
| 4 | B | - |

| | |
|-----------------|--|
| Connector No. | E122 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | WHITE |



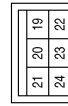
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-----------------|
| 38 | B | GND (SIGNAL) |
| 39 | L | CAN-H |
| 40 | P | CAN-L |
| 42 | SB | OIL PRESSURE SW |
| 46 | GR | FUEL RLY CONT |
| 47 | O | ETC RLY CONT |

| | |
|-----------------|--|
| Connector No. | E121 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | BROWN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30 | R | ECM BAT |

| | |
|-----------------|--|
| Connector No. | E120 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 20 | Y | MOTOR FAN 1 |
| 24 | W | MOTOR FAN 2 |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

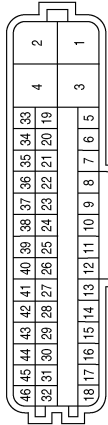
[VQ40DE]

| | |
|-----------------|--|
| Connector No. | E124 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 59 | B | GND (POWER) |

| | |
|-----------------|---|
| Connector No. | E125 |
| Connector Name | ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) |
| Connector Color | BLACK |



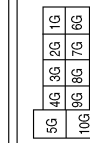
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 37 | LG | STP |
| 46 | W | STPO |

| | |
|-----------------|-----------------|
| Connector No. | E128 |
| Connector Name | STOP LAMP RELAY |
| Connector Color | BLUE |



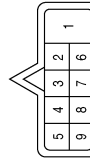
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | GR | - |
| 2 | W | - |
| 3 | O | - |
| 5 | LG | - |

| | |
|-----------------|--------------|
| Connector No. | E152 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |

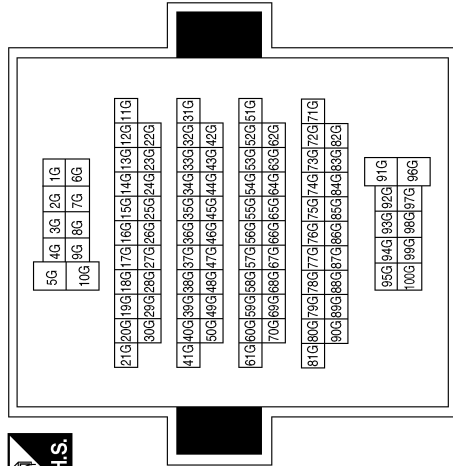


| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 13G | B | - |
| 14G | R | - |
| 17G | LG | - |
| 21G | O | - |

| | |
|-----------------|--------------|
| Connector No. | E207 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | SB | - |



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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

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| Connector No. | E211 |
| Connector Name | OIL PRESSURE SWITCH (WITH VQ40DE) |
| Connector Color | BLACK |



| | | | | | |
|--------------|---|---------------|----|-------------|---|
| Terminal No. | 1 | Color of Wire | SB | Signal Name | - |
|--------------|---|---------------|----|-------------|---|

| | |
|-----------------|--------------|
| Connector No. | E212 |
| Connector Name | WIRE TO WIRE |
| Connector Color | BLACK |



| | | | | | |
|--------------|---|---------------|----|-------------|---|
| Terminal No. | 1 | Color of Wire | SB | Signal Name | - |
|--------------|---|---------------|----|-------------|---|

| | |
|-----------------|--------------|
| Connector No. | E213 |
| Connector Name | WIRE TO WIRE |
| Connector Color | BLACK |



| | | | | | |
|--------------|---|---------------|----|-------------|---|
| Terminal No. | 1 | Color of Wire | SB | Signal Name | - |
|--------------|---|---------------|----|-------------|---|

| | |
|-----------------|---|
| Connector No. | F5 |
| Connector Name | AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2) |
| Connector Color | BROWN |



| | | | | | |
|--------------|----|---------------|---|-------------|---|
| Terminal No. | 1 | Color of Wire | V | Signal Name | - |
| 2 | BR | BR | - | - | - |
| 3 | L | L | - | - | - |
| 4 | G | G | - | - | - |

| | |
|-----------------|--|
| Connector No. | F6 |
| Connector Name | IGNITION COIL NO. 2 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| | | | | | |
|--------------|---|---------------|---|-------------|---|
| Terminal No. | 1 | Color of Wire | G | Signal Name | - |
| 2 | B | B | - | - | - |
| 3 | O | O | - | - | - |

| | |
|-----------------|--|
| Connector No. | F7 |
| Connector Name | IGNITION COIL NO. 4 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| | | | | | |
|--------------|---|---------------|---|-------------|---|
| Terminal No. | 1 | Color of Wire | W | Signal Name | - |
| 2 | B | B | - | - | - |
| 3 | O | O | - | - | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

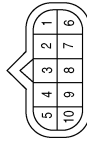
[VQ40DE]

| | |
|-----------------|---|
| Connector No. | F12 |
| Connector Name | HEATED OXYGEN SENSOR 2 (BANK 2) (WITH VQ40DE) |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 2 | LG | - |
| 3 | V | - |
| 4 | B | - |

| | |
|-----------------|--------------|
| Connector No. | F9 |
| Connector Name | A/T ASSEMBLY |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | L | - |
| 8 | P | - |
| 9 | BR | - |

| | |
|-----------------|---|
| Connector No. | F8 |
| Connector Name | IGNITION COIL NO. 6 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



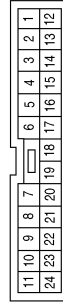
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|---|
| Connector No. | F15 |
| Connector Name | EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|----------------|
| 1 | SB | -(WITH VQ40DE) |
| 2 | BR | -(WITH VQ40DE) |

| | |
|-----------------|--------------|
| Connector No. | F14 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 2 | B | - |
| 3 | W | - |
| 4 | O | - |
| 5 | L | - |
| 9 | BR | - |
| 10 | B | - |
| 11 | O | - |
| 13 | B | - |
| 15 | P | - |
| 19 | GR | - |
| 24 | GR | - |

| | |
|-----------------|---|
| Connector No. | F13 |
| Connector Name | HEATED OXYGEN SENSOR 2 (BANK 1) (WITH VQ40DE) |
| Connector Color | BLUE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 2 | GR | - |
| 3 | V | - |
| 4 | B | - |

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ENGINE CONTROL SYSTEM

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[VQ40DE]

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| Connector No. | F20 |
| Connector Name | FUEL INJECTOR NO. 4 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | P | - |

| | |
|-----------------|---------------------|
| Connector No. | F18 |
| Connector Name | FUEL INJECTOR NO. 2 |
| Connector Color | GRAY |



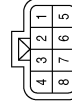
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | L | - |

| | |
|-----------------|--|
| Connector No. | F17 |
| Connector Name | CRANKSHAFT POSITION SENSOR (POS) (WITH VQ40DE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | BR | - |
| 2 | O | - |
| 3 | B | - |

| | |
|-----------------|--------------|
| Connector No. | F26 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | L | - |
| 3 | V | - |
| 4 | B | - |
| 5 | O | - |
| 6 | O | - |
| 7 | LG | - |
| 8 | O | - |

| | |
|-----------------|---------------------|
| Connector No. | F22 |
| Connector Name | FUEL INJECTOR NO. 6 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | Y | - |

| | |
|-----------------|-------------|
| Connector No. | F21 |
| Connector Name | CONDENSER-1 |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | B | - |

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ENGINE CONTROL SYSTEM

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[VQ40DE]

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|-----------------|--------------|
| Connector No. | F37 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GREEN |



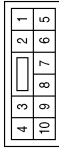
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | G | - |
| 3 | W | - |
| 4 | L | - |

| | |
|-----------------|--------------|
| Connector No. | F35 |
| Connector Name | WIRE TO WIRE |
| Connector Color | BLUE |



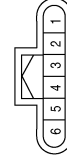
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |
| 3 | W | - |
| 4 | B | - |

| | |
|-----------------|--------------|
| Connector No. | F32 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



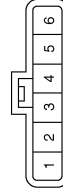
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | W | - |
| 4 | V | - |
| 5 | BR | - |
| 6 | B | - |
| 7 | O | - |
| 8 | R | - |
| 9 | BR | - |

| | |
|-----------------|----------------------|
| Connector No. | F53 |
| Connector Name | MASS AIR FLOW SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 2 | BR | - |
| 3 | B | - |
| 4 | W | - |
| 5 | V | - |
| 6 | B | - |

| | |
|-----------------|------------------------------------|
| Connector No. | F50 |
| Connector Name | ELECTRIC THROTTLE CONTROL ACTUATOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | W | - |
| 3 | W | - |
| 4 | R | - |
| 5 | L/W | - |
| 6 | L/B | - |

| | |
|-----------------|--------------------------------|
| Connector No. | F46 |
| Connector Name | POWER STEERING PRESSURE SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | SB | - |
| 2 | R | - |
| 3 | B | - |

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ENGINE CONTROL SYSTEM

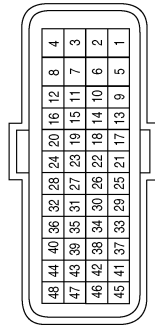
< WIRING DIAGRAM >

[VQ40DE]

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30 | - | - |
| 31 | W | SSOFF |
| 32 | - | - |
| 33 | G | INJ#1 |
| 34 | O | MOT RLY |
| 35 | - | - |
| 36 | - | - |
| 37 | GR | O2 HRR |
| 38 | - | - |
| 39 | SB | VIAS |
| 40 | - | - |
| 41 | LG | O2 HRL |
| 42 | SB | EVAP |
| 43 | GR | FPR |
| 44 | L | INJ#2 |
| 45 | Y | INJ#6 |
| 46 | L | INJ#5 |
| 47 | P | INJ#4 |
| 48 | V | INJ#3 |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 10 | G | IGN#2 |
| 11 | Y | IGN#1 |
| 12 | B | GND |
| 13 | V | IGN#6 |
| 14 | V | IGN#5 |
| 15 | W | IGN#4 |
| 16 | B | GND |
| 17 | - | - |
| 18 | - | - |
| 19 | R | GND-A TPS |
| 20 | - | - |
| 22 | B | TPS1 |
| 23 | W | TPS2 |
| 24 | W | AVCC1-TPS |
| 25 | - | - |
| 26 | R | BATT |
| 27 | - | - |
| 28 | - | - |
| 29 | - | - |

| | |
|-----------------|-------------------|
| Connector No. | F54 |
| Connector Name | ECM (WITH VQ40DE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | VMOT |
| 2 | L/W | MOTOR 2 |
| 3 | BR | AF-H2 |
| 4 | - | - |
| 5 | L/B | MOTOR 1 |
| 6 | B | AF-H1 |
| 7 | - | - |
| 8 | - | - |
| 9 | L | IGN#3 |

| | |
|-----------------|---|
| Connector No. | F67 |
| Connector Name | INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1) (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | O | - |

| | |
|-----------------|---|
| Connector No. | F66 |
| Connector Name | CAMSHAFT POSITION SENSOR (PHASE) (BANK 1) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | BR | - |

| | |
|-----------------|---------------------------------------|
| Connector No. | F65 |
| Connector Name | AIR FUEL RATIO (AF) SENSOR 1 (BANK 1) |
| Connector Color | BROWN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | B | - |
| 3 | W | - |
| 4 | O | - |

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ENGINE CONTROL SYSTEM

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[VQ40DE]

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|-----------------|---|
| Connector No. | F76 |
| Connector Name | CAMSHAFT POSITION SENSOR (PHASE) (BANK 2) |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | Y | - |
| 3 | BR | - |

| | |
|-----------------|-----------------------------|
| Connector No. | F75 |
| Connector Name | VIAS CONTROL SOLENOID VALVE |
| Connector Color | BLACK |



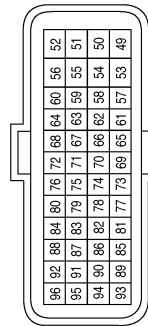
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | SB | - |

| | |
|-----------------|---|
| Connector No. | F70 |
| Connector Name | ENGINE COOLANT TEMPERATURE SENSOR (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | B | - |

| | |
|-----------------|-------------------|
| Connector No. | F77 |
| Connector Name | ECM (WITH VQ40DE) |
| Connector Color | BROWN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 49 | - | - |
| 50 | - | - |
| 51 | - | - |
| 52 | - | - |
| 53 | - | - |
| 54 | - | - |
| 55 | LG | C-VTC (R) |
| 56 | W | C-VTC (L) |
| 57 | R | O2 SRR |
| 58 | R | O2 SRL |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|----------------|
| 79 | SB | AVCC (PSPRES) |
| 80 | B | QA GNDA TA1 |
| 81 | L | A/F-2 |
| 82 | W | QA+ |
| 83 | - | - |
| 84 | - | - |
| 85 | W | KNK 1 |
| 86 | W | KNK 2 |
| 87 | - | - |
| 88 | - | - |
| 89 | O | POS |
| 90 | - | - |
| 91 | B | GNDA-KNK1 KNK2 |
| 92 | - | - |
| 93 | Y | PHASE (LH) |
| 94 | L | PHASE (RH) |
| 95 | - | - |
| 96 | O | AVCC (PDPRES) |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 59 | B | GND A |
| 60 | - | - |
| 61 | - | - |
| 62 | - | - |
| 63 | GR | PDPRES |
| 64 | B | GNDA-PDPRES |
| 65 | R | PS PRESS |
| 66 | - | - |
| 67 | - | - |
| 68 | - | - |
| 69 | O | A/F+1 |
| 70 | Y | TW |
| 71 | - | - |
| 72 | B | GNDA-PSPRES |
| 73 | W | A/F-1 |
| 74 | V | TA1 |
| 75 | - | - |
| 76 | B | GND-A |
| 77 | G | A/F+2 |
| 78 | - | - |

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ENGINE CONTROL SYSTEM

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[VQ40DE]

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|-----------------|--------------|
| Connector No. | F204 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GREEN |



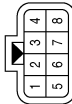
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | G | - |
| 3 | W/G | - |
| 4 | L | - |

| | |
|-----------------|--------------|
| Connector No. | F202 |
| Connector Name | WIRE TO WIRE |
| Connector Color | BLUE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |
| 3 | W | - |
| 4 | B | - |

| | |
|-----------------|--------------|
| Connector No. | F201 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | L | - |
| 3 | V | - |
| 4 | B | - |
| 5 | O | - |
| 6 | W | - |
| 7 | LG | - |
| 8 | R | - |

| | |
|-----------------|---|
| Connector No. | F208 |
| Connector Name | IGNITION COIL NO. 3 (WITH POWER TRANSISTOR) (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | - |
| 2 | B | - |
| 3 | W | - |

| | |
|-----------------|---|
| Connector No. | F207 |
| Connector Name | IGNITION COIL NO. 1 (WITH POWER TRANSISTOR) (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|---|
| Connector No. | F206 |
| Connector Name | INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) (WITH VQ40DE) |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | LG | - |
| 2 | R | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VQ40DE]

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|-----------------|--------------------------------------|
| Connector No. | F211 |
| Connector Name | FUEL INJECTOR NO. 3 (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W/G | - |
| 2 | V | - |

| | |
|-----------------|--------------------------------------|
| Connector No. | F210 |
| Connector Name | FUEL INJECTOR NO. 5 (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W/G | - |
| 2 | L | - |

| | |
|-----------------|--|
| Connector No. | F209 |
| Connector Name | IGNITION COIL NO. 5 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | B | - |
| 3 | W | - |

| | |
|-----------------|-----------------------|
| Connector No. | F214 |
| Connector Name | KNOCK SENSOR (BANK 2) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |

| | |
|-----------------|-----------------------|
| Connector No. | F213 |
| Connector Name | KNOCK SENSOR (BANK 1) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |

| | |
|-----------------|--------------------------------------|
| Connector No. | F212 |
| Connector Name | FUEL INJECTOR NO. 1 (WITH VQ40DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W/G | - |
| 2 | G | - |

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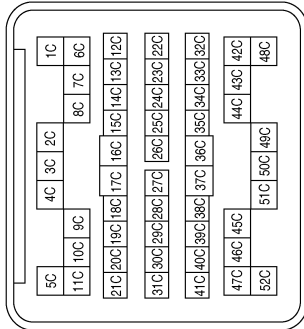
ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

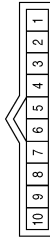
[VQ40DE]

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30C | Y | - |
| 31C | LG | - |
| 42C | G | - |
| 44C | O | - |
| 45C | L | - |
| 46C | B | - |
| 47C | SB | - |
| 48C | B | - |
| 52C | R | - |

| Connector No. | C1 |
|-----------------|--------------|
| Connector Name | WIRE TO WIRE |
| Connector Color | GRAY |



| Connector No. | F502 |
|-----------------|-----------------------------------|
| Connector Name | TCM (TRANSMISSION CONTROL MODULE) |
| Connector Color | GRAY |



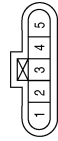
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | BR | CAN-H |
| 2 | L/Y | CAN-L |
| 8 | G | START-RLY |

| Connector No. | C6 |
|-----------------|----------------------------------|
| Connector Name | EVAP CANISTER VENT CONTROL VALVE |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | G | - |

| Connector No. | C5 |
|-----------------|--------------------------------------|
| Connector Name | FUEL LEVEL SENSOR UNIT AND FUEL PUMP |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 3 | B | - |
| 4 | Y | - |
| 5 | LG | - |

| Connector No. | C4 |
|-----------------|-------------------------------------|
| Connector Name | EVAP CONTROL SYSTEM PRESSURE SENSOR |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | SB | - |

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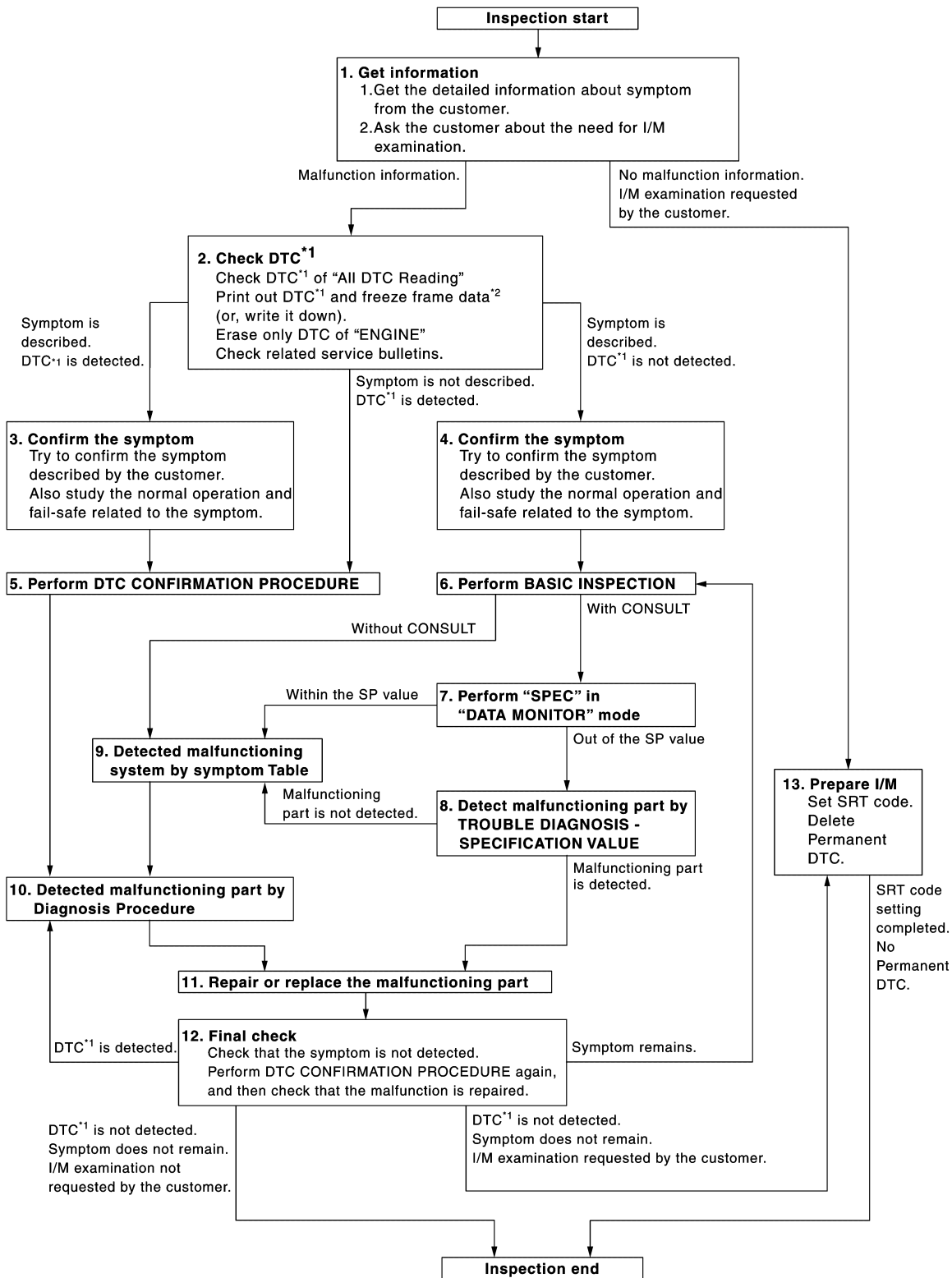
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000012524275

OVERALL SEQUENCE



JSBIA0123GB

*1: Include 1st trip DTC.

*2: Include 1st trip freeze frame data.

DETAILED FLOW

1. GET INFORMATION FOR SYMPTOM

1. Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "Diagnostic Work Sheet". (Refer to [EC-132. "Diagnostic Work Sheet"](#).)
2. Ask if the customer requests I/M examination.

Malfunction information, obtained>>GO TO 2.

No Malfunction information, but a request for I/M examination>>GO TO 13.

2. CHECK DTC

1. Check DTC.
 2. Perform the following procedure if DTC is displayed.
 - Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
 - Erase DTC.
- With CONSULT: Refer to [EC-68. "CONSULT Function"](#).
- Without CONSULT: Refer to [EC-65. "On Board Diagnosis Function"](#).
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to [EC-452. "Symptom Table"](#).)
3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

Symptom is described, DTC is detected>>GO TO 3.

Symptom is described, DTC is not detected>>GO TO 4.

Symptom is not described, DTC is detected>>GO TO 5.

3. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).

Also study the normal operation and fail-safe related to the symptom. Refer to [EC-456. "Description"](#) and [EC-92. "Fail safe"](#).

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Also study the normal operation and fail-safe related to the symptom. Refer to [EC-456. "Description"](#) and [EC-92. "Fail safe"](#).

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5. PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.

If two or more DTCs are detected, refer to [EC-93. "DTC Inspection Priority Chart"](#) and determine trouble diagnosis order.

NOTE:

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.

DIAGNOSIS AND REPAIR WORKFLOW

[VQ40DE]

< BASIC INSPECTION >

If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

YES >> GO TO 10.

NO >> Check according to [GI-43, "Intermittent Incident"](#).

6. PERFORM BASIC INSPECTION

Perform [EC-142, "Work Procedure"](#).

Do you have CONSULT?

YES >> GO TO 7.

NO >> GO TO 9.

7. PERFORM SPEC IN DATA MONITOR MODE

 With CONSULT

Make sure that "MAS A/F SE-B1", "B/FUEL SCHDL", "A/F ALPHA-B1" and "A/F ALPHA-B2" are within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode. Refer to [EC-160, "Component Function Check"](#).

Is the measurement value within the SP value?

YES >> GO TO 9.

NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to [EC-161, "Diagnosis Procedure"](#).

Is a malfunctioning part detected?

YES >> GO TO 11.

NO >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to [EC-452, "Symptom Table"](#) based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptoms.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.

NOTE:

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to [GI-45, "Circuit Inspection"](#).

Is a malfunctioning part detected?


YES >> GO TO 11.

NO >> Monitor input data from related sensors or check voltage of related ECM terminals using CONSULT. Refer to [EC-78, "Reference Value"](#).

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it.

 With CONSULT: Refer to [EC-68, "CONSULT Function"](#).

 Without CONSULT: Refer to [EC-65, "On Board Diagnosis Function"](#).

>> GO TO 12.

12. FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been completely repaired.

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DIAGNOSIS AND REPAIR WORKFLOW

[VQ40DE]

< BASIC INSPECTION >

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.

YES-2 >> Symptom remains: GO TO 6.

NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). Refer to [EC-65, "On Board Diagnosis Function"](#) (Without CONSULT) or [EC-68, "CONSULT Function"](#) (With CONSULT).

NO-2 >> I/M examination, requested from the customer: GO TO 13.

13. PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to [EC-148, "Description"](#).
2. Erase permanent DTCs. Refer to [EC-154, "Description"](#).

>> INSPECTION END.

Diagnostic Work Sheet

INFOID:0000000012524276

DESCRIPTION

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about an incident. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the WORKSHEET SAMPLE below in order to organize all the information for troubleshooting.

Some conditions may cause the MIL to illuminate steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT Vehicle & engine model
WHEN Date, Frequencies
WHERE..... Road conditions
HOW Operating conditions,
Weather conditions,
Symptoms

SEF907L

ADDITIONAL SERVICE WHEN REPLACING ECM

Description

INFOID:0000000012524277

When replacing ECM, the following procedure must be performed. (For details, refer to [EC-134, "Work Procedure."](#))

PROGRAMMING OPERATION

NOTE:

After replacing with a blank ECM, programming is required to write ECM information. Be sure to follow the procedure to perform the programming.

Work Procedure

INFOID:0000000012524278

1. SAVE ECM DATA

Ⓟ With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Select "SAVING DATA FOR REPLC CPU" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.
5. Follow the instruction of CONSULT display.

NOTE:

- Necessary data in ECM is copied and saved to CONSULT.
- Go to Step 2 regardless of with or without success in saving data.

>> GO TO 2.

2. CHECK ECM PART NUMBER

Check ECM part number to see whether it is blank ECM or not.

NOTE:

- Part number of blank ECM is 23703 - xxxxxx.
- Check part number when ordering ECM or the one included in the label on the container box.

Is the ECM a blank ECM?

- YES >> GO TO 3.
 NO >> GO TO 5.

3. SAVE ECM PART NUMBER

Read out the part number from the old ECM and save the number, following the programming instructions. Refer to CONSULT Operation Manual.

NOTE:

- The ECM part number is saved in CONSULT.
- Even when ECM part number is not saved in CONSULT, go to 4.

>> GO TO 4.

4. PERFORM ECM PROGRAMMING

After replacing ECM, perform the ECM programming. Refer to CONSULT Operation Manual.

NOTE:

- Refer to [EC-462, "Removal and Installation"](#) for replacement of ECM.
- During programming, maintain the following conditions:
 - Ignition switch: ON
 - Electric load: OFF
 - Brake pedal: Not depressed
 - Battery voltage: 12 – 13.5 V (Be sure to check the value of battery voltage by selecting "BATTERY VOLT" in "Data monitor" of CONSULT.)

>> GO TO 6.

5. REPLACE ECM

ADDITIONAL SERVICE WHEN REPLACING ECM

[VQ40DE]

< BASIC INSPECTION >

Replace ECM. Refer to [EC-462. "Removal and Installation"](#).

>> GO TO 6.

6.PERFORM INITIALIZATION OF IVIS (NATS) SYSTEM AND REGISTRATION OF ALL IVIS (NATS) IGNITION KEY IDS

Refer to [SEC-40. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#).

>> GO TO 7.

7.CHECK ECM DATA STATUS

Check if the data is successfully copied from the ECM at Step 1 (before replacement) and saved in CONSULT.
Is the data saved successfully?

YES >> GO TO 8.

NO >> GO TO 9.

8.WRITE ECM DATA

ⓂWith CONSULT

1. Select "WRITING DATA FOR REPLC CPU" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.

2. Follow the instruction of CONSULT display.

NOTE:

The data saved by "SAVING DATA FOR REPLC CPU" is written to ECM.

>> GO TO 10.

9.PERFORM VIN REGISTRATION

Refer to [EC-136. "Description"](#).

>> GO TO 10.

10.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to [EC-137. "Description"](#).

>> GO TO 11.

11.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to [EC-138. "Description"](#).

>> GO TO 12.

12.PERFORM IDLE AIR VOLUME LEARNING

Refer to [EC-139. "Description"](#).

>> END

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VIN REGISTRATION

Description

INFOID:0000000012524279

VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced. (For details, refer to [EC-136, "Work Procedure"](#).)

NOTE:

Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

Work Procedure

INFOID:0000000012524280

1. CHECK VIN

Check the VIN of the vehicle and note it. Refer to [GI-24, "Identification Number"](#).

>> GO TO 2.

2. PERFORM VIN REGISTRATION

 With CONSULT

1. Turn ignition switch ON and engine stopped.
2. Select "VIN REGISTRATION" in "WORK SUPPORT" mode of "ENGINE".
3. Follow the instruction of CONSULT display.

>> END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

< BASIC INSPECTION >

[VQ40DE]

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description

INFOID:000000012524281

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected. (For details, refer to [EC-137, "Work Procedure"](#).)

Work Procedure

INFOID:000000012524282

1. START

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.

>> END

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THROTTLE VALVE CLOSED POSITION LEARNING

< BASIC INSPECTION >

[VQ40DE]

THROTTLE VALVE CLOSED POSITION LEARNING

Description

INFOID:000000012524283

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected or electric throttle control actuator is cleaned. (For details, refer to [EC-138, "Work Procedure"](#).)

Work Procedure

INFOID:000000012524284

1. START

Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Select "CLSD THL POS LEAR" in "WORK SUPPORT" mode of "ENGINE".
3. Follow the instruction on the CONSULT display.
4. Turn ignition switch OFF and wait at least 10 seconds.
Check that throttle valve moves during above 10 seconds by confirming the operating sound.

ⓧ Without CONSULT

1. Check that accelerator pedal is fully released.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
Check that throttle valve moves during above 10 seconds by confirming the operating sound.

>> END

IDLE AIR VOLUME LEARNING

Description

INFOID:000000012524285

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within the specific range. It must be performed under the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Each time VVEL actuator sub assembly or VVEL control module is replaced.
- Idle speed or ignition timing is out of specification.

(For details, refer to [EC-139, "Work Procedure"](#).)

Work Procedure

INFOID:000000012524286

1. PRECONDITIONING

Make sure that all of the following conditions are satisfied.

Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 105°C (158 - 221°F)
- Selector lever: P or N
- Electric load switch: OFF
(Air conditioner, headlamp, rear window defogger)

On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not be illuminated.

- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
- Without CONSULT: Drive vehicle for 10 minutes.

Do you have CONSULT?

- YES >> GO TO 2.
- NO >> GO TO 3.

2. PERFORM IDLE AIR VOLUME LEARNING

With CONSULT

1. Perform Accelerator Pedal Released Position Learning. Refer to [EC-137, "Description"](#).
2. Perform Throttle Valve Closed Position Learning. [EC-138, "Description"](#).
3. Start engine and warm it up to normal operating temperature.
4. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode of "ENGINE".
5. Touch "START" and wait 20 seconds.

Is "CMPLT" displayed on CONSULT screen?

- YES >> GO TO 4.
- NO >> GO TO 5.

3. PERFORM IDLE AIR VOLUME LEARNING

Without CONSULT

NOTE:

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

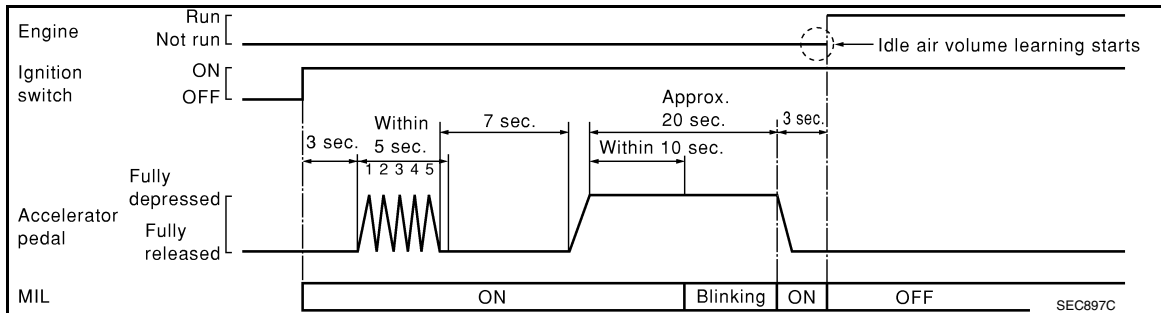
1. Perform Accelerator Pedal Released Position Learning. Refer to [EC-137, "Description"](#).
2. Perform Throttle Valve Closed Position Learning. [EC-138, "Description"](#).
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly five times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.

IDLE AIR VOLUME LEARNING

[VQ40DE]

< BASIC INSPECTION >

7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and illuminates.
8. Fully release the accelerator pedal within 3 seconds after the MIL illuminates.
9. Start engine and let it idle.
10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

1. Start engine and warm it up to normal operating temperature.
2. Let it idle for 20 seconds.
3. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications. Refer to [EC-463, "Idle Speed"](#) and [EC-463, "Ignition Timing"](#).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART-1

Check the following

- Check that throttle valve is fully closed.
- Check PCV valve operation.
- Check that downstream of throttle valve is free from air leakage.

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace malfunctioning part.

6. DETECT MALFUNCTIONING PART-2

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.

It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to [EC-160, "Description"](#).

If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:

- Engine stalls.
- Erroneous idle.

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

< BASIC INSPECTION >

[VQ40DE]

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description

INFOID:000000012524287

This describes how to erase the mixture ratio self-learning value. (For details, refer to [EC-141. "Work Procedure"](#).)

Work Procedure

INFOID:000000012524288

1. START

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.
3. Clear mixture ratio self-learning value by touching "CLEAR".

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Select Service \$03 with GST. Make sure DTC P0102 is detected.
7. Select Service \$04 with GST to erase the DTC P0102.

>> END

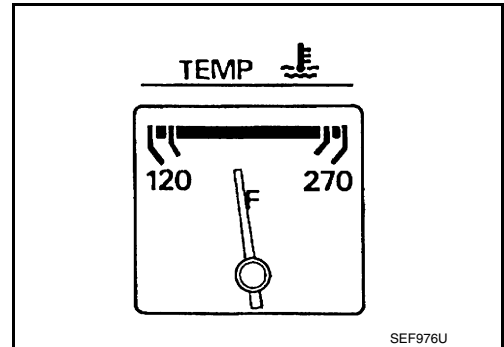
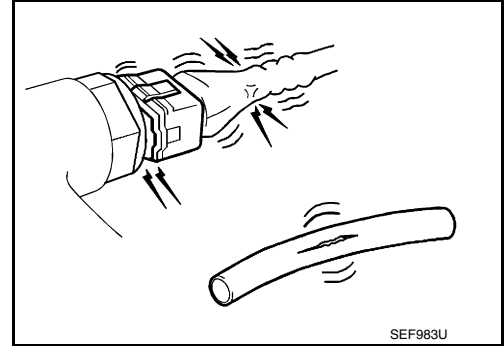
BASIC INSPECTION

Work Procedure

INFOID:000000012524289

1.INSPECTION START

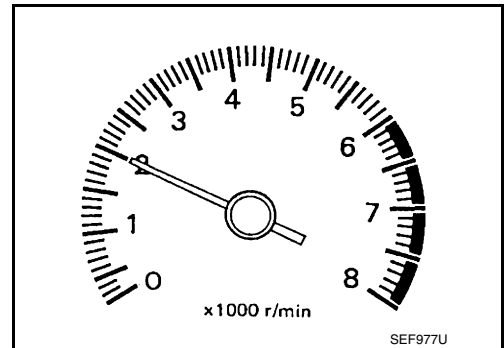
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
 - Harness connectors for improper connections
 - Wiring harness for improper connections, pinches and cut
 - Vacuum hoses for splits, kinks and improper connections
 - Hoses and ducts for leaks
 - Air cleaner clogging
 - Gasket
3. Confirm that electrical or mechanical loads are not applied.
 - Headlamp switch is OFF.
 - Air conditioner switch is OFF.
 - Rear window defogger switch is OFF.
 - Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge. Ensure engine stays below 1,000 rpm.



5. Run engine at about 2,000 rpm for about 2 minutes under no load.
6. Make sure that no DTC is displayed with CONSULT or GST.

Are any DTCs detected?

- YES >> GO TO 2.
- NO >> GO TO 3.



2.REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnosis Procedure.

>> GO TO 3

3.CHECK IDLE SPEED

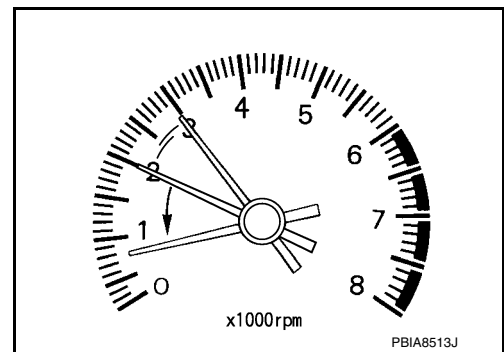
1. Run engine at about 2,000 rpm for about 2 minutes under no load.

BASIC INSPECTION

[VQ40DE]

< BASIC INSPECTION >

- Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
- Check idle speed.
For procedure, refer to [EC-457, "Inspection"](#).
For specification, refer to [EC-463, "Idle Speed"](#).



Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 4.

4.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform [EC-137, "Description"](#).

>> GO TO 5.

5.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-138, "Description"](#).

>> GO TO 6.

6.PERFORM IDLE AIR VOLUME LEARNING

Perform [EC-139, "Description"](#).

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 7.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

7.CHECK IDLE SPEED AGAIN

- Start engine and warm it up to normal operating temperature.
- Check idle speed.
For procedure, refer to [EC-457, "Inspection"](#).
For specification, refer to [EC-463, "Idle Speed"](#).

Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-285, "Component Inspection"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-282, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 9.
NO >> Repair or replace. Then GO TO 4.

9.CHECK ECM FUNCTION

- Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
- Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to [EC-134, "Description"](#).

>> GO TO 4.

10.CHECK IGNITION TIMING

- Run engine at idle.

BASIC INSPECTION

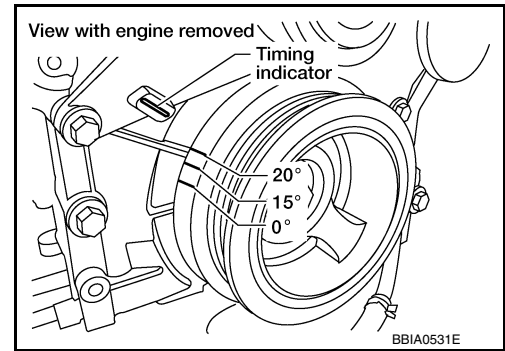
[VQ40DE]

< BASIC INSPECTION >

2. Check ignition timing with a timing light.
For procedure, refer to [EC-458, "Inspection"](#).
For specification, refer to [EC-463, "Ignition Timing"](#).

Is the inspection result normal?

- YES >> GO TO 19.
NO >> GO TO 11.



11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform [EC-137, "Description"](#).

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-138, "Description"](#).

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform [EC-139, "Description"](#).

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 14.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

14. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
For procedure, refer to [EC-457, "Inspection"](#).
For specification, refer to [EC-463, "Idle Speed"](#).

Is the inspection result normal?

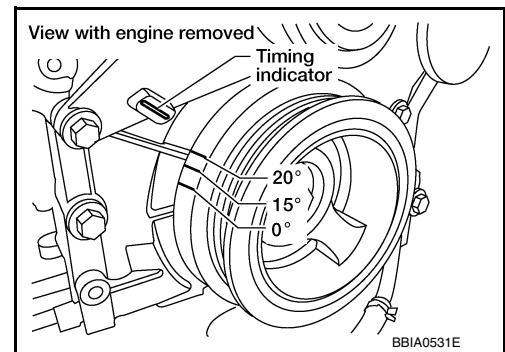
- YES >> GO TO 15.
NO >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
For procedure, refer to [EC-458, "Inspection"](#).
For specification, refer to [EC-463, "Ignition Timing"](#).

Is the inspection result normal?

- YES >> GO TO 19.
NO >> GO TO 16.



16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to [EM-61, "Removal and Installation"](#).

Is the inspection result normal?

- YES >> GO TO 17.
NO >> Repair the timing chain installation. Then GO TO 4.

BASIC INSPECTION

< BASIC INSPECTION >

[VQ40DE]

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-285, "Component Inspection"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-282, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 18.

NO >> Repair or replace. Then GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to [EC-134, "Description"](#).

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to [EC-134, "Description"](#).

>> INSPECTION END

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FUEL PRESSURE CHECK

[VQ40DE]

< BASIC INSPECTION >

FUEL PRESSURE CHECK

Work Procedure

INFOID:000000012524290

FUEL PRESSURE RELEASE

1. FUEL PRESSURE RELEASE

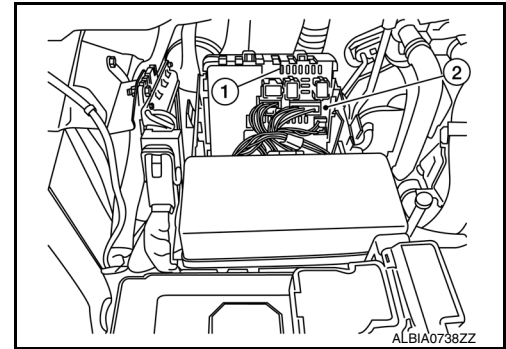
Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Select ENGINE using CONSULT.
3. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode of "ENGINE".
4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
6. Turn ignition switch OFF.

ⓧ Without CONSULT

1. Remove fuel pump fuse (# 48) located in IPDM E/R.
 1. Fuel pump fuse
 2. IPDM E/R
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.

>> END



FUEL PRESSURE CHECK

1. FUEL PRESSURE CHECK

CAUTION:

Be careful not to scratch or get the fuel hose connection area dirty when servicing, so that the quick connector o-ring maintains sealability.

NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because this models do not have fuel return system.
- Use Fuel Pressure Gauge Kit [— (J-44321)] and Fuel Pressure Adapter [— (J-44321-6)] to check fuel pressure.

1. Release fuel pressure to zero.
2. Remove fuel hose using Quick Connector Release [— (J-45488)]. Refer to [EM-45, "Removal and Installation"](#).

CAUTION:

- Do not twist or kink fuel hose because it is plastic hose.
- Do not remove fuel hose from quick connector.
- Keep fuel hose connections clean.

3. Install Fuel Pressure Adapter [— (J-44321-6)] and Fuel Pressure Gauge {from kit [— (J-44321)]} as shown in figure.

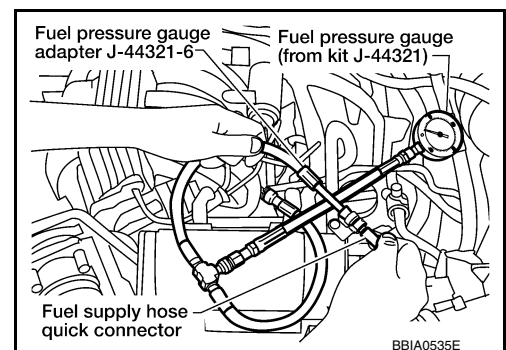
CAUTION:

- Do not distort or bend fuel rail tube when installing fuel pressure gauge adapter.
- When reconnecting fuel hose, check the original fuel hose for damage and abnormality.

4. Turn ignition switch ON (reactivate fuel pump), and check for fuel leakage.
5. Start engine and check for fuel leakage.
6. Read the indication of fuel pressure gauge.

CAUTION:

During fuel pressure check, check for fuel leakage from fuel connection every 3 minutes.



FUEL PRESSURE CHECK

< BASIC INSPECTION >

[VQ40DE]

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

A

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

EC

2.CHECK FUEL HOSE AND FUEL TUBE

If result is unsatisfactory, check fuel hoses and fuel tubes for clogging.

C

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to [FL-11, "Removal and Installation"](#).

NO >> Repair or replace error-detected parts.

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HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ40DE]

HOW TO SET SRT CODE

Description

INFOID:000000012524291

OUTLINE

In order to set all SRTs, the self-diagnoses as in the “SRT ITEM” table must have been performed at least once. Each diagnosis may require actual driving for a long period of time under various conditions.

SRT ITEM

The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

| SRT item*1 (CONSULT indication) | Performance Priority*2 | Required self-diagnostic items to set the SRT to “CMPLT” | Corresponding DTC No. |
|------------------------------------|---------------------------|--|--|
| CATALYST | 1 | Three way catalyst function | P0420, P0430 |
| EVAP SYSTEM | 1 | EVAP control system purge flow monitoring | P0441 |
| | 1 | EVAP control system | P0456 |
| HO2S | 2 | Air fuel ratio (A/F) sensor 1 | P014C, P014D, P014E, P014F P015A, P015B, P015C, P015D |
| | | Heated oxygen sensor 2 | P0137, P0157 |
| | | Heated oxygen sensor 2 | P0138, P0158 |
| | | Heated oxygen sensor 2 | P0139, P0159 |
| EGR/VVT SYSTEM | 2 | Intake valve timing control function | P0011, P0021 |

*1: Though displayed on the CONSULT screen, “HO2S HTR” is not SRT item.

*2: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT.

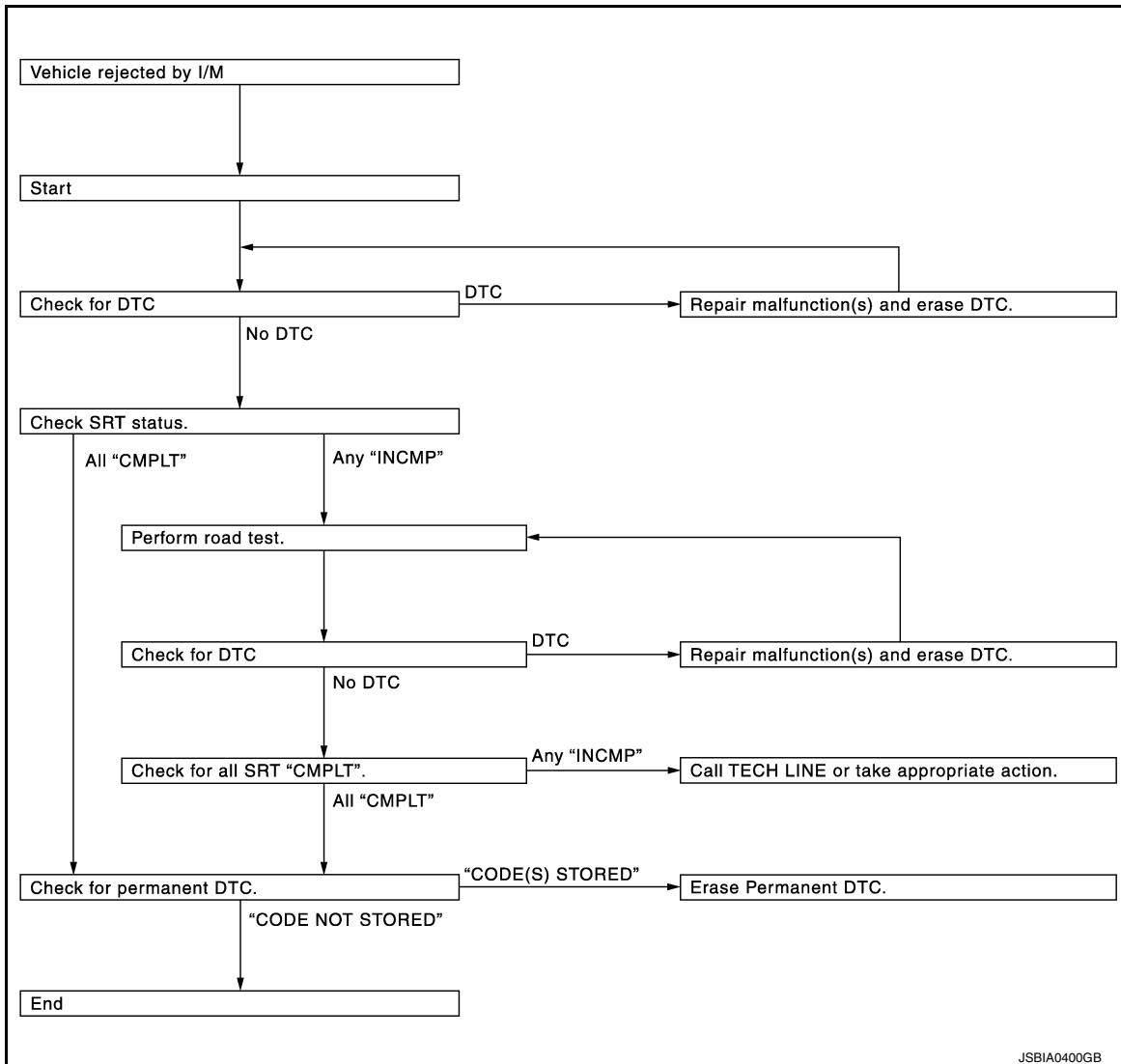
SRT SERVICE PROCEDURE

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating “INCMP”, review the flowchart diagnostic sequence, referring to the following flowchart.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ40DE]



SRT Set Driving Pattern

INFOID:000000012524292

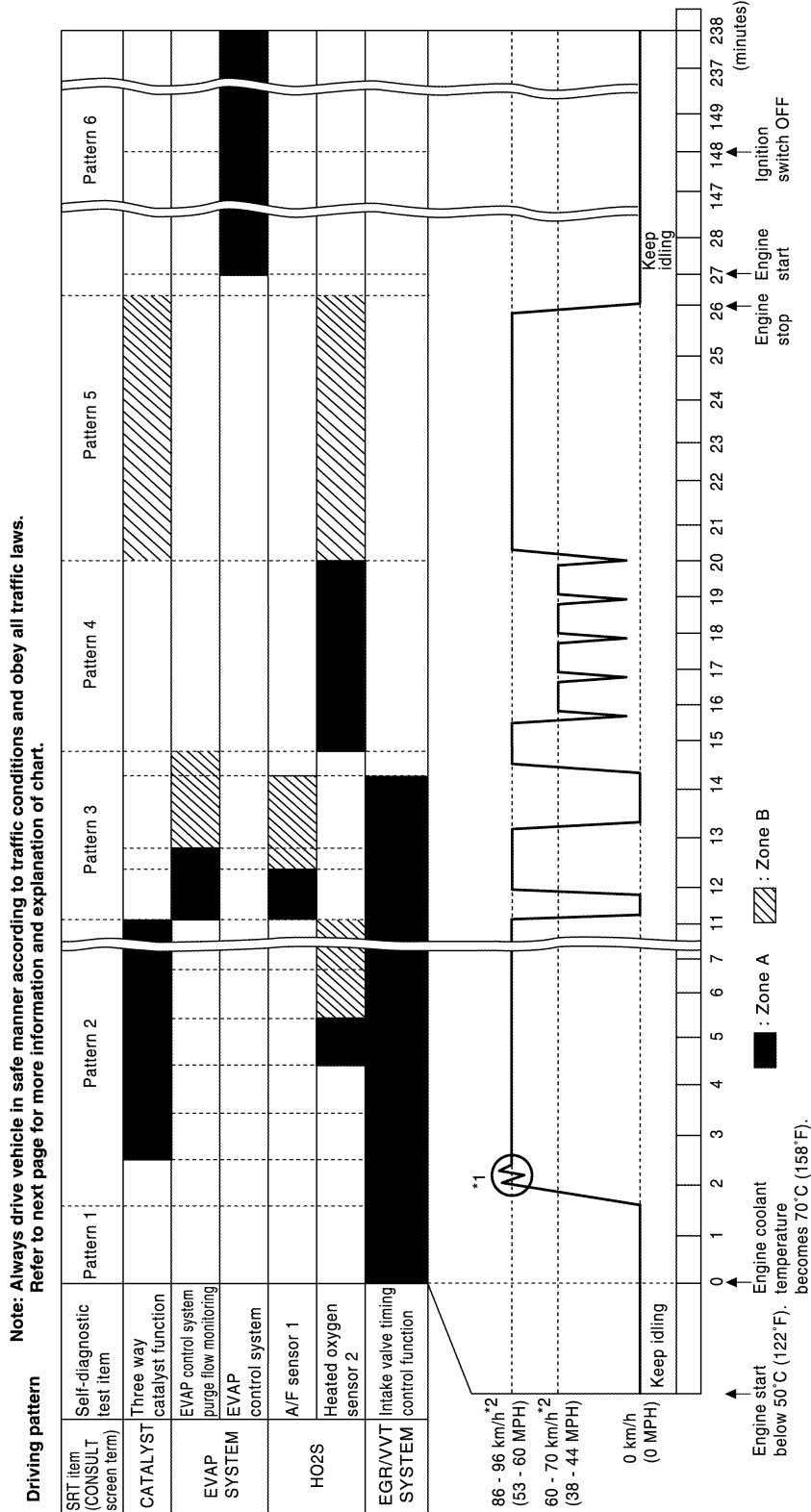
CAUTION:

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VQ40DE]

Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.



JPBIA5320GB

HOW TO SET SRT CODE

[VQ40DE]

< BASIC INSPECTION >

*: Normal conditions

- Sea level
- Flat road
- Ambient air temperature: 20 – 30°C (68 – 86°F)

NOTE:

Diagnosis is performed as quickly as possible under normal conditions. However, under other conditions, diagnosis may also be performed. [For example: ambient air temperature other than 20 – 30°C (68 – 86°F)]

Work Procedure

INFOID:000000012524293

1.CHECK DTC

Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-94, "DTC Index"](#).
- NO >> GO TO 2.

2.CHECK SRT STATUS

With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode of "ENGINE" using CONSULT.

Without CONSULT

Perform "SRT status" mode with [EC-65, "On Board Diagnosis Function"](#).

With GST

Select Service \$01 with GST.

Is SRT code(s) set?

- YES >> GO TO 12.
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 4.

3.DTC CONFIRMATION PROCEDURE

1. Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode of "ENGINE" using CONSULT.
2. For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" according to the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-148, "Description"](#).
3. Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-94, "DTC Index"](#).
- NO >> GO TO 11.

4.PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-148, "Description"](#).
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to [EC-149, "SRT Set Driving Pattern"](#).

In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

1. Check the vehicle condition;
 - Engine coolant temperature is –10 to 35°C (14 to 95°F).
 - Fuel tank temperature is more than 0°C (32°F).
2. Start the engine.
3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:

ECM terminal voltage is follows;

- Engine coolant temperature
 - –10 to 35°C (14 to 95°F): 3.0 – 4.3 V
 - 70°(158°F): Less than 4.1 V
- Fuel tank temperature: Less than 1.4 V

Refer to [EC-78, "Reference Value"](#).

>> GO TO 6.

6.PATTERN 2

1. Drive the vehicle. And depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds.
2. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

NOTE:

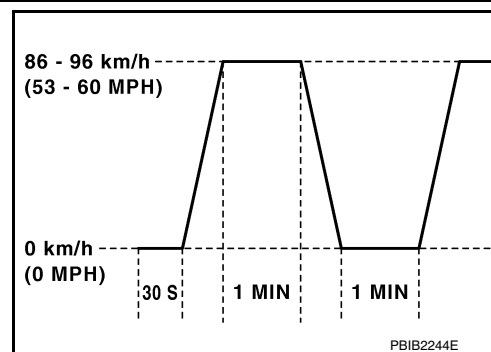
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

7.PATTERN 3

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).

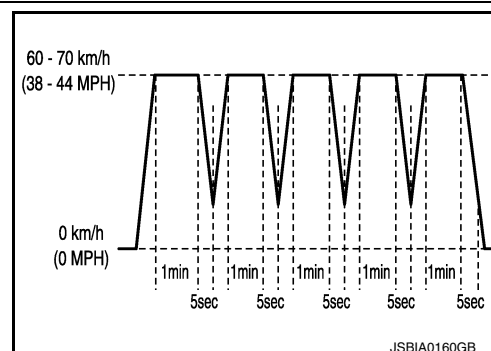
>> GO TO 8.



8.PATTERN 4

- Operate vehicle, following the driving pattern shown in the figure.
- Drive the vehicle in a proper gear at 60 km/h (38 MPH) and maintain the speed.
- Release the accelerator pedal fully at least 5 seconds.
- Repeat the above two steps at least 5 times.

>> GO TO 9.



9.PATTERN 5

- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted again.

>> GO TO 10.

10.PATTERN 6

Start engine and wait at least 2 hours. Then turn ignition switch OFF and wait at least 90 minutes.

>> GO TO 11.

11.CHECK SRT STATUS

With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode of "ENGINE" using CONSULT.

Without CONSULT

Perform "SRT status" mode with [EC-65, "On Board Diagnosis Function"](#).

With GST

Select Service \$01 with GST.

HOW TO SET SRT CODE

[VQ40DE]

< BASIC INSPECTION >

Is SRT(s) set?

YES >> GO TO 12.

NO >> Call TECH LINE or take appropriate action.

12.CHECK PERMANENT DTC

NOTE:

Permanent DTC cannot be checked with a tool other than CONSULT or GST.

Ⓜ With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode of "ENGINE" using CONSULT.

Ⓜ With GST

Select Service \$0A with GST.

Is permanent DTC(s) detected?

YES >> Proceed to [EC-148, "Description"](#).

NO >> END

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HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

HOW TO ERASE PERMANENT DTC

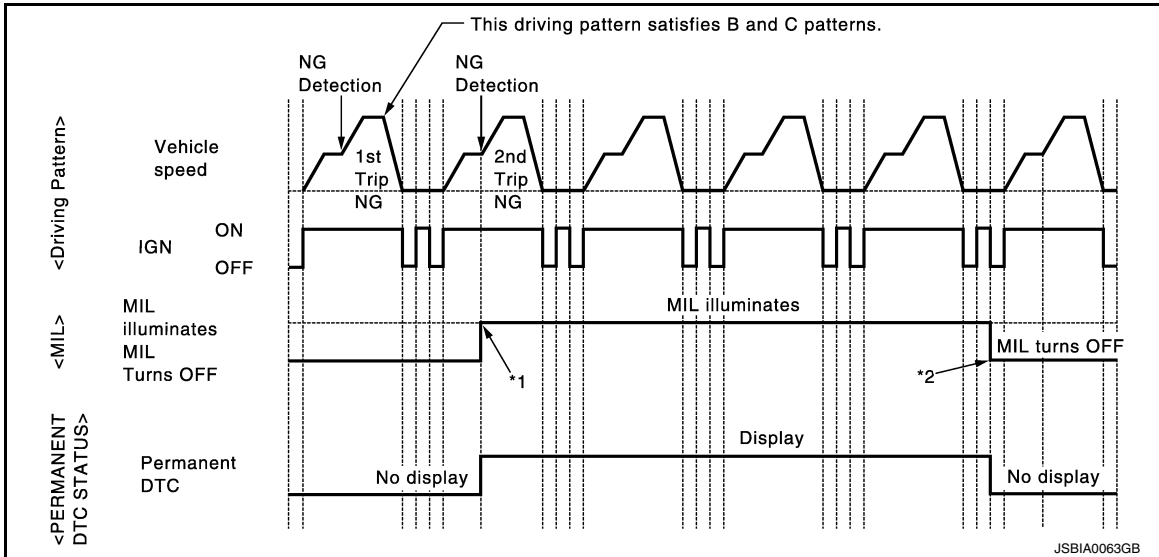
Description

INFOID:000000012524294

OUTLINE

When a DTC is stored in ECM

When a DTC is stored in ECM and MIL is ON, a permanent DTC is erased with MIL shutoff if the same malfunction is not detected after performing the driving pattern for MIL shutoff three times in a row.



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: MIL will turn off after vehicle is driven 3 times (driving pattern B) without any malfunctions.

When a DTC is not stored in ECM

The erasing method depends on a permanent DTC stored in ECM. Refer to the following table.

NOTE:

If the applicable permanent DTC includes multiple groups, perform the procedure of Group B first. If the permanent DTC is not erased, perform the procedure of Group A.

×: Applicable —: Not applicable

| Group * | Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs. | Driving pattern | |
|---------|---|-----------------|---|
| | | B | D |
| A | × | — | — |
| B | — | × | × |

*: For group, refer to [EC-94, "DTC Index"](#).

PERMANENT DTC ITEM

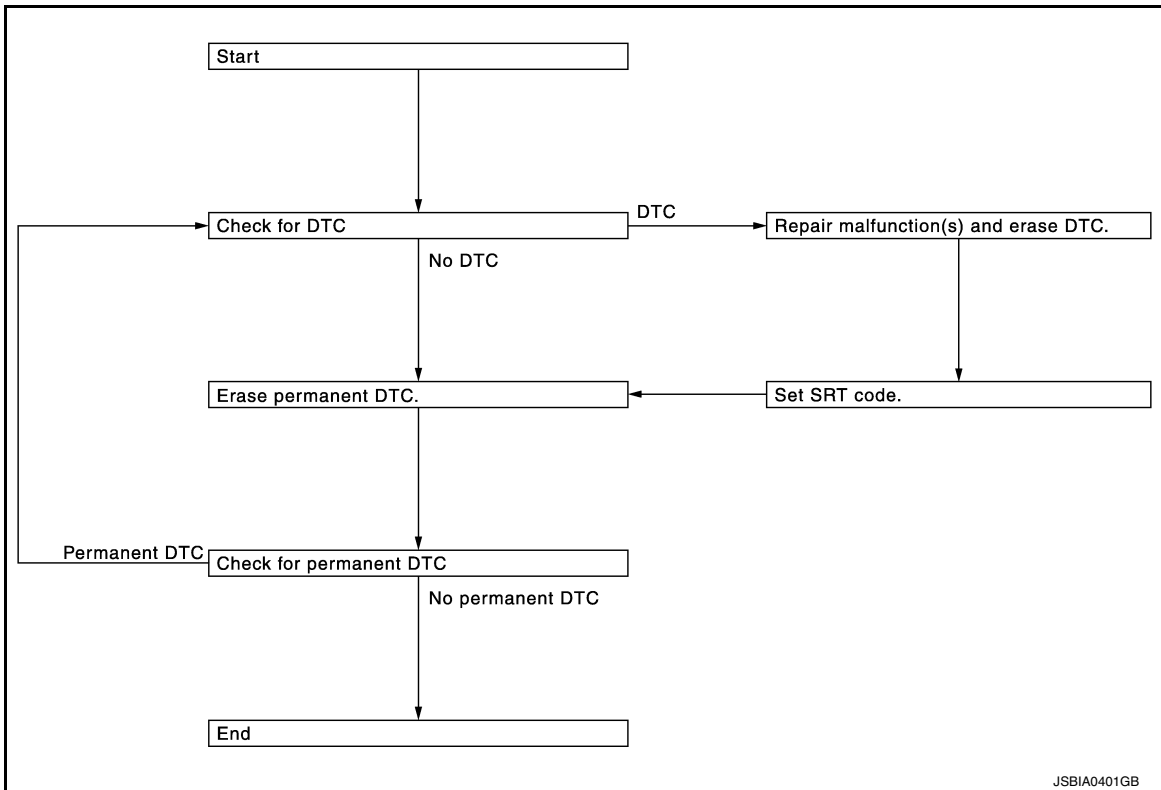
For permanent DTC items, MIL turns ON. Refer to [EC-94, "DTC Index"](#).

HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

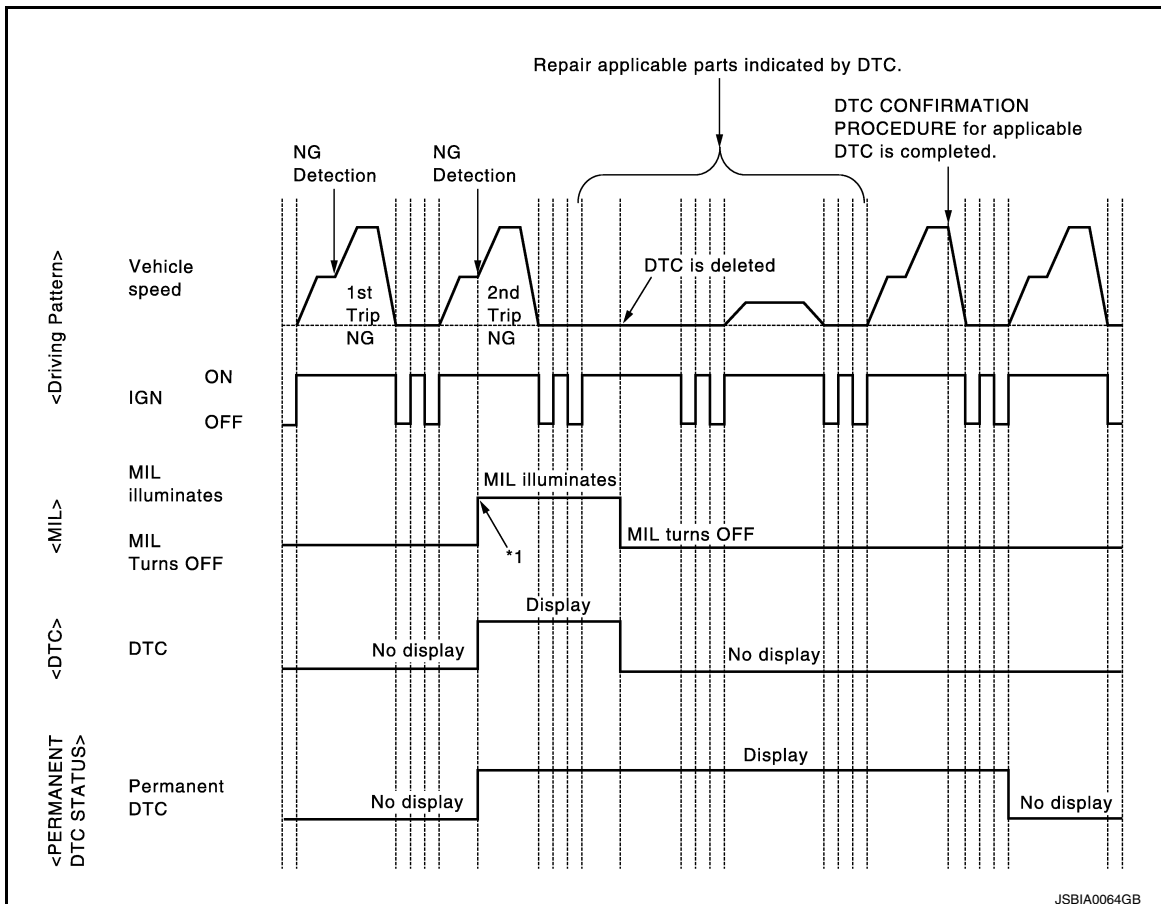
[VQ40DE]

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:000000012524295



HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-65, "On Board Diagnosis Function"](#), [EC-68, "CONSULT Function"](#).

NO >> GO TO 2.

2. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode of "ENGINE" using CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

3. PERFORM DTC CONFIRMATION PROCEDURE

Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in ECM. Refer to [EC-94, "DTC Index"](#).

>> GO TO 4.

4. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode of "ENGINE" using CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

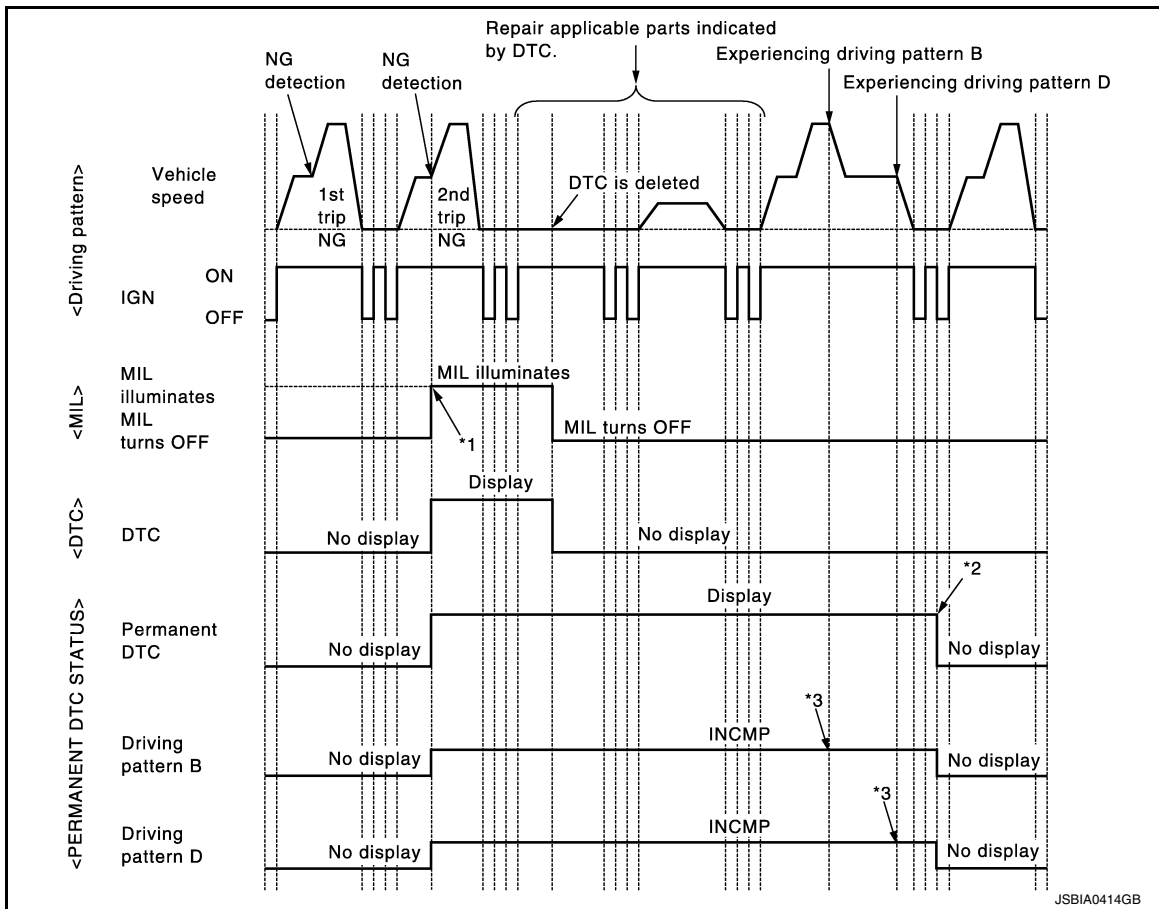
HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

[VQ40DE]

Work Procedure (Group B)

INFOID:000000012524296



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: After experiencing driving pattern B and D, permanent DTC is erased.

*3: Indication does not change unless the ignition switch is turned from ON to OFF twice even after experiencing driving pattern B or D.

NOTE:

Drive the vehicle according to only driving patterns indicating "INCMP" in driving patterns B and D on the "PERMANENT DTC STATUS" screen.

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-65. "On Board Diagnosis Function"](#), [EC-68. "CONSULT Function"](#).

NO >> GO TO 2.

2. CHECK PERMANENT DTC

Ⓜ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode of "ENGINE" using CONSULT.

Ⓜ With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

< BASIC INSPECTION >

4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 3.
NO >> END

3. DRIVE DRIVING PATTERN B

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.

Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Use "PERMANENT DTC WORK SUPPORT" mode of "ENGINE" using CONSULT. to drive the vehicle according to driving pattern B. Refer to [EC-68. "CONSULT Function"](#), [EC-62. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Ⓢ With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle according to driving pattern B. Refer to [EC-62. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 4.

4. CHECK PERMANENT DTC

Ⓟ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode of "ENGINE" using CONSULT.

Ⓢ With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 5.
NO >> END

5. DRIVE DRIVING PATTERN D

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.

1. Drive the vehicle according to driving pattern D. Refer to [EC-62. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 6.

6. CHECK PERMANENT DTC

Ⓟ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.

HOW TO ERASE PERMANENT DTC

[VQ40DE]

< BASIC INSPECTION >

5. Select "PERMANENT DTC STATUS" mode of "ENGINE" using CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 1.
NO >> END

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DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000012524297

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" in "DATA MONITOR" mode of CONSULT during normal operation of the Engine Control System. When the value in "SPEC" in "DATA MONITOR" mode is within the SP value, the Engine Control System is confirmed OK. When the value in "SPEC" in "DATA MONITOR" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.

The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Component Function Check

INFOID:0000000012524298

1. PRECONDITIONING

Make sure that all of the following conditions are satisfied.

TESTING CONDITION

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm², 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle until "ATF TEMP 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle

>> GO TO 2.

2. PERFORM SPEC IN DATA MONITOR MODE

Ⓢ With CONSULT

NOTE:

Perform "SPEC" in "DATA MONITOR" mode in maximum scale display.

1. Perform [EC-142, "Work Procedure"](#).
2. Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Make sure that monitor items are within the SP value.

Is the measurement value within the SP value?

- YES >> INSPECTION END
 NO >> Proceed to [EC-161, "Diagnosis Procedure"](#).

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

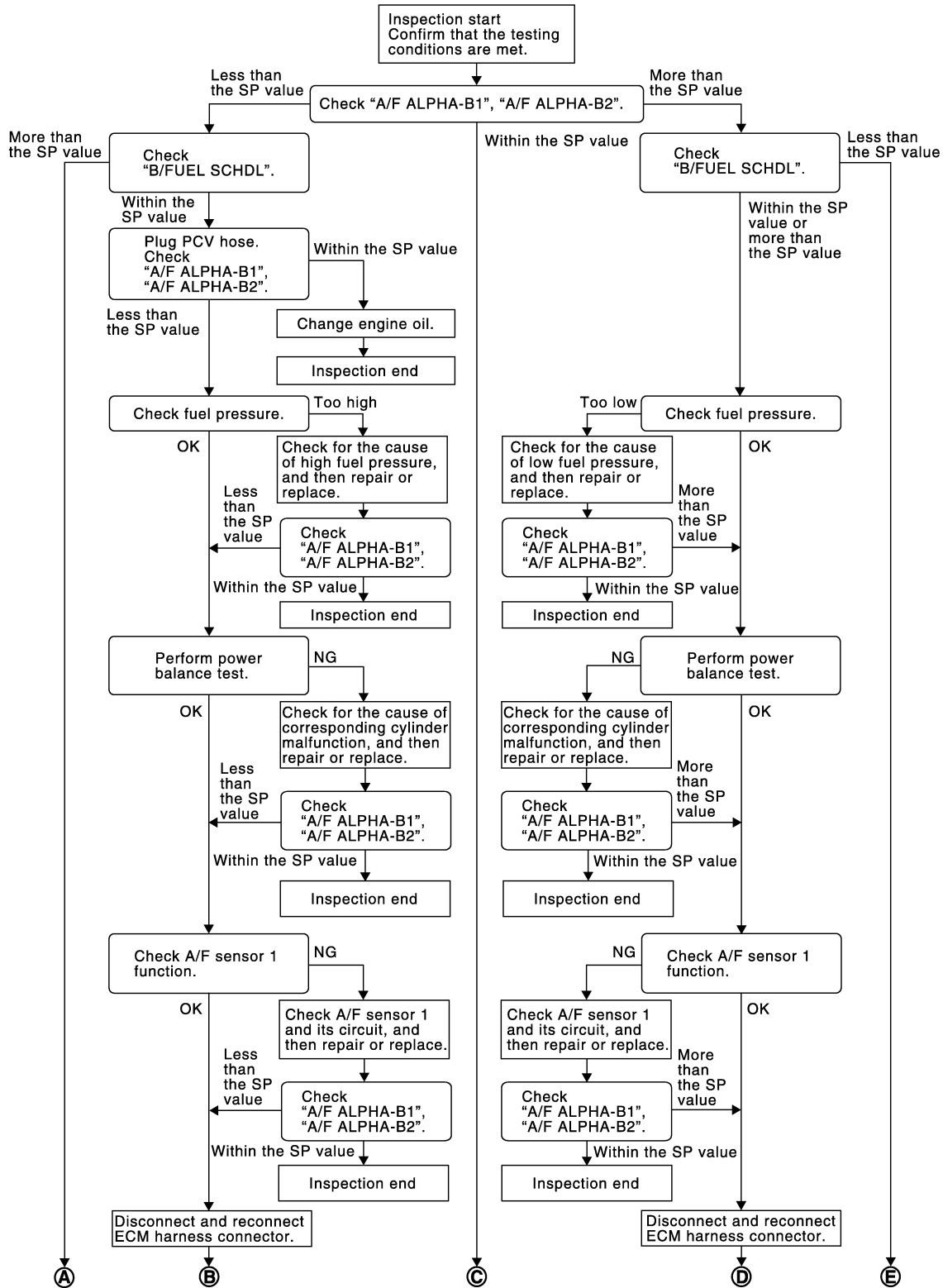
< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Diagnosis Procedure

INFOID:000000012524299

OVERALL SEQUENCE

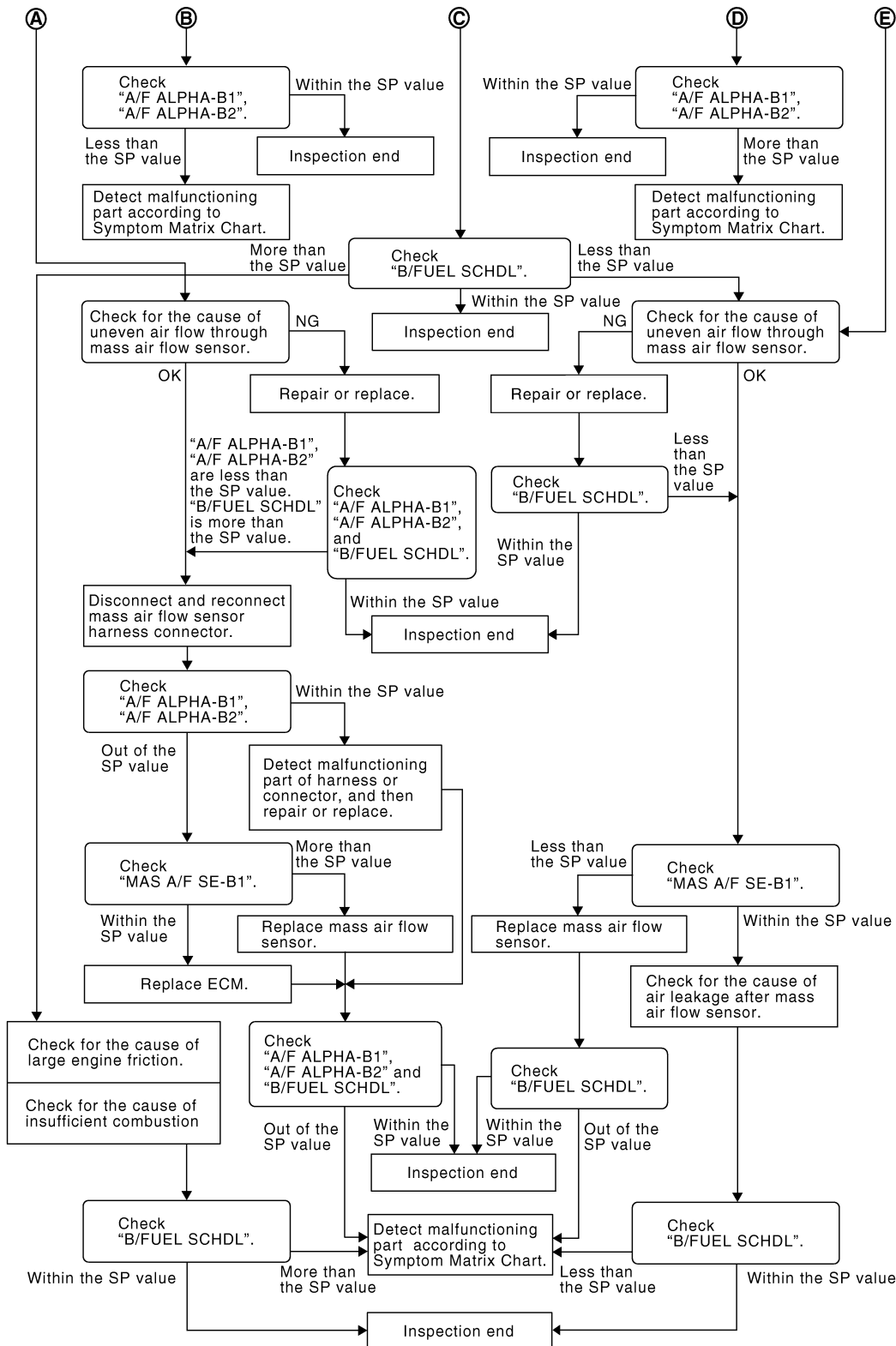


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TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]



PBIB3214E

DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

ⓑ With CONSULT

1. Start engine.
2. Confirm that the testing conditions are met. Refer to [EC-160, "Component Function Check"](#).
3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

NOTE:

Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

YES >> GO TO 17.

NO-1 >> Less than the SP value: GO TO 2.

NO-2 >> More than the SP value: GO TO 3.

2.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 4.

NO >> More than the SP value: GO TO 19.

3.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 6.

NO-1 >> More than the SP value: GO TO 6.

NO-2 >> Less than the SP value: GO TO 25.

4.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Stop the engine.

2. Disconnect PCV hose, and then plug it.

3. Start engine.

4. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 5.

NO >> GO TO 6.

5.CHANGE ENGINE OIL

1. Stop the engine.

2. Change engine oil.

NOTE:

This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving conditions.

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to [EC-146, "Work Procedure"](#).)

Is the inspection result normal?

YES >> GO TO 9.

NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly", refer to [FL-11, "Removal and Installation"](#), and then GO TO 8.

NO-2 >> Fuel pressure is too low: GO TO 7.

7.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly", refer to [FL-11, "Removal and Installation"](#), and then GO TO 8.

NO >> Repair or replace and then GO TO 8.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

8. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 9.

9. PERFORM POWER BALANCE TEST

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE".
2. Make sure that the each cylinder produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following below.

- Ignition coil and its circuit (Refer to [EC-433, "Component Function Check"](#).)
- Fuel injector and its circuit (Refer to [EC-428, "Component Function Check"](#).)
- Intake air leakage
- Low compression pressure (Refer to [EM-22, "Compression Pressure"](#).)

Is the inspection result normal?

YES >> Replace fuel injector, refer to [EM-45, "Removal and Installation"](#), and then GO TO 11.

NO >> Repair or replace malfunctioning part and then GO TO 11.

11. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 12.

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.

- For DTC P0130, P0150, refer to [EC-216, "DTC Logic"](#).
- For DTC P0131, P0151, refer to [EC-220, "DTC Logic"](#).
- For DTC P0132, P0152, refer to [EC-223, "DTC Logic"](#).
- For DTC P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D refer to [EC-247, "DTC Logic"](#).
- For DTC P2096, P2097, P2098, P2099, refer to [EC-387, "DTC Logic"](#).

Are any DTCs detected?

YES >> GO TO 13.

NO >> GO TO 15.

13. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnosis Procedure according to corresponding DTC.

>> GO TO 14.

14. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> GO TO 15.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.

>> GO TO 16.

16. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to [EC-452. "Symptom Table"](#).

17. CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO-1 >> More than the SP value: GO TO 18.

NO-2 >> Less than the SP value: GO TO 25.

18. DETECT MALFUNCTIONING PART

1. Check for the cause of large engine friction. Refer to the following.
 - Engine oil level is too high
 - Engine oil viscosity
 - Belt tension of power steering, alternator, A/C compressor, etc. is excessive
 - Noise from engine
 - Noise from transmission, etc.
2. Check for the cause of insufficient combustion. Refer to the following.
 - Valve clearance malfunction
 - Intake valve timing control function malfunction
 - Camshaft sprocket installation malfunction, etc.

>> Repair or replace malfunctioning part, and then GO TO 30.

19. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

Is the inspection result normal?

YES >> GO TO 21.

NO >> Repair or replace malfunctioning part, and then GO TO 20.

20. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> "B/FUEL SCHDL" is more, "A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value: GO TO 21.

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

1. Stop the engine.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect mass air flow sensor harness connector. Check pin terminal and connector for damage and then reconnect it again.

>> GO TO 22.

22.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to [EC-192. "Diagnosis Procedure"](#). Then GO TO 29.

NO >> GO TO 23.

23.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 24.

NO >> More than the SP value: Replace malfunctioning mass air flow sensor, refer to [EM-24. "Removal and Installation"](#), and then GO TO 29.

24.REPLACE ECM

Replace ECM. Refer to [EC-462. "Removal and Installation"](#).

>> GO TO 29.

25.CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal in air cleaner element
- Uneven dirt in air cleaner element
- Improper specification in intake air system

Is the inspection result normal?

YES >> GO TO 27.

NO >> Repair or replace malfunctioning part, and then GO TO 26.

26.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Less than the SP value: GO TO 27.

27.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 28.

NO >> Less than the SP value: Replace malfunctioning mass air flow sensor, refer to [EM-24. "Removal and Installation"](#), and then GO TO 30.

28.CHECK INTAKE SYSTEM

Check for the cause of air leak after the mass air flow sensor. Refer to the following.

- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks in PCV valve

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Disconnection or cracks in EVAP purge hose, stuck open EVAP canister purge volume control solenoid valve
- Malfunctioning seal in rocker cover gasket
- Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts
- Malfunctioning seal in intake air system, etc.

>> GO TO 30.

29.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to [EC-452. "Symptom Table"](#).

30.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode of "ENGINE", and then make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to [EC-452. "Symptom Table"](#).

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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:000000012524300

1. CHECK FUSE

Check that the following fuse is not blown.

| Location | Fuse No. | Capacity |
|------------------|----------|----------|
| Fuse block (J/B) | #12 | 10 A |
| IPDM E/R | #53 | 20 A |

Is the inspection result normal?

- YES >> Replace the fuse after repairing the applicable circuit. (If the replaced fuse is blown again, check the power supply circuit upstream of IPDM E/R or fuse box [J/B].)
NO >> GO TO 2.

2. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection E9. Refer to Ground Inspection in [GI-45, "Circuit Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace ground connection.

3. CHECK ECM GROUND CIRCUIT

- Disconnect ECM harness connector.
- Check the continuity between ECM harness connector and ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 123 | Ground | Existed |
| | 124 | | |
| | 127 | | |
| | 128 | | |
| F54 | 12 | | |
| | 16 | | |

- Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4. CHECK IGNITION SWITCH SIGNAL

- Reconnect ECM harness connector.
- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following condition.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|-----|----------------------|-------------------|
| Connector | + | - | | |
| | Terminal | | | |
| E16 | 109 | 128 | Ignition switch: OFF | 0 V |
| | | | Ignition switch: ON | Battery voltage |

Is the inspection result normal?

POWER SUPPLY AND GROUND CIRCUIT

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 5.
NO >> Perform trouble diagnosis for power supply circuit.

5.CHECK ECM POWER SUPPLY-I

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Voltage (Approx.) |
|-----------|----------|-----|----------------------|
| Connector | + | - | |
| | Terminal | | |
| E16 | 121 | 128 | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 7.

6.CHECK ECM POWER SUPPLY-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|-----|---|----------------------|
| Connector | + | - | | |
| | Terminal | | | |
| E16 | 121 | 128 | After turning ignition switch OFF, battery voltage will exist for a few seconds | Drop to 0 V |

Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 8.

7.CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| E16 | 121 | E119 | 4 | Existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for IPDM E/R power supply circuit.
NO >> Repair or replace error-detected parts.

8.CHECK ECM RELAY CONTROL SIGNAL

1. Reconnect ECM and IPDM E/R harness connector.
2. Check the voltage between ECM harness connector terminals as per the following condition.

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| ECM | | | | Condition | Voltage (Approx.) |
|-----------|----------|-----------|----------|--|-------------------|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F54 | 31 | E16 | 128 | Ignition switch: ON | 0 V |
| | | | | Turn ignition switch OFF and wait at least 10 seconds. | Battery voltage |

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to [PCS-25, "Removal and Installation"](#).

NO >> GO TO 9.

9. CHECK ECM RELAY CONTROL SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 31 | E119 | 7 | Existed |

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to [PCS-25, "Removal and Installation"](#).

NO >> Repair or replace error-detected parts.

10. CHECK ECM POWER SUPPLY (BACK-UP)

1. Turn ignition switch OFF.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | | Voltage (Approx.) |
|-----------|----------|-----------|----------|-------------------|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 26 | E16 | 128 | Battery voltage |

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 11.

11. CHECK ECM POWER SUPPLY (BACK-UP) CIRCUIT

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 26 | E121 | 30 | Existed |

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

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U0101 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

U0101 CAN COMM CIRCUIT

Description

INFOID:0000000012524301

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

DTC Logic

INFOID:0000000012524302

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| U0101 | LOST COMM (TCM) (Lost communication with TCM) | When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with TCM for 2 seconds or more. | <ul style="list-style-type: none">CAN communication line between TCM and ECM (CAN communication line is open or shorted) |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-172, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524303

Perform the trouble diagnosis for CAN communication system. Refer to [LAN-16, "Trouble Diagnosis Flow Chart"](#).

U1001 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

U1001 CAN COMM CIRCUIT

Description

INFOID:0000000012524304

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

DTC Logic

INFOID:0000000012524305

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| U1001 | CAN COMM CIRCUIT (CAN communication line) | When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more. | <ul style="list-style-type: none">Harness or connectors (CAN communication line is open or shorted) |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-173, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524306

Perform the trouble diagnosis for CAN communication system. Refer to [LAN-16, "Trouble Diagnosis Flow Chart"](#).

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0011, P0021 IVT CONTROL

DTC Logic

INFOID:000000012524307

DTC DETECTION LOGIC

NOTE:

If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to [EC-184, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | Detecting condition | Possible cause |
|---------|---|--|---|
| P0011 | INT/V TIM CONT-B1 [Intake valve timing control performance (bank 1)] | There is a gap between angle of target and phase-control angle degree. | <ul style="list-style-type: none"> • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Intake valve control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control |
| P0021 | INT/V TIM CONT-B2 [Intake valve timing control performance (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds. Hold the accelerator pedal as steady as possible.

| | |
|----------------|------------------------|
| ENG SPEED | 1200 - 2,000 rpm |
| COOLAN TEMP/S | More than 60°C (140°F) |
| Selector lever | P or N position |

4. Let engine idle for 10 seconds.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-175, "Diagnosis Procedure"](#)

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

1. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

| | |
|---------------|--|
| ENG SPEED | 1,400 - 3,175 rpm (A constant rotation is maintained.) |
| COOLAN TEMP/S | More than 70°C (158°F) |

P0011, P0021 IVT CONTROL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| | |
|------------------|---|
| Selector lever | 1st or 2nd position |
| Driving location | Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) |

CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-175, "Diagnosis Procedure"](#)
NO >> INSPECTION END

Diagnosis Procedure

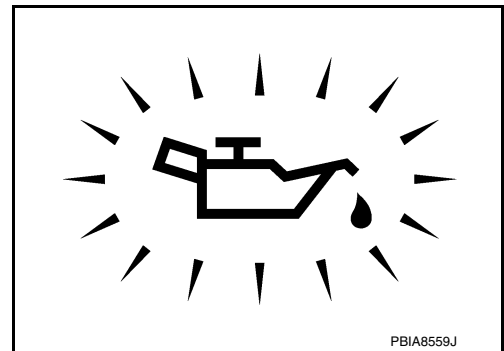
INFOID:0000000012524308

1. CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check oil pressure warning lamp and confirm it is not illuminated.

Is oil pressure warning lamp illuminated?

- YES >> Check the engine oil level. Refer to [LU-8, "Inspection"](#).
NO >> GO TO 2.



2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Check the intake valve timing control solenoid valve. Refer to [EC-176, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

3. CHECK CRANKSHAFT POSITION SENSOR (POS)

Check the crankshaft position sensor (POS). Refer to [EC-282, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Replace crankshaft position sensor (POS). Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Check the camshaft position sensor (PHASE). Refer to [EC-285, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-77, "Exploded View"](#).

5. CHECK CAMSHAFT (INTAKE)

Check the following.

P0011, P0021 IVT CONTROL

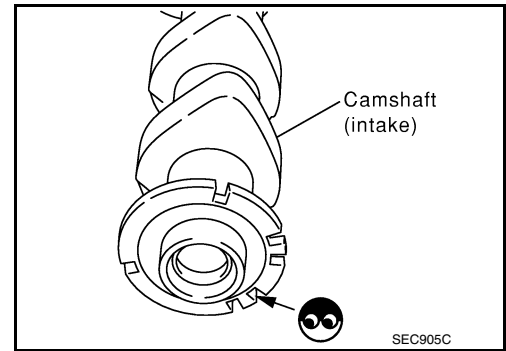
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Accumulation of debris on the signal plate of camshaft front end
- Chipping signal plate of camshaft front end

Is the inspection result normal?

- YES >> GO TO 6.
 NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to [EM-78, "Removal and Installation"](#).



6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

- YES >> Check timing chain installation. Refer to [EM-61, "Removal and Installation"](#).
 NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to [EM-78, "Removal and Installation"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Clean lubrication line.

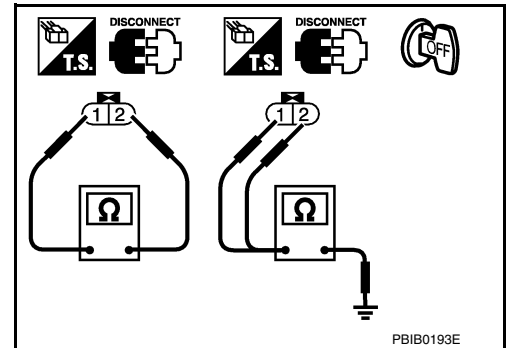
Component Inspection

INFOID:0000000012524309

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as follows.

| Intake valve timing control solenoid valve | | Resistance (Ω) |
|--|--------|-------------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | 7.0 - 7.7 [at 20°C (68°F)] |
| 1 | Ground | ∞ |
| 2 | | (Continuity should not exist) |



Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-2

1. Remove intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

P0011, P0021 IVT CONTROL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

CAUTION:

Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

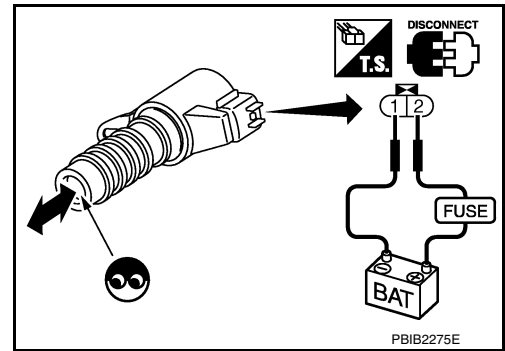
NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77. "Exploded View"](#).



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P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

DTC Logic

INFOID:0000000012524310

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0030 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (Voltage signal is higher/lower than voltage in the normal range.) | <ul style="list-style-type: none">• Harness or connectors (A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0031 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit low] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0032 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit high] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (A/F sensor 1 heater circuit is shorted.)• A/F sensor 1 heater |
| P0036 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (Voltage signal is higher/lower than voltage in the normal range.) | <ul style="list-style-type: none">• Harness or connectors (A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0051 | A/F SEN1 HTR (B2) [Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit low] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0052 | A/F SEN1 HTR (B2) [Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit high] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (A/F sensor 1 heater circuit is shorted.)• A/F sensor 1 heater |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-178, "Diagnosis Procedure"](#).
NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524311

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.

P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage |
|---------------------|--------------|-----------|----------|--------|-----------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0030, P0031, P0032 | 1 | F65 | 1 | Ground | Battery voltage |
| P0036, P0051, P0052 | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace error-detected parts.

2. CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|---------------------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0030, P0031, P0032 | 1 | F65 | 2 | F54 | 6 | Existed |
| P0036, P0051, P0052 | 2 | F5 | 2 | | 3 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK A/F SENSOR 1 HEATER

Refer to [EC-179, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> GO TO 4.

4. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-30, "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

Component Inspection

INFOID:0000000012524312

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.

P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

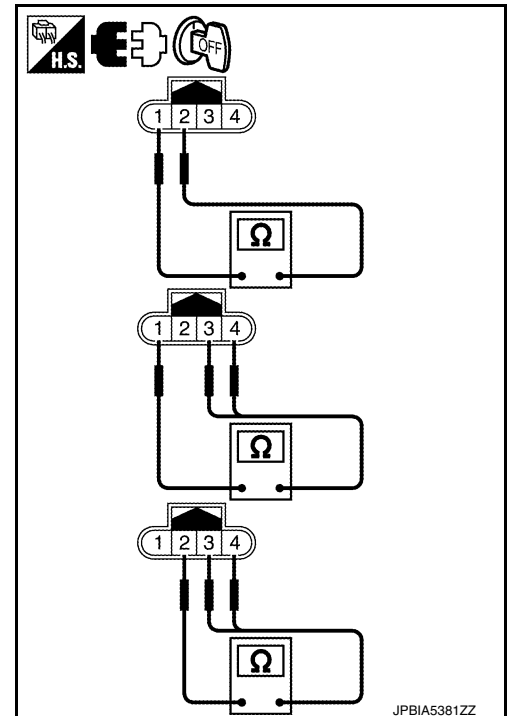
3. Check resistance between A/F sensor 1 terminals as follows.

| + | | - | | Resistance (Ω) |
|--------------|---|---|--|---|
| A/F sensor 1 | | | | |
| Terminal | | | | |
| 1 | 2 | | | 1.80 - 2.44 [at 25°C (77°F)] |
| | 3 | | | ∞ (Continuity should not exist) |
| | 4 | | | |
| 2 | 3 | | | ∞ (Continuity should not exist) |
| | 4 | | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.



2. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-30. "Exploded View"](#).

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0037, P0038, P0057, P0058 HO2S2 HEATER

DTC Logic

INFOID:000000012524313

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0037 | HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit low] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)• Heated oxygen sensor 2 heater |
| P0038 | HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit high] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)• Heated oxygen sensor 2 heater |
| P0057 | HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit low] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)• Heated oxygen sensor 2 heater |
| P0058 | HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit high] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)• Heated oxygen sensor 2 heater |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11 V and 16 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-181. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524314

1. CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S2 harness connector and ground.

P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | + | | | - | Voltage |
|--------------|-------|-----------|----------|--------|-----------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0037, P0038 | 1 | F13 | 3 | Ground | Battery voltage |
| P0057, P0058 | 2 | F12 | 3 | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|--------------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0037, P0038 | 1 | F13 | 2 | F54 | 37 | Existed |
| P0057, P0058 | 2 | F12 | 2 | | 41 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to [EC-182. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> GO TO 4.

4. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

Component Inspection

INFOID:0000000012524315

1. CHECK HEATED OXYGEN SENSOR 2 HEATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VQ40DE]

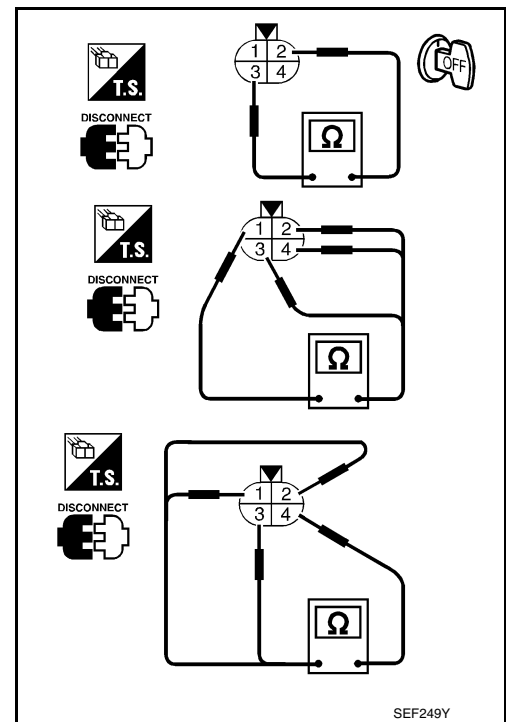
< DTC/CIRCUIT DIAGNOSIS >

3. Check resistance between HO2S2 terminals as follows.

| Heated oxygen sensor 2 | | Resistance (Ω) |
|------------------------|---|------------------------------------|
| + | - | |
| Terminal | | |
| 2 | 3 | 9.9 - 13.3 [at 25°C (77°F)] |
| 1 | 2 | ∞ (Continuity should not exist) |
| | 3 | |
| 4 | 1 | |
| | 2 | |
| | 3 | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.



2. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).

>> INSPECTION END

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0075, P0081 IVT CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000012524316

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0075 | INT/V TIM V/CIR-B1 [Intake valve timing control solenoid valve (bank 1) circuit] | An improper voltage is sent to the ECM through intake valve timing control solenoid valve. | <ul style="list-style-type: none"> • Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve |
| P0081 | INT/V TIM V/CIR-B2 [Intake valve timing control solenoid valve (bank 2) circuit] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-184, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524317

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between intake valve timing control solenoid valve harness connector and ground.

| DTC | + | | | - | Voltage |
|-------|----------------------------|-----------|----------|--------|-----------------|
| | IVT control solenoid valve | | | | |
| | Bank | Connector | Terminal | | |
| P0075 | 1 | F67 | 2 | Ground | Battery voltage |
| P0081 | 2 | F206 | 2 | | |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace error-detected parts.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | + | | | - | | Continuity |
|-------|----------------------------|-----------|----------|-----------|----------|------------|
| | IVT control solenoid valve | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0075 | 1 | F67 | 1 | F77 | 56 | Existed |
| P0081 | 2 | F206 | 1 | | 55 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to [EC-176, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

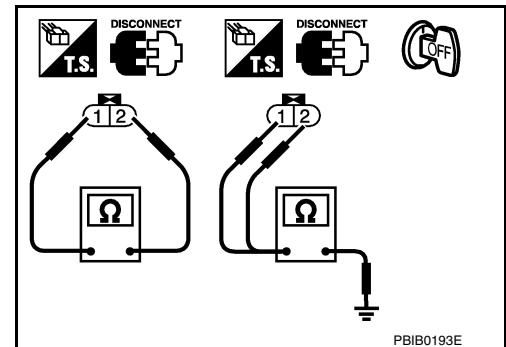
Component Inspection

INFOID:000000012524318

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as follows.

| Intake valve timing control solenoid valve | | Resistance (Ω) |
|--|--------|------------------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | 7.0 - 7.7 [at 20°C (68°F)] |
| 1 | Ground | ∞ (Continuity should not exist) |
| 2 | | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-2

1. Remove intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

CAUTION:

Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

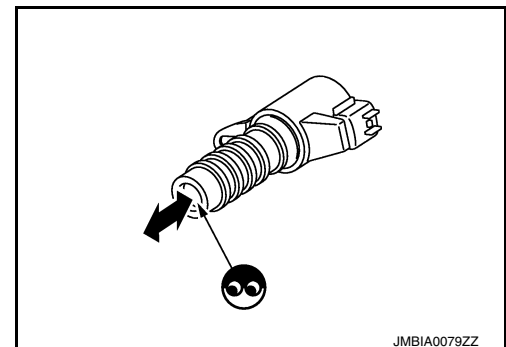
NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-77, "Exploded View"](#).

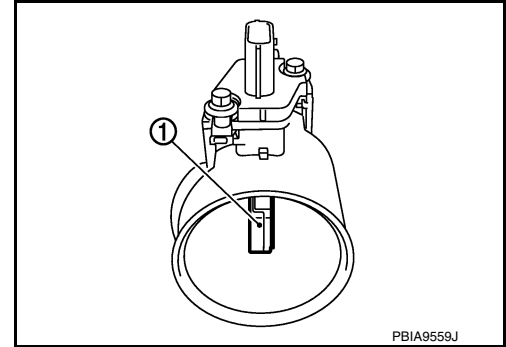


P0101 MAF SENSOR

Description

INFOID:000000012524319

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss. Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



DTC Logic

INFOID:000000012524320

DTC DETECTION LOGIC

NOTE:

If DTC P0101 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0101 | MAF SEN/CIRCUIT-B1 [Mass air flow (MAF) sensor (bank 1) circuit range/perfor- mance] | <ul style="list-style-type: none"> A high voltage from the sensor is sent to ECM under light load driving condition. A low voltage from the sensor is sent to ECM under heavy load driving condition. | <ul style="list-style-type: none"> Harness or connectors (Intake air temperature sensor circuit is open or shorted.) Intake air leaks MAF sensor EVAP control system pressure sensor Intake air temperature sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and warm it up to normal operating temperature.
- Drive the vehicle for at least 5 seconds under the following conditions:

CAUTION:

Always drive vehicle at a safe speed.

| | |
|----------------|--------------------------|
| Selector lever | Suitable position |
| Vehicle speed | 40 km/h (25 MPH) or more |

NOTE:

- The gear must be fixed while driving the vehicle.
- Keep the accelerator pedal as steady as possible during cruising.

- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-187. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

P0101 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000012524321

Diagnosis Procedure

1. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

Is the inspection result normal?

YES >> GO TO 2.

NO >> Reconnect the parts.

2. CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between MAF sensor harness connector and ground.

| + | | - | Voltage |
|------------|----------|--------|-----------------|
| MAF sensor | | | |
| Connector | Terminal | | |
| F53 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between MAF sensor harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 2 | E119 | 4 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

4. CHECK MAF SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 3 | F77 | 80 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

P0101 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 4 | F77 | 82 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair or replace error-detected parts

6. CHECK INTAKE AIR TEMPERATURE SENSOR

Check the intake air temperature sensor. Refer to [EC-198, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 7.
NO >> Replace MAF sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to [EC-314, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 8.
NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

8. CHECK MAF SENSOR

Check the MAF sensor. Refer to [EC-188, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace MAF sensor. Refer to [EM-24, "Exploded View"](#).

Component Inspection

INFOID:000000012524322

1. CHECK MASS AIR FLOW SENSOR-1

 With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
5. Select "MAS A/F SE-B1" and check indication.

| Monitor item | Condition | MAS A/F SE-B1 |
|---------------|--|-------------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 V |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | Idle to about 4,000 rpm | 0.9 - 1.2 V to Approx. 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

 Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals.

P0101 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| Connector | ECM | | Condition | Voltage (Approx.) |
|-----------|----------|----|--|-----------------------|
| | + | - | | |
| | Terminal | | | |
| F77 | 82 | 80 | Ignition switch ON (Engine stopped.) | 0.4 V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.2 V to 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> GO TO 2.

2. CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

- Turn ignition switch OFF.
- Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Intake valve deposits
 - Improper specification of intake air system parts

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 3.

3. CHECK MASS AIR FLOW SENSOR-2

Ⓜ With CONSULT

- Repair or replace malfunctioning part.
- Start engine and warm it up to normal operating temperature.
- Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
- Select "MAS A/F SE-B1" and check indication.

| Monitor item | Condition | MAS A/F SE-B1 |
|---------------|--|-------------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 V |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | Idle to about 4,000 rpm | 0.9 - 1.2 V to Approx. 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Ⓧ Without CONSULT

- Repair or replace malfunctioning part.
- Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM harness connector terminals.

P0101 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|----|--|-----------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F77 | 82 | 80 | Ignition switch ON (Engine stopped.) | 0.4 V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.2 V to 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK MASS AIR FLOW SENSOR-3

Ⓟ With CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
5. Select "MAS A/F SE-B1" and check indication.

| Monitor item | Condition | MAS A/F SE-B1 |
|---------------|--|-------------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 V |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | Idle to about 4,000 rpm | 0.9 - 1.2 V to Approx. 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Ⓧ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|----|--|-----------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F77 | 82 | 80 | Ignition switch ON (Engine stopped.) | 0.4 V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.2 V to 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

P0101 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace mass air flow sensor. Refer to [EM-24. "Exploded View"](#).

A

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C

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P

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0102, P0103 MAF SENSOR

DTC Logic

INFOID:000000012524323

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0102 | MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit low input) | An excessively low voltage from the mass air flow sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (Mass air flow sensor circuit is open or shorted.)• Intake air leaks• Mass air flow sensor |
| P0103 | MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit high input) | An excessively high voltage from the mass air flow sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (Mass air flow sensor circuit is open or shorted.)• Mass air flow sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Which DTC is detected?

- P0102 >> GO TO 2.
P0103 >> GO TO 3.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-192, "Diagnosis Procedure"](#).
NO >> INSPECTION END

3. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-1

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-192, "Diagnosis Procedure"](#).
NO >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-2

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-192, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524324

1. INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

- P0102 >> GO TO 2.
P0103 >> GO TO 3.

P0102, P0103 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

Is the inspection result normal?

YES >> GO TO 3.

NO >> Reconnect the parts. Refer to [EM-24. "Exploded View"](#).

3. CHECK MAF SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect mass air flow (MAF) sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between MAF sensor harness connector and ground.

| + | | - | Voltage |
|------------|----------|--------|-----------------|
| MAF sensor | | | |
| Connector | Terminal | | |
| F53 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between MAF sensor harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 2 | E119 | 4 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

5. CHECK MAF SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 3 | F77 | 80 | Existed |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace error-detected parts.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 4 | F77 | 82 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR

Check the MAF sensor. Refer to [EC-194, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace mass air flow sensor. Refer to [EM-24, "Exploded View"](#).

Component Inspection

INFOID:000000012524325


1. CHECK MASS AIR FLOW SENSOR-1

 With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
5. Select "MAS A/F SE-B1" and check indication.

| Monitor item | Condition | MAS A/F SE-B1 |
|---------------|--|-------------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 V |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | Idle to about 4,000 rpm | 0.9 - 1.2 V to Approx. 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

 Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|----|--|-----------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F77 | 82 | 80 | Ignition switch ON (Engine stopped.) | 0.4 V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.2 V to 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

P0102, P0103 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Improper specification of intake air system parts

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> GO TO 3.


3.CHECK MASS AIR FLOW SENSOR-2

 With CONSULT

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
4. Select "MAS A/F SE-B1" and check indication.

| Monitor item | Condition | MAS A/F SE-B1 |
|---------------|--|-------------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 V |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | Idle to about 4,000 rpm | 0.9 - 1.2 V to Approx. 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

 Without CONSULT

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector terminals.


| Connector | ECM | | Condition | Voltage (Approx.) |
|-----------|-----|----|--|-----------------------|
| | + | - | | |
| F77 | 82 | 80 | Ignition switch ON (Engine stopped.) | 0.4 V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.2 V to 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 4.

4.CHECK MASS AIR FLOW SENSOR-3

 With CONSULT

1. Turn ignition switch OFF.

P0102, P0103 MAF SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
5. Select "MAS A/F SE-B1" and check indication.

| Monitor item | Condition | MAS A/F SE-B1 |
|---------------|--|-------------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 V |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | Idle to about 4,000 rpm | 0.9 - 1.2 V to Approx. 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals.

| Connector | ECM | | Condition | Voltage (Approx.) |
|-----------|----------|----|--|-----------------------|
| | + | - | | |
| | Terminal | | | |
| F77 | 82 | 80 | Ignition switch ON (Engine stopped.) | 0.4 V |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 - 1.2 V |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.5 - 1.8 V |
| | | | Idle to about 4,000 rpm | 0.9 - 1.2 V to 2.4 V* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace mass air flow sensor. Refer to [EM-24, "Exploded View"](#).

P0111 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

P0111 IAT SENSOR

DTC Logic

INFOID:000000012524326

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0111 | IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/performance] | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | <ul style="list-style-type: none">• Harness or connectors (High or low resistance in the IAT sensor circuit)• IAT sensor |

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 3.
NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-198, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the IAT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-198, "Diagnosis Procedure"](#).

3. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

P0111 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

- YES >> Proceed to [EC-198, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Component Function Check

INFOID:000000012524327

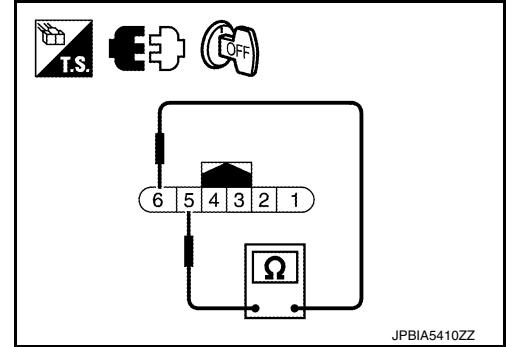
1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

| Mass air flow sensor | | Condition | Resistance (kΩ) |
|----------------------|---|-----------------------|-----------------------|
| + | - | | |
| Terminal | | | |
| 5 | 6 | Temperature [°C (°F)] | 25 (77) 1.800 – 2.200 |

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Proceed to [EC-198, "Diagnosis Procedure"](#).



Diagnosis Procedure

INFOID:000000012524328

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to [EC-198, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:000000012524329

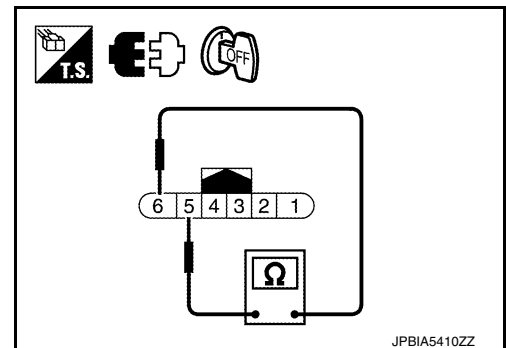
1. CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as per the following.

| Mass air flow sensor | | Condition | Resistance (kΩ) |
|----------------------|---|-----------------------|-----------------------|
| + | - | | |
| Terminals | | | |
| 5 | 6 | Temperature [°C (°F)] | 25 (77) 1.800 - 2.200 |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).



P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0112, P0113 IAT SENSOR

DTC Logic

INFOID:000000012524330

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0112 | IAT SEN/CIRCUIT- B1 (Intake air temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (IAT sensor circuit is open or shorted.) • Intake air temperature sensor |
| P0113 | IAT SEN/CIRCUIT- B1 (Intake air temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-199. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524331

1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (with intake air temperature sensor) harness connector.
3. Turn ignition switch ON.
4. Check the voltage between mass air flow sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| MAF sensor | | | |
| Connector | Terminal | | |
| F53 | 5 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

2. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.

P0112, P0113 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 5 | F77 | 74 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 6 | F77 | 64 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace error-detected parts.

4. CHECK INTAKE AIR TEMPERATURE SENSOR

Check the intake air temperature sensor. Refer to [EC-200, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).

Component Inspection

INFOID:000000012524332

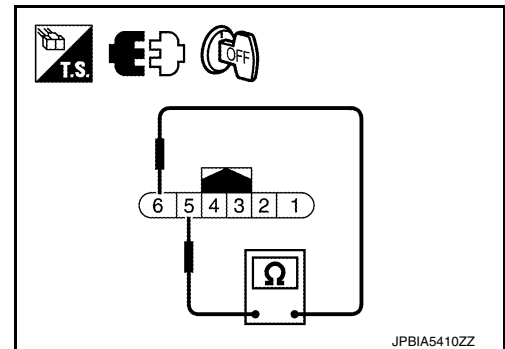
1. CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as per the following.

| Mass air flow sensor | | Condition | Resistance (kΩ) | |
|----------------------|---|-----------------------|-----------------|---------------|
| + | - | | | |
| Terminals | | | | |
| 5 | 6 | Temperature [°C (°F)] | 25 (77) | 1.800 - 2.200 |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).



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P0116 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

P0116 ECT SENSOR

DTC Logic

INFOID:000000012524333

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0116 | ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/per- formance] | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor) shows that the voltage signal of the ECT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | <ul style="list-style-type: none">• Harness or connectors (High or low resistance in the ECT sensor circuit)• ECT sensor |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 3.

NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-202, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the ECT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-202, "Diagnosis Procedure"](#).

3.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

P0116 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-202, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

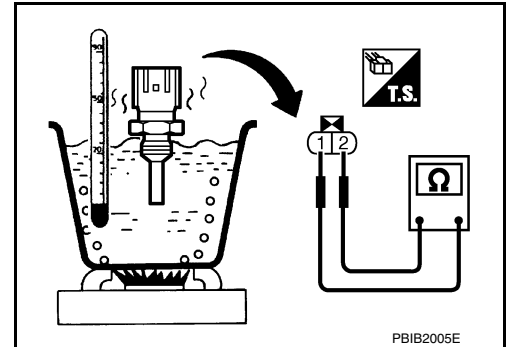
Component Function Check

INFOID:0000000012524334

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to [CO-32, "Exploded View"](#).
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 90 (194) |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Proceed to [EC-202, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524335

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to [EC-202, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace ECT sensor. Refer to [CO-32, "Exploded View"](#).

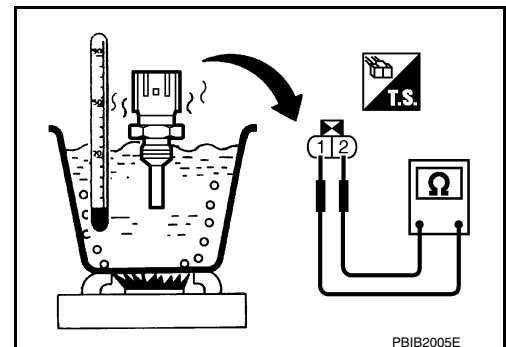
Component Inspection

INFOID:0000000012524336

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor.
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 90 (194) |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Exploded View"](#).

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0117, P0118 ECT SENSOR

DTC Logic

INFOID:000000012524337

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC Detecting Condition | Possible Cause |
|---------|--|---|---|
| P0117 | ECT SEN/CIRC (Engine coolant temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | • Harness or connectors (Engine coolant temperature sensor circuit is open or shorted.) • Engine coolant temperature sensor |
| P0118 | ECT SEN/CIRC (Engine coolant temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-203, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524338

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECT sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| ECT sensor | | | |
| Connector | Terminal | | |
| F70 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECT sensor harness connector and ECM harness connector.

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| ECT sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F70 | 1 | F77 | 70 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK ENGINE COOLANT TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECT sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| ECT sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F70 | 2 | F77 | 76 | Existed |

4. Also check harness for short to ground to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace error-detected parts.

4. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check the engine coolant temperature sensor. Refer to [EC-204, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Exploded View"](#).

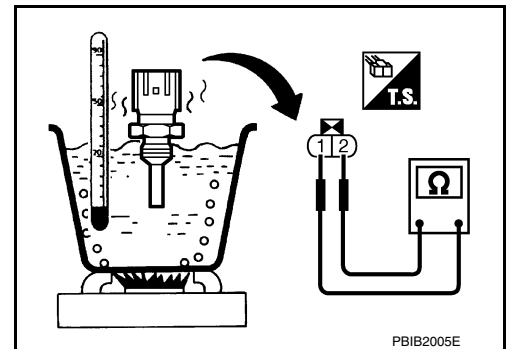
Component Inspection

INFOID:0000000012524339

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor.
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|-----------------------|------------------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) 2.10 - 2.90 |
| | | | 50 (122) 0.68 - 1.00 |
| | | | 90 (194) 0.236 - 0.260 |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Exploded View"](#).

P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0122, P0123 TP SENSOR

DTC Logic

INFOID:000000012524340

DTC DETECTION LOGIC

NOTE:

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0122 | TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit low input) | An excessively low voltage from the TP sensor 2 is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (TP sensor 2 circuit is open or shorted.)• Electric throttle control actuator (TP sensor 2) |
| P0123 | TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit high input) | An excessively high voltage from the TP sensor 2 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-205, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524341

1. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector terminals.

| Electric throttle control actuator | | | Voltage (Approx.) |
|------------------------------------|----------|---|----------------------|
| Connector | + | - | |
| | Terminal | | |
| F50 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 7.
NO >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY-2

P0122, P0123 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the voltage between electric throttle control actuator harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| Connector | Terminal | | |
| F50 | 2 | Ground | 5 V |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F50 | 2 | F54 | 24 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Check sensor power supply 2 circuit. Refer to [EC-446, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

5. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F50 | 4 | F54 | 19 | Existed |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace error-detected parts.

6. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 123 | Ground | Existed |
| | 124 | | |
| | 127 | | |
| | 128 | | |
| F54 | 12 | | |
| | 16 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

7. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 3 | F54 | 23 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace error-detected parts.

8. CHECK THROTTLE POSITION SENSOR

Check the throttle position sensor. Refer to [EC-207, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace electric throttle control actuator. Refer to [CO-32, "Exploded View"](#).

Component Inspection

INFOID:000000012524342

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform "Throttle Valve Closed Position Learning". Refer to [EC-138, "Description"](#).
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----|----------|-----------------|-----------------|
| Connector | + | - | | |
| | | Terminal | | |
| F54 | 22 | 19 | Fully released | More than 0.36V |
| | | | Fully depressed | Less than 4.75V |
| | 23 | | Fully released | Less than 4.75V |
| | | | Fully depressed | More than 0.36V |

P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to [EM-25. "Removal and Installation"](#).

P0125 ECT SENSOR

DTC Logic

INFOID:000000012524343

DTC DETECTION LOGIC

NOTE:

- If DTC P0125 is displayed with P0116, first perform the trouble diagnosis for DTC P0116. Refer to [EC-201, "DTC Logic"](#).
- If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to [EC-203, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0125 | ECT SENSOR (Insufficient engine coolant temperature for closed loop fuel control) | <ul style="list-style-type: none"> • Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. • Engine coolant temperature is insufficient for closed loop fuel control. | <ul style="list-style-type: none"> • Harness or connectors (High resistance in the circuit) • Engine coolant temperature sensor • Thermostat |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

 With CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check that "COOLAN TEMP/S" is above 20°C (68°F).

 With GST

Follow the procedure "With CONSULT" above.

Is it above 20°C (68°F)?

- YES >> INSPECTION END
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

 With CONSULT

1. Start engine and run it for 65 minutes at idle speed.
2. Check 1st trip DTC.

If "COOLAN TEMP/S" indication increases to more than 20°C (68°F) within 65 minutes, stop engine because the test result will be OK.

CAUTION:

Be careful not to overheat engine.

 With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-210, "Diagnosis Procedure"](#).
NO >> INSPECTION END

P0125 ECT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

INFOID:000000012524344

Diagnosis Procedure

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check the engine coolant temperature sensor. Refer to [EC-210, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Exploded View"](#).

2. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant does not flow.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace thermostat. Refer to [CO-30, "Removal and Installation"](#).

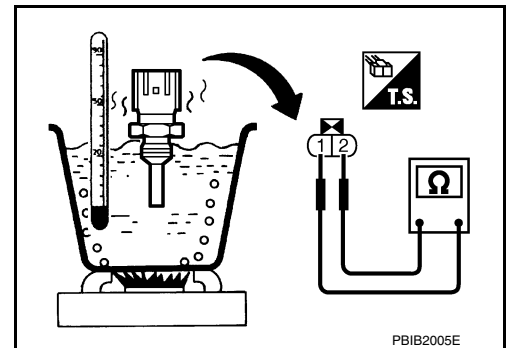
Component Inspection

INFOID:000000012524345

1. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor.
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|-----------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | 20 (68) | 2.10 - 2.90 |
| | | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | 0.236 - 0.260 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Exploded View"](#).

P0127 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0127 IAT SENSOR

DTC Logic

INFOID:000000012524346

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0127 | IAT SENSOR-B1 (Intake air temperature too high) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor. | <ul style="list-style-type: none">• Harness or connectors (Intake air temperature sensor circuit is open or shorted)• Intake air temperature sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Wait until engine coolant temperature is less than 96°C (205°F)
 - Turn ignition switch ON.
 - Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
 - Check the engine coolant temperature.
 - If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.

NOTE:

Perform the following steps before engine coolant temperature is above 96°C (205°F).

2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode of "ENGINE" using CONSULT
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.

CAUTION:

Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-211. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524347

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Check the intake air temperature sensor. Refer to [EC-212. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

P0127 IAT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).

Component Inspection

INFOID:000000012524348

1. CHECK INTAKE AIR TEMPERATURE SENSOR

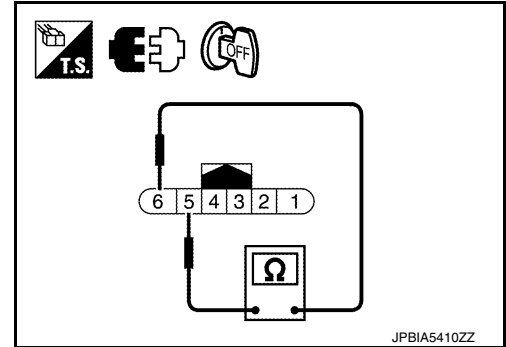
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as per the following.

| Mass air flow sensor | | Condition | Resistance (k Ω) |
|----------------------|---|---|--------------------------|
| + | - | | |
| Terminals | | | |
| 5 | 6 | Temperature [$^{\circ}$ C ($^{\circ}$ F)] | 25 (77) 1.800 - 2.200 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EM-24, "Exploded View"](#).



P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0128 THERMOSTAT FUNCTION

DTC Logic

INFOID:000000012524349

DTC DETECTION LOGIC

NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305 or P0306, first perform the trouble diagnosis for P0300, P0301, P0302, P0303, P0304, P0305 or P0306, Refer to [EC-272, "DTC Logic"](#).

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.

This is due to a leak in the seal or the thermostat being stuck open.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0128 | THERMSTAT FNCTN [Coolant thermostat (coolant temperature below thermostat regulating temperature)] | The engine coolant temperature does not reach to specified temperature even though the engine has run long enough. | <ul style="list-style-type: none">• Thermostat• Leakage from sealing portion of thermostat• Engine coolant temperature sensor |

DTC CONFIRMATION PROCEDURE

NOTE:

Never refuel before and during the following procedure.

1.PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PRECONDITIONING-2

 With CONSULT

1. Turn ignition switch ON.
2. Check the following conditions:

| | |
|---------------------|----------------------|
| Ambient temperature | -10°C (14°F) or more |
| A/C switch | OFF |
| Blower fan switch | OFF |


3. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
4. Check the following conditions:

| | |
|---------------|---------------------------|
| COOLAN TEMP/S | -10°C – 56°C (14 – 133°F) |
|---------------|---------------------------|

Is the condition satisfied?

- YES >> GO TO 3.
NO >> 1. Satisfy the condition.
2. GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-1

 With CONSULT

1. Start engine.
2. Drive the vehicle until the following condition is satisfied.

CAUTION:

Always drive vehicle at safe speed.

- **STEP 1**

P0128 THERMOSTAT FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Drive the vehicle under the conditions instructed below until the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" becomes at least 25°C (45°F).

| | |
|---------------|--|
| COOLAN TEMP/S | 75°C (167°F) or less |
| FUEL T/TMP SE | Less than the value calculated by subtracting 25°C (45°F) from "COOLAN TEMP/S".* |

*: Example

| COOLAN TEMP/S | FUEL T/TMP SE |
|---------------|----------------------|
| 70°C (158°F) | 47°C (117°F) or less |
| 65°C (149°F) | 42°C (108°F) or less |
| 60°C (140°F) | 37°C (99°F) or less |

- STEP 2

Drive the vehicle at 50 km/h (32 MPH) or more with the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" maintained at 25°C (45°F) or more.

NOTE:

Keep the accelerator pedal as steady as possible during cruising.

- STEP 3

Drive the vehicle at 50 km/h (32 MPH) or more until "COOLAN TEMP/S" increases by 6°C (11°F).

NOTE:


Keep the accelerator pedal as steady as possible during cruising.

Is the condition satisfied?

YES >> GO TO 4.

NO >> GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

 With CONSULT

1. Drive the vehicle until the following condition is satisfied.

| | |
|---------------|----------------------|
| COOLAN TEMP/S | 75°C (167°F) or more |
|---------------|----------------------|

CAUTION:

Always drive vehicle at safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-273, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524350

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-214, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor.

2.CHECK THERMOSTAT

Check thermostat. Refer to [CO-30, "Removal and Installation"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace thermostat.

Component Inspection

INFOID:0000000012524351

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

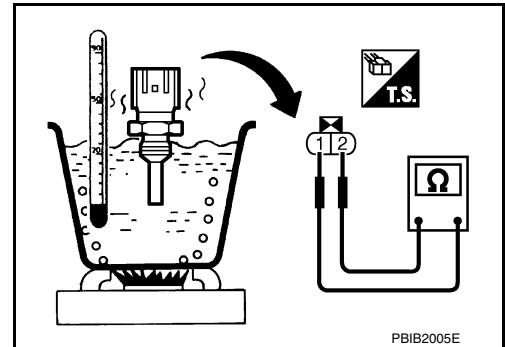
P0128 THERMOSTAT FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor.
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 90 (194) |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Exploded View"](#).

A
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P

P0130, P0150 A/F SENSOR 1

DTC Logic

INFOID:000000012524352

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal fluctuates according to fuel feedback control.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible Cause |
|---------|--|-------------------------|--|--|
| P0130 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 circuit] | A) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | <ul style="list-style-type: none"> • Harness or connectors (A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | |
| P0150 | A/F SENSOR1 (B2) Air fuel ratio (A/F) sensor 1 (bank 2) circuit | A) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | |
| | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-218, "Diagnosis Procedure"](#).

NO-1 >> With CONSULT: GO TO 3.

NO-2 >> Without CONSULT: GO TO 7.

3. CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Does the indication fluctuate around 2.2 V?

YES >> GO TO 4.

NO >> Proceed to [EC-218, "Diagnosis Procedure"](#).

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-1

1. Select "A/F SEN1 (B1) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/F SEN1" in "DTC WORK SUPPORT" mode of "ENGINE" using CONSULT.
2. Touch "START".
3. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen.

| | |
|----------------|----------------------------|
| ENG SPEED | 1,100 - 3,200 rpm |
| VHCL SPEED SE | More than 64 km/h (40 mph) |
| B/FUEL SCHDL | 1.0 - 8.0 msec |
| Selector lever | D position |

A

EC

If "TESTING" is not displayed after 20 seconds, retry from step 2.

CAUTION:

Always drive vehicle at a safe speed.

Is "TESTING" displayed on CONSULT screen?

C

D

YES >> GO TO 5.

NO >> Check A/F sensor 1 function again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-2

Release accelerator pedal fully.

NOTE:

Never apply brake when releasing the accelerator pedal.

Which does "TESTING" change to?

E

F

COMPLETED>>GO TO 6.

OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-3

G

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT screen?

H

YES >> INSPECTION END

NO >> Proceed to [EC-218. "Diagnosis Procedure"](#).

7.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

I

Perform component function check. Refer to [EC-217. "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

J

K

YES >> INSPECTION END

NO >> Proceed to [EC-218. "Diagnosis Procedure"](#).

Component Function Check

INFOID:0000000012524353

L

1.PERFORM COMPONENT FUNCTION CHECK

 With GST

M

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever to D position, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).

N

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

Never apply brake when releasing the accelerator pedal.

O

4. Repeat steps 2 and 3 for five times.
5. Stop the vehicle and turn ignition switch OFF.
6. Turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for five times.
10. Stop the vehicle and connect GST to the vehicle.
11. Check 1st trip DTC.

P

Is 1st trip DTC detected?

P0130, P0150 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Proceed to [EC-218. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524354

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage |
|-------|--------------|-----------|----------|--------|-----------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0130 | 1 | F65 | 1 | Ground | Battery voltage |
| P0150 | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0130 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0150 | 2 | F5 | 1 | | | |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0130 | 1 | F65 | 3 | F77 | 73 | Existed |
| | | | 4 | | 69 | |
| P0150 | 2 | F5 | 3 | | 81 | |
| | | | 4 | | 77 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0130 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0150 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0130 | 1 | F77 | 73 | Ground | Not existed |
| | | | 69 | | |
| P0150 | | | 2 | | |
| | 77 | | | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK INTERMITTENT INCIDENT

Perform [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to [EM-32, "Removal and Installation \(Three Way Catalyst\)"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

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P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0131, P0151 A/F SENSOR 1

DTC Logic

INFOID:000000012524355

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately low.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|---|--|---|
| P0131 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage] | • The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V. | • Harness or connectors (A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| P0151 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2. CHECK A/F SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 0 V?

YES >> Proceed to [EC-221, "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.

CAUTION:

Always drive vehicle at a safe speed.

6. Maintain the following conditions for about 20 consecutive seconds.

| | |
|----------------|----------------------------|
| ENG SPEED | 1,000 - 3,200 rpm |
| VHCL SPEED SE | More than 40 km/h (25 mph) |
| B/FUEL SCHDL | 1.5 - 9.0 msec |
| Selector lever | Suitable position |

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 1.

7. Check 1st trip DTC.

P0131, P0151 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

- YES >> Proceed to [EC-221, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524356

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage |
|-------|--------------|-----------|----------|--------|-----------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0131 | 1 | F65 | 1 | Ground | Battery voltage |
| P0151 | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0131 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0151 | 2 | F5 | 1 | | | |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0131 | 1 | F65 | 3 | F77 | 73 | Existed |
| | | | 4 | | 69 | |
| P0151 | 2 | F5 | 3 | | 81 | |
| | | | 4 | | 77 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

P0131, P0151 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0131 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0151 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0131 | 1 | F77 | 73 | Ground | Not existed |
| | | | 69 | | |
| P0151 | 2 | | 81 | | |
| | | | 77 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK INTERMITTENT INCIDENT

Perform [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to [EM-32. "Removal and Installation \(Three Way Catalyst\)"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0132, P0152 A/F SENSOR 1

DTC Logic

INFOID:000000012524357

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|--|--|--|
| P0132 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage] | • The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V. | <ul style="list-style-type: none"> • Harness or connectors (A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| P0152 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2. CHECK A/F SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 5V?

YES >> Proceed to [EC-224, "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.

CAUTION:

Always drive vehicle at a safe speed.

6. Maintain the following conditions for about 20 consecutive seconds.

| | |
|----------------|----------------------------|
| ENG SPEED | 1,000 - 3,200 rpm |
| VHCL SPEED SE | More than 40 km/h (25 mph) |
| B/FUEL SCHDL | 1.5 - 9.0 msec |
| Selector lever | Suitable position |

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.
- If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 1.

7. Check 1st trip DTC.

P0132, P0152 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

- YES >> Proceed to [EC-224, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524358

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage |
|-------|--------------|-----------|----------|--------|-----------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0132 | 1 | F65 | 1 | Ground | Battery voltage |
| P0152 | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0132 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0152 | 2 | F5 | 1 | | | |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0132 | 1 | F65 | 3 | F77 | 73 | Existed |
| | | | 4 | | 69 | |
| P0152 | 2 | F5 | 3 | | 81 | |
| | | | 4 | | 77 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0132 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0152 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0132 | 1 | F77 | 73 | Ground | Not existed |
| | | | 69 | | |
| P0152 | | | 2 | | |
| | 77 | | | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK INTERMITTENT INCIDENT

Perform [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to [EM-32, "Removal and Installation \(Three Way Catalyst\)"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

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P0137, P0157 HO2S2

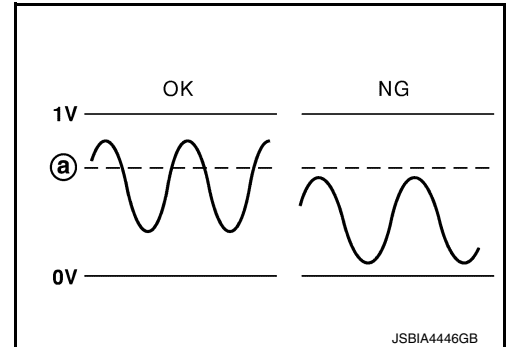
DTC Logic

INFOID:000000012524359

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.

Ⓐ : 0.70 V



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0137 | HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit low voltage] | The maximum voltage from the sensor does not reach the specified voltage. | <ul style="list-style-type: none"> • Harness or connectors (Heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks |
| P0157 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit low voltage] | | |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

- YES >> GO TO 2.
- NO >> GO TO 5.

2.PRECONDITIONING

If DTC confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

Ⓔ With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode of “ENGINE using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).

< DTC/CIRCUIT DIAGNOSIS >

If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).

9. Open engine hood.
10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode of "ENGINE using CONSULT."
11. Start engine and follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

- YES >> INSPECTION END
- NO >> Proceed to [EC-228, "Diagnosis Procedure"](#).
- CAN NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-227, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-228, "Diagnosis Procedure"](#).

Component Function Check

INFOID:0000000012524360

1.PERFORM COMPONENT FUNCTION CHECK-1

⊗Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0137 | F77 | 57 | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.70 V at least once during this procedure. |
| P0157 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-2

Check the voltage between ECM harness connector terminals as per the following condition.

< DTC/CIRCUIT DIAGNOSIS >

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0137 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | The voltage should be above 0.70 V at least once during this procedure. |
| P0157 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-3

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0137 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be above 0.70 V at least once during this procedure. |
| P0157 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-228, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524361

1.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to [EC-253, "DTC Logic"](#).
- NO >> GO TO 2.

2.CHECK HO2S2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0137 | 1 | F13 | 4 | F77 | 59 | Existed |
| P0157 | 2 | F12 | 4 | | | |

5. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair or replace error-detected parts.

3.CHECK HO2S2 INPUT SIGNAL CIRCUIT

P0137, P0157 HO2S2

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0137 | 1 | F13 | 1 | F77 | 57 | Existed |
| P0157 | 2 | F12 | 1 | | 58 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0137 | 1 | F13 | 1 | Ground | Not existed |
| P0157 | 2 | F12 | 1 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0137 | 1 | F77 | 57 | Ground | Not existed |
| P0157 | 2 | | 58 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK HEATED OXYGEN SENSOR 2

Check the heated oxygen sensor 2. Refer to [EC-229, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 5.

5. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

Component Inspection

INFOID:0000000012524362

1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

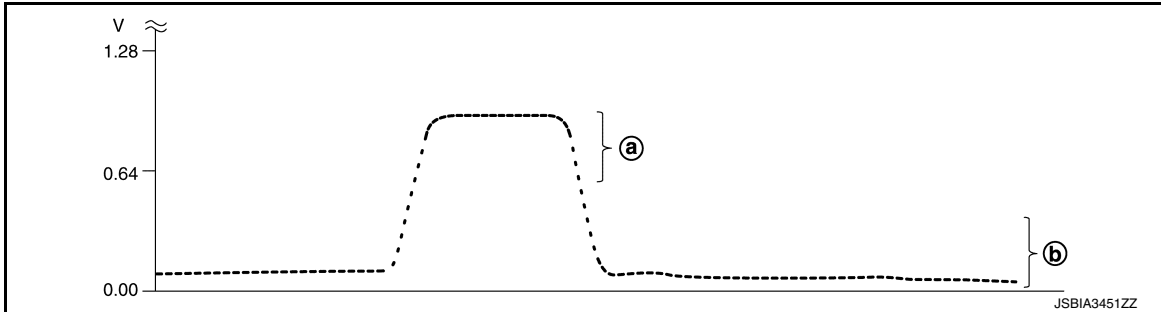
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

< DTC/CIRCUIT DIAGNOSIS >

Ⓜ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item using CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



- ⓐ : The voltage should be above 0.70 V at least on time.
- ⓑ : The voltage should be below 0.18 V at least on time.

"HO2S2 (B1)/(B2)" should be above 0.70 V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-1

Ⓧ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | Condition | Voltage | |
|-------|-----------|----------|-----------|---|---|
| | Connector | + | | | - |
| | | Terminal | | | |
| P0137 | F77 | 57 | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.70 V at least once during this procedure. |
| P0157 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-2

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0137 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | The voltage should be above 0.70 V at least once during this procedure. |
| P0157 | | 58 | | | |

A

EC

C

Is the inspection result normal?

D

YES >> INSPECTION END

NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-3

E

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0137 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be above 0.70 V at least once during this procedure. |
| P0157 | | 58 | | | |

F

G

H

Is the inspection result normal?

I

YES >> INSPECTION END

NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

J

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

K

L

>> INSPECTION END

M

N

O

P

P0138, P0158 HO2S2

DTC Logic

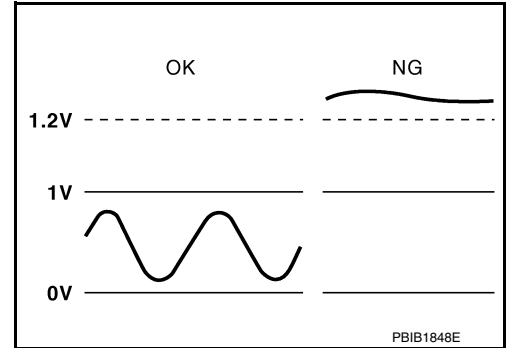
INFOID:000000012524363

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time.

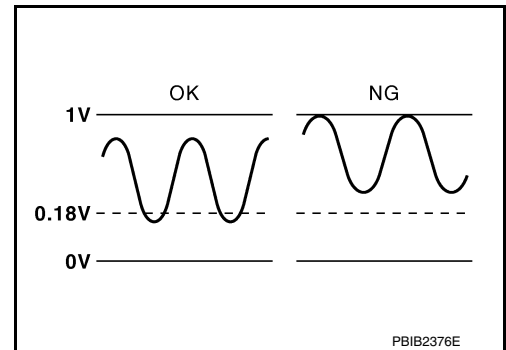
MALFUNCTION A

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|--|-------------------------|--|---|
| P0138 | HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit high voltage] | A) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (Heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 |
| | | B) | The minimum voltage from the sensor is not reached to the specified voltage. | <ul style="list-style-type: none"> • Harness or connectors (Heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector |
| P0158 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit high voltage] | A) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (Heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 |
| | | B) | The minimum voltage from the sensor is not reached to the specified voltage. | <ul style="list-style-type: none"> • Harness or connectors (Heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

< DTC/CIRCUIT DIAGNOSIS >

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 2 minutes.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-235, "Diagnosis Procedure"](#).

NO-1 >> With CONSULT: GO TO 3.

NO-2 >> Without CONSULT: GO TO 5.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT

NOTE:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30 °C (32 to 86 °F).

1. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode of "ENGINE" using CONSULT.
11. Start engine and follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

YES >> INSPECTION END

NO >> Proceed to [EC-235, "Diagnosis Procedure"](#).

CON NOT BE DIAGNOSED>>GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Without CONSULT

Perform component function check. Refer to [EC-234, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

- YES >> INSPECTION END
- NO >> Proceed to [EC-235, "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524364

1. PERFORM COMPONENT FUNCTION CHECK-1

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0138 | F77 | 57 | 59 | Reving up to 4,000 rpm under no load at least 10 times | The voltage should be below 0.18 V at least once during this procedure. |
| P0158 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-2

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0138 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. |
| P0158 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-3

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0138 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be below 0.18 V at least once during this procedure. |
| P0158 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-235, "Diagnosis Procedure"](#).

Diagnosis Procedure

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-232, "DTC Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
- B >> GO TO 7.

2.CHECK HO2S2 CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Check connectors for water.

Water should not exist.

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair or replace error-detected parts.

3.CHECK HO2S2 GROUND CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F13 | 4 | F77 | 59 | Existed |
| P0158 | 2 | F12 | 4 | | | |

3. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace error-detected parts.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F13 | 1 | F77 | 57 | Existed |
| P0158 | 2 | F12 | 1 | | 58 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0138 | 1 | F13 | 1 | Ground | Not existed |
| P0158 | 2 | F12 | 1 | | |

< DTC/CIRCUIT DIAGNOSIS >

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0138 | 1 | F77 | 57 | Ground | Not existed |
| P0158 | 2 | | 58 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK HEATED OXYGEN SENSOR 2

Check the heated oxygen sensor 2. Refer to [EC-237, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

7.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-141, "Work Procedure"](#).

2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172 or P0175. Refer to [EC-257, "DTC Logic"](#).

NO >> GO TO 8.

8.CHECK HO2S2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F13 | 4 | F77 | 59 | Existed |
| P0158 | 2 | F12 | 4 | | | |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace error-detected parts.

9.CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F13 | 1 | F77 | 57 | Existed |
| P0158 | 2 | F12 | 1 | | 58 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0138 | 1 | F13 | 1 | Ground | Not existed |
| P0158 | 2 | F12 | 1 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0138 | 1 | F77 | 57 | Ground | Not existed |
| P0158 | 2 | | 58 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK HEATED OXYGEN SENSOR 2

Check the heated oxygen sensor 2. Refer to [EC-237, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 11.

11. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

Component Inspection

INFOID:000000012524366

1. INSPECTION START


Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

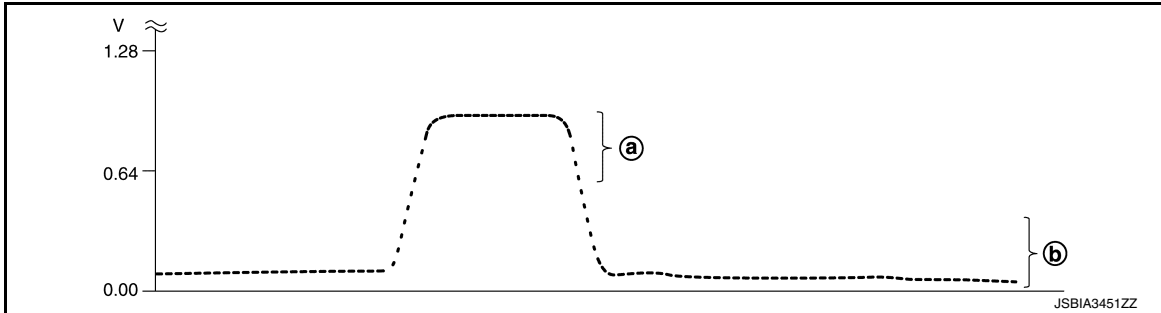
 With CONSULT

P0138, P0158 HO2S2

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item using CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



(a) : The voltage should be above 0.70 V at least on time.

(b) : The voltage should be below 0.18 V at least on time.

"HO2S2 (B1)/(B2)" should be above 0.70 V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-1

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | Connector | ECM | | Condition | Voltage |
|-------|-----------|----------|----|---|---|
| | | + | - | | |
| | | Terminal | | | |
| P0138 | F77 | 57 | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.70 V at least once during this procedure. |
| P0158 | | 58 | | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-2

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0138 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | The voltage should be above 0.70 V at least once during this procedure. |
| P0158 | | 58 | | | |

A

EC

C

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

D

5. CHECK HEATED OXYGEN SENSOR 2-3

E

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0138 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be above 0.70 V at least once during this procedure. |
| P0158 | | 58 | | | |

F

G

H

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

I

6. REPLACE HEATED OXYGEN SENSOR 2

J

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

K

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>> INSPECTION END

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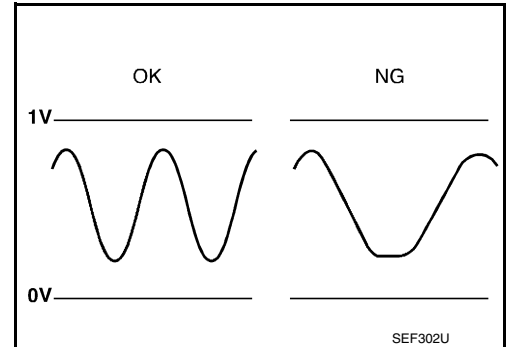
P0139, P0159 HO2S2

DTC Logic

INFOID:000000012524367

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0139 | HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit slow response] | The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM. | <ul style="list-style-type: none"> • Harness or connectors (Heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel system • EVAP system • Intake air system |
| P0159 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit slow response] | | |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

ⓐWith CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.

< DTC/CIRCUIT DIAGNOSIS >

8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed.

CAUTION:

Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.

CAUTION:

- Enable the engine brake.
- Always drive carefully.
- Never apply brake when releasing the accelerator pedal.

11. Repeat step 9 and 10 at least 8 times.
12. Check the following item of "DATA MONITOR".

| DTC | Data monitor item | Status |
|-------|-------------------|--------|
| P0139 | HO2 S2 DIAG1 (B1) | CMPLT |
| | HO2 S2 DIAG2 (B1) | |
| P0159 | HO2 S2 DIAG1 (B2) | |
| | HO2 S2 DIAG2 (B2) | |

Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 6.

NO-1: "CMPLT" is not displayed on DIAG 1>>Perform DTC confirmation procedure again.

NO-2: "CMPLT" is not displayed on DIAG 2>>GO TO 4.

4.PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode of "ENGINE" using CONSULT.
3. Start engine and follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 6.

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

6.PERFORM SELF-DIAGNOSIS

ⓂWith CONSULT

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to [EC-243. "Diagnosis Procedure"](#).

NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-242. "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-243. "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524368

1.PERFORM COMPONENT FUNCTION CHECK-1

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals as per the following condition.

Except for Mexico

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|--|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Reving up to 4,000 rpm under no load at least 10 times | A change of voltage should be more than 0.96 V for 1 second during this procedure. |
| P0159 | | 58 | | | |

For Mexico

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|--|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Reving up to 4,000 rpm under no load at least 10 times | A change of voltage should be more than 0.80 V for 1 second during this procedure. |
| P0159 | | 58 | | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-2

Check the voltage between ECM harness connector terminals as per the following condition.

Except for Mexico

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|--|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | A change of voltage should be more than 0.96 V for 1 second during this procedure. |
| P0159 | | 58 | | | |

< DTC/CIRCUIT DIAGNOSIS >

For Mexico

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|--|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | A change of voltage should be more than 0.80 V for 1 second during this procedure. |
| P0159 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-3

Check the voltage between ECM harness connector terminals as per the following condition.

Except for Mexico

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|--|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) on the suitable gear position | A change of voltage should be more than 0.96 V for 1 second during this procedure. |
| P0159 | | 58 | | | |

For Mexico

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|--|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) on the suitable gear position | A change of voltage should be more than 0.80 V for 1 second during this procedure. |
| P0159 | | 58 | | | |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-243. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524369

1.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-141. "Description"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171, P0172, P0174 or P0175. Refer to [EC-253. "DTC Logic"](#) or [EC-257. "DTC Logic"](#).
- NO >> GO TO 2.

2.CHECK HO2S2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

< DTC/CIRCUIT DIAGNOSIS >

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0139 | 1 | F13 | 4 | F77 | 59 | Existed |
| P0159 | 2 | F12 | 4 | | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0139 | 1 | F13 | 1 | F77 | 57 | Existed |
| P0159 | 2 | F12 | 1 | | 58 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0139 | 1 | F13 | 1 | Ground | Not existed |
| P0159 | 2 | F12 | 1 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0139 | 1 | F77 | 57 | Ground | Not existed |
| P0159 | 2 | | 58 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK HEATED OXYGEN SENSOR 2

Check the heated oxygen sensor 2. Refer to [EC-245, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 5.

5.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

Component Inspection

INFOID:0000000012524370

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

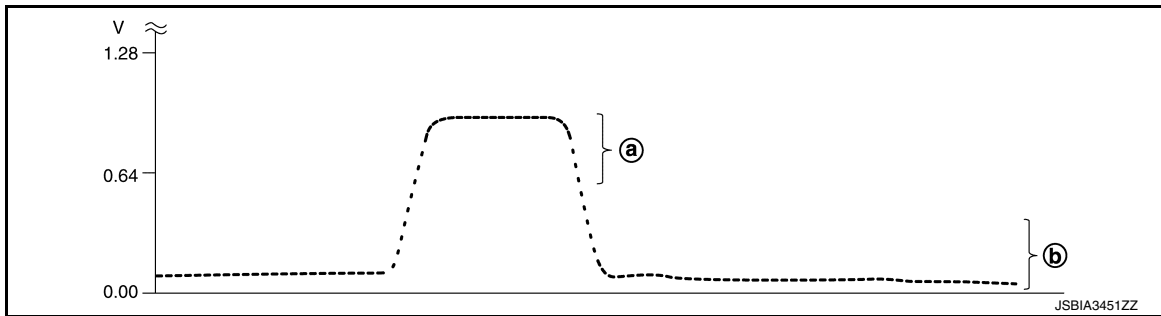
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

Ⓜ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item using CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



ⓐ : The voltage should be above 0.70 V at least on time.

ⓑ : The voltage should be below 0.18 V at least on time.

"HO2S2 (B1)/(B2)" should be above 0.70 V at least once when the "FUEL INJECTION" is +25%.

"HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is -25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-1

ⓧ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.70 V at least once during this procedure. |
| P0159 | | 58 | | | |

Is the inspection result normal?

YES >> INSPECTION END
 NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-2

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|---------------------------------------|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Keeping engine at idle for 10 minutes | The voltage should be above 0.70 V at least once during this procedure. |
| P0159 | | 58 | | | |

Is the inspection result normal?

YES >> INSPECTION END
 NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-3

Check the voltage between ECM harness connector terminals as per the following condition.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0139 | F77 | 57 | 59 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be above 0.70 V at least once during this procedure. |
| P0159 | | 58 | | | |

Is the inspection result normal?

YES >> INSPECTION END
 NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

CAUTION:

- Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new heated oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

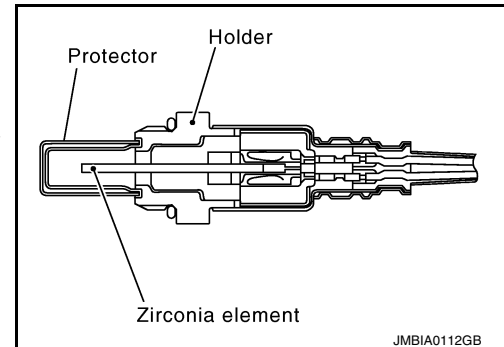
Description

INFOID:000000012524371

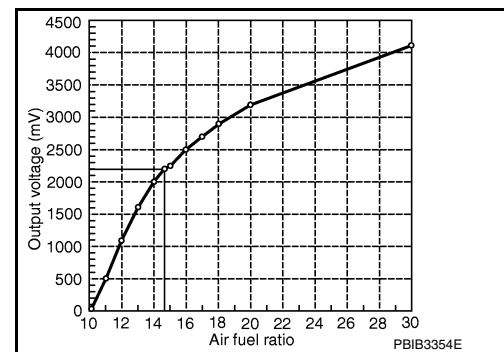
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



DTC Logic

INFOID:000000012524372

DTC DETECTION LOGIC

To judge malfunctions, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause |
|---------|---|---|--|
| P014C | Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response | <ul style="list-style-type: none"> The response time of a A/F sensor 1 signal delays more than the specified time computed by ECM. | <ul style="list-style-type: none"> Harness or connectors (The A/F sensor 1 circuit is open or shorted.) A/F sensor 1 |
| P014D | Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response | | |
| P015A | Air fuel ratio (A/F) sensor 1 (bank 2) circuit delayed response | | |
| P015B | Air fuel ratio (A/F) sensor 1 (bank 2) circuit delayed response | | |
| P014E | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P014F | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P015C | Air fuel ratio (A/F) sensor 1 (bank 2) circuit delayed response | | |
| P015D | Air fuel ratio (A/F) sensor 1 (bank 2) circuit delayed response | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓜ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
8. Fully release accelerator pedal and then let engine idle for about 1 minute.
9. Check the items status of "DATA MONITOR" as follows.

NOTE:

If "PRCNT" changed to "ABSNP", refer to [EC-217, "Component Function Check"](#).

| DTC | Data monitor item | Status |
|---|---------------------|--------|
| <ul style="list-style-type: none">• P014C• P014D• P015A• P015B | A/F SEN1 DIAG3 (B1) | PRCNT |
| <ul style="list-style-type: none">• P014E• P014F• P015C• P015D | A/F SEN1 DIAG3 (B2) | |

Is "PRCNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

Ⓜ With CONSULT

Perform DTC confirmation procedure-1 again.

Is "PRCNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> Refer to [EC-217, "Component Function Check"](#).

4.PERFORM DTC CONFIRMATION PROCEDURE-2

Ⓜ With CONSULT

1. Wait for about 20 seconds at idle.
2. Check the items status of "DATA MONITOR" as follows.

NOTE:

If "CMPLT" changed to "INCMPT", refer to [EC-217, "Component Function Check"](#).

| DTC | Data monitor item | Status |
|---|---------------------|--------|
| <ul style="list-style-type: none">• P014C• P014D• P015A• P015B | A/F SEN1 DIAG1 (B1) | CMPLT |
| | A/F SEN1 DIAG2 (B1) | |
| <ul style="list-style-type: none">• P014E• P014F• P015C• P015D | A/F SEN1 DIAG1 (B2) | |
| | A/F SEN1 DIAG2 (B2) | |

Is "CMPLT" displayed on CONSULT screen?

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- YES >> GO TO 5.
NO >> Refer to [EC-217, "Component Function Check"](#).

5.PERFORM SELF-DIAGNOSIS

With CONSULT

Check the "SELF-DIAG RESULT".

Is any DTC detected?

- YES >> Proceed to [EC-249, "Diagnosis Procedure"](#).
NO >> INSPECTION END

6.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

With GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service \$01 with GST.
3. Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.

Is the total percentage within $\pm 15\%$?

- YES >> GO TO 8.
NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

8.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
7. Fully release accelerator pedal and then let engine idle for about 1 minute.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-249, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524373

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E9. Refer to Ground Inspection in [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to [EM-30, "Removal and Installation \(Exhaust Manifold\)"](#).

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

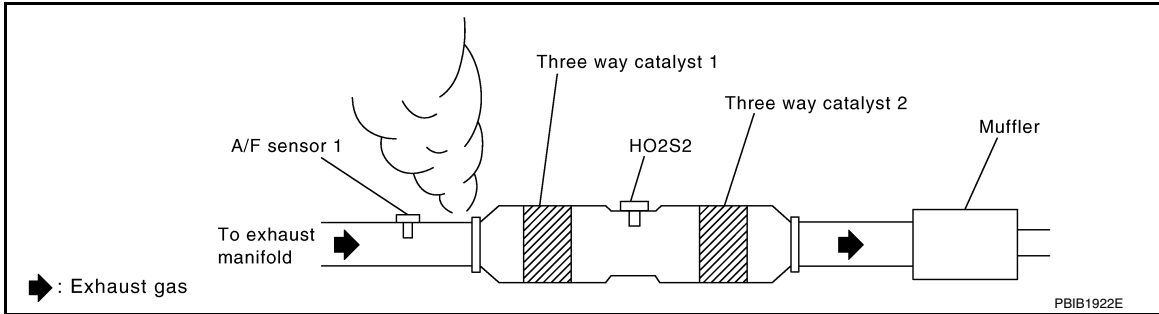
< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

>> GO TO 3.

3. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

- YES >> Repair or replace.
NO >> GO TO 4.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

- YES >> Repair or replace.
NO >> GO TO 5.

5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-141, "Work Procedure"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-253, "DTC Logic"](#) or [EC-257, "DTC Logic"](#).
NO >> GO TO 6.

6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect A/F sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | A/F sensor 1 | | | Ground | Voltage |
|---|--------------|-----------|----------|--------|-----------------|
| | Bank | Connector | Terminal | | |
| <ul style="list-style-type: none">• P014C• P014D• P015A• P015B | 1 | F65 | 1 | Ground | Battery voltage |
| <ul style="list-style-type: none">• P014E• P014F• P015C• P015D | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 8.
NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | ECM | | Continuity |
|--|--------------|-----------|----------|-----------|----------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | |
| • P014C • P014D • P015A • P015B | 1 | F65 | 3 | F77 | 73 | Existed |
| | | | 4 | | 69 | |
| • P014E • P014F • P015C • P015D | 2 | F5 | 3 | | 81 | |
| | | | 4 | | 77 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | Ground | Continuity |
|--|--------------|-----------|----------|--------|-------------|
| | Bank | Connector | Terminal | | |
| • P014C • P014D • P015A • P015B | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| • P014E • P014F • P015C • P015D | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | ECM | | | Ground | Continuity |
|--|------|-----------|----------|--------|-------------|
| | Bank | Connector | Terminal | | |
| • P014C • P014D • P015A • P015B | 1 | F77 | 73 | Ground | Not existed |
| | | | 69 | | |
| • P014E • P014F • P015C • P015D | 2 | | 81 | | |
| | | | 77 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to [EC-179, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 13.

10. CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2).

Refer to [EC-188, "Component Inspection"](#).

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning mass air flow sensor.

11. CHECK PCV VALVE

Refer to [EC-461. "Inspection"](#).

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace PCV valve.

12. CHECK INTERMITTENT INCIDENT

Perform [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace.

13. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000012524374

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator |
|--------------|--|------------------------|---------------|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector |

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0171 | FUEL SYS-LEAN-B1 [Fuel injection system too lean (bank 1)] | • Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | • Intake air leaks • A/F sensor 1 • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection |
| P0174 | FUEL SYS-LEAN-B2 [Fuel injection system too lean (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

1. Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).
2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

3. RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Proceed to [EC-254, "Diagnosis Procedure"](#).

NO >> Check exhaust and intake air leak visually.

4. PERFORM DTC CONFIRMATION PROCEDURE-2

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

- YES >> Proceed to [EC-254, "Diagnosis Procedure"](#).
- NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-3

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine.
3. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

VHCL SPEED SE

50 - 120 km/h (31 - 75 MPH)

CAUTION:

Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

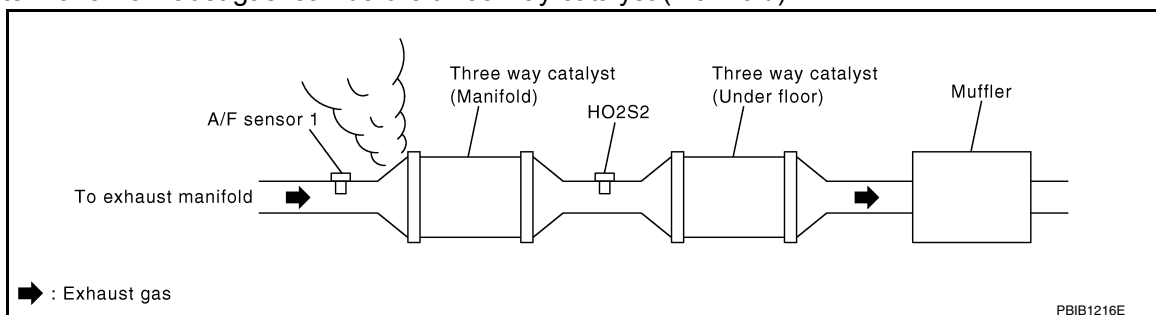
- YES >> Proceed to [EC-254, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524375

1.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

- YES >> Repair or replace error-detected parts.
- NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAK

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leak detected?

- YES >> Repair or replace error-detected parts.
- NO >> GO TO 3.

3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0171 | 1 | F65 | 3 | F77 | 73 | Existed |
| | | | 4 | | 69 | |
| P0174 | 2 | F5 | 3 | | 81 | |
| | | | 4 | | 77 | |

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0171 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0174 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P0171 | 1 | F77 | 73 | Ground | Not existed |
| | | | 69 | | |
| P0174 | 2 | | 81 | | |
| | | | 77 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK FUEL PRESSURE

Check fuel pressure. Refer to [EC-146. "Work Procedure"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to [FL-11. "Removal and Installation"](#).

NO >> Repair or replace.

6. CHECK MASS AIR FLOW SENSOR

Ⓜ With CONSULT

1. Install all removed parts.

2. Check "MASS AIR FLOW" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
For specification, refer to [EC-463. "Mass Air Flow Sensor"](#).

Ⓜ With GST

1. Install all removed parts.

2. Check mass air flow sensor signal in Service \$01 with GST.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

Is the measurement value within the specification?

YES >> GO TO 7.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to [EC-192, "Diagnosis Procedure"](#).

7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

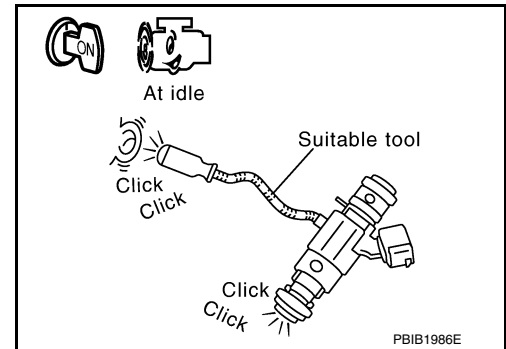
1. Start engine and let it idle.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-428, "Component Function Check"](#).



8. CHECK FUEL INJECTOR

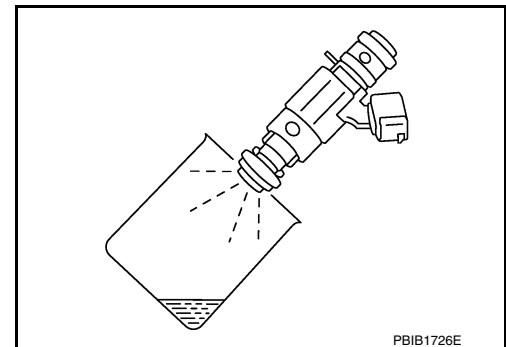
1. Turn ignition switch OFF.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Remove fuel tube assembly. Refer to [EM-45, "Removal and Installation"](#). Keep fuel hose and all fuel injectors connected to fuel tube.
5. For DTC P0171, reconnect fuel injector harness connectors on bank 1. For DTC P0174, reconnect fuel injector harness connectors on bank 2.
6. Disconnect all ignition coil harness connectors.
7. Prepare pans or saucers under each fuel injector.
8. Crank engine for about 3 seconds.
For DTC P0171, make sure that fuel sprays out from fuel injectors on bank 1.
For DTC P0174, make sure that fuel sprays out from fuel injectors on bank 2.

Fuel should be sprayed evenly for each fuel injector.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones. Refer to [EM-45, "Removal and Installation"](#).



P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000012524376

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator |
|--------------|---|------------------------|---------------|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector |

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0172 | FUEL SYS-RICH-B1 [Fuel injection system too rich (bank 1)] | <ul style="list-style-type: none">Fuel injection system does not operate properly.The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | <ul style="list-style-type: none">A/F sensor 1Fuel injectorExhaust gas leaksIncorrect fuel pressureMass air flow sensor |
| P0175 | FUEL SYS-RICH-B2 [Fuel injection system too rich (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

- Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).
- Start engine.

Is it difficult to start engine?

- YES >> GO TO 3.
NO >> GO TO 4.

3. RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:

When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine.
Do not depress accelerator pedal too much.

Does engine start?

- YES >> Proceed to [EC-258, "Diagnosis Procedure"](#).
NO >> Remove spark plugs and check for fouling, etc.

4. PERFORM DTC CONFIRMATION PROCEDURE-2

- Keep engine idle for at least 10 minutes.
- Check 1st trip DTC.

Is 1st trip DTC detected?

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Proceed to [EC-258. "Diagnosis Procedure"](#).
 NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-3

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine.
3. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

| | |
|---------------|-----------------------------|
| VHCL SPEED SE | 50 - 120 km/h (31 - 75 MPH) |
|---------------|-----------------------------|

CAUTION:

Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

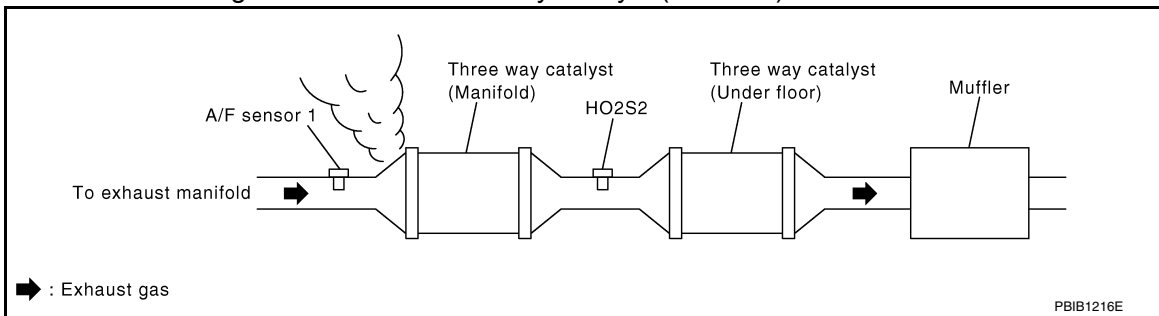
- YES >> Proceed to [EC-258. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524377

1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

- YES >> Repair or replace error-detected parts.
 NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

- YES >> Repair or replace error-detected parts.
 NO >> GO TO 3.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0172 | 1 | F65 | 3 | F77 | 73 | Existed |
| | | | 4 | | 69 | |
| P0175 | 2 | F5 | 3 | | 81 | |
| | | | 4 | | 77 | |

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | Ground | |
| | Bank | Connector | Terminal | | |
| P0172 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0175 | 2 | F5 | 3 | Ground | |
| | | | 4 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | Ground | |
| | Bank | Connector | Terminal | | |
| P0172 | 1 | F77 | 73 | Ground | Not existed |
| | | | 69 | | |
| P0175 | 2 | | 81 | | |
| | | | 77 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK FUEL PRESSURE


Check fuel pressure. Refer to [EC-146, "Work Procedure"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace "fuel filter and fuel pump assembly". Refer to [FL-11, "Removal and Installation"](#).

5.CHECK MASS AIR FLOW SENSOR

 With CONSULT

1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

 With GST


1. Install all removed parts.
2. Check mass air flow sensor signal in "Service \$01" with GST.
For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

Is the measurement value within the specification?

YES >> GO TO 6.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to [EC-192, "Diagnosis Procedure"](#).

6.CHECK FUNCTION OF FUEL INJECTOR

 With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

 Without CONSULT

1. Start engine and let it idle.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

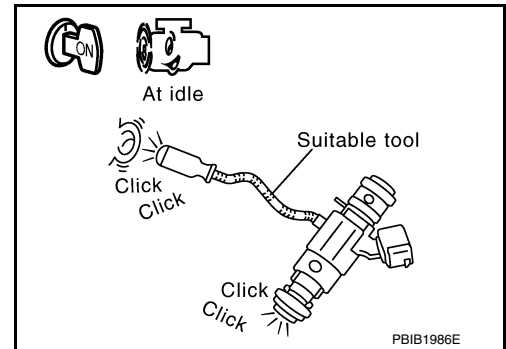
- Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-428. "Diagnosis Procedure"](#).



7. CHECK FUEL INJECTOR

- Remove fuel injector assembly. Refer to [EM-45. "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
- Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- Disconnect all fuel injector harness connectors.
- Disconnect all ignition coil harness connectors.
- Prepare pans or saucers under each fuel injector.
- Crank engine for about 3 seconds.
Make sure fuel that does not drip from fuel injector.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one. Refer to [EM-45. "Removal and Installation"](#).

P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0181 FTT SENSOR

DTC Logic

INFOID:000000012524378

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|--|--|
| P0181 | FTT SENSOR [Fuel tank temperature (FTT) sensor circuit range/performance] | A) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor. | <ul style="list-style-type: none"> • Harness or connectors (FTT sensor circuit is open or shorted) • FTT sensor |
| | | B) | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | <ul style="list-style-type: none"> • Harness or connectors (High or low resistance in the FTT sensor circuit) • FTT sensor |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 7.
- NO >> GO TO 2.

2.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-1

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
- NO >> GO TO 4.

4.CHECK ENGINE COOLANT TEMPERATURE

 With CONSULT

1. Select "COOLAN TEMP/S" in "DATA MONITOR" of "ENGINE" using CONSULT.
2. Check "COOLAN TEMP/S" value.


 With GST

Follow the procedure "With CONSULT" above.

"COOLAN TEMP/S" less than 60°C (140°F)?

- YES >> INSPECTION END
- NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-2

 With CONSULT

1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).

< DTC/CIRCUIT DIAGNOSIS >

2. Wait at least 10 seconds.
3. Check 1st trip DTC.

 With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
 NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to [EC-262, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-263, "Diagnosis Procedure"](#).

7. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-263, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Component Function Check

INFOID:000000012524379

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

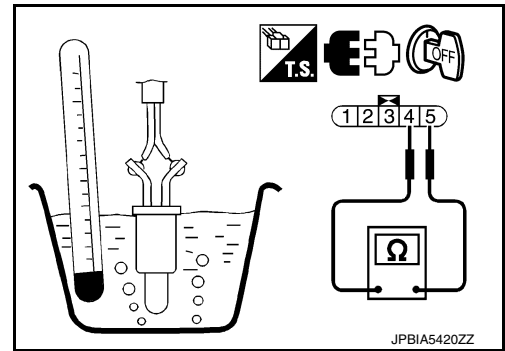
P0181 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

| Fuel level sensor unit and fuel pump | | Condition | Resistance (kΩ) |
|--------------------------------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 4 | 5 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 2.3 – 2.7 |
| | | | 0.79 – 0.90 |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Proceed to [EC-263, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524380

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-261, "DTC Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
 B >> GO TO 6.

2. CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Proceed to [MWI-54, "Component Function Check"](#).

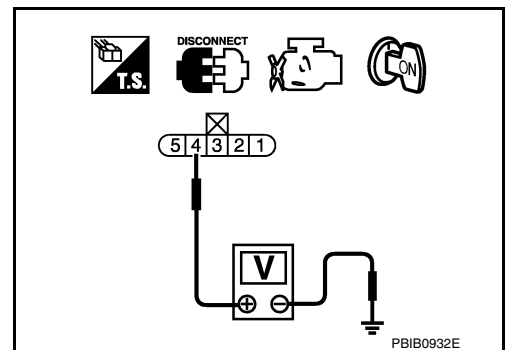
3. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER

- Turn ignition switch OFF.
- Disconnect fuel level sensor unit and fuel pump harness connector.
- Turn ignition switch ON.
- Check the voltage between fuel level sensor unit and fuel pump harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|-------------------|
| Connector | Terminal | | |
| C5 | 4 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> GO TO 4.



4. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between fuel level sensor unit and fuel pump harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C5 | 4 | E16 | 111 | Existed |

P0181 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

5. CHECK FTT SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect combination meter harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and combination meter harness connector.

| + | | - | | Continuity |
|--------------------------------------|----------|-------------------|----------|------------|
| Fuel level sensor unit and fuel pump | | Combination meter | | |
| Connector | Terminal | Connector | Terminal | |
| C5 | 5 | M24 | 24 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace error-detected parts.

6. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

Check the FTT sensor. Refer to [EC-264. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11. "Removal and Installation"](#).

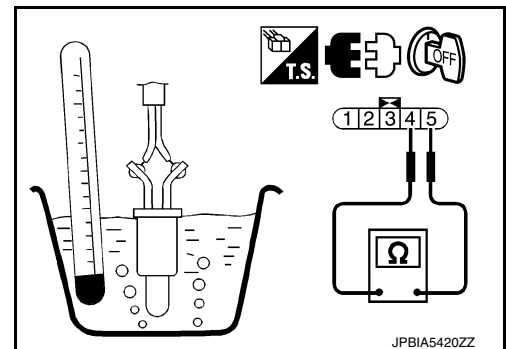
Component Inspection

INFOID:000000012524381

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11. "Removal and Installation"](#).
4. Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

| Fuel level sensor unit and fuel pump | | Condition | Resistance (kΩ) |
|--------------------------------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 4 | 5 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 2.3 – 2.7 |
| | | | 0.79 – 0.90 |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11. "Removal and Installation"](#).

P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0182, P0183 FTT SENSOR

DTC Logic

INFOID:000000012524382

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0182 | FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The FTT sensor circuit is open or shorted.) • Fuel tank temperature sensor |
| P0183 | FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-265. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524383

1. CHECK DTC WITH COMBINATION METER

Refer to [MWI-17. "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Proceed to [MWI-54. "Component Function Check"](#).

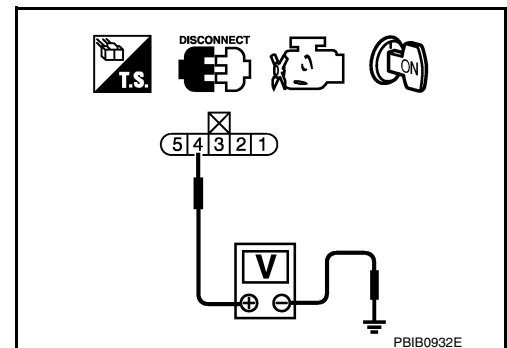
2. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel level sensor unit and fuel pump harness connector and ground.

| + | | - | Voltage (Approx.) |
|--------------------------------------|-----------|---|----------------------|
| Fuel level sensor unit and fuel pump | Connector | | |
| | Terminal | | |
| | C5 | 4 | Ground |
| | | | 5 V |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 3.



P0182, P0183 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and ECM harness connector.

| + | | - | | Continuity |
|--------------------------------------|----------|-----------|----------|------------|
| Fuel level sensor unit and fuel pump | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C5 | 4 | E16 | 111 | Existed |

4. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

4. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect combination meter harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and combination meter harness connector.

| + | | - | | Continuity |
|--------------------------------------|----------|-------------------|----------|------------|
| Fuel level sensor unit and fuel pump | | Combination meter | | |
| Connector | Terminal | Connector | Terminal | |
| C5 | 5 | M24 | 24 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

Check the FTT sensor. Refer to [EC-266, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace "fuel level sensor unit and fuel pump". Refer to [FL-11, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524384

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

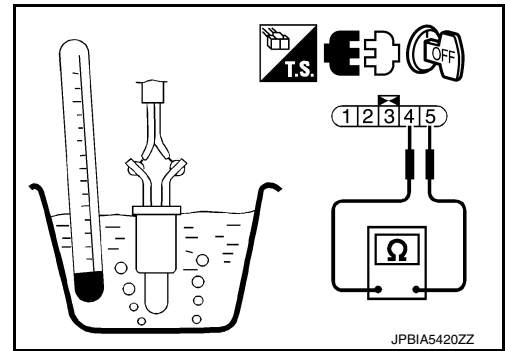
P0182, P0183 FTT SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

| Fuel level sensor unit and fuel pump | | Condition | Resistance (kΩ) |
|--------------------------------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 4 | 5 | Temperature [°C (°F)] | |
| | | 20 (68) | 2.3 – 2.7 |
| | | 50 (122) | 0.79 – 0.90 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11, "Removal and Installation"](#).

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P0222, P0223 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0222, P0223 TP SENSOR

DTC Logic

INFOID:000000012524385

DTC DETECTION LOGIC

NOTE:

If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0222 | TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit low input) | An excessively low voltage from the TP sensor 1 is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (TP sensor 1 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1) |
| P0223 | TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit high input) | An excessively high voltage from the TP sensor 1 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-268, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524386

1. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector terminals.

| Electric throttle control actuator | | | Voltage (Approx.) |
|------------------------------------|---|----------|----------------------|
| Connector | + | - | |
| | | Terminal | |
| F50 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY-2

P0222, P0223 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| Connector | Terminal | | |
| F50 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F50 | 2 | F54 | 24 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4. CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Check sensor power supply 2 circuit. Refer to [EC-446. "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
NO >> Repair or replace error-detected parts.

5. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F50 | 4 | F54 | 19 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair or replace error-detected parts.

6. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

P0222, P0223 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 123 | Ground | Existed |
| | 124 | | |
| | 127 | | |
| | 128 | | |
| F54 | 12 | | |
| | 16 | | |

Is inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> Repair or replace error-detected parts.

7. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 1 | F54 | 22 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 8.
 NO >> Repair or replace error-detected parts.

8. CHECK THROTTLE POSITION SENSOR

Check the throttle position sensor. Refer to [EC-270. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> Replace electric throttle control actuator. Refer to [EM-25. "Removal and Installation"](#).

Component Inspection

INFOID:000000012524387

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform "Throttle Valve Closed Position Learning". Refer to [EC-138. "Description"](#).
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----|----------|-----------------|-----------------|
| Connector | + | - | | |
| | | Terminal | | |
| F54 | 22 | 19 | Fully released | More than 0.36V |
| | | | Fully depressed | Less than 4.75V |
| | 23 | | Fully released | Less than 4.75V |
| | | | Fully depressed | More than 0.36V |

P0222, P0223 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to [EM-25. "Removal and Installation"](#).

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P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic

INFOID:000000012524388

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input signal to ECM | ECM function |
|----------------------------------|---------------------|-------------------------------|
| Crankshaft position sensor (POS) | Engine speed | On board diagnosis of misfire |

The misfire detection logic consists of the following two conditions.

- One Trip Detection Logic (Three Way Catalyst Damage)**
On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain illuminating.
If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
- Two Trip Detection Logic (Exhaust quality deterioration)**
For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|-----------------------------|---|
| P0300 | Multiple cylinder misfires detected | Multiple cylinders misfire. | <ul style="list-style-type: none">• Improper spark plug• Insufficient compression• Incorrect fuel pressure• The fuel injector circuit is open or shorted• Fuel injector• Intake air leak• The ignition signal circuit is open or shorted• Lack of fuel• Signal plate• A/F sensor 1• Incorrect PCV hose connection |
| P0301 | MULTI CYL MISFIRE (Multiple cylinder misfire detected) | No. 1 cylinder misfires. | |
| P0302 | CYL 1 MISFIRE (No. 1 cylinder misfire detected) | No. 2 cylinder misfires. | |
| P0303 | CYL 2 MISFIRE (No. 2 cylinder misfire detected) | No. 3 cylinder misfires. | |
| P0304 | CYL 3 MISFIRE (No. 3 cylinder misfire detected) | No. 4 cylinder misfires. | |
| P0305 | CYL 5 MISFIRE (No. 5 cylinder misfire detected) | No. 5 cylinder misfires. | |
| P0306 | CYL 6 MISFIRE (No. 6 cylinder misfire detected) | No. 6 cylinder misfires. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

1. Start engine and warm it up to normal operating temperature.

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Restart engine and let it idle for about 15 minutes.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-273. "Diagnosis Procedure"](#).

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.

Hold the accelerator pedal as steady as possible.

Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.

CAUTION:

Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

| | |
|--|--|
| Engine speed | Engine speed in the freeze frame data \pm 400 rpm |
| Vehicle speed | Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH) |
| Base fuel schedule | Base fuel schedule in the freeze frame data \times (1 \pm 0.1) |
| Engine coolant temperature (T) condition | When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F). |
| | When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F). |

Driving time varies according to the engine speed in the freeze frame data.

| Engine speed | Time |
|---------------------|---------------------------|
| Around 1,000 rpm | Approximately 10 minutes |
| Around 2,000 rpm | Approximately 5 minutes |
| More than 3,000 rpm | Approximately 3.5 minutes |

- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-273. "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524389

1.CHECK GROUND CONNECTION

Check the following.

- Connection condition of the ground F10 and F16
- Connection condition of the ground harness between the engine assembly and vehicle body (if equipped)

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace the error-detected parts.

2.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- Start the engine and run it at idle speed.
- Listen for the sound of the intake air leak.
- Check PCV hose connection.

Is intake air leak detected?

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Discover air leak location and repair.
NO >> GO TO 3.

3. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop the engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 4.
YES-2 >> Without CONSULT: GO TO 5.
NO >> Repair or replace it.

4. PERFORM POWER BALANCE TEST

With CONSULT

1. Start the engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 5.

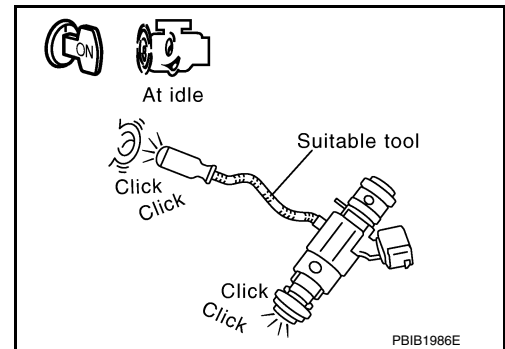
5. CHECK FUNCTION OF FUEL INJECTOR

1. Start the engine and let it idle.
2. Listen to each fuel injector operation sound.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-428. "Diagnosis Procedure"](#).



6. CHECK FUNCTION OF IGNITION COIL-1

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

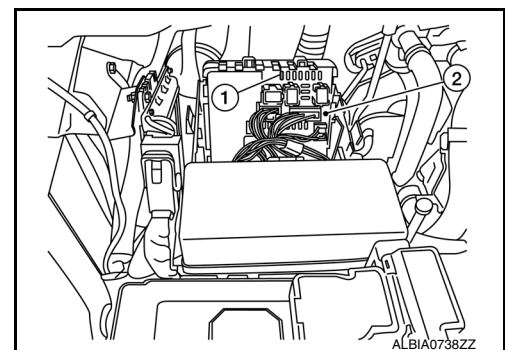
1. Turn ignition switch OFF.
2. Remove fuel pump fuse (#48) in IPDM E/R to release fuel pressure.

1. Fuel pump fuse
2. IPDM E/R

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start the engine.
4. After the engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank the engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.



P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank the engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 7.

7.CHECK FUNCTION OF IGNITION COIL-2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank the engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

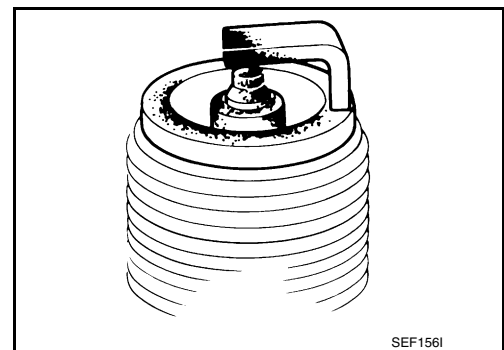
- YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to [EC-433, "Diagnosis Procedure"](#).

8.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-16, "Removal and Installation"](#).
- NO >> Repair or clean spark plug. Then GO TO 9.



9.CHECK FUNCTION OF IGNITION COIL-3

1. Reconnect the initial spark plugs.
2. Crank the engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-16, "Removal and Installation"](#).

10.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to [EM-22, "Compression Pressure"](#).

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P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 11.

NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

11. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to [EC-146. "Work Procedure"](#).
3. Install fuel pressure gauge and check fuel pressure. Refer to [EC-146. "Work Procedure"](#).

At idle: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to [FL-11. "Removal and Installation"](#).

NO >> Repair or replace.

13. CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to [EC-142. "Work Procedure"](#).

For specification, refer to [EC-463. "Idle Speed"](#) and [EC-463. "Ignition Timing"](#).

Is the inspection result normal?

YES >> GO TO 14.

NO >> Follow the [EC-142. "Work Procedure"](#).

14. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| + | | | - | | Continuity |
|--------------|-----------|----------|-----------|----------|------------|
| A/F sensor 1 | | | ECM | | |
| Bank | Connector | Terminal | Connector | Terminal | |
| 1 | F65 | 3 | F77 | 73 | Existed |
| | | 4 | | 69 | |
| 2 | F5 | 3 | | 81 | |
| | | 4 | | 77 | |

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| + | | | - | Continuity |
|--------------|-----------|----------|--------|-------------|
| A/F sensor 1 | | | | |
| Bank | Connector | Terminal | | |
| 1 | F65 | 3 | Ground | Not existed |
| | | 4 | | |
| 2 | F5 | 3 | | |
| | | 4 | | |

| + | | | - | Continuity |
|------|-----------|----------|--------|-------------|
| ECM | | | | |
| Bank | Connector | Terminal | | |
| 1 | F77 | 73 | Ground | Not existed |
| | | 69 | | |
| 81 | | | | |
| 77 | | | | |
| 2 | | | | |

A
EC

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

15.CHECK A/F SENSOR 1 HEATER

Refer to [EC-179, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace (malfunctioning) A/F sensor 1. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

16.CHECK MASS AIR FLOW SENSOR

With CONSULT

Check mass air flow sensor signal in "DATA MONITOR" mode of "ENGINE" using CONSULT. For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

With GST

Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

Is the measurement value within the specification?

YES >> GO TO 17.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-192, "Diagnosis Procedure"](#).

17.CHECK SYMPTOM TABLE

Check items on the rough idle symptom in [EC-452, "Symptom Table"](#).

Is the inspection result normal?

YES >> GO TO 18.

NO >> Repair or replace error-detected parts.

18.ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests.

With CONSULT: Refer to [EC-68, "CONSULT Function"](#).

Without CONSULT: Refer to [EC-65, "On Board Diagnosis Function"](#).

>> GO TO 19.

19.CHECK INTERMITTENT INCIDENT

Refer to [GI-43, "Intermittent Incident"](#).

>> INSPECTION END

C
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P0327, P0328, P0332, P0333 KS

DTC Logic

INFOID:000000012524390

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detected condition | Possible cause |
|---------|---|---|--|
| P0327 | KNOCK SEN/CIRC-B1 (Knock sensor (bank 1) circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (Knock sensor circuit is open or shorted.) • Knock sensor |
| P0328 | KNOCK SEN/CIRC-B1 (Knock sensor (bank 1) circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |
| P0332 | KNOCK SEN/CIRC-B2 (Knock sensor (bank 2) circuit low input) | An excessively low voltage from the sensor is sent to ECM. | |
| P0333 | KNOCK SEN/CIRC-B2 (Knock sensor (bank 2) circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-278. "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524391

1. CHECK KNOCK SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check the continuity between knock sensor harness connector and ground.

| DTC | + | | | - | Continuity |
|--------------|--------------|-----------|----------|--------|------------|
| | Knock sensor | | | | |
| | Bank | Connector | Terminal | | |
| P0327, P0328 | 1 | F213 | 2 | Ground | Existed |
| P0332, P0333 | 2 | F214 | 2 | | |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 2.

P0327, P0328, P0332, P0333 KS

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Repair or replace error-detected parts.

2.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|--------------|--------------|-----------|----------|-----------|----------|------------|
| | Knock sensor | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0327, P0328 | 1 | F213 | 1 | F77 | 85 | Existed |
| P0332, P0333 | 2 | F214 | 1 | | 86 | |

3. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK KNOCK SENSOR

Check the knock sensor. Refer to [EC-279. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace knock sensor. Refer to [EM-105. "Exploded View"](#).

Component Inspection

INFOID:000000012524392

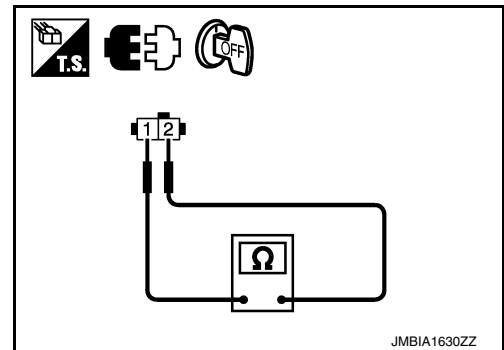
1.CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as per the following.

NOTE:

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

| Knock sensor | | Resistance |
|--------------|---|---------------------------------------|
| + | - | |
| Terminals | | |
| 1 | 2 | Approx. 532 - 588 kΩ [at 20°C (68°F)] |



CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace knock sensor. Refer to [EM-105. "Exploded View"](#).

P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0335 CKP SENSOR (POS)

DTC Logic

INFOID:000000012524393

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0335 | CKP SEN/CIRCUIT [Crankshaft position sensor (POS) circuit] | <ul style="list-style-type: none"> The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. The crankshaft position sensor (POS) signal is not in the normal pattern during engine running. | <ul style="list-style-type: none"> Harness or connectors [CKP sensor (POS) circuit is open or shorted.] Crankshaft position sensor (POS) Signal plate |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 5 seconds.
If engine does not start, crank engine for at least 2 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-280, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524394

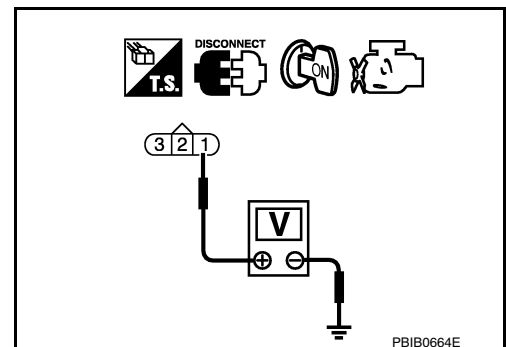
1. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY

- Disconnect crankshaft position (CKP) sensor (POS) harness connector.
- Turn ignition switch ON.
- Check the voltage between CKP sensor (POS) harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| Connector | Terminal | | |
| F17 | 1 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.



P0335 CKP SENSOR (POS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK CKP SENSOR (POS) POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between CKP sensor (POS) harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|------------------|----------|-----------|----------|------------|
| CKP sensor (POS) | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F17 | 1 | E119 | 4 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3. CHECK CKP SENSOR (POS) GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between CKP sensor (POS) harness connector and ground.

| + | | - | Continuity |
|------------------|----------|--------|------------|
| CKP sensor (POS) | | | |
| Connector | Terminal | | |
| F17 | 3 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------|----------|-----------|----------|------------|
| CKP sensor (POS) | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F17 | 2 | F77 | 89 | Existed |

3. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK CRANKSHAFT POSITION SENSOR (POS)

Check the crankshaft position sensor (POS). Refer to [EC-282, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace crankshaft position sensor (POS). Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

6. CHECK GEAR TOOTH

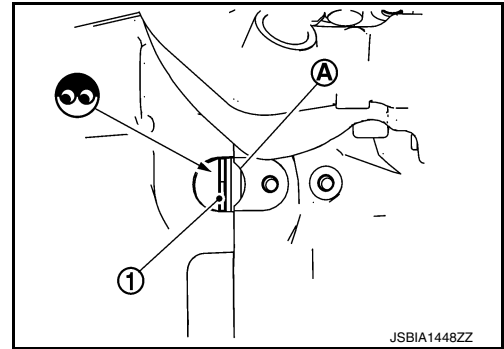
1. Remove crankshaft position sensor (POS). Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

P0335 CKP SENSOR (POS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Look into the mounting hole (A) of the crankshaft position sensor (POS) to check that there is no missing gear tooth in the signal plate (1).



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Replace the signal plate. Refer to [EM-105, "Exploded View"](#).

Component Inspection

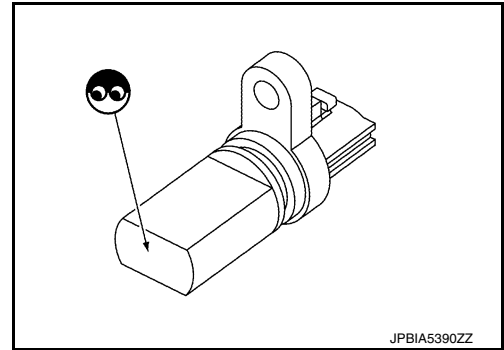
INFOID:000000012524395

1. CHECK CRANKSHAFT POSITION SENSOR (POS)-1

- Turn ignition switch OFF.
- Loosen the fixing bolt of the sensor.
- Disconnect crankshaft position sensor (POS) harness connector.
- Remove the sensor.
- Visually check the sensor for chipping.

Is the inspection result normal?

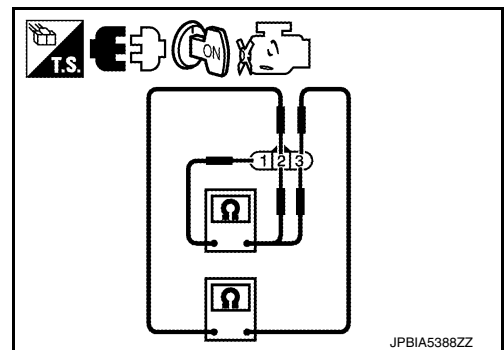
- YES >> GO TO 2.
 NO >> Replace crankshaft position sensor (POS). Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).



2. CHECK CRANKSHAFT POSITION SENSOR (POS)-2

Check the resistance between crankshaft position sensor (POS) terminals as per the following.

| Crankshaft position sensor (POS) | | Resistance [at 25°C (77°F)] |
|----------------------------------|---|-----------------------------|
| + | - | |
| Terminal (Polarity) | | Except 0 or ∞ Ω |
| 1 | 2 | |
| | 3 | |
| 2 | 3 | |



Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Replace crankshaft position sensor (POS). Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

P0340, P0345 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0340, P0345 CMP SENSOR (PHASE)

DTC Logic

INFOID:0000000012524396

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0340 | CMP SEN/CIRC-B1 [Camshaft position sensor (PHASE) (bank 1) circuit] | <ul style="list-style-type: none">The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.The cylinder No. signal is not sent to ECM during engine running.The cylinder No. signal is not in the normal pattern during engine running. | <ul style="list-style-type: none">Harness or connectors [CMP sensor (PHASE) circuit is open or shorted.]CMP sensor (PHASE)Camshaft (INT)Starter motorStarting system circuitDead (Weak) battery |
| P0345 | CMP SEN/CIRC-B2 [Camshaft position sensor (PHASE) (bank 2) circuit] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

- Start engine and let it idle for at least 5 seconds.
If engine does not start, crank engine for at least 2 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-283. "Diagnosis Procedure"](#).
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

- Maintaining engine speed at more than 800 rpm for at least 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-283. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524397

1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

- YES >> GO TO 2.
NO >> Check starting system. (Refer to [EC-129. "Work Flow"](#).)

2. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY

- Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
- Turn ignition switch ON.

P0340, P0345 CMP SENSOR (PHASE)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check the voltage between CMP sensor (PHASE) harness connector and ground.

| DTC | + | | | - | Voltage (Approx.) |
|-------|--------------------|-----------|----------|--------|----------------------|
| | CMP sensor (PHASE) | | | | |
| | Bank | Connector | Terminal | | |
| P0340 | 1 | F66 | 3 | Ground | Battery voltage |
| P0345 | 2 | F76 | 3 | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. CHECK CMP SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between CMP sensor (PHASE) harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------------|-----------|----------|-----------|----------|------------|
| | CMP sensor (PHASE) | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0340 | 1 | F66 | 3 | E119 | 4 | Existed |
| P0345 | 2 | F76 | 3 | | | |

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

4. CHECK CMP SENSOR (PHASE) GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between CMP sensor (PHASE) harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------------|-----------|----------|--------|------------|
| | CMP sensor (PHASE) | | | | |
| | Bank | Connector | Terminal | | |
| P0340 | 1 | F66 | 1 | Ground | Existed |
| P0345 | 2 | F76 | 1 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------------|-----------|----------|-----------|----------|------------|
| | CMP sensor (PHASE) | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0340 | 1 | F66 | 2 | F77 | 94 | Existed |
| P0345 | 2 | F76 | 2 | | 93 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

P0340, P0345 CMP SENSOR (PHASE)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 6.
- NO >> Repair or replace error-detected parts.

6. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to [EC-285. "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Replace malfunctioning camshaft position sensor (PHASE).

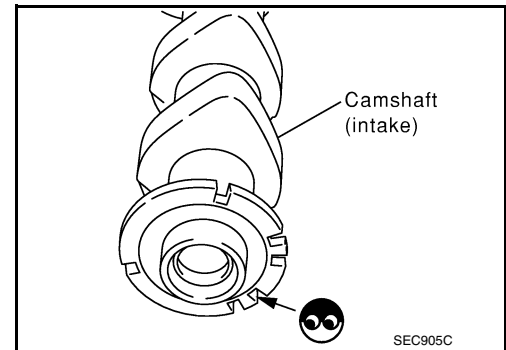
7. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft.



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INFOID:000000012524398

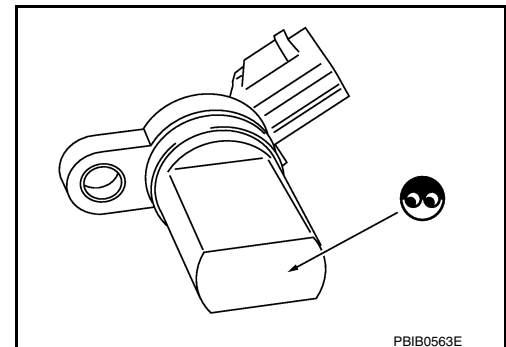
Component Inspection

1. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE)-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace CMP sensor (PHASE).

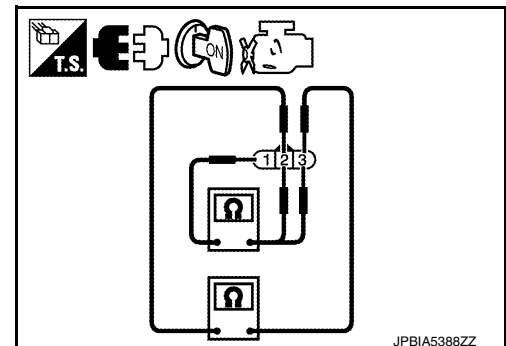


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2. CHECK CMP SENSOR (PHASE)-2

Check the resistance CMP sensor (PHASE) terminals as per the following.

| CMP sensor (PHASE) | | Resistance [Ω at 25°C (77°F)] |
|----------------------|---|---------------------------------------|
| + | - | |
| Terminals (Polarity) | | Except 0 or ∞ |
| 1 | 2 | |
| | 3 | |
| 2 | 3 | |



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Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace CMP sensor (PHASE). Refer to [EM-78. "Removal and Installation"](#).

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

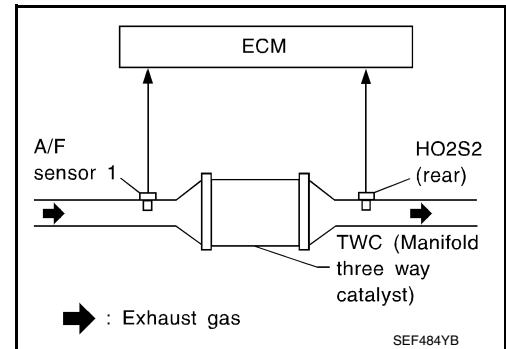
INFOID:000000012524399

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0420 | TW CATALYST SYS-B1 [Catalyst system efficiency below threshold (bank 1)] | <ul style="list-style-type: none"> • Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity. | <ul style="list-style-type: none"> • Three way catalyst (manifold) • Exhaust tube • Intake air leaks • Fuel injector • Fuel injector leaks • Spark plug • Improper ignition timing |
| P0430 | TW CATALYST SYS-B2 [Catalyst system efficiency below threshold (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 7.

2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓜ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.

P0420, P0430 THREE WAY CATALYST FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode of "ENGINE" using CONSULT.
11. Rev engine up to about 2,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of "CATALYST".

Which is displayed on CONSULT screen?

CMPLT >> GO TO 6.

INCMP >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Wait 5 seconds at idle.
2. Rev engine up to about 2,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).

Does the indication change to "CMPLT"?

YES >> GO TO 6.

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

6.PERFORM DTC CONFIRMATION PROCEDURE-3

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-288. "Diagnosis Procedure"](#).

NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-287. "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-288. "Diagnosis Procedure"](#).

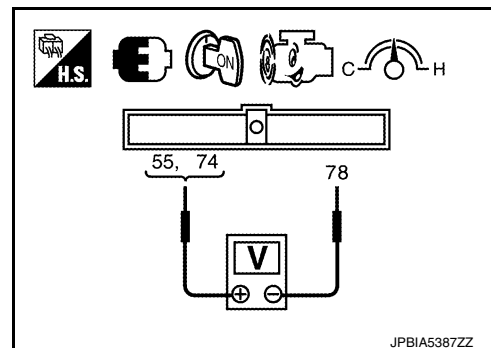
Component Function Check

INFOID:000000012524400

1.PERFORM COMPONENT FUNCTION CHECK

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Open engine hood.
6. Check the voltage between ECM harness connector terminals as per the following condition.



JPBIA5387ZZ

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0420 | F77 | 57 | 59 | Keeping engine speed at 2,500 rpm constant under no load | The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0 |
| P0430 | | 58 | | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-288, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524401

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dent.

Is the inspection result normal?

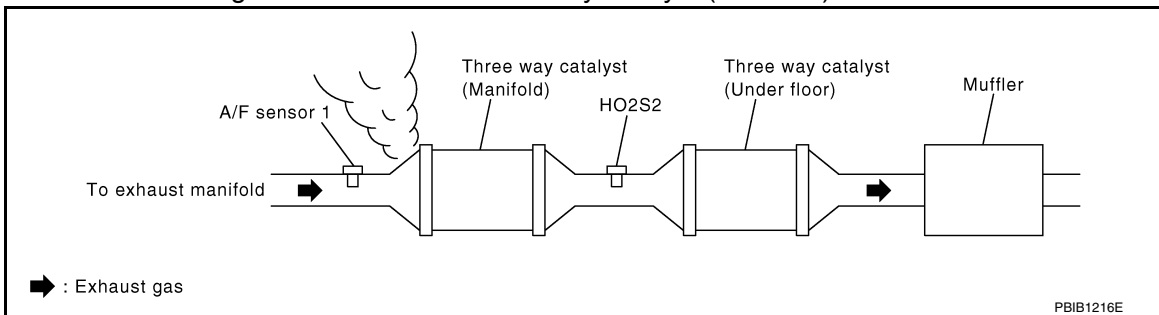
YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

2. Listen for an exhaust gas leak before the three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace error-detected parts.

NO >> GO TO 3.

3. CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace error-detected parts.

NO >> GO TO 4.

4. CHECK IGNITION TIMING AND IDLE SPEED

Check the following items. Refer to [EC-142, "Work Procedure"](#).

For specification, refer to [EC-463, "Ignition Timing"](#)

For specification, refer to [EC-463, "Idle Speed"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Follow the [EC-142, "Work Procedure"](#).

5. CHECK FUEL INJECTOR-1

Check the fuel injector. Refer to [EC-428, "Component Function Check"](#).

Is the inspection result normal?

P0420, P0430 THREE WAY CATALYST FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 6.
NO >> Perform [EC-428, "Diagnosis Procedure"](#).

6. CHECK FUNCTION OF IGNITION COIL-1

CAUTION:

Do the following procedure in the place where ventilation is good without the combustible.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (#48) in IPDM E/R to release fuel pressure.
 1. Fuel pump fuse
 2. IPDM E/R

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.

NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-2

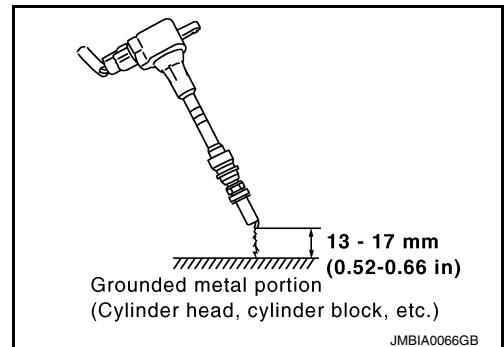
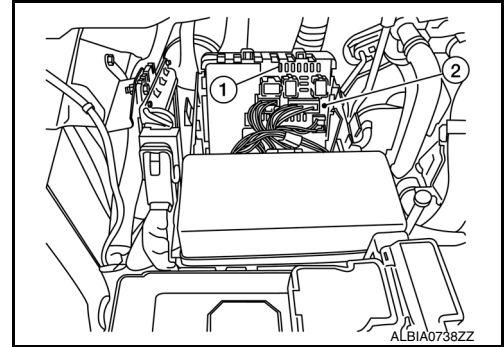
1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

- YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to [EC-433, "Diagnosis Procedure"](#).

8. CHECK SPARK PLUG



P0420, P0430 THREE WAY CATALYST FUNCTION

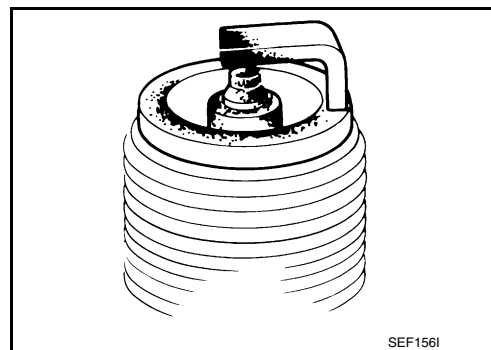
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the initial spark plug for fouling, etc. Refer to [EM-16. "Removal and Installation"](#).

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type.
- NO >> Repair or clean spark plug. Then GO TO 9



9. CHECK FUNCTION OF IGNITION COIL-3

1. Reconnect the initial spark plugs.
2. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-16. "Removal and Installation"](#).

10. CHECK FUEL INJECTOR-2

1. Turn ignition switch OFF.
2. Remove fuel injector assembly. Refer to [EM-45. "Removal and Installation"](#). Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.

Does fuel drip from fuel injector?

- YES >> GO TO 11.
- NO >> Replace the fuel injector(s) from which fuel is dripping. Refer to [EM-45. "Removal and Installation"](#).

11. CHECK INTERMITTENT INCIDENT

Refer to [GI-43. "Intermittent Incident"](#).

Is the trouble fixed?

- YES >> INSPECTION END
- NO >> Replace three way catalyst assembly. Refer to [EM-32. "Removal and Installation \(Three Way Catalyst\)"](#).

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0441 EVAP CONTROL SYSTEM

DTC Logic

INFOID:000000012524402

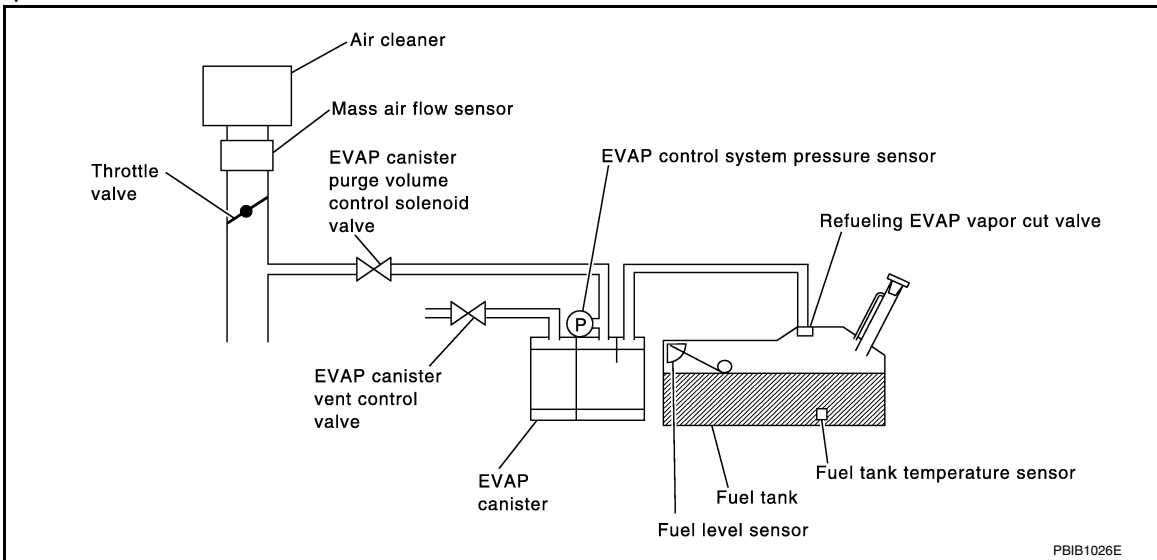
DTC DETECTION LOGIC

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0441 | EVAP PURG FLOW/MON (EVAP control system incorrect purge flow) | EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. | <ul style="list-style-type: none"> • EVAP canister purge volume control solenoid valve stuck closed • EVAP control system pressure sensor and the circuit • Loose, disconnected or improper connection of rubber tube • Blocked rubber tube • Cracked EVAP canister • EVAP canister purge volume control solenoid valve circuit • Accelerator pedal position sensor • Blocked purge port • EVAP canister vent control valve |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 6.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓟ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode of "ENGINE" using CONSULT.
7. Touch "START".

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

| Selector lever | Suitable position |
|----------------|-----------------------------|
| VHCL SPEED SE | 32 - 120 km/h (20 - 75 mph) |
| ENG SPEED | 500 - 3,000 rpm |
| B/FUEL SCHDL | 1.25 - 9.0 msec |
| COOLAN TEMP/S | More than 0°C (32°F) |

CAUTION:

Always drive vehicle at a safe speed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE-3

Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

YES >> INSPECTION END

NO >> Proceed to [EC-293, "Diagnosis Procedure"](#).

6.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-292, "Component Function Check"](#).

NOTE:

Use component function check to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-293, "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524403

1.PERFORM COMPONENT FUNCTION CHECK

ⓧ Without CONSULT

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Lift up drive wheels.
2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 70 seconds.
7. Set voltmeter probes to ECM harness connector terminals as per the following.

| ECM | | |
|-----------|----------|-----|
| Connector | + | - |
| | Terminal | |
| E16 | 102 | 112 |

8. Check EVAP control system pressure sensor value at idle speed and note it.
9. Establish and maintain the following conditions for at least 1 minute.

| | |
|-----------------------------|-----------------------------------|
| Air conditioner switch | ON |
| Headlamp switch | ON |
| Rear window defogger switch | ON |
| Engine speed | Approx. 3,000 rpm |
| Gear position | Any position other than P, N or R |

10. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 8) for at least 1 second.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-293, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524404

1. CHECK EVAP CANISTER

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

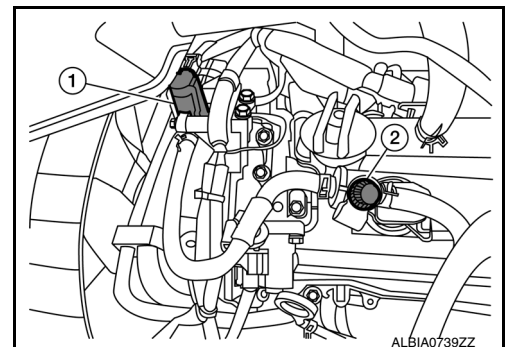
Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 2.
 YES-2 >> Without CONSULT: GO TO 3.
 NO >> Replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

2. CHECK PURGE FLOW

With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve (1) at EVAP service port (2).
2. Start engine and let it idle.
3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
4. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check vacuum existence.



| PURG VOL C/V | Vacuum |
|--------------|-------------|
| 100% | Existed |
| 0% | Not existed |

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 4.

3. CHECK PURGE FLOW

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve (1) at EVAP service port (2) and install vacuum gauge.
4. Start engine and let it idle.
Do not depress accelerator pedal even slightly.
5. Check vacuum gauge indication before 60 seconds passed after starting engine.

Vacuum should not exist.

6. Revving engine up to 2,000rpm after 100 seconds passed after starting engine.

Vacuum should exist.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK EVAP PURGE LINE

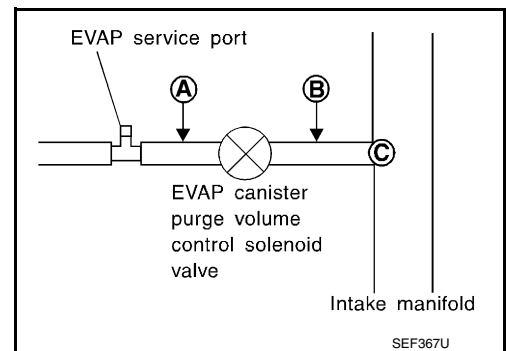
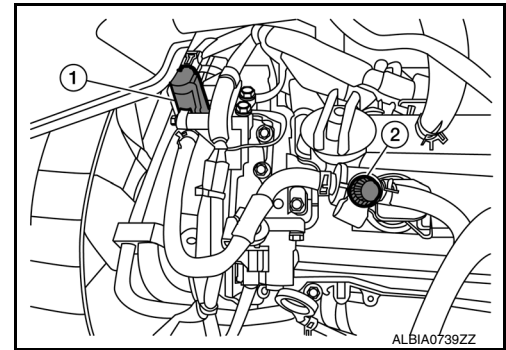
1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Diagram"](#).

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Repair it.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

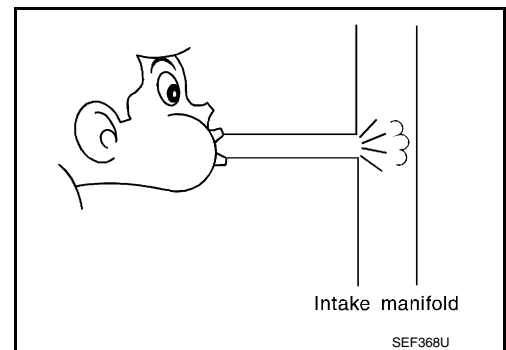
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.
2. Blow air into each hose and EVAP purge port **C**.



3. Check that air flows freely.

Is the inspection result normal?

- YES-1 >> ⊕ With CONSULT: GO TO 6.
YES-2 >> ⊗ Without CONSULT: GO TO 7.
NO >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

⊕ With CONSULT

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT. Check that engine speed varies according to the valve opening.

P0441 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Does engine speed vary according to the valve opening?

- YES >> GO TO 8.
NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-299, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25, "Exploded View"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

- YES >> GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to [EC-315, "DTC Logic"](#) for DTC P0452, [EC-318, "DTC Logic"](#) for DTC P0453.

Is the inspection result normal?

- YES >> GO TO 10.
NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

- YES >> GO TO 11.
NO >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-306, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 12.
NO >> Replace EVAP canister vent control valve. Refer to [FL-15, "Removal and Installation"](#).

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

Refer to [EC-46, "EVAPORATIVE EMISSION SYSTEM : System Diagram"](#).

Is the inspection result normal?

- YES >> GO TO 13.
NO >> Replace it.

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:000000012524405

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|--|---|
| P0443 | PURG VOLUME CONT/ V (EVAP canister purge volume control solenoid valve) | A | The canister purge flow is detected during the vehicle is stopped while the engine is running, even when EVAP canister purge volume control solenoid valve is completely closed. | <ul style="list-style-type: none">• EVAP control system pressure sensor• EVAP canister purge volume control solenoid valve (The valve is stuck open.)• EVAP canister vent control valve• EVAP canister• Hoses (Hoses are connected incorrectly or clogged.) |
| | | B | The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Perform DTC CONFIRMATION PROCEDURE when the fuel is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 60°C (41 to 140°F).
- Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.

Do you have CONSULT

- YES >> GO TO 2.
NO >> GO TO 4.

2. PERFORM DTC CONFIRMATION PROCEDURE A

Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check that the following condition are met.
FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
4. Start engine and wait at least 60 seconds.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-297, "Diagnosis Procedure"](#).
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE B

Ⓜ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode of "ENGINE" using CONSULT.
5. Touch "START".
6. Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take approximately 10 seconds.)

If "TESTING" is not displayed after 5 minutes, retry from step 2.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

7. Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT?

YES >> INSPECTION END

NO >> Proceed to [EC-297, "Diagnosis Procedure"](#).

4.PERFORM DTC CONFIRMATION PROCEDURE A

 With GST

1. Turn ignition switch ON.

2. Check the voltage between ECM harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 111 | Ground | 3.1 - 4.2 V |

3. Start engine and wait at least 60 seconds.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-297, "Diagnosis Procedure"](#).

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

 With GST

1. Start engine and warm it up to normal operating temperature.

2. Turn ignition switch OFF and wait at least 10 seconds.

3. Start engine and let it idle for at least 20 seconds.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-297, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524406

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.

2. Disconnect EVAP canister purge volume control solenoid valve harness connector.

3. Turn ignition switch ON.

4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| + | | - | Voltage (Approx.) |
|--|----------|--------|----------------------|
| EVAP canister purge volume control solenoid valve | | | |
| Connector | Terminal | | |
| F15 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect IPDM E/R harness connector.

3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 2 | E119 | 4 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 1 | F54 | 42 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to [EC-314, "Component Inspection"](#).

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.

YES-2 >> Without CONSULT: GO TO 7.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT. Check that engine speed varies according to the valve opening.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the EVAP canister purge volume control solenoid valve. Refer to [EC-299, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25, "Exploded View"](#).

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to [EC-306, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace EVAP canister vent control valve. Refer to [FL-15, "Removal and Installation"](#).

10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

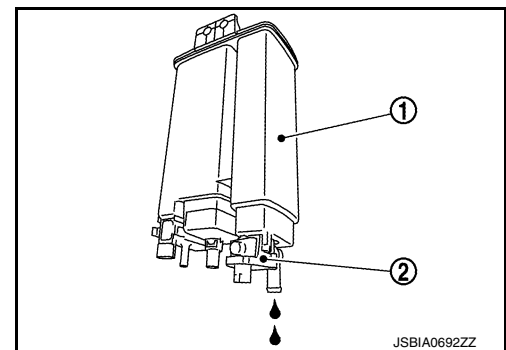
1. Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.

2. Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

YES >> GO TO 11.

NO >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524407

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Ⓜ With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Start engine.
5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.

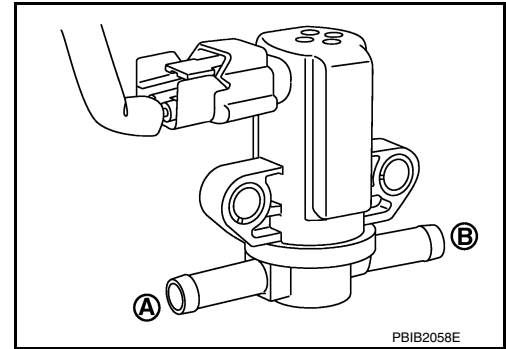
P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.

| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|---|
| 100% | Existed |
| 0% | Not existed |



⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|--|---|
| 12V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25, "Exploded View"](#).

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:000000012524408

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0444 | PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit open) | An excessively low voltage signal is sent to ECM through the valve | <ul style="list-style-type: none"> Harness or connectors (The solenoid valve circuit is open or shorted.) EVAP canister purge volume control solenoid valve |
| P0445 | PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit shorted) | An excessively high voltage signal is sent to ECM through the valve | <ul style="list-style-type: none"> Harness or connectors (The solenoid valve circuit is shorted.) EVAP canister purge volume control solenoid valve |

DTC CONFIRMATION PROCEDURE

1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 13 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-301, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524409

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY

- Turn ignition switch OFF.
- Disconnect EVAP canister purge volume control solenoid valve harness connector.
- Turn ignition switch ON.
- Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|-------------------|
| Connector | Terminal | | |
| F15 | 2 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 2 | E119 | 4 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
 NO >> Repair or replace error-detected parts.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 1 | F54 | 42 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 4.
 YES-2 >> Without CONSULT: GO TO 5.
 NO >> Repair or replace error-detected parts.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
4. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check the EVAP canister purge volume control solenoid valve. Refer to [EC-302, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25, "Exploded View"](#).

Component Inspection

INFOID:000000012524410

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.

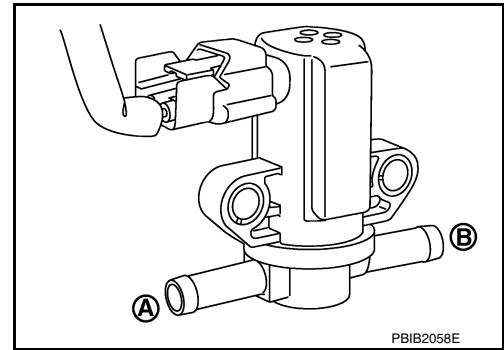
P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Start engine.
5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
6. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.

| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|---|
| 100% | Existed |
| 0% | Not existed |



⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|--|---|
| 12V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25. "Exploded View"](#).

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:000000012524411

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0447 | VENT CONTROL VALVE (EVAP canister vent control valve circuit open) | An improper voltage signal is sent to ECM through EVAP canister vent control valve. | <ul style="list-style-type: none">• Harness or connectors (EVAP canister vent control valve circuit is open or shorted.)• EVAP canister vent control valve |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-304, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524412

1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

- YES >> GO TO 2.
NO >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT

1. Turn ignition switch OFF and then turn ON.
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Touch "ON/OFF" on CONSULT screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister vent control valve harness connector.
3. Turn ignition switch ON.

P0447 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

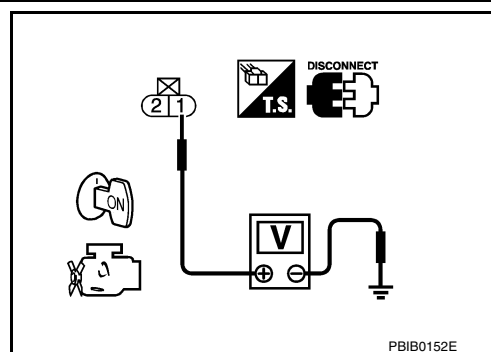
< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between EVAP canister vent control valve harness connector and ground.

| + | | - | | Voltage (Approx.) |
|-----------|----------|-----------|----------|-------------------|
| Connector | Terminal | Connector | Terminal | |
| C6 | 1 | Ground | | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 4.



4. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector.
- Check the continuity between EVAP canister vent control valve harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C6 | 1 | E119 | 3 | Existed |

- Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVAP canister vent control valve harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C6 | 2 | E16 | 106 | Existed |

- Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair or replace error-detected parts.

6. CHECK RUBBER TUBE FOR CLOGGING

- Disconnect rubber tube connected to EVAP canister vent control valve.
- Check the rubber tube for clogging.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> Clean the rubber tube using an air blower.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to [EC-306. "Component Inspection"](#).

Is the inspection result normal?

P0447 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#)

Component Inspection

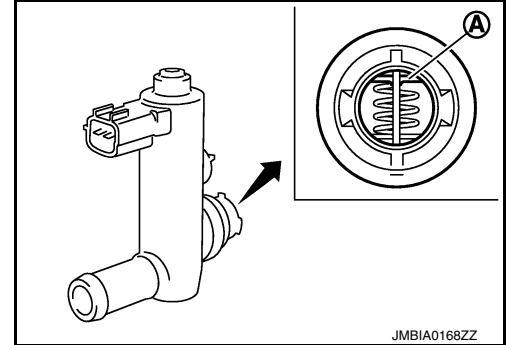
INFOID:000000012524413

1. CHECK EVAP CANISTER VENT CONTROL VALVE-1

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-15. "Removal and Installation"](#).
3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).
NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-2

With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode of "ENGINE".
4. Check air passage continuity and operation delay time.
Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time as per the following conditions.
Make sure that new O-ring is installed properly.

| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

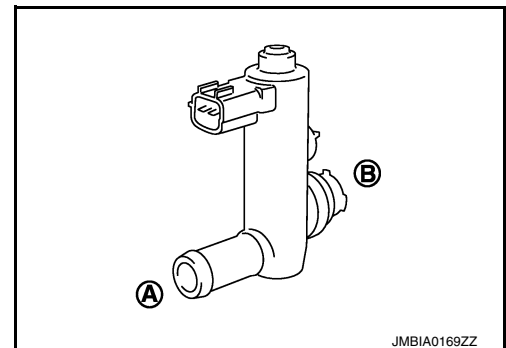
Is the inspection result normal?

- YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).

3. CHECK EVAP CANISTER VENT CONTROL VALVE-3

With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode of "ENGINE".



P0447 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

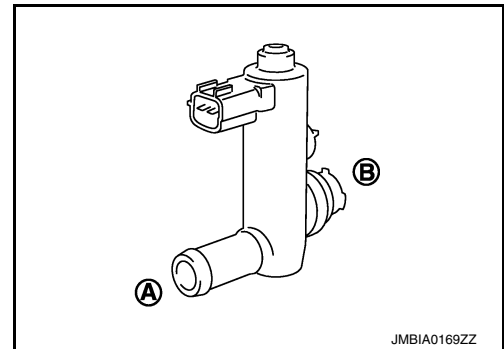
3. Check air passage continuity and operation delay time.
Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

⊗ Without CONSULT

- Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- Check air passage continuity and operation delay time as per the following conditions.
Make sure that new O-ring is installed properly.



| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).

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P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0448 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:000000012524414

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0448 | VENT CONTROL VALVE (EVAP canister vent control valve close) | EVAP canister vent control valve remains closed under specified driving conditions. | <ul style="list-style-type: none">• EVAP canister vent control valve• EVAP control system pressure sensor and the circuit• Blocked rubber tube to EVAP canister vent control valve• EVAP canister is saturated with water |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

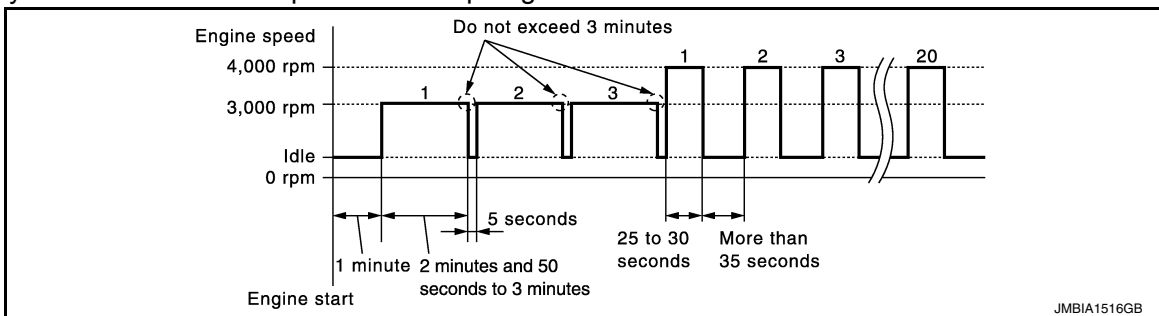
If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and let it idle for at least 1 minute.
4. Repeat next procedures five times.
 - Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes.
- Do not exceed 2 minutes.**
 - Fully released accelerator pedal and keep engine idle for about 5 seconds.
5. Repeat next procedure 27 times.
 - Quickly increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 25 to 30 seconds.
 - Fully released accelerator pedal and keep engine idle for at least 35 seconds.



6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-308. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524415

1. CHECK RUBBER TUBE

1. Turn ignition switch OFF.
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.

P0448 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Clean rubber tube using an air blower.

2.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to [EC-310. "Component Inspection"](#).

Is the inspection result normal?

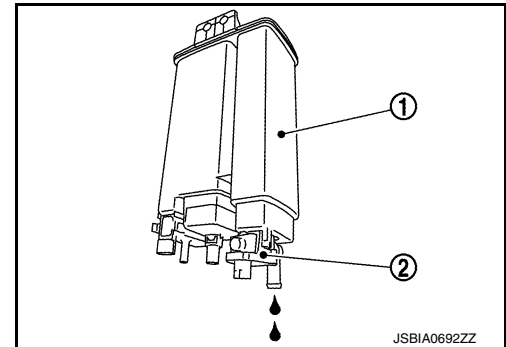
- YES >> GO TO 3.
- NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister.

Does water drain from EVAP canister?

- YES >> GO TO 4.
- NO >> GO TO 6.



4.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13. "Removal and Installation"](#).

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Replace EVAP control system pressure sensor. Refer to [FL-17. "Removal and Installation"](#).

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to [EC-314. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace EVAP control system pressure sensor. Refer to [FL-17. "Removal and Installation"](#).

P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

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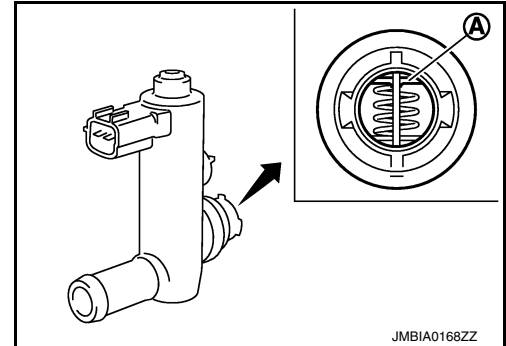
Component Inspection

1. CHECK EVAP CANISTER VENT CONTROL VALVE-1

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-15. "Removal and Installation"](#).
3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).
- NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-2

Ⓟ With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode of "ENGINE".
4. Check air passage continuity and operation delay time.
Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

ⓧ Without CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time as per the following conditions.
Make sure that new O-ring is installed properly.

| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

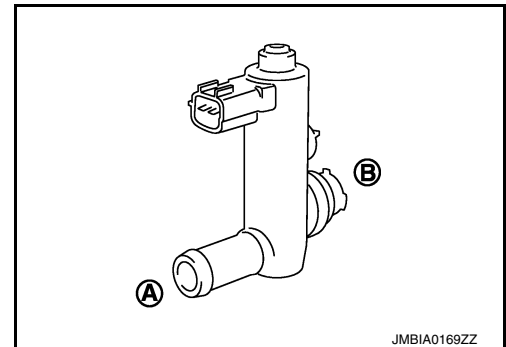
Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).

3. CHECK EVAP CANISTER VENT CONTROL VALVE-3

Ⓟ With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode of "ENGINE".



P0448 EVAP CANISTER VENT CONTROL VALVE

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

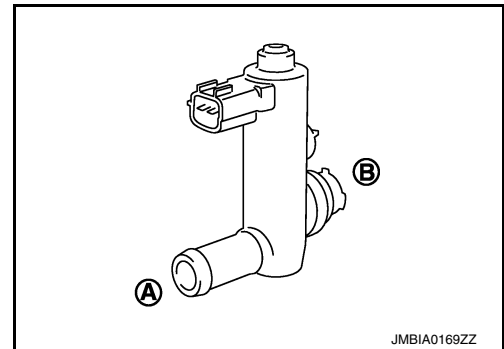
3. Check air passage continuity and operation delay time.
Make sure that new O-ring is installed properly.

| Condition VENT CONT/V | Air passage continuity between (A) and (B) |
|-----------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

⊗ Without CONSULT

- Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- Check air passage continuity and operation delay time as per the following conditions.
Make sure that new O-ring is installed properly.



| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).

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P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:000000012524417

DTC DETECTION LOGIC

NOTE:

If DTC P0451 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0451 | EVAP SYS PRES SEN (EVAP control system pressure sensor performance) | ECM detects a sloshing signal from the EVAP control system pressure sensor | <ul style="list-style-type: none">• Harness or connectors (EVAP control system pressure sensor circuit is shorted.)• EVAP control system pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and wait at least 40 seconds.

NOTE:

Do not depress accelerator pedal even slightly.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-312, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524418

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.

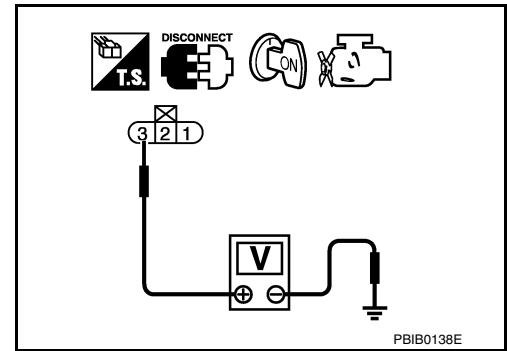
P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between EVAP control system pressure sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|-------------------------------------|----------|--------|-------------------|
| EVAP control system pressure sensor | | | |
| Connector | Terminal | | |
| C4 | 3 | Ground | 5 V |



Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 3 | E16 | 107 | Existed |

- Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 1 | E16 | 112 | Existed |

- Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR SIGNAL CIRCUIT

- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 2 | E16 | 102 | Existed |

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace error-detected parts.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to [EC-314, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524419

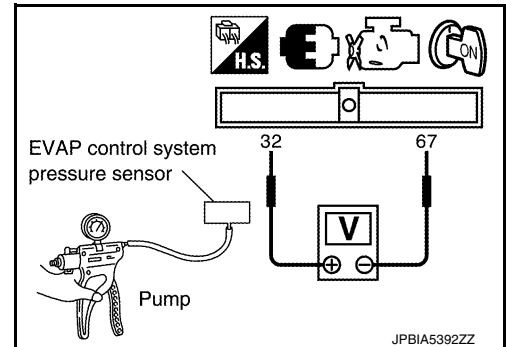
1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.

Always replace O-ring with a new one.

3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals as per the following conditions.

| Connector | ECM | | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (Approx.) |
|-----------|----------|-----|---|-------------------------------------|
| | + | - | | |
| | Terminal | | | |
| E16 | 102 | 112 | Not applied | 1.8 - 4.8 V |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 V lower than above value |



CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:000000012524420

DTC DETECTION LOGIC

NOTE:

If DTC P0451 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0452 | EVAP SYS PRES SEN (EVAP control system pressure sensor low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.)• EVAP control system pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
5. Make sure that "FUEL T/TMP SE" indication is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. Check 1st trip DTC.

Ⓜ With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals as per the following.

| Connector | ECM | | Voltage (Approx.) |
|-----------|-----|-----|----------------------|
| | + | - | |
| E16 | 111 | 128 | Less than 4.2 V |

3. Make sure that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and wait at least 20 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-316, "Diagnosis Procedure"](#).
NO >> INSPECTION END

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Diagnosis Procedure

INFOID:000000012524421

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|-------------------------------------|----------|--------|----------------------|
| EVAP control system pressure sensor | | | |
| Connector | Terminal | | |
| C4 | 3 | Ground | 5 V |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 3 | E16 | 107 | Existed |

4. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 1 | E16 | 112 | Existed |

4. Also check harness for short to power.

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair or replace error-detected parts.

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR SIGNAL CIRCUIT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 2 | E16 | 102 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace error-detected parts.

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to [EC-317. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace EVAP control system pressure sensor. Refer to [FL-17. "Removal and Installation"](#).

Component Inspection

INFOID:000000012524422

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals as per the following conditions.

| Connector | ECM | | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (Approx.) |
|-----------|-----|-----|---|-------------------------------------|
| | + | - | | |
| Terminal | | | | |
| E16 | 102 | 112 | Not applied | 1.8 - 4.8 V |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 V lower than above value |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace EVAP control system pressure sensor. Refer to [FL-17. "Removal and Installation"](#).

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:000000012524423

DTC DETECTION LOGIC

NOTE:

If DTC P0453 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0453 | EVAP SYS PRES SEN (EVAP control system pressure sensor high input) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (EVAP control system pressure sensor circuit is shorted.)• EVAP control system pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
5. Make sure that "FUEL T/TMP SE" indication is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. Check 1st trip DTC.

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals as per the following.

| Connector | ECM | | Voltage (Approx.) |
|-----------|-----|-----|----------------------|
| | + | - | |
| E16 | 111 | 128 | Less than 4.2 V |

3. Make sure that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and wait at least 20 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-319, "Diagnosis Procedure"](#).
NO >> INSPECTION END

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Diagnosis Procedure

INFOID:000000012524424

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| Connector | Terminal | | |
| C4 | 3 | Ground | 5 V |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C4 | 3 | E16 | 107 | Existed |

4. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C4 | 1 | E16 | 112 | Existed |

4. Also check harness for short to power.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair or replace error-detected parts.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR SIGNAL CIRCUIT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 2 | E16 | 102 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace error-detected parts.

6. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to [EC-306, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Replace EVAP canister vent control valve. Refer to [FL-15, "Removal and Installation"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-321, "Component Inspection"](#).

Is the inspection result normal?

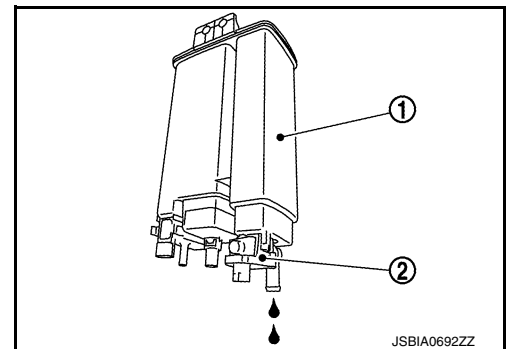
- YES >> GO TO 9.
- NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister.

Does water drain from EVAP canister?

- YES >> GO TO 10.
- NO >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524425

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals as per the following conditions.

| Connector | ECM | | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (Approx.) |
|-----------|-----|-----|---|--|
| | + | - | | |
| Terminal | | | | |
| E16 | 102 | 112 | Not applied | 1.8 - 4.8 V |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 V lower than above value |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

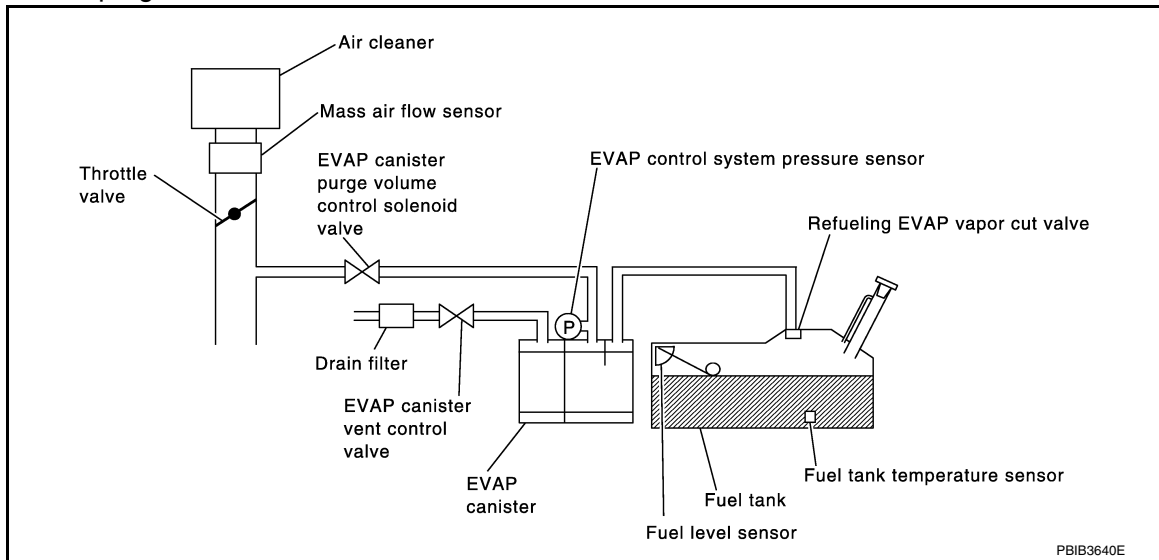
[VQ40DE]

P0455 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:000000012524426

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------------|---|--|---|
| P0455 0455 | EVAP control system gross leak detected | EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly. | <ul style="list-style-type: none"> Fuel filler cap remains open or fails to close. Incorrect fuel tank vacuum relief valve Incorrect fuel filler cap used Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line rubber tube bent. Loose or disconnected rubber tube EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit Fuel tank temperature sensor O-ring of EVAP canister vent control valve is missing or damaged. EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC Confirmation Procedure

INFOID:000000012524427

CAUTION:

Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.
- If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next step.
 1. Turn ignition switch OFF and wait at least 10 seconds.
 2. Turn ignition switch ON.
 3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 and 3/4 full and vehicle is placed on flat level surface.
- Open engine hood before conducting the following procedures.

Ⓟ WITH CONSULT

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
5. Check that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select "EVP V/S LEAK P0456/P1456" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
Follow the instructions displayed.
NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to [EC-129, "Work Flow"](#).
7. Check that "OK" is displayed.
If "NG" is displayed, select "SELF-DIAG RESULTS" mode and check that "EVAP GROSS LEAK [P0455]" is displayed. If it is displayed, refer to [EC-323, "Diagnosis Procedure"](#).

Ⓢ WITH GST

NOTE:

Be sure to read the explanation of [EC-149, "SRT Set Driving Pattern"](#) before driving vehicle.

1. Start engine.
2. Drive vehicle according to [EC-62, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).
3. Stop vehicle.
4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
5. Select Service \$07 with GST.
 - If P0455 is displayed on the screen, go to [EC-323, "Diagnosis Procedure"](#).
 - If P0441 is displayed on the screen, go to [EC-293, "Diagnosis Procedure"](#).

Diagnosis Procedure

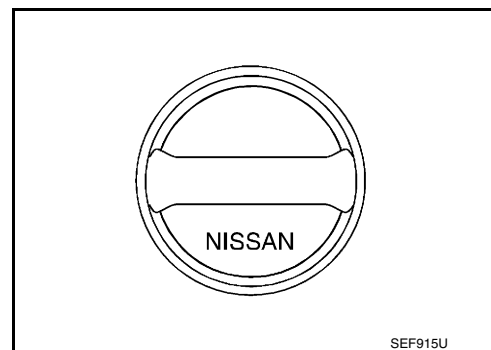
INFOID:0000000012524428

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

- OK >> GO TO 2.
- NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.

NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.

NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

OK or NG

OK >> GO TO 5.

NG >> Replace fuel filler cap with a genuine one.

5. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.

Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

OK or NG

OK >> GO TO 6.

NG >> Repair or reconnect the hose.

6. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
Refer to [FL-13. "Removal and Installation"](#).
- EVAP canister vent control valve.
Refer to [FL-13. "Component Inspection"](#).

OK or NG

OK >> GO TO 8.

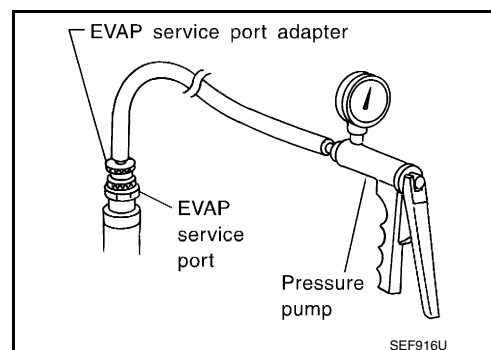
NG >> Repair or replace EVAP canister vent control valve and O-ring.

8. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.

NOTE:

Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.



P0455 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- With CONSULT>>GO TO 9.
Without CONSULT>>GO TO 10.

9. CHECK FOR EVAP LEAK

With CONSULT

1. Turn ignition switch ON.
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

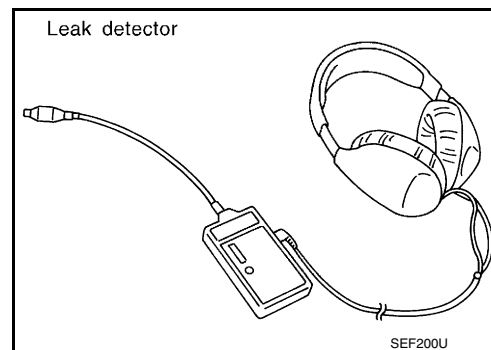
CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

OK or NG

- OK >> GO TO 11.
NG >> Repair or replace.



10. CHECK FOR EVAP LEAK

Without CONSULT

1. Turn ignition switch OFF.
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.) Refer to [EC-30. "EVAP Canister Vent Control Valve"](#).
3. Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi), then remove pump and EVAP service port adapter.

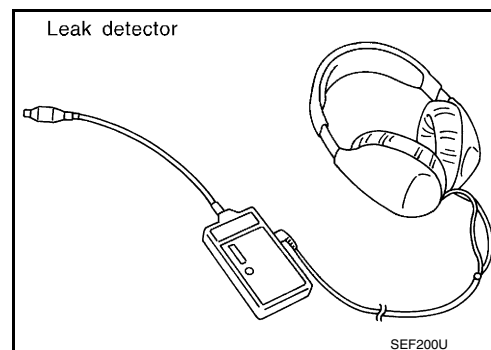
CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

OK or NG

- OK >> GO TO 12.
NG >> Repair or replace.



11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

- OK >> GO TO 14.

P0455 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NG >> GO TO 13.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

OK or NG

OK >> GO TO 15.

NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

OK or NG

OK (With CONSULT)>>GO TO 14.

OK (Without CONSULT)>>GO TO 15.

NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Ⓟ With CONSULT

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 16.

NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to [EC-302. "Component Inspection"](#).

OK or NG

OK >> GO TO 16.

NG >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25. "Exploded View"](#).

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to [EC-264. "Component Inspection"](#).

OK or NG

OK >> GO TO 17.

NG >> Replace fuel level sensor unit. Refer to [FL-11. "Removal and Installation"](#).

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to [EC-317. "Component Inspection"](#).

OK or NG

OK >> GO TO 18.

NG >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

18. CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and improper connection. For location, refer to [EC-20. "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

OK or NG

OK >> GO TO 19.

NG >> Repair or replace hoses and tubes.

P0455 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

19. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 20.

NG >> Repair or replace hose, tube or filler neck tube. Refer to [FL-6, "Removal and Installation"](#).

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-441, "Component Inspection \(Refueling EVAP vapor cut valve\)"](#).

OK or NG

OK >> GO TO 21.

NG >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

21. CHECK INTERMITTENT INCIDENT

Refer to [GI-43, "Intermittent Incident"](#).

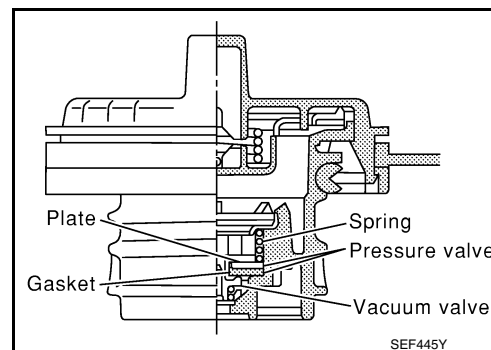
>> **INSPECTION END**

Component Inspection

INFOID:000000012524429

FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



2. Check valve opening pressure and vacuum.

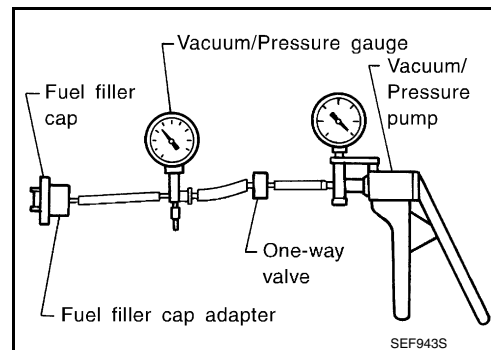
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.



P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0456 EVAP CONTROL SYSTEM

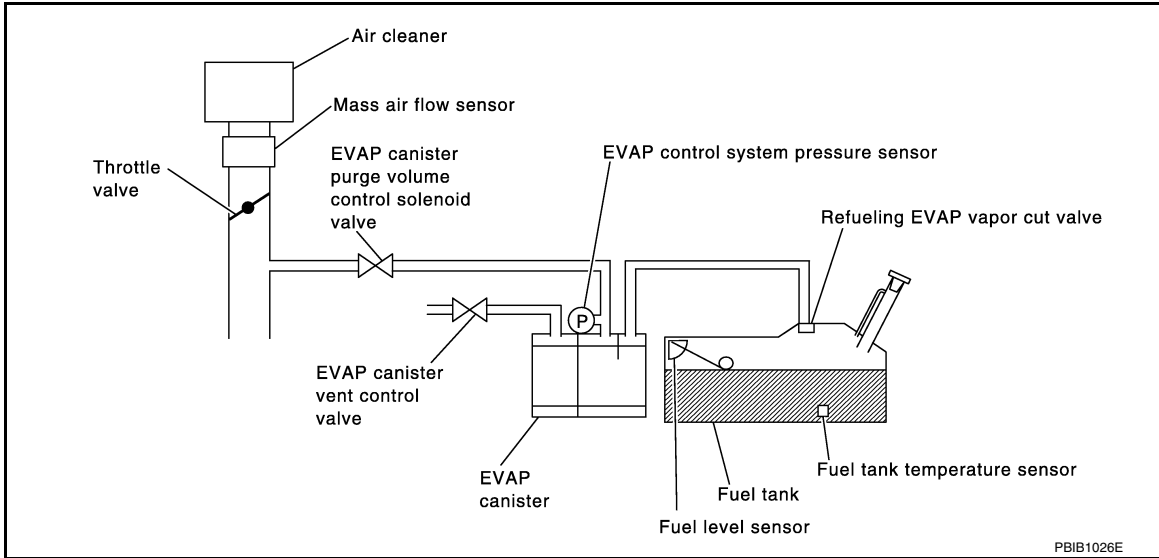
DTC Logic

INFOID:000000012524430

DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.

If ECM judges that there are no leaks, the diagnosis will be OK.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0456 | EVAP VERY SML LEAK (Evaporative emission control system leak) | <ul style="list-style-type: none"> EVAP system has a very small leak. EVAP system does not operate properly. | <ul style="list-style-type: none"> Incorrect fuel tank vacuum relief valve Incorrect fuel filler cap used Fuel filler cap remains open or fails to close. Foreign matter caught in fuel filler cap. Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. Foreign matter caught in EVAP canister vent control valve. EVAP canister or fuel tank leaks EVAP purge line (pipe and rubber tube) leaks EVAP purge line rubber tube bent Loose or disconnected rubber tube EVAP canister vent control valve and the circuit EVAP canister purge volume control solenoid valve and the circuit Fuel tank temperature sensor O-ring of EVAP canister vent control valve is missing or damaged EVAP canister is saturated with water EVAP control system pressure sensor Refueling EVAP vapor cut valve ORVR system leaks Fuel level sensor and the circuit Foreign matter caught in EVAP canister purge volume control solenoid valve |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC CONFIRMATION PROCEDURE

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

1. PRECONDITIONING


If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Do you have CONSULT?

- YES >> GO TO 2.
NO >> GO TO 4.

2. PERFORM DTC CONFIRMATION PROCEDURE

 With CONSULT

1. Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and wait at idle until "OFF" of "EVAP DIAG READY" changes to "ON".
NOTE:
It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".
3. Turn ignition switch OFF and wait at least 90 minutes.
NOTE:
Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON and select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
5. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT?

- CMPLT >> GO TO 3.
YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3. PERFORM COMPONENT FUNCTION CHECK

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-329, "Diagnosis Procedure"](#).
NO >> INSPECTION END

4. PERFORM DTC CONFIRMATION PROCEDURE

 With GST

1. Start engine and wait engine idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
NOTE:
Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-329, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524431

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

P0456 EVAP CONTROL SYSTEM

[VQ40DE]

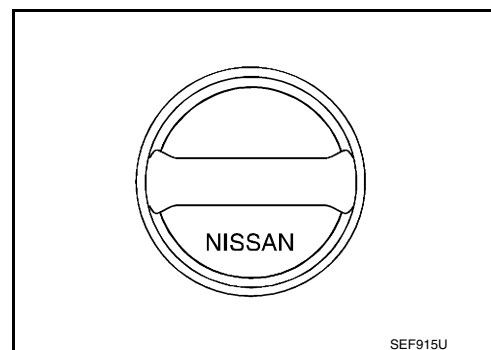
< DTC/CIRCUIT DIAGNOSIS >

2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to [EC-441, "Component Inspection \(Refueling EVAP vapor cut valve\)"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one.

5. CHECK FOR EVAP LEAK

Refer to [EC-459, "Inspection"](#).

Is there any leak in EVAP line?

YES >> Repair or replace.

NO >> GO TO 6.

6. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

• EVAP canister vent control valve is installed properly.

Refer to [FL-15, "Removal and Installation"](#).

• EVAP canister vent control valve.

Refer to [EC-306, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-15, "Removal and Installation"](#).

7. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

P0456 EVAP CONTROL SYSTEM

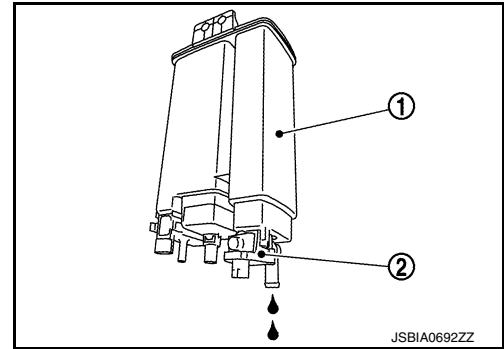
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.
2. Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

- YES >> GO TO 8.
NO-1 >> With CONSULT: GO TO 10.
NO-2 >> Without CONSULT: GO TO 11.



8. CHECK EVAP CANISTER

Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 10.
YES-2 >> Without CONSULT: GO TO 11.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

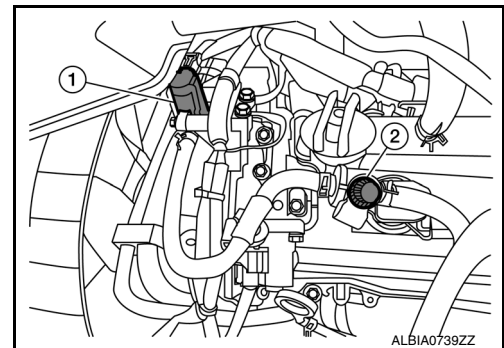
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose connected to EVAP service port (2) and EVAP canister purge volume control solenoid valve (1) from EVAP service port.
2. Start engine and let it idle.
3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode of "ENGINE".
4. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
5. Check vacuum hose for vacuum.



Vacuum should exist.

Is the inspection result normal?

- YES >> GO TO 13.
NO >> GO TO 12.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

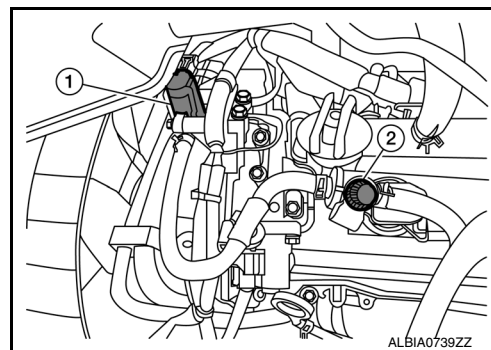
1. Start engine and warm it up to normal operating temperature.
2. Stop engine.

P0456 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Disconnect vacuum hose connected to EVAP service port (2) and EVAP canister purge volume control solenoid valve (1) from EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.



Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12.CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or reconnect the hose.

13.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check the EVAP canister purge volume control solenoid valve. Refer to [EC-299. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-25. "Exploded View"](#).

14.CHECK FUEL TANK TEMPERATURE SENSOR

Check the fuel tank temperature sensor. Refer to [EC-264. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel level sensor unit. Refer to [FL-11. "Removal and Installation"](#).

15.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to [EC-314. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-17. "Removal and Installation"](#).

16.CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or reconnect the hose.

17.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 18.

18.CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-439. "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 19.

NO >> Repair or replace hoses and tubes.

19.CHECK RECIRCULATION LINE

P0456 EVAP CONTROL SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 20.

NO >> Repair or replace hose, tube or filler tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Check the refueling EVAP vapor cut valve. Refer to [EC-441, "Component Inspection \(Refueling EVAP vapor cut valve\)"](#).

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6, "Removal and Installation"](#).

21. CHECK FUEL LEVEL SENSOR

Check the fuel level sensor. Refer to [MWI-55, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

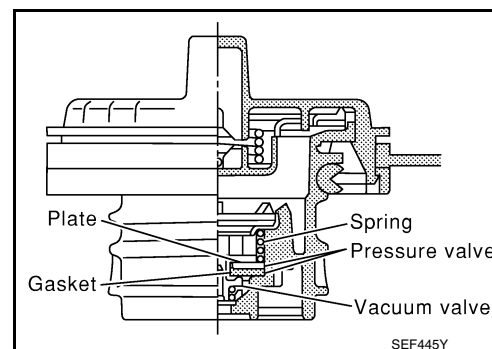
NO >> Replace fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524432

1. CHECK FUEL TANK VACUUM RELIEF VALVE

1. Turn ignition switch OFF.
2. Remove fuel filler cap.
3. Wipe clean valve housing.



4. Check valve opening pressure and vacuum.

Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

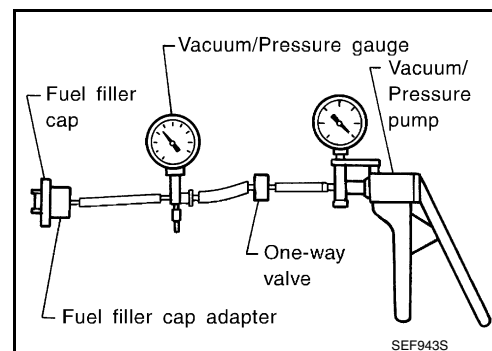
2. REPLACE FUEL FILLER CAP

Replace fuel filler cap.

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END



P0460 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0460 FUEL LEVEL SENSOR

DTC Logic

INFOID:000000012524433

DTC DETECTION LOGIC

NOTE:

- If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0460 | FUEL LEV SEN SLOSH (Fuel level sensor circuit noise) | Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait maximum of 2 consecutive minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-334, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524434

1. CHECK COMBINATION METER FUNCTION

Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Refer to [MWI-54, "Component Function Check"](#).

P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0461 FUEL LEVEL SENSOR

DTC Logic

INFOID:000000012524435

DTC DETECTION LOGIC

NOTE:

- If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

Driving long distances naturally affect fuel gauge level.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0461 | FUEL LEVEL SENSOR (Fuel level sensor circuit range/performance) | The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-335, "Component Function Check"](#).

Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-336, "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524436

1. PRECONDITIONING

WARNING:

When performing the following procedure, always observe the handling of the fuel. Refer to [FL-2, "General Precaution"](#).

TESTING CONDITION:


Before starting component function check, preparation of draining fuel and refilling fuel is required.

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 3.

2. PERFORM COMPONENT FUNCTION CHECK

 With CONSULT

NOTE:

Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to [EC-146, "Work Procedure"](#).
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
7. Check "FUEL LEVEL SE" output voltage and note it.

P0461 FUEL LEVEL SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

8. Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
9. Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check "FUEL LEVEL SE" output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check "FUEL LEVEL SE" output voltage and note it.
13. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-336, "Diagnosis Procedure"](#).

3.PERFORM COMPONENT FUNCTION CHECK

⊗Without CONSULT

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line. Refer to [EC-146, "Work Procedure"](#).
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-336, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524437

1.CHECK COMBINATION METER FUNCTION

Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Refer to [MWI-54, "Component Function Check"](#)

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0462, P0463 FUEL LEVEL SENSOR

DTC Logic

INFOID:000000012524438

DTC DETECTION LOGIC

NOTE:

- If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0462 | FUEL LEVEL SEN/ CIRC (Fuel level sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor |
| P0463 | FUEL LEVEL SEN/ CIRC (Fuel level sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-337, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524439

1. CHECK COMBINATION METER FUNCTION

Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Refer to [MWI-54, "Component Function Check"](#)

P0500 VSS

Description

INFOID:0000000012524440

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

DTC Logic

INFOID:0000000012524441

DTC DETECTION LOGIC

NOTE:

- If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0500 | VEH SPEED SEN/CIRC (Vehicle speed sensor) | At 20 km/h (13 MPH), ECM detects the following status continuously for 5 seconds or more: The difference between a vehicle speed calculated by a output speed sensor transmitted from TCM to ECM via CAN communication and the vehicle speed indicated on the combination meter exceeds 15km/h (10 MPH). | <ul style="list-style-type: none"> • Harness or connector (CAN communication line is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • Output speed sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Shift the selector lever to D range and wait at least for 2 seconds.
3. Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-338, "Diagnosis Procedure"](#)
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524442

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-48, "DTC Index"](#).

Is the inspection result normal?

- YES >> GO TO 2.

P0500 VSS

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to [BRC-44, "DTC Index"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble shooting relevant to DTC indicated.

3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-22, "DTC Index"](#).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform trouble shooting relevant to DTC indicated.

4.CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to [TM-93, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace or replace error-detected parts.

5.CHECK WHEEL SENSOR

Check wheel sensor. Refer to [BRC-77, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace or replace error-detected parts.

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P0506 ISC SYSTEM

Description

INFOID:000000012524443

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:000000012524444

DTC DETECTION LOGIC

NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0506 | ISC SYSTEM (Idle speed control system RPM lower than expected) | The idle speed is less than the target idle speed by 100 rpm or more. | <ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leak |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform [EC-139, "Description"](#), before conducting DTC Confirmation Procedure.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.
- Always perform the test at a temperature above -10°C(14°F).

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-340, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524445

1. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

P0506 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

YES >> Discover air leak location and repair.

NO >> Replace ECM. Refer to [EC-462, "Removal and Installation"](#).

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P0507 ISC SYSTEM

Description

INFOID:0000000012524446

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000012524447

DTC DETECTION LOGIC

NOTE:

If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0507 | ISC SYSTEM (Idle speed control system RPM higher than expected) | The idle speed is more than the target idle speed by 200 rpm or more. | <ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leak • PCV system |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform [EC-139, "Description"](#), before conducting DTC Confirmation Procedure.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.
- Always perform the test at a temperature above -10°C(14°F).

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-342, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524448

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

- YES >> GO TO 2.

P0507 ISC SYSTEM

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Repair or replace.

2. CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Discover air leak location and repair.

NO >> Replace ECM. Refer to [EC-462. "Removal and Installation"](#).

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P050A, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P050A, P050E COLD START CONTROL

Description

INFOID:000000012524449

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Logic

INFOID:000000012524450

DTC DETECTION LOGIC

NOTE:

If DTC P050A or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P050A | COLD START CONTROL (Cold start idle air control system performance) | ECM does not control engine idle speed properly when engine is started with pre-warming up condition. | <ul style="list-style-type: none">• Lack of intake air volume• Fuel injection system• ECM |
| P050E | COLD START CONTROL (Cold start engine exhaust temperature too low) | The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

④ With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
4. Check the indication of "COOLAN TEMP/S".

④ With GST

Follow the procedure "With CONSULT" above.

Is the value of "COOLAN TEMP/S" between 15°C (59°F) and 36°C (97°F)?

YES >> GO TO 3.

NO-1 [If it is below 15°C (59°F)]>>Warm up the engine until the value of "COOLAN TEMP/S" reaches 15°C (59°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

④ With CONSULT

1. Set the select lever in N range.
2. Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between 15°C (59°F) and 40°C (104°F) for more than 15 seconds.
3. Check 1st trip DTC.

④ With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

P050A, P050E COLD START CONTROL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Proceed to [EC-345, "Diagnosis Procedure"](#).
NO >> INSPECTION END

A

Diagnosis Procedure

INFOID:0000000012524451

1. PERFORM IDLE AIR VOLUME LEARNING

EC

Perform [EC-139, "Description"](#).

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 2.
NO >> Follow the instruction of Idle Air Volume Learning.

C

2. CHECK INTAKE SYSTEM

D

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

E

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace malfunctioning part

F

3. CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to [EC-253, "DTC Logic"](#).

G

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Proceed to [EC-254, "Diagnosis Procedure"](#) for DTC P0171, P0174.

H

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
See [EC-344, "DTC Logic"](#).

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Is the 1st trip DTC P050A or P050E displayed again?

- YES >> Replace ECM. Refer to [EC-462, "Removal and Installation"](#).
NO >> INSPECTION END

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P0550 PSP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

P0550 PSP SENSOR

DTC Logic

INFOID:000000012524452

DTC DETECTION LOGIC

NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0550 | PW ST P SEN/CIRC (Power steering pressure sensor circuit) | An excessively low or high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted)• Power steering pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-346, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524453

1. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure (PSP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between PSP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| PSP sensor | | | |
| Connector | Terminal | | |
| F46 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF
2. Disconnect ECM harness connector.
3. Check the continuity between PSP sensor harness connector and ECM harness connector.

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| PSP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F46 | 1 | F77 | 79 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3.CHECK PSP SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between PSP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| PSP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F46 | 3 | F77 | 72 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK PSP SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between PSP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| PSP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F46 | 2 | F77 | 65 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK PSP SENSOR

Refer to [EC-347, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace PSP sensor. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Component Inspection

INFOID:000000012524454

1.CHECK POWER STEERING PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and let it idle.

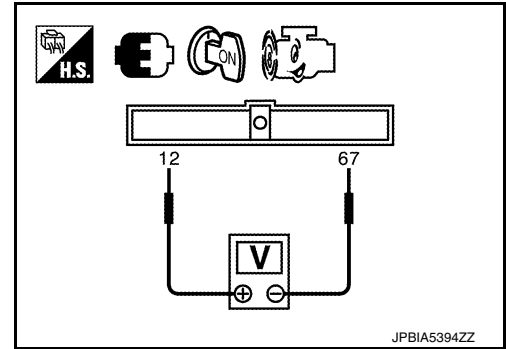
P0550 PSP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | Condition | Voltage (Approx.) | |
|-----------|----------|----|----------------|-------------------|-------------|
| Connector | + | - | | | |
| | Terminal | | | | |
| F77 | 65 | 72 | Steering wheel | Being turned | 0.5 - 4.5 V |
| | | | | Not being turned | 0.4 - 0.8 V |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace power steering pressure sensor. Refer to [EC-20. "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

P0603 ECM

Description

INFOID:0000000012524455

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.

DTC Logic

INFOID:0000000012524456

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0603 | ECM BACK UP CIRCUIT [Internal control module keep alive memory (KAM) error] | <ul style="list-style-type: none"> Malfunction in the internal back up RAM of ECM. Malfunction in the internal EEP-ROM system of ECM. | <ul style="list-style-type: none"> ECM power supply ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF and wait at least 10 seconds.
- Repeat step 1 and 2 for 10 times.
- Turn ignition switch ON.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-349, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524457

1. CHECK ECM POWER SUPPLY AND GROUND CIRCUIT

Perform trouble diagnosis for ECM power supply and ground circuit. Refer to [EC-168, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Erase DTC.
- Perform DTC confirmation procedure. Refer to [EC-349, "DTC Logic"](#).

Is the 1st trip DTC P0603 displayed again?

YES >> Replace ECM. Refer to [EC-462, "Removal and Installation"](#).

P0603 ECM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

NO >> INSPECTION END

P0604 ECM

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0604 ECM

DTC Logic

INFOID:0000000012524458

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|----------------|
| P0604 | ECM [Internal control module random access memory (RAM) error] | Malfunction in the internal RAM of ECM. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait at least 20 minutes.

CAUTION:

Never start engine during this procedure.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-351, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524459

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-351, "DTC Logic"](#).

Is the 1st trip DTC P0604 displayed again?

YES >> Replace ECM. Refer to [EC-462, "Removal and Installation"](#).

NO >> INSPECTION END

P0605 ECM

DTC Logic

INFOID:000000012524460

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|----------------|
| P0605 | ECM [Internal control module read only memory (ROM) error] | Malfunction in the internal ROM of ECM. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 20 minutes.

CAUTION:

Never start engine during this procedure.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-352. "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524461

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-352. "DTC Logic"](#).

Is the 1st trip DTC P0605 displayed again?

YES >> Replace ECM. Refer to [EC-462. "Removal and Installation"](#).

NO >> INSPECTION END

P0606 ECM

DTC Logic

INFOID:000000012524462

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|-------------------------------|----------------|
| P0606 | CONTROL MODULE (Control module processor) | Malfunction in ECM processor. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Turn ignition switch ON (engine stopped) and wait at least 10 seconds.

CAUTION:

Never start engine during this procedure.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-353. "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Start engine.
2. Rev up the engine quickly to approximately 3,000 rpm under unloaded condition and completely release the accelerator pedal.
3. Let the engine idle and wait at least 10 seconds.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-353. "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524463

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure for 3 times. Refer to [EC-353. "DTC Logic"](#).

Is the 1st trip DTC P0606 displayed again?

YES >> Replace ECM. Refer to [EC-462. "Removal and Installation"](#).

NO >> INSPECTION END

P0607 ECM

DTC Logic

INFOID:0000000012524464

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|----------------|
| P0607 | ECM (CAN communication bus) | ECM internal communication system is mal-functioning. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 10 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-354, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524465

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-354, "DTC Logic"](#).
4. Check DTC.

Is the 1st trip DTC P0607 displayed again?

- YES >> Replace ECM. Refer to [EC-462, "Removal and Installation"](#).
- NO >> INSPECTION END

P060A ECM

DTC Logic

INFOID:000000012524466

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|----------------|
| P060A | CONTROL MODULE (Internal control module monitoring processor performance) | ECM internal monitoring processor is malfunctioning. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Repeat step 1 and 2 for 5 times.
4. Turn ignition switch ON.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-355, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524467

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-355, "DTC Logic"](#).

Is the 1st trip DTC P060A displayed again?

- YES >> Replace ECM. Refer to [EC-462, "Removal and Installation"](#).
- NO >> INSPECTION END

P060B ECM

DTC Logic

INFOID:000000012524468

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|----------------|
| P060B | CONTROL MODULE (Internal control module A/ D processing performance) | ECM internal analog/digital conversion processing system is malfunctioning. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 10 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-356. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524469

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-356. "DTC Logic"](#).

Is the 1st trip DTC P060B displayed again?

- YES >> Replace ECM. Refer to [EC-462. "Removal and Installation"](#).
- NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0643 SENSOR POWER SUPPLY

Description

INFOID:0000000012524470

ECM supplies a voltage of 5 V to some of the sensors systematically divided into 2 groups, respectively. Accordingly, when a short circuit develops in a sensor power source, a malfunction may occur simultaneously in the sensors belonging to the same group as the short-circuited sensor.

SENSOR POWER SUPPLY

Sensor Power Supply 1

- Accelerator pedal position sensor (APP sensor 1)
- EVAP control system pressure sensor
- Power steering pressure sensor
- Refrigerant pressure sensor

NOTE:

If sensor power supply 1 circuit is malfunctioning, DTC P0643 is displayed.

Sensor Power Supply 2

- Accelerator pedal position sensor (APP sensor 2)
- Electric throttle control actuator

DTC Logic

INFOID:0000000012524471

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0643 | SENSOR POWER/ CIRC (Sensor power supply circuit short) | ECM detects that the voltage of power source for sensor is excessively low or high. | <ul style="list-style-type: none"> • Harness or connectors (APP sensor 1 circuit is shorted.) (PSP sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1) • EVAP control system pressure sensor • Power steering pressure sensor • Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-358, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Diagnosis Procedure

INFOID:000000012524472

1. CHECK SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| ECM | | | |
| Connector | Terminal | Ground | 5 V |
| E16 | 99 | | |
| | 107 | | |
| F77 | 79 | | |
| | 96 | | |

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 2.

2. CHECK SENSOR POWER SUPPLY ROUTING CIRCUIT FOR SHORT

1. Turn ignition switch OFF.
2. Check harness for short to power and to ground, between the following terminals.

| + | | - | | |
|-----------|----------|-------------------------------------|-----------|----------|
| ECM | | Sensor | | |
| Connector | Terminal | Name | Connector | Terminal |
| E16 | 99 | APP sensor | E20 | 2 |
| | 107 | EVAP control system pressure sensor | C4 | 3 |
| F77 | 79 | PSP sensor | F46 | 1 |
| | 96 | Refrigerant pressure sensor | E48 | 1 |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3. CHECK COMPONENTS

Check the following.

- EVAP control system pressure sensor
Refer to [EC-314, "Component Inspection"](#).
- Refrigerant pressure sensor
Refer to [EC-444, "Diagnosis Procedure"](#).
- Power steering pressure sensor
Refer to [EC-347, "Component Inspection"](#).
- Accelerator pedal position sensor
Refer to [EC-401, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning component.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P0850 PNP SWITCH

Description

INFOID:000000012524473

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM. ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:000000012524474

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0850 | P-N POS SW/CIRCUIT (Park/neutral position switch) | The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started. | <ul style="list-style-type: none"> • Harness or connectors [Park/neutral position (PNP) signal circuit is open or shorted.] • TCM |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 5.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3.CHECK PNP SIGNAL FUNCTION

 With CONSULT

1. Turn ignition switch ON.
2. Select "P/N POSI SW" in "DATA MONITOR" mode of "ENGINE" using CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

| Position (Selector lever) | Known-good signal |
|---------------------------|-------------------|
| N or P position | ON |
| Except above position | OFF |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Proceed to [EC-360, "Diagnosis Procedure"](#).

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.

CAUTION:

Always drive vehicle at a safe speed.

| | |
|----------------|----------------------------|
| ENG SPEED | 1,400 - 6,375 rpm |
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | 2.0 - 31.8 msec |
| VHCL SPEED SE | More than 64 km/h (40 mph) |
| Selector lever | Suitable position |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-360, "Diagnosis Procedure"](#).

NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-360, "Component Function Check"](#).

NOTE:

Use component function check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-360, "Diagnosis Procedure"](#).

Component Function Check

INFOID:0000000012524475

1.PERFORM COMPONENT FUNCTION CHECK

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following conditions.

| Conne- tor | ECM | | Condition | Voltage (Approx.) |
|---------------|----------|-----|----------------|----------------------|
| | + | - | | |
| | Terminal | | | |
| E16 | 118 | 128 | Selector lever | Battery voltage |
| | | | Except above | 0 V |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-360, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524476

1.CHECK DTC WITH TCM

Refer to [TM-37, "Introduction"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.

NO >> Check DTC with BCM. Refer to [BCS-16, "COMMON ITEM : CONSULT Function \(BCM - COMMON ITEM\)"](#).

3.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect ECM harness connector.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

4. Check the continuity between A/T assembly harness connector and ECM harness connector.

| + | | - | | Continuity |
|--------------|----------|-----------|----------|------------|
| A/T assembly | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F9 | 9 | E16 | 118 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Repair or replace error-detected parts.

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P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

INFOID:000000012524477

DTC DETECTION LOGIC

NOTE:

DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.

When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1148 | CLOSED LOOP-B1 [Closed loop control function (bank 1)] | The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition. | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 circuit is open or shorted.)• A/F sensor 1• A/F sensor 1 heater |
| P1168 | CLOSED LOOP-B2 [Closed loop control function (bank 2)] | The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition. | |

Diagnosis Procedure

INFOID:000000012524478

DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.

When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1. Refer to [EC-94](#), "DTC Index".

P1211 TCS CONTROL UNIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1211 TCS CONTROL UNIT

Description

INFOID:0000000012524479

The malfunction information related to TCS is transferred via the CAN communication line from “ABS actuator and electric unit (control unit)” to ECM.

Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000012524480

DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1211 | TCS/CIRC (TCS communication line) | ECM receives malfunction information from “ABS actuator and electric unit (control unit)”. | <ul style="list-style-type: none">• ABS actuator and electric unit (control unit)• TCS related parts |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-363. "Diagnosis Procedure"](#)

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524481

Perform the trouble diagnosis for TCS. Refer to [TM-62. "Work Flow"](#).

P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000012524482

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)".

Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000012524483

DTC DETECTION LOGIC

NOTE:

- If DTC P1212 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1212 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P1212 | TCS/CIRC (TCS communication line) | ECM cannot receive the information from "ABS actuator and electric unit (control unit)" continuously. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted.)• ABS actuator and electric unit (control unit)• Dead (Weak) battery |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-364, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524484

Perform the trouble diagnosis for TCS. Refer to [TM-62, "Work Flow"](#).

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:000000012524485

DTC DETECTION LOGIC

NOTE:

- If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1217 | ENG OVER TEMP [Engine over temperature (Overheat)] | <ul style="list-style-type: none">• Cooling fan does not operate properly (Overheat).• Cooling fan system does not operate properly (Overheat).• Engine coolant was not added to the system using the proper filling method.• Engine coolant is not within the specified range. | <ul style="list-style-type: none">• Harness or connectors (The cooling fan circuit is open or shorted.)• IPDM E/R• Cooling fan control module• Cooling fan motor• Radiator hose• Radiator• Radiator cap• Water pump• Thermostat |

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to [CO-12, "Changing Engine Coolant"](#). Also, replace the engine oil. Refer to [LU-9, "Changing Engine Oil"](#).

1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to [MA-17, "FOR USA AND CANADA : Engine Coolant Recommendation"](#) (For USA and Canada), [MA-19, "FOR MEXICO : Engine Coolant Mixture Ratio"](#) (For Mexico).
2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

DTC CONFIRMATION PROCEDURE

1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-365, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-366, "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524486

1. PERFORM COMPONENT FUNCTION CHECK-1

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

P1217 ENGINE OVER TEMPERATURE

[VQ40DE]

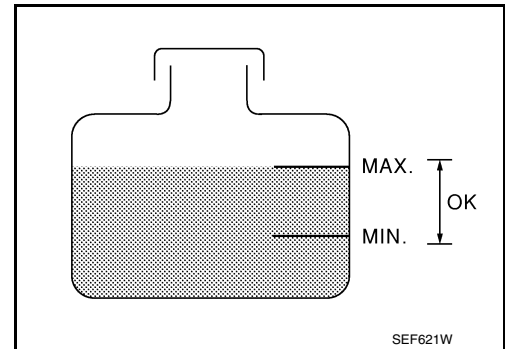
< DTC/CIRCUIT DIAGNOSIS >

Check the coolant level in the reservoir tank and radiator.

Allow engine to cool before checking coolant level.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

- YES >> Proceed to [EC-366, "Diagnosis Procedure"](#).
NO >> GO TO 2.



2.PERFORM COMPONENT FUNCTION CHECK-2

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

- YES >> Proceed to [EC-366, "Diagnosis Procedure"](#).
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-3

With CONSULT

1. Turn ignition switch ON.
2. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT

Perform IPDM E/R auto active test and check cooling fan motors operation, refer to [PCS-8, "Diagnosis Description"](#).

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-366, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524487

1.CHECK COOLING FAN OPERATION

With CONSULT

1. Turn ignition switch ON.
2. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Check that cooling fan speed varies according to the percentage.

Without CONSULT

1. Activate IPDM E/R auto active test and check cooling fan motors operation, refer to [PCS-8, "Diagnosis Description"](#).
2. Check that cooling fan operates.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Proceed to [EC-424, "Component Function Check"](#).

2.CHECK COOLING SYSTEM FOR LEAK-1

Check cooling system for leak. Refer to [CO-11, "System Inspection"](#).

Is leakage detected?

- YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK COOLING SYSTEM FOR LEAK-2

Check the following for leak.

- Hose (Refer to [CO-11, "System Inspection"](#).)
- Radiator (Refer to [CO-17, "Checking Radiator"](#).)
- Water pump (Refer to [CO-24, "Removal and Installation"](#).)

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap.

5. CHECK THERMOSTAT

Check thermostat. Refer to [CO-30, "Removal and Installation"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat. Refer to [CO-30, "Removal and Installation"](#).

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to [EC-202, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor. Refer to [CO-32, "Removal and Installation"](#).

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|--------|------|--|--|---|--|
| OFF | 1 | <ul style="list-style-type: none"> Blocked radiator Blocked condenser Blocked radiator grille Blocked bumper | <ul style="list-style-type: none"> Visual | No blocking | — |
| | 2 | <ul style="list-style-type: none"> Coolant mixture | <ul style="list-style-type: none"> Coolant tester | MA-17, "FOR USA AND CANADA : Engine Coolant Recommendation" | |
| | 3 | <ul style="list-style-type: none"> Coolant level | <ul style="list-style-type: none"> Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | CO-11, "System Inspection" |
| | 4 | <ul style="list-style-type: none"> Radiator cap | <ul style="list-style-type: none"> Pressure tester | 107 kPa (1.1 kg/cm ² , 16 psi) (Limit) | — |
| ON*2 | 5 | <ul style="list-style-type: none"> Coolant leaks | <ul style="list-style-type: none"> Visual | No leaks | CO-11, "System Inspection" |
| ON*2 | 6 | <ul style="list-style-type: none"> Thermostat | <ul style="list-style-type: none"> Touch the upper and lower radiator hoses | Both hoses should be hot | CO-30, "Removal and Installation" |
| ON*1 | 7 | <ul style="list-style-type: none"> Cooling fan | <ul style="list-style-type: none"> CONSULT | Operating | EC-424, "Component Function Check" |
| OFF | 8 | <ul style="list-style-type: none"> Combustion gas leak | <ul style="list-style-type: none"> Color checker chemical tester 4 Gas analyzer | Negative | — |
| ON*3 | 9 | <ul style="list-style-type: none"> Coolant temperature gauge | <ul style="list-style-type: none"> Visual | Gauge less than 3/4 when driving | — |
| | | <ul style="list-style-type: none"> Coolant overflow to reservoir tank | <ul style="list-style-type: none"> Visual | No overflow during driving and idling | CO-11, "System Inspection" |
| OFF*4 | 10 | <ul style="list-style-type: none"> Coolant return from reservoir tank to radiator | <ul style="list-style-type: none"> Visual | Should be initial level in reservoir tank | CO-11, "System Inspection" |
| OFF | 11 | <ul style="list-style-type: none"> Cylinder head | <ul style="list-style-type: none"> Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | EM-91, "Removal and Installation" |
| | 12 | <ul style="list-style-type: none"> Cylinder block and pistons | <ul style="list-style-type: none"> Visual | No scuffing on cylinder walls or piston | EM-115, "Inspection After Disassembly" |

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

*4: After 60 minutes of cool down time.

For more information, refer to [CO-9, "Troubleshooting Chart"](#).

>> INSPECTION END

P1225 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1225 TP SENSOR

DTC Logic

INFOID:000000012524488

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P1225 | CTP LEARNING-B1 (Closed throttle position learning performance) | Closed throttle position learning value is excessively low. | Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-369, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

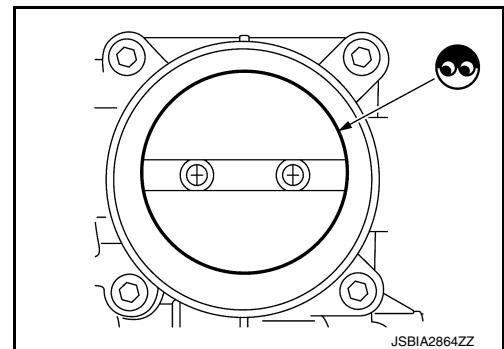
INFOID:000000012524489

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-24, "Exploded View"](#).
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> Replace electric throttle control actuator. Refer to [EM-25, "Removal and Installation"](#).
 NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to [EC-138, "Description"](#).



P1226 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1226 TP SENSOR

DTC Logic

INFOID:000000012524490

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P1226 | CTP LEARNING-B1 (Closed throttle position learning performance) | Closed throttle position learning is not performed successfully, repeatedly. | Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-370, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

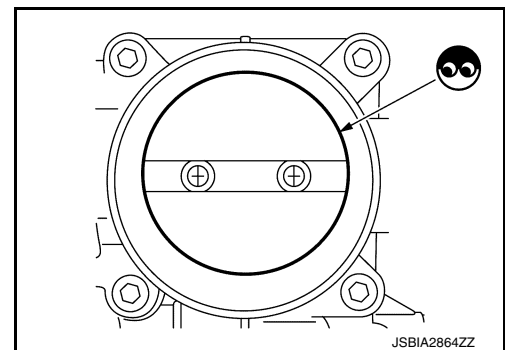
INFOID:000000012524491

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-24, "Exploded View"](#).
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> Replace electric throttle control actuator. Refer to [EM-25, "Removal and Installation"](#).
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to [EC-138, "Description"](#).



P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1564 ASCD STEERING SWITCH

DTC Logic

INFOID:000000012524492

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-352, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1564 | ASCD SW (ASCD steering switch) | <ul style="list-style-type: none">An excessively high voltage signal from the ASCD steering switch is sent to ECM.ECM detects that input signal from the ASCD steering switch is out of the specified range.ECM detects that the ASCD steering switch is stuck ON. | <ul style="list-style-type: none">Harness or connectors (The switch circuit is open or shorted.)ASCD steering switchECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 10 seconds.
- Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press ACCEL/RES switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press COAST/SET switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-371, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524493

1. CHECK ASCD STEERING SWITCH CIRCUIT

④ With CONSULT

- Turn ignition switch ON.
- Select "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
- Check each item indication as per the following conditions.

| Monitor item | Condition | Indication | |
|---------------|------------------|------------|-----|
| MAIN SW | MAIN switch | Pressed | ON |
| | | Released | OFF |
| CANCEL SW | CANCEL switch | Pressed | ON |
| | | Released | OFF |
| RESUME/ACC SW | ACCEL/RES switch | Pressed | ON |
| | | Released | OFF |

P1564 ASCD STEERING SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| Monitor item | Condition | | Indication |
|--------------|------------------|----------|------------|
| SET SW | COAST/SET switch | Pressed | ON |
| | | Released | OFF |

⊗ Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | | Condition | Voltage (Approx.) |
|----------------|---------------|----------------|---------------|---|-------------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E16 | 101 | E16 | 108 | MAIN switch: Pressed | 0 V |
| | | | | CANCEL switch: Pressed | 1 V |
| | | | | COAST/SET switch: Pressed | 2 V |
| | | | | ACCEL/RES switch: Pressed | 3 V |
| | | | | All ASCD steering switches: Released | 4 V |

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> GO TO 2.

2.CHECK ASCD STEERING SWITCH GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect spiral cable harness connector.
4. Check the continuity between spiral cable harness connector and ECM harness connector.

| + | | - | | Continuity |
|--------------|----------|-----------|----------|------------|
| Spiral cable | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| M30 | 32 | E16 | 108 | Existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair or replace error-detected parts.

3.CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT

1. Check the continuity between ECM harness connector and spiral cable harness connector.

| + | | - | | Continuity |
|--------------|----------|-----------|----------|------------|
| Spiral cable | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| M30 | 25 | E16 | 101 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Repair or replace error-detected parts.

4.CHECK ASCD STEERING SWITCH

Refer to [EC-373, "Component Inspection"](#).

P1564 ASCD STEERING SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace ASCD steering switch. Refer to [ST-10, "Exploded View"](#).

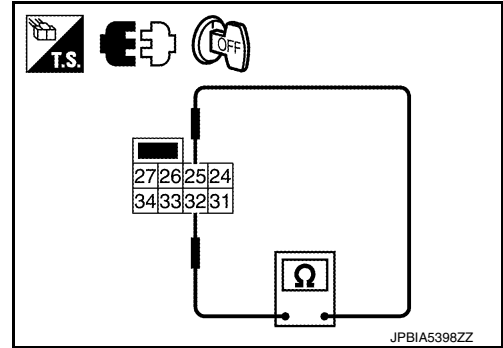
Component Inspection

INFOID:0000000012524494

1. CHECK ASCD STEERING SWITCH

1. Disconnect spiral cable harness connector.
2. Check the resistance between spiral cable harness connector terminals as per the following conditions.

| Spiral cable | | | Condition | Resistance (Approx.) |
|--------------|-----------|----|--------------------------------------|----------------------|
| Connector | + | - | | |
| | Terminals | | | |
| M30 | 25 | 32 | MAIN switch: Pressed | 0 Ω |
| | | | CANCEL switch: Pressed | 250 Ω |
| | | | COAST/SET switch: Pressed | 660 Ω |
| | | | ACCEL/RES switch: Pressed | 1,480 Ω |
| | | | All ASCD steering switches: Released | 4,000 Ω |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace ASCD steering switch. Refer to [ST-10, "Exploded View"](#).

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1572 ASCD BRAKE SWITCH

Description

INFOID:000000012524495

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to [EC-43, "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for the ASCD function.

DTC Logic

INFOID:000000012524496

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-352, "DTC Logic"](#).
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|--|--|
| P1572 | ASCD BRAKE SW (ASCD brake switch) | A) | When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time. | <ul style="list-style-type: none">• Harness or connectors (The stop lamp switch circuit is shorted.)• Harness or connectors (The ASCD brake switch circuit is shorted.)• Stop lamp switch• ASCD brake switch• Incorrect stop lamp switch installation• Incorrect ASCD brake switch installation• ECM |
| | | B) | ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine (VDC switch OFF).
2. Press MAIN switch and make sure that CRUISE lamp illuminates.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| | |
|----------------|----------------------------|
| Vehicle speed | More than 30 km/h (19 mph) |
| Selector lever | Suitable position |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-375, "Diagnosis Procedure"](#).
- NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

| | |
|------------------|---|
| Vehicle speed | More than 30 km/h (19 mph) |
| Selector lever | Suitable position |
| Driving location | Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed. |

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-375, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524497

1.CHECK OVERALL FUNCTION-1

 With CONSULT

1. Turn ignition switch ON.
2. Select "BRAKE SW1" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "BRAKE SW1" indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| | Brake pedal | Fully released | ON |

 Without CONSULT


1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

| Connector | ECM | | Condition | Voltage (Approx.) |
|-----------|----------|-----|--------------------|-------------------|
| | + | - | | |
| | Terminal | | | |
| E16 | 126 | 128 | Slightly depressed | 0 V |
| | | | Fully released | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-2

 With CONSULT

P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Select "BRAKE SW2" and check indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| | | Fully released | OFF |

⊗ Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

| Connector | ECM | | Condition | Voltage (Approx.) |
|-----------|-----|-----|--------------------------------|-------------------|
| | + | - | | |
| Terminal | | | | |
| E16 | 126 | 128 | Brake pedal Slightly depressed | Battery voltage |
| | | | Fully released | 0 V |

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> GO TO 6.

3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

| + | | - | Voltage |
|-------------------|----------|--------|-----------------|
| ASCD brake switch | | | |
| Connector | Terminal | | |
| E37 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform the trouble diagnosis for power supply circuit.

4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------|----------|-----------|----------|------------|
| ASCD brake switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E37 | 2 | E16 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ASCD BRAKE SWITCH

Refer to [EC-377. "Component Inspection \(ASCD Brake Switch\)"](#)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace ASCD brake switch. Refer to [BR-22. "Exploded View"](#).

P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

6. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the voltage between stop lamp switch harness connector and ground.

| + | | - | Voltage |
|------------------|----------|--------|-----------------|
| Stop lamp switch | | | |
| Connector | Terminal | Ground | Battery voltage |
| E38 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> Perform the trouble diagnosis for power supply circuit.

7. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------|----------|-----------|----------|------------|
| Stop lamp switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| E38 | 2 | E16 | 122 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 8.
 NO >> Repair or replace error-detected parts.

8. CHECK STOP LAMP SWITCH

Check the stop lamp switch. Refer to [EC-378. "Component Inspection \(Stop Lamp Switch\)"](#)

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> Replace stop lamp switch. Refer to [BR-22. "Exploded View"](#).

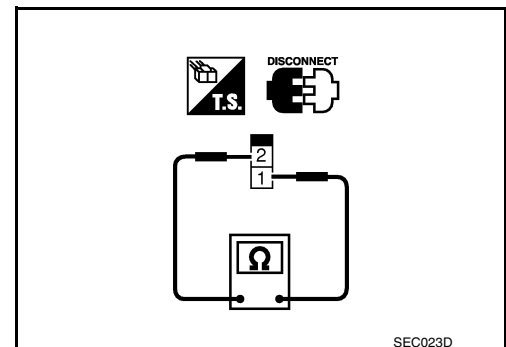
Component Inspection (ASCD Brake Switch)

INFOID:000000012524498

1. CHECK ASCD BRAKE SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|-------------|----------------|
| + | - | | |
| Terminals | | Brake pedal | Fully released |
| 1 | 2 | | |



Is the inspection result normal?

- YES >> INSPECTION END
 NO >> GO TO 2.

2. CHECK ASCD BRAKE SWITCH-2

1. Adjust ASCD brake switch installation. Refer to [BR-10. "Inspection and Adjustment"](#).

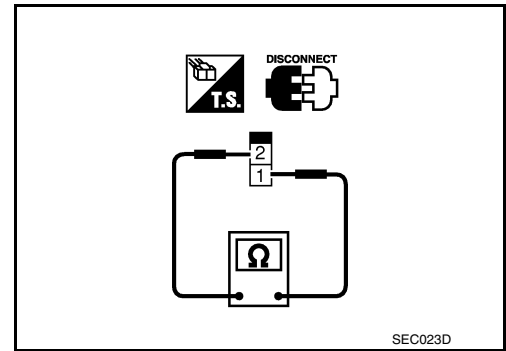
P1572 ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Existed |
| | | Slightly de-pressed | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to [BR-22. "Exploded View"](#).

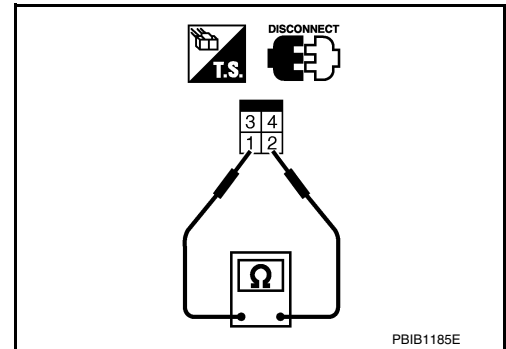
Component Inspection (Stop Lamp Switch)

INFOID:000000012524499

1. CHECK STOP LAMP SWITCH-1

- Turn ignition switch OFF.
- Disconnect stop lamp switch harness connector.
- Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

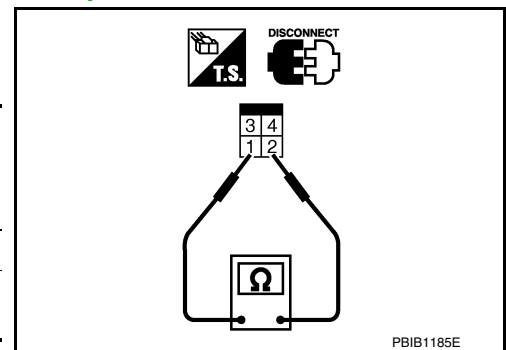
YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK STOP LAMP SWITCH-2

- Adjust stop lamp switch installation. Refer to [BR-10. "Inspection and Adjustment"](#).
- Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to [BR-22. "Exploded View"](#).

P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000012524500

The ECM receives two vehicle speed signals via the CAN communication line. One is sent from “combination meter”, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to [EC-43, "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for ASCD functions.

DTC Logic

INFOID:0000000012524501

DTC DETECTION LOGIC

NOTE:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to [EC-338, "DTC Logic"](#).
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-352, "DTC Logic"](#).
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P1574 | ASCD VHL SPD SEN (ASCD vehicle speed sensor) | The difference between the two vehicle speed signals is out of the specified range. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted.)• Combination meter• ABS actuator and electric unit (control unit)• Wheel sensor• TCM• ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 38 km/h (24 MPH).

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-380, "Diagnosis Procedure"](#).
NO >> INSPECTION END

P1574 ASCD VEHICLE SPEED SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure

INFOID:000000012524502

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-39, "CONSULT Function"](#).

Is DTC detected?

YES >> GO TO 2.

NO >> Perform trouble diagnosis relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to [BRC-32, "CONSULT Function \(ABS\)"](#).

Is DTC detected?

YES >> GO TO 3.

NO >> Perform trouble diagnosis relevant to DTC indicated.

3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is DTC detected?

NO >> INSPECTION END

YES >> Perform trouble diagnosis relevant to DTC indicated.

P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

Description

INFOID:0000000012524503

ECM receives input speed sensor signal from TCM via the CAN communication line. ECM uses this signal for engine control.

DTC Logic

INFOID:0000000012524504

DTC DETECTION LOGIC

NOTE:

- If DTC P1715 is displayed with DTC UXXXX first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to [EC-280, "DTC Logic"](#).
- If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to [EC-283, "DTC Logic"](#).
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-352, "DTC Logic"](#).
- If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-354, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1715 | IN PULY SPEED [Input speed sensor (TCM output)] | Input speed sensor signal is different from the theoretical value calculated by ECM from output speed sensor signal and engine rpm signal. | <ul style="list-style-type: none">• Harness or connectors (CAN communication line is open or shorted)• Harness or connectors (Input speed sensor circuit is open or shorted)• TCM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Drive vehicle at a speed of more than 50 km/h (31 MPH) for at least 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-381, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524505

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-48, "DTC Index"](#).

Is the inspection result normal?

- YES >> Replace TCM. Refer to [TM-171, "Exploded View"](#).
NO >> Perform trouble shooting relevant to DTC indicated.

P1800 VIAS CONTROL SOLENOID VALVE 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1800 VIAS CONTROL SOLENOID VALVE 1

DTC Logic

INFOID:000000012524506

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P1800 | VIAS S/V-1 (VIAS control solenoid valve circuit) | An excessively low or high voltage signal is sent to ECM through the VIAS control solenoid valve. | <ul style="list-style-type: none"> Harness or connectors (VIAS control solenoid valve circuit is open or shorted.) VIAS control solenoid valve |

DTC CONFIRMATION PROCEDURE

1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

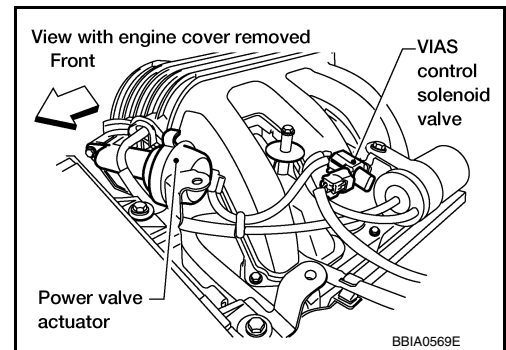
- YES >> Proceed to [EC-382, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524507

1.CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect VIAS control solenoid valve harness connector.
- Turn ignition switch ON.



- Check the voltage between VIAS control solenoid valve harness connector and ground

| + | | - | Voltage (Approx.) |
|--|----------|--------|----------------------|
| VIAS control solenoid valve Connector | Terminal | | |
| F75 | 1 | Ground | Battery voltage |

Is the inspection result normal?

P1800 VIAS CONTROL SOLENOID VALVE 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 2.
- NO >> Repair or replace error-detected parts.

2. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector and VIAS control solenoid valve harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------------------------|----------|------------|
| ECM | | VIAS control solenoid valve | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 39 | F75 | 2 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK VIAS CONTROL SOLENOID VALVE

Check VIAS control solenoid valve. Refer to [EC-383, "Component Inspection \(VIAS Control Solenoid Valve\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace VIAS control solenoid valve. Refer to [EM-25, "Exploded View"](#).

Component Inspection (VIAS Control Solenoid Valve)

INFOID:000000012524508

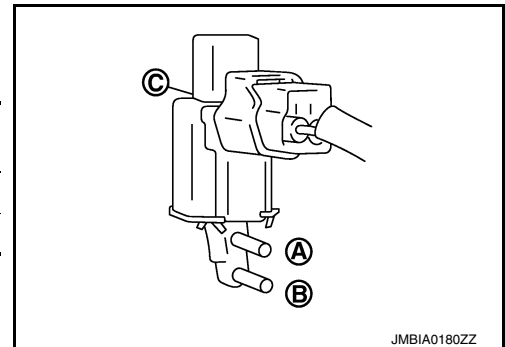
1. CHECK VIAS CONTROL SOLENOID VALVE

Ⓜ With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VIAS SOL VALVE" in "ACTIVE TEST" mode of "ENGINE".
4. Check air passage continuity and operation delay time as per the following conditions.

| VIAS SOL VALVE | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|----------------|--|--|
| ON | Yes | No |
| OFF | No | Yes |

Operation takes less than 1 second.



JMBIA0180ZZ

ⓧ Without CONSULT

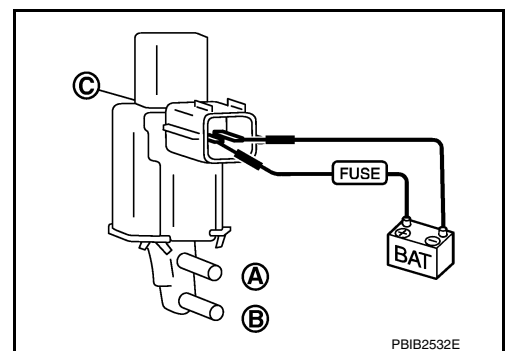
Check air passage continuity and operation delay time as per the following conditions.

| Condition | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals 1 and 2 | Yes | No |
| No supply | No | Yes |

Operation takes less than 1 second.

Is the inspection result normal?

- YES >> INSPECTION END



PBIB2532E

P1800 VIAS CONTROL SOLENOID VALVE 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

NO >> Replace VIAS control solenoid valve. Refer to [EM-25. "Exploded View"](#).

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P1805 BRAKE SWITCH

DTC Logic

INFOID:000000012524509

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P1805 | BRAKE SW/CIRCUIT (Stop lamp switch) | Stop lamp switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | <ul style="list-style-type: none"> Harness or connectors (Stop lamp switch circuit is open or shorted.) Stop lamp switch |

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Fully depress the brake pedal for at least 5 seconds.
- Erase the DTC.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-385, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524510

1.CHECK STOP LAMP SWITCH CIRCUIT

- Turn ignition switch OFF.
- Check the stop lamp when depressing and releasing the brake pedal.

| Brake pedal | Stop lamp |
|--------------------|-----------------|
| Fully released | Not illuminated |
| Slightly depressed | Illuminated |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- Disconnect stop lamp switch harness connector.
- Check the voltage between stop lamp switch harness connector and ground.

| + | | - | Voltage |
|------------------|----------|--------|-----------------|
| Stop lamp switch | | | |
| Connector | Terminal | | |
| E38 | 1 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Perform the trouble diagnosis for power supply circuit.

3.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT

- Disconnect stop lamp switch harness connector.
- Disconnect ECM harness connector.
- Check the continuity between stop lamp switch harness connector and ECM harness connector.

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | | Continuity |
|------------------|----------|-----------|----------|------------|
| Stop lamp switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E38 | 2 | E16 | 122 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK STOP LAMP SWITCH

Refer to [EC-386, "Component Inspection \(Stop Lamp Switch\)"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace stop lamp switch. Refer to [BR-22, "Exploded View"](#).

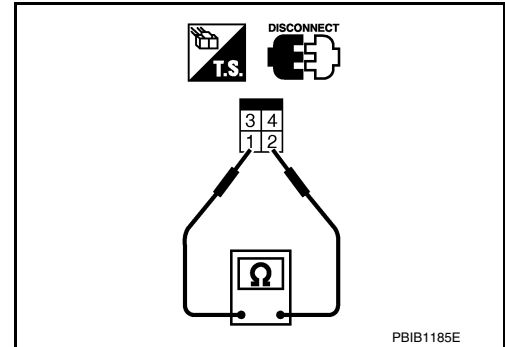
Component Inspection (Stop Lamp Switch)

INFOID:000000012524511

1.CHECK STOP LAMP SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

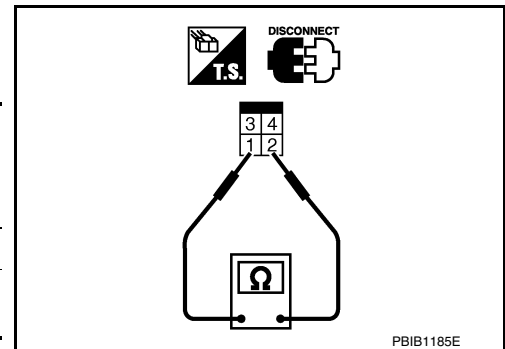
YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-2

1. Adjust stop lamp switch installation. Refer to [BR-10, "Inspection and Adjustment"](#).
2. Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to [BR-22, "Exploded View"](#).

P2096, P2097, P2098, P2099 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2096, P2097, P2098, P2099 A/F SENSOR 1

DTC Logic

INFOID:000000012524512

DTC DETECTION LOGIC

To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not it will shift to LEAN side or RICH side.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|---|--|---|
| P2096 | POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too lean bank 1) | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period. | <ul style="list-style-type: none">• A/F sensor 1 (bank 1)• A/F sensor 1 heater• Heated oxygen sensor 2 (bank 1) |
| P2097 | POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too rich bank 1) | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period. | <ul style="list-style-type: none">• Fuel pressure• Fuel injector• Intake air leaks• Exhaust gas leaks |
| P2098 | POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too lean bank 2) | The output voltage computed by ECM from the A/F sensor 2 signal is shifts to the lean side for a specified period. | <ul style="list-style-type: none">• A/F sensor 1 (bank 2)• A/F sensor 1 heater• Heated oxygen sensor 2 (bank 2) |
| P2099 | POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too rich bank 2) | The output voltage computed by ECM from the A/F sensor 2 signal is shifts to the rich side for a specified period. | <ul style="list-style-type: none">• Fuel pressure• Fuel injector• Intake air leaks• Exhaust gas leaks |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
6. Let engine idle for 1 minute.
7. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-387, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524513

1. CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Check harness connector for water.

Water should not exit.

P2096, P2097, P2098, P2099 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace harness connector.

2. RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

>> GO TO 3.

3. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas detected?

- YES >> Repair or replace.
- NO >> GO TO 4.

4. CHECK FOR INTAKE AIR LEAK

1. Reconnect A/F sensor 1 harness connector.
2. Start engine and run it at idle.
3. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

- YES >> Repair or replace malfunctioning parts.
- NO >> GO TO 5.

5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-253, "DTC Logic"](#) or [EC-257, "DTC Logic"](#).
- NO >> GO TO 6.

6. CHECK A/F SENSOR 1 POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage |
|-------|--------------|-----------|----------|--------|-----------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P2096 | 1 | F65 | 1 | Ground | Battery voltage |
| P2097 | | | | | |
| P2098 | 2 | F5 | 1 | | |
| P2099 | | | | | |

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> GO TO 7.

7. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

P2096, P2097, P2098, P2099 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P2096 | 1 | F65 | 1 | E119 | 8 | Existed |
| P2097 | | | | | | |
| P2098 | 2 | F5 | 1 | | | |
| P2099 | | | | | | |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P2096 | 1 | F65 | 3 | F77 | 73 | Existed |
| P2097 | | | 4 | | 69 | |
| P2098 | 2 | F5 | 3 | | 81 | |
| P2099 | | | 4 | | 77 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P2096 | 1 | F65 | 3 | Ground | Not existed |
| P2097 | | | 4 | | |
| P2098 | 2 | F5 | 3 | | |
| P2099 | | | 4 | | |

| DTC | + | | | - | Continuity |
|-------|------|-----------|----------|--------|-------------|
| | ECM | | | | |
| | Bank | Connector | Terminal | | |
| P2096 | 1 | F77 | 73 | Ground | Not existed |
| P2097 | | | 69 | | |
| P2098 | 2 | F77 | 81 | | |
| P2099 | | | 77 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace error-detected parts.

9. CHECK A/F SENSOR 1 HEATER

P2096, P2097, P2098, P2099 A/F SENSOR 1

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the A/F sensor 1 heater. Refer to [EC-179, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> GO TO 12.

10. CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-229, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 11.
- NO >> Replace heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

11. CHECK INTERMITTENT INCIDENT

Perform [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> GO TO 12.
- NO >> Repair or replace.

12. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

CAUTION:

- Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

Do you have CONSULT?

- YES >> GO TO 13.
- NO >> GO TO 14.

13. CONFIRM A/F ADJUSTMENT DATA

Ⓟ With CONSULT

1. Turn ignition switch ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Make sure that "0.000" is displayed on CONSULT screen.

Is "0.000" displayed?

- YES >> INSPECTION END
- NO >> GO TO 14.

14. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).

Do you have CONSULT?

- YES >> GO TO 15.
- NO >> INSPECTION END

15. CONFIRM A/F ADJUSTMENT DATA

Ⓟ With CONSULT

1. Turn ignition switch ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Make sure that "0.000" is displayed on CONSULT screen.

>> INSPECTION END

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

INFOID:000000012524514

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P2100 | ETC MOT PWR-B1 (Throttle control motor relay circuit open) | ECM detects a voltage of power source for throttle control motor is excessively low. | <ul style="list-style-type: none"> • Harness or connectors (Throttle control motor relay circuit is open) • Throttle control motor relay |
| P2103 | ETC MOT PWR (Throttle control motor relay circuit short) | ECM detect the throttle control motor relay is stuck ON. | <ul style="list-style-type: none"> • Harness or connectors (Throttle control motor relay circuit is shorted) • Throttle control motor relay |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V.

Which DTC is detected?

- P2100 >> GO TO 2.
P2103 >> GO TO 3.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-391. "Diagnosis Procedure"](#).
NO >> INSPECTION END

3. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-391. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524515

1. CHECK THROTTLE CONTROL MOTOR RELAY CONTROL SIGNAL

1. Turn ignition switch OFF.
2. Check the voltage between ECM harness connector and ground.

| Connector | ECM | | Voltage |
|-----------|----------|-----|-----------------|
| | + | - | |
| | Terminal | | |
| F54 | 34 | 128 | Battery voltage |

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. CHECK THROTTLE CONTROL MOTOR RELAY CONTROL SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 34 | E122 | 47 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK THROTTLE CONTROL MOTOR POWER SUPPLY

Check the voltage between ECM harness connector and ground as per the following conditions.

| ECM | | | | Condition | Voltage (Approx.) |
|-----------|----------|-----------|----------|----------------------|-------------------|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F54 | 1 | E16 | 128 | Ignition switch: OFF | 0 V |
| | | | | Ignition switch: ON | Battery voltage |

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> GO TO 4.

4. CHECK THROTTLE CONTROL MOTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 1 | E119 | 6 | Existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Repair or replace error-detected parts.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

DTC Logic

INFOID:000000012524516

DTC DETECTION LOGIC

NOTE:

- If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to [EC-391, "DTC Logic"](#).
- If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to [EC-398, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P2101 | ETC FNCTN/CIRC-B1 (Electric throttle control performance) | Electric throttle control function does not operate properly. | <ul style="list-style-type: none"> • Harness or connectors (Throttle control motor circuit is open or shorted) • Electric throttle control actuator |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-393, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

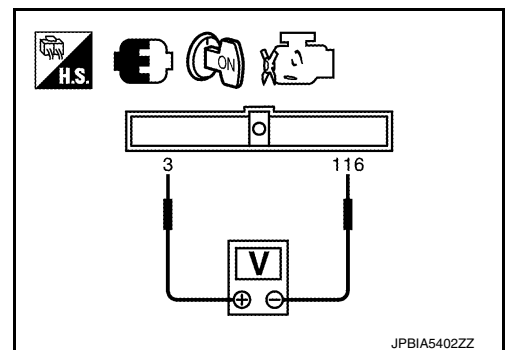
Diagnosis Procedure

INFOID:000000012524517

1. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL

Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | | Condition | Voltage (Approx.) |
|-----------|----------|-----------|----------|-------------------------|----------------------|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F54 | 1 | E16 | 128 | Ignition switch: OFF | 0 V |
| | | | | Ignition switch: ON | Battery voltage |



Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 2.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 1 | E119 | 6 | Existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 34 | E122 | 47 | Existed |

2. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

4. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector. Refer to [EM-25, "Exploded View"](#).
3. Disconnect ECM harness connector.
4. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|-------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 5 | F54 | 5 | Not existed |
| | | | 2 | Existed |
| | 6 | | 5 | Existed |
| | | | 2 | Not existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct. Refer to [EM-24, "Exploded View"](#).

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

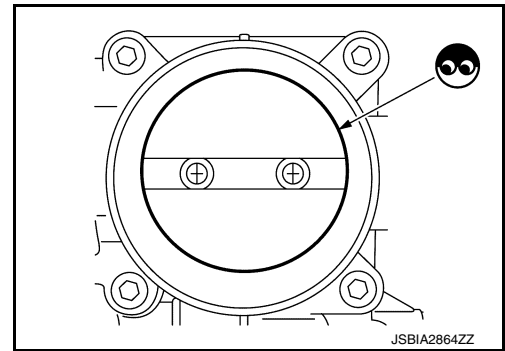
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> GO TO 6.
 NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to [EC-138, "Description"](#).



6. CHECK THROTTLE CONTROL MOTOR

Check the throttle control motor. Refer to [EC-395, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Replace electric throttle control actuator. Refer to [EM-25, "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524518

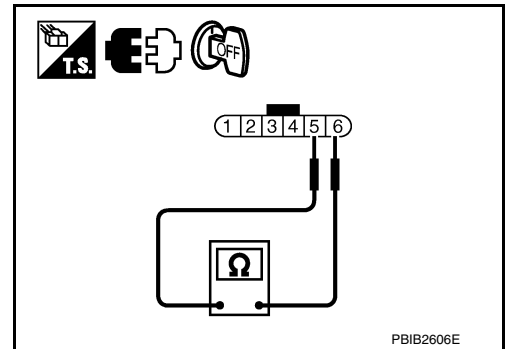
1. CHECK THROTTLE CONTROL MOTOR

- Turn ignition switch OFF.
- Disconnect electric throttle control actuator harness connector. Refer to [EM-25, "Exploded View"](#).
- Check the resistance between electric throttle control actuator terminals as per the following.

| Electric throttle control actuator | | Resistance (Approx.) |
|------------------------------------|---|---------------------------|
| + | - | |
| Terminals | | 1 - 15 Ω [at 25°C (77°F)] |
| 5 | 6 | |

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Replace electric throttle control actuator. Refer to [EM-25, "Removal and Installation"](#).



P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2118 THROTTLE CONTROL MOTOR

DTC Logic

INFOID:000000012524519

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P2118 | ETC MOT-B1 (Throttle control motor circuit short) | ECM detects short in both circuits between ECM and throttle control motor. | <ul style="list-style-type: none">• Harness or connectors (Throttle control motor circuit is shorted.)• Electric throttle control actuator (Throttle control motor) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-396. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524520

1. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|-------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 5 | F54 | 5 | Not existed |
| | | | 2 | Existed |
| | 6 | | 5 | Existed |
| | | | 2 | Not existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2. CHECK THROTTLE CONTROL MOTOR

Check the throttle control motor. Refer to [EC-397. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace electric throttle control actuator. Refer to [EM-25. "Removal and Installation"](#).

Component Inspection

INFOID:000000012524521

1. CHECK THROTTLE CONTROL MOTOR

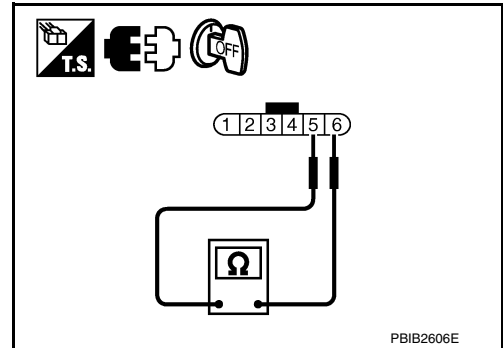
1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector. Refer to [EM-25. "Exploded View"](#).
3. Check the resistance between electric throttle control actuator terminals as per the following.

| Electric throttle control actuator | | Resistance (Approx.) |
|------------------------------------|---|----------------------------------|
| + | - | |
| Terminals | | |
| 5 | 6 | 1 - 15 Ω [at 25°C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to [EM-25. "Removal and Installation"](#).



P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic

INFOID:000000012524522

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|---|------------------------------------|
| P2119 | ETC ACTR-B1 (Electric throttle control actuator) | A | Electric throttle control actuator does not function properly due to the return spring malfunction. | Electric throttle control actuator |
| | | B | Throttle valve opening angle in fail-safe mode is not in specified range. | |
| | | C | ECM detect the throttle valve is stuck open. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position and wait at least 3 seconds.
3. Shift selector lever to P position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Shift selector lever to D position and wait at least 3 seconds.
7. Shift selector lever to P position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-398, "Diagnosis Procedure"](#).
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position and wait at least 3 seconds.
3. Shift selector lever to P position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-398, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524523

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

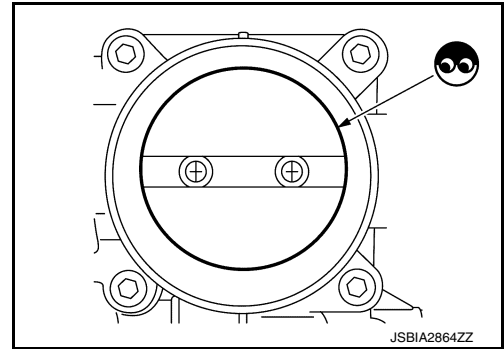
[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> Replace electric throttle control actuator. Refer to [EM-25, "Removal and Installation"](#).
- NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to [EC-138, "Description"](#).



A

EC

C

D

E

F

G

H

I

J

K

L

M

N

O

P

P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2122, P2123 APP SENSOR

DTC Logic

INFOID:000000012524524

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P2122 | APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit low input) | An excessively low voltage from the APP sensor 1 is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (APP sensor 1 circuit is open or shorted.)• Accelerator pedal position sensor (APP sensor 1) |
| P2123 | APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit high input) | An excessively high voltage from the APP sensor 1 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-400, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524525

1. CHECK APP SENSOR 1 POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect accelerator pedal position (APP) sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

P2122, P2123 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 2 | E16 | 99 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3.CHECK APP SENSOR 1 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 4 | E16 | 100 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK APP SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 3 | E16 | 97 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK APP SENSOR

Check the APP sensor. Refer to [EC-401. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace accelerator pedal assembly.

Component Inspection

INFOID:000000012524526

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals as per the following.

P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| ECM | | | Condition | Voltage (V) |
|----------------|----------|-----|----------------------|---------------|
| Con- nector | + | - | | |
| | Terminal | | | |
| E16 | 97 | 100 | Fully re- leased | 0.65 - 0.87 |
| | | | Fully de- pressed | More than 4.3 |
| | 98 | 116 | Fully re- leased | 0.28 - 0.48 |
| | | | Fully de- pressed | More than 2.0 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly. Refer to [ACC-3. "Removal and Installation"](#).

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2127, P2128 APP SENSOR

DTC Logic

INFOID:000000012524527

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P2127 | APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit low input) | An excessively low voltage from the APP sensor 2 is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (APP sensor 2 circuit is open or shorted.) (TP sensor circuit shorted.) |
| P2128 | APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit high input) | An excessively high voltage from the APP sensor 2 is sent to ECM. | <ul style="list-style-type: none"> Accelerator pedal position sensor (APP sensor 2) Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-403, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524528

1. CHECK APP SENSOR 2 POWER SUPPLY-1

- Turn ignition switch OFF.
- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector terminals.

| Connector | APP sensor | | Voltage (Approx.) |
|-----------|------------|---|----------------------|
| | + | - | |
| | Terminal | | |
| E20 | 1 | 5 | 5 V |

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> GO TO 2.

2. CHECK APP SENSOR 2 POWER SUPPLY-2

Check the voltage between APP sensor harness connector and ground.

P2127, P2128 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 1 | E16 | 103 | Existed |

Is inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Check sensor power supply 2 circuit. Refer to [EC-446, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Repair or replace error-detected parts.

5.CHECK APP SENSOR 2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 5 | E16 | 116 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair or replace error-detected parts.

6.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 123 | Ground | Existed |
| | 124 | | |
| | 127 | | |
| | 128 | | |
| F54 | 12 | | |
| | 16 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

7. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 6 | E16 | 98 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace error-detected parts

8. CHECK APP SENSOR

Check the APP sensor. Refer to [EC-405, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace accelerator pedal assembly. Refer to [ACC-3, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524529

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals as per the following.

| ECM | | | | Condition | Voltage (V) |
|----------------|---------------|----------------|---------------|----------------------|---------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E16 | 97 | E16 | 100 | Fully re- leased | 0.65 - 0.87 |
| | | | | Fully de- pressed | More than 4.3 |
| | 98 | | 116 | Fully re- leased | 0.28 - 0.48 |
| | | | | Fully de- pressed | More than 2.0 |

P2127, P2128 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly. Refer to [ACC-3. "Removal and Installation"](#).

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2135 TP SENSOR

DTC Logic

INFOID:000000012524530

DTC DETECTION LOGIC

NOTE:

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P2135 | TP SENSOR-B1 (Throttle position sensor circuit range/performance) | Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2. | <ul style="list-style-type: none">• Harness or connector (TP sensor 1 or 2 circuit is open or shorted.)• Electric throttle control actuator (TP sensor 1 or 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-407, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524531

1. CHECK THROTTLE POSITION SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector terminals.

| Electric throttle control actuator | | | Voltage (Approx.) |
|------------------------------------|----------|---|----------------------|
| Connector | + | - | |
| | Terminal | | |
| F50 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 7.
NO >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY-2

Check the voltage between electric throttle control actuator harness connector and ground.

P2135 TP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | Voltage (Approx.) |
|------------------------------------|----------|--------|----------------------|
| Electric throttle control actuator | | | |
| Connector | Terminal | | |
| F50 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ground.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 2 | F54 | 24 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4. CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Check sensor power supply 2 circuit. Refer to [EC-446. "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
NO >> Repair or replace error-detected parts.

5. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 4 | F54 | 19 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair or replace error-detected parts.

6. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 123 | Ground | Existed |
| | 124 | | |
| | 127 | | |
| | 128 | | |
| F54 | 12 | | |
| | 16 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

7. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 1 | F54 | 22 | Existed |
| | 3 | | 23 | |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR

Check the throttle position sensor. Refer to [EC-409, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace electric throttle control actuator. Refer to [EM-25, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524532

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform "Throttle Valve Closed Position Learning". Refer to [EC-138, "Description"](#).
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals as per the following conditions.

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| ECM | | | Condition | Voltage | |
|-----------|----------|----|-------------------|-----------------|-----------------|
| Connector | + | - | | | |
| | Terminal | | | | |
| F54 | 22 | 19 | Accelerator pedal | Fully released | More than 0.36V |
| | | | Fully depressed | Less than 4.75V | |
| | 23 | | Fully released | Less than 4.75V | |
| | | | Fully depressed | More than 0.36V | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to [EM-25. "Removal and Installation"](#).

P2138 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P2138 APP SENSOR

DTC Logic

INFOID:000000012524533

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-357, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P2138 | APP SENSOR (Accelerator pedal position sensor circuit range/performance) | Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2. | <ul style="list-style-type: none"> Harness or connectors (APP sensor 1 and 2 circuit is open or shorted.) (TP sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 1 or 2) Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-411, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524534

1. CHECK APP SENSOR 1 POWER SUPPLY-1

- Turn ignition switch OFF.
- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector terminals.

| Connector | APP sensor | | Voltage (Approx.) |
|-----------|------------|---|----------------------|
| | + | - | |
| | Terminal | | |
| E20 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 2.

P2138 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK APP SENSOR 1 POWER SUPPLY-2

Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> GO TO 3.

3. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 2 | E16 | 99 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

4. CHECK APP SENSOR 2 POWER SUPPLY-1

Check the voltage between APP sensor harness connector and ground.

| Connector | APP sensor | | Voltage (Approx.) |
|-----------|------------|---|----------------------|
| | + | - | |
| | Terminal | | |
| E20 | 1 | 5 | 5 V |

Is the inspection result normal?

- YES >> GO TO 11.
- NO >> GO TO 5.

5. CHECK APP SENSOR 2 POWER SUPPLY-2

Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 9.
- NO >> GO TO 6.

6. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

P2138 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 1 | E16 | 103 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Check sensor power supply 2 circuit. Refer to [EC-446, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

8.CHECK APP SENSOR 1 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 4 | E16 | 100 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace error-detected parts.

9.CHECK APP SENSOR 2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 5 | E16 | 116 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace error-detected parts.

10.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

P2138 APP SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E16 | 123 | Ground | Existed |
| | 124 | | |
| | 127 | | |
| | 128 | | |
| F54 | 12 | | |
| | 16 | | |

Is inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> Repair or replace error-detected parts.

11. CHECK APP SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 3 | E16 | 97 | Existed |
| | 6 | | 98 | |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> GO TO 12.
 NO >> Repair or replace error-detected parts

12. CHECK APP SENSOR

Check the APP sensor. Refer to [EC-414. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> Replace accelerator pedal assembly. Refer to [ACC-3. "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524535

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals as per the following.

P2138 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| ECM | | | | Condition | Voltage (V) |
|----------------|---------------|----------------|---------------|----------------------|---------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E16 | 97 | E16 | 100 | Fully re- leased | 0.65 - 0.87 |
| | | | | Fully de- pressed | More than 4.3 |
| | 98 | | 116 | Fully re- leased | 0.28 - 0.48 |
| | | | | Fully de- pressed | More than 2.0 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly. Refer to [ACC-3, "Removal and Installation"](#).

A

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P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

P219A, P219B AIR FUEL RATIO

DTC Logic

INFOID:000000012524536

DTC DETECTION LOGIC

NOTE:

If DTC P219A or P219B is displayed with other DTC, first perform the trouble diagnosis for the other DTC. Refer to [EC-94, "DTC Index"](#).

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P219A | AIR FUEL RATIO IMBALANCE B1 (Air-fuel ratio imbalance bank 1) | ECM detects a lean/rich air fuel ratio state in any cylinder for a specified length of time. | <ul style="list-style-type: none">• Fuel injector• Exhaust gas leaks• Incorrect fuel pressure• Mass air flow sensor• Intake air leaks• Lack of fuel• Incorrect PCV hose connection• Improper spark plug• Insufficient compression• The fuel injector circuit is open or shorted• ignition coil• The ignition signal circuit is open or shorted |
| P219B | AIR FUEL RATIO IMBALANCE B2 (Air-fuel ratio imbalance bank 2) | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2. PRECONDITIONING-2

1. Turn ignition switch ON.
2. Clear the mixture ratio self-learning value. Refer to [EC-141, "Description"](#).

Will CONSULT be used?

- YES >> GO TO 3.
NO >> GO TO 6.

3. PERFORM DTC CONFIRMATION PROCEDURE-1

1. Turn ignition switch ON.
2. Select "COOLAN TEMP/S" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Start engine.
4. Make sure that "COOLAN TEMP/S" indicates more than 75°C (167°F).

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Select "SYSTEM 1 DIAGNOSIS B B1" and "SYSTEM 1 DIAGNOSIS A B1" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.

CAUTION:

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

- Always drive vehicle at a safe speed.

| | |
|-------------------------|------------------------|
| ENG SPEED | 1,400 – 2,400 rpm |
| COOLAN TEMP/S | More than 75°C (167°F) |
| B/FUEL SCHDL | 11 – 16 msec |
| Selector lever | D position |
| SYSTEM 1 DIAGNOSIS B B1 | PRSENT |

NOTE:

- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during crusing.

3. Check "SYSTEM 1 DIAGNOSIS A B1" indication.

Is "CMPLT" displayed?

- YES >> GO TO 5.
NO >> GO TO 2.

5.PERFORM DTC CONFIRMATION PROCEDURE-3

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-417, "Diagnosis Procedure"](#).
NO >> INSPECTION END

6.PERFORM DTC CONFIRMATION PROCEDURE-4

Without CONSULT

1. Start the engine and warm it up to normal operating temperature.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.

CAUTION:

- Always drive vehicle at a safe speed.

| | |
|-----------------------|-------------------|
| Engine speed | 1,400 – 2,400 rpm |
| Calculated load value | 47 – 92 % |
| Selector lever | D position |

NOTE:

- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during crusing.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-417, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524537

1.CHECK FOR INTAKE AIR LEAK

1. Stop engine and check the following for connection.
 - Air duct
 - Vacuum hoses
 - PCV hose
 - Intake air passage between air duct to intake manifold
2. Start engine and let it idle.
3. Listen for an intake air leak after the mass air flow sensor.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

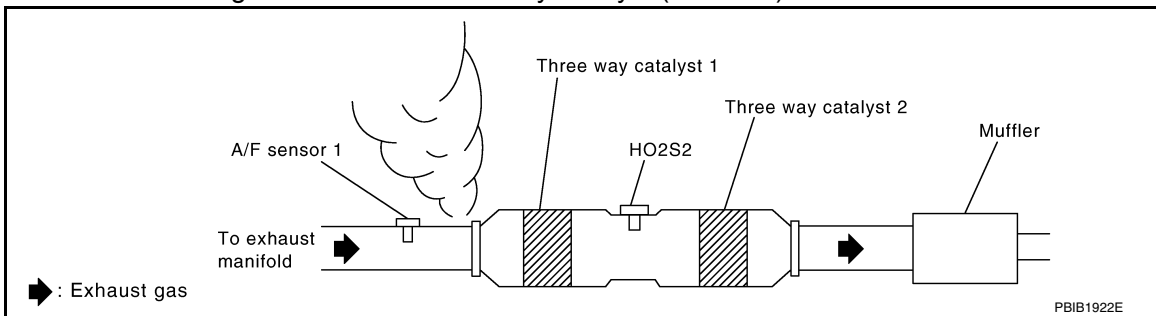
2.CHECK EXHAUST GAS LEAK

P219A, P219B AIR FUEL RATIO

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Stop engine and visually check exhaust tube, three way catalyst and muffler for dents connection.
2. Start engine and let it idle.
3. Listen for an exhaust gas leak before three way catalyst (manifold).



Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-146, "Work Procedure"](#).
2. Check fuel pressure. Refer to [EC-146, "Work Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 4.
NO >> GO TO 9.

4. CHECK MASS AIR FLOW SENSOR

Ⓜ With CONSULT

Check "MASS AIR FLOW" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

Ⓜ With GST

Check mass air flow sensor signal in Service \$01 using GST.
For specification, refer to [EC-463, "Mass Air Flow Sensor"](#).

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to [EC-187, "Diagnosis Procedure"](#).

5. CHECK FUNCTION OF FUEL INJECTOR-1

Ⓜ With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

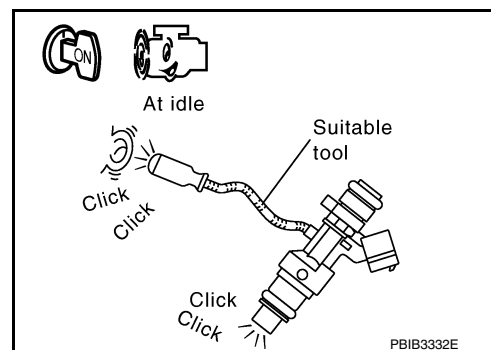
⊗ Without CONSULT

1. Let engine idle.
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Perform trouble diagnosis for fuel injector, refer to [EC-429, "Component Inspection"](#).



6. CHECK FUNCTION OF FUEL INJECTOR-2

CAUTION:

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Perform the following procedure in a place with no combustible objects and good ventilation.

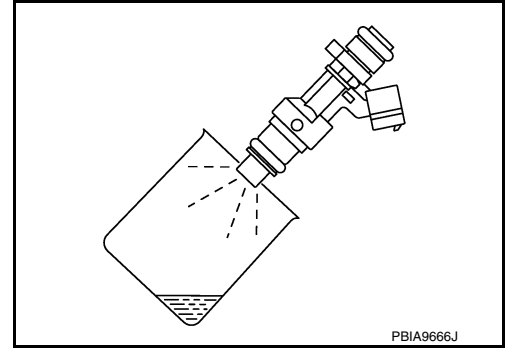
1. Turn ignition switch OFF.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Remove fuel tube assembly. Refer to [EM-45, "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each fuel injector.
7. Crank engine for approximately 3 seconds.

- Fuel should be sprayed evenly for each fuel injector.
- Fuel must not drip from the tip of fuel injector.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace fuel injector. Refer to [EM-45, "Removal and Installation"](#).



7. CHECK FUNCTION OF IGNITION COIL-1

CAUTION:

Perform the following steps in a well-ventilated area with no combustibles.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse from IPDM E/R to release fuel pressure.
NOTE:
CONSULT must not be used to release fuel pressure. It develops again during the following steps, if released by using CONSULT.
3. Start the engine.
4. After an engine stall, crank the engine two or three times to release all the fuel pressure.
5. Turn ignition switch OFF.
6. Disconnect all the harness connectors of ignition coil to prevent electric discharge from occurring in ignition coil.
7. Remove ignition coil assembly and spark plug of cylinder. Refer to [EM-40, "Removal and Installation"](#).
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Allow a 13-17mm (0.52-0.66 in) spacing between spark plug and grounded metal portion as shown in the figure to fix the ignition coil with a rope or an equivalent.
11. Crank the engine for approximately 3 seconds to see if sparking occurs between spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- The discharge voltage becomes 20 kV or higher. Therefore, always stay away from the spark plug and ignition coil at least 50 cm (19.7 in) during the inspection.
- Leaving a space of more than 17mm (0.66 in) may damage the ignition coil.

NOTE:

When the gap is less than 13 mm (0.52 in), a the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

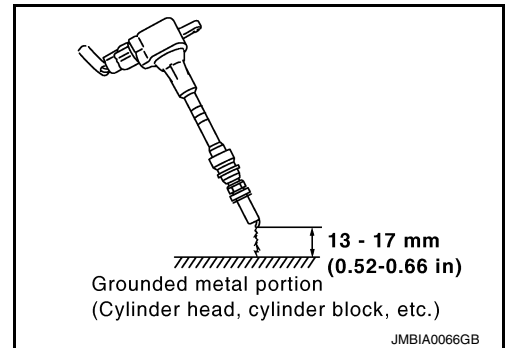
YES >> GO TO 8.

NO >> GO TO 10.

8. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to [EM-22, "Compression Pressure"](#).

Is the inspection result normal?



P219A, P219B AIR FUEL RATIO

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

9. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

- YES >> Replace fuel level sensor, fuel filter and fuel pump assembly. Refer to [FL-11, "Removal and Installation"](#).
NO >> Repair or replace error-detected parts.

10. CHECK FUNCTION OF IGNITION COIL-2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

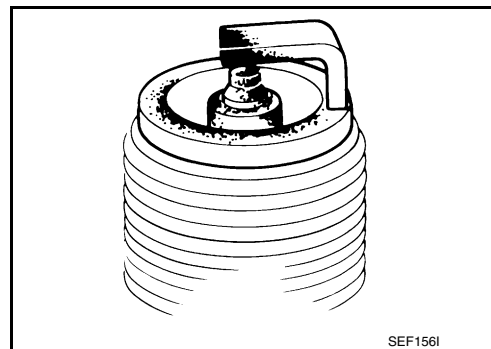
- YES >> GO TO 11.
NO >> Check ignition coil, power transistor and their circuits. Refer to [EC-436, "Component Inspection \(Ignition Coil with Power Transistor\)"](#).

11. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> 1. Repair or clean spark plug. Refer to [EM-40, "Removal and Installation"](#).
2. GO TO 12.
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-132, "Standard and Limit"](#).



12. CHECK FUNCTION OF IGNITION COIL-3

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-132, "Standard and Limit"](#).

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

ASCD BRAKE SWITCH

Component Function Check

INFOID:000000012524538

1.CHECK ASCD BRAKE SWITCH FUNCTION

Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Select "BRAKE SW1" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| | Brake pedal | Fully released | ON |

ⓧ Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | Condition | | Voltage (Approx.) |
|-----------|-----|----------|-------------|--------------------|-------------------|
| Connector | + | - | | | |
| | | Terminal | | | |
| E16 | 126 | 128 | Brake pedal | Slightly depressed | 0 V |
| | | | Brake pedal | Fully released | Battery voltage |

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-421, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524539

1.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

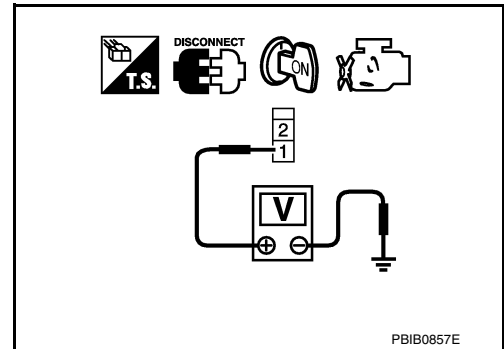
| + | | - | Voltage |
|-------------------|----------|--------|-----------------|
| ASCD brake switch | | | |
| Connector | Terminal | | |
| E37 | 1 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Perform the trouble diagnosis for power supply circuit.

2.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.



ASCD BRAKE SWITCH

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | | Continuity |
|-------------------|----------|-----------|----------|------------|
| ASCD brake switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E37 | 2 | E16 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK ASCD BRAKE SWITCH

Refer to [EC-422, "Component Inspection \(ASCD Brake Switch\)"](#)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace ASCD brake switch.

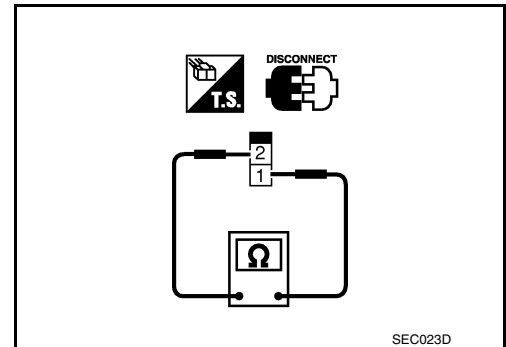
Component Inspection (ASCD Brake Switch)

INFOID:000000012524540

1.CHECK ASCD BRAKE SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|-------------|------------------------------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal | Fully released Existed |
| | | | Slightly de-pressed Not existed |



Is the inspection result normal?

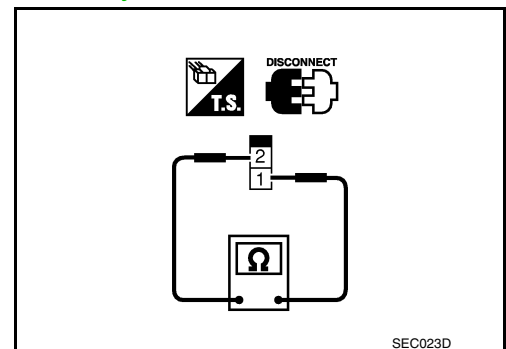
YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-2

1. Adjust ASCD brake switch installation. Refer to [BR-10, "Inspection and Adjustment"](#).
2. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|-------------|------------------------------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal | Fully released Existed |
| | | | Slightly de-pressed Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to [BR-22, "Exploded View"](#).

ASCD INDICATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

ASCD INDICATOR

Component Function Check

INFOID:000000012524541

1. CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator as per the following conditions.

| ASCD indicator | Condition | | Specification |
|----------------|---|--|---------------|
| CRUISE LAMP | Ignition switch: ON | MAIN switch: Pressed at the 1st time → at the 2nd time | ON → OFF |
| SET LAMP | • MAIN switch: ON • When vehicle speed is between 38 km/h (24 MPH) and 144 km/h (89 MPH) | ASCD: Operating | ON |
| | | ASCD: Not operating | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-423, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524542

1. CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble diagnosis for DTC UXXXX.

2. CHECK DTC WITH COMBINATION METER

Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace combination meter. Refer to [MWI-68, "Removal and Installation"](#).

NO >> Repair or replace.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

COOLING FAN

Component Function Check

INFOID:000000012524543

1. CHECK COOLING FAN FUNCTION

① With CONSULT

1. Turn ignition switch ON.
2. Perform "COOLING FAN" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Touch "LOW" and "HI" on the CONSULT screen.
4. Check that cooling fan operates.

② Without CONSULT

1. Activate IPDM E/R auto active test and check cooling fan motor operation. Refer to [PCS-8. "Diagnosis Description"](#).
2. Check that cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-424. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524545

1. CHECK IPDM E/R GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| IPDM E/R | | | |
| Connector | Terminal | Ground | Existed |
| E122 | 38 | | |
| E124 | 59 | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2. CHECK COOLING FAN MOTOR CONTROL SIGNAL CIRCUIT

1. Disconnect cooling fan motor harness connector.
2. Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector.

| - | | + | | Continuity |
|-----------|----------|-------------------|----------|------------|
| IPDM E/R | | Cooling fan motor | | |
| Connector | Terminal | Connector | Terminal | Existed |
| E120 | 20 | E113 | 1 | |
| | 24 | | 3 | |

3. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3. CHECK COOLING FAN MOTOR GROUND CIRCUIT

1. Check the continuity between cooling fan motor harness connector and ground.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| | | | |
|-------------------|----------|--------|------------|
| + | | - | Continuity |
| Cooling fan motor | | | |
| Connector | Terminal | Ground | Existed |
| E113 | 2 | | |
| | 4 | | |

2. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK COOLING FAN MOTOR

Check the cooling fan motor. Refer to [EC-425, "Component Inspection \(Cooling Fan Motor\)"](#).

YES >> INSPECTION END

NO >> Replace cooling motor. Refer to [CO-22, "Removal and Installation \(Motor driven type\)"](#).

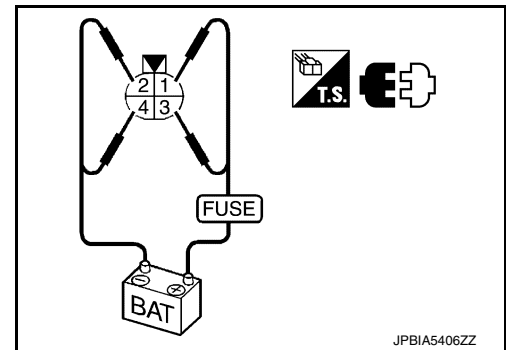
Component Inspection (Cooling Fan Motor)

INFOID:0000000012524546

1. CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connectors. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Supply cooling fan motor terminals with battery voltage and check operation.

| Cooling fan motor terminals | | Cooling fan speed |
|-----------------------------|---------|-------------------|
| + | - | |
| Terminal | | |
| 1 | 2 and 4 | Low |
| 3 | | High |
| 1 and 3 | | |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan motor. Refer to [CO-22, "Removal and Installation \(Motor driven type\)"](#).

ELECTRICAL LOAD SIGNAL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

ELECTRICAL LOAD SIGNAL

Description

INFOID:000000012524548

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication line.

Component Function Check

INFOID:000000012524549

1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

Ⓟ With CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Select "LOAD SIGNAL" and check indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-----------------------------|-----|------------|
| LOAD SIGNAL | Rear window defogger switch | ON | ON |
| | | OFF | OFF |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to [EC-426. "Diagnosis Procedure"](#).

2. CHECK LIGHTING SWITCH FUNCTION

Ⓟ With CONSULT

Check "LOAD SIGNAL" indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-----------------|--------------------|------------|
| LOAD SIGNAL | Lighting switch | ON at 2nd position | ON |
| | | OFF | OFF |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Proceed to [EC-426. "Diagnosis Procedure"](#).

3. CHECK HEATER FAN CONTROL SWITCH FUNCTION

Ⓟ With CONSULT

Select "HEATER FAN SW" and check indication as per the following conditions.

| Monitor item | Condition | | Indication |
|---------------|---------------------------|-----|------------|
| HEATER FAN SW | Heater fan control switch | ON | ON |
| | | OFF | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-426. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524550

1. INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to [EC-426. "Component Function Check"](#).

Which circuit is related to the incident?

Rear window defogger >> GO TO 2.

Headlamp >> GO TO 3.

Heater fan >> GO TO 4.

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to [DEF-25, "Work Flow"](#).

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Refer to [EXL-88, "Work Flow"](#).

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to [HAC-159, "Workflow"](#).

>> INSPECTION END

A

EC

C

D

E

F

G

H

I

J

K

L

M

N

O

P

FUEL INJECTOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

FUEL INJECTOR

Component Function Check

INFOID:000000012524551

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

- YES >> GO TO 2.
- NO >> Proceed to [EC-428, "Diagnosis Procedure"](#).

2.CHECK FUEL INJECTOR FUNCTION

Ⓟ With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE using CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

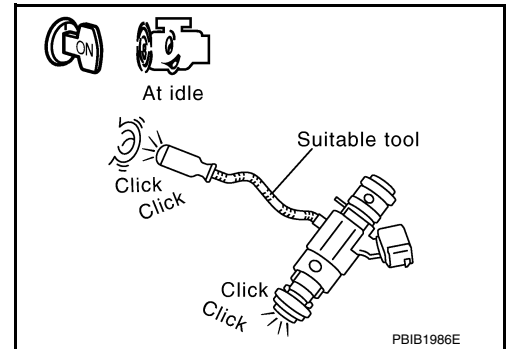
ⓧ Without CONSULT

1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-428, "Diagnosis Procedure"](#).



Diagnosis Procedure

INFOID:000000012524552

1.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel injector harness connector and ground.

| + | | | - | Voltage |
|---------------|-----------|----------|--------|-----------------|
| Fuel injector | | | | |
| Cylinder | Connector | Terminal | Ground | Battery voltage |
| 1 | F212 | 1 | | |
| 2 | F18 | 1 | | |
| 3 | F211 | 1 | | |
| 4 | F20 | 1 | | |
| 5 | F210 | 1 | | |
| 6 | F22 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace error-detected parts.

2.CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | | - | | Continuity |
|---------------|-----------|----------|-----------|----------|------------|
| Fuel injector | | | ECM | | |
| Cylinder | Connector | Terminal | Connector | Terminal | |
| 1 | F212 | 2 | F54 | 33 | Existed |
| 2 | F18 | 2 | | 44 | |
| 3 | F211 | 2 | | 48 | |
| 4 | F20 | 2 | | 47 | |
| 5 | F210 | 2 | | 46 | |
| 6 | F22 | 2 | | 45 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK FUEL INJECTOR

Refer to [EC-429, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace malfunctioning fuel injector. Refer to [EM-45, "Removal and Installation"](#).

4.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:000000012524553

1.CHECK FUEL INJECTOR

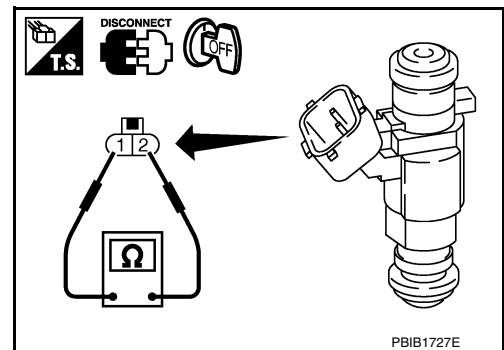
1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Check resistance between fuel injector terminals as per the following.

| Fuel injector | | Resistance |
|---------------|---|---|
| + | - | |
| Terminals | | |
| 1 | 2 | 11.1 - 14.5 Ω [at 10 - 60°C (50 - 140°F)] |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning fuel injector. Refer to [EM-45, "Removal and Installation"](#).



FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

FUEL PUMP

Component Function Check

INFOID:000000012524554

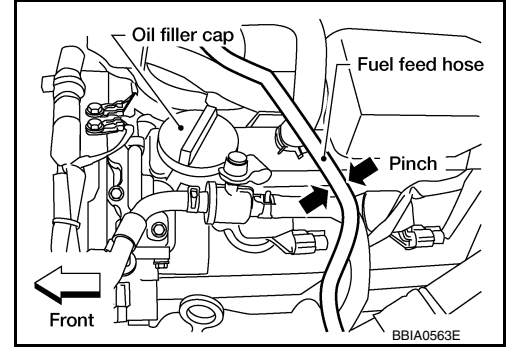
1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-430. "Diagnosis Procedure"](#).



Diagnosis Procedure

INFOID:000000012524555

1.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-1

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECM harness connector and ground.

| + | | - | Voltage |
|-----------|----------|--------|-----------------|
| ECM | | | |
| Connector | Terminal | Ground | Battery voltage |
| F54 | 43 | | |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-2

Check the voltage between IPDM E/R harness connector and ground.

| + | | - | Voltage |
|-----------|----------|--------|-----------------|
| IPDM E/R | | | |
| Connector | Terminal | Ground | Battery voltage |
| E122 | 46 | | |

Is the inspection result normal?

- YES >> Repair or replace error-detected parts.
NO >> GO TO 8.

3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-3

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
4. Turn ignition switch ON.
5. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | Voltage |
|--------------------------------------|----------|--------|---|
| Fuel level sensor unit and fuel pump | | | |
| Connector | Terminal | | |
| C5 | 1 | Ground | Battery voltage should exist for 1 second after ignition switch is turned ON. |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 4.

4.CHECK 15A FUSE

1. Turn ignition switch OFF.
2. Disconnect 15A fuse (No. 48) from IPDM E/R.
3. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuse.

5.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-4

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between IPDM E/R harness connector and "fuel level sensor unit and fuel pump" harness connector.

| + | | - | | Continuity |
|-----------|----------|--------------------------------------|----------|------------|
| IPDM E/R | | Fuel level sensor unit and fuel pump | | |
| Connector | Terminal | Connector | Terminal | |
| E119 | 13 | C5 | 1 | Existed |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace error-detected parts.

6.CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and ground.

| + | | - | Continuity |
|--------------------------------------|----------|--------|------------|
| Fuel level sensor unit and fuel pump | | | |
| Connector | Terminal | | |
| C5 | 3 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7.CHECK FUEL PUMP

Refer to [EC-432. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace fuel pump. Refer to [FL-11. "Removal and Installation"](#).

FUEL PUMP

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

8. CHECK INTERMITTENT INCIDENT

Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to [PCS-25, "Removal and Installation"](#).
- NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:000000012524556

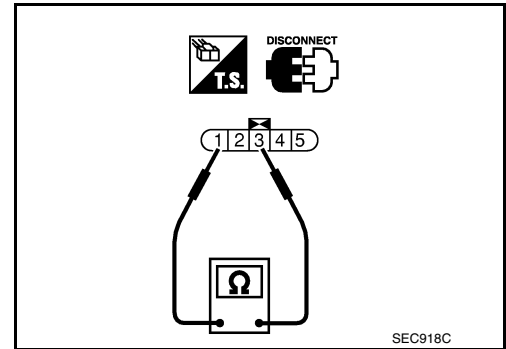
1. CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect "fuel level sensor unit and fuel pump" harness connector. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

| Fuel pump | | Resistance |
|-----------|---|--------------------------------------|
| + | - | |
| Terminals | | |
| 1 | 3 | 0.2 - 5.0 [Ω at 25°C (77°F)] |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11, "Removal and Installation"](#).



IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

IGNITION SIGNAL

Component Function Check

INFOID:000000012524557

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES >> GO TO 2.

NO >> Proceed to [EC-433, "Diagnosis Procedure"](#).

2.IGNITION SIGNAL FUNCTION

Ⓜ With CONSULT

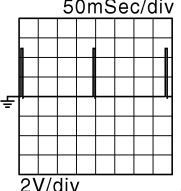
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.

2. Check that each circuit produces a momentary engine speed drop.

ⓧ Without CONSULT

1. Let engine idle.

2. Check the voltage signal between ECM harness connector and ground with an oscilloscope.

| ECM | | | | Voltage signal |
|------------|----------|------------|----------|--|
| + | | - | | |
| Connec-tor | Terminal | Connec-tor | Terminal | |
| F54 | 9 | E16 | 128 |  |
| | 10 | | | |
| | 11 | | | |
| | 13 | | | |
| | 14 | | | |
| | 15 | | | |

NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-433, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524558

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-1

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.

2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | Voltage |
|-----------|----------|-----|-----------------|
| Connector | + | - | |
| | Terminal | | |
| E16 | 121 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform the trouble diagnosis for power supply circuit.

2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-2

1. Turn ignition switch OFF.

2. Disconnect condenser harness connector.

3. Turn ignition switch ON.

4. Check the voltage between condenser-1 harness connector and ground.

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | - | Voltage |
|-------------|----------|--------|-----------------|
| Condenser-1 | | | |
| Connector | Terminal | | |
| F21 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 3.

3. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-3

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

| + | | - | | Continuity |
|-----------|----------|-------------|----------|------------|
| IPDM E/R | | Condenser-1 | | |
| Connector | Terminal | Connector | Terminal | |
| E119 | 3 | F21 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> GO TO 4.

4. CHECK CONDENSER-1 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between condenser harness connector and ground.

| + | | - | Continuity |
|-------------|----------|--------|------------|
| Condenser-1 | | | |
| Connector | Terminal | | |
| F21 | 2 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK CONDENSER-1

Refer to [EC-437. "Component Inspection \(Condenser-1\)"](#)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace condenser-1.

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-4

1. Reconnect all harness connectors disconnected.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

| + | | | - | Voltage |
|---------------|-----------|----------|--------|-----------------|
| Ignition coil | | | | |
| Cylinder | Connector | Terminal | Ground | Battery voltage |
| 1 | F207 | 3 | | |
| 2 | F6 | 3 | | |
| 3 | F208 | 3 | | |
| 4 | F7 | 3 | | |
| 5 | F209 | 3 | | |
| 6 | F8 | 3 | | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7. CHECK IGNITION COIL GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

| + | | | - | Continuity |
|---------------|-----------|----------|--------|------------|
| Ignition coil | | | | |
| Cylinder | Connector | Terminal | Ground | Existed |
| 1 | F207 | 2 | | |
| 2 | F6 | 2 | | |
| 3 | F208 | 2 | | |
| 4 | F7 | 2 | | |
| 5 | F209 | 2 | | |
| 6 | F8 | 2 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace error-detected parts.

8. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ignition coil harness connector and ECM harness connector.

| + | | | - | | Continuity |
|---------------|-----------|----------|-----------|----------|------------|
| Ignition coil | | | ECM | | |
| Cylinder | Connector | Terminal | Connector | Terminal | Existed |
| 1 | F207 | 1 | F54 | 11 | |
| 2 | F6 | 1 | | 10 | |
| 3 | F208 | 1 | | 9 | |
| 4 | F7 | 1 | | 15 | |
| 5 | F209 | 1 | | 14 | |
| 6 | F8 | 1 | | 13 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace error-detected parts.

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

9. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to [EC-436, "Component Inspection \(Ignition Coil with Power Transistor\)"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-40, "Removal and Installation"](#).

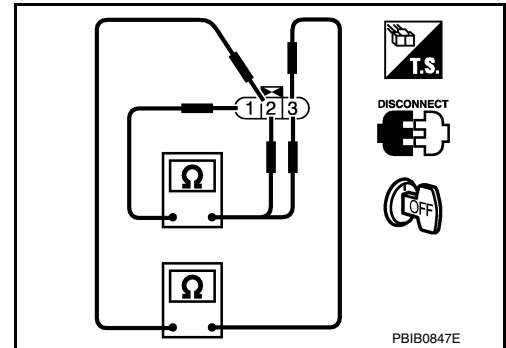
Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000012524559

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-1

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Check resistance between ignition coil terminals as per the following.

| Ignition coil with power transistor | | Resistance [Ω at 25°C (77°F)] |
|-------------------------------------|---|---------------------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | Except 0 or ∞ |
| | 3 | |
| 2 | 3 | Except 0 |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-40, "Removal and Installation"](#).

2. CHECK IGNITION COIL WITH POWER TRANSISTOR-2

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

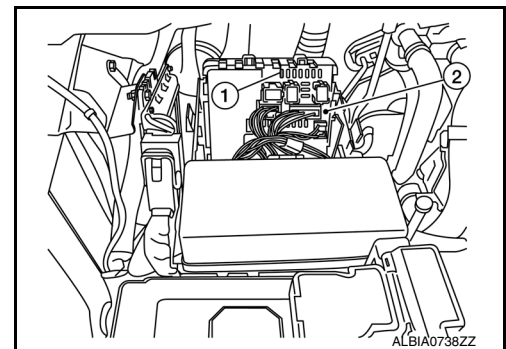
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Remove fuel pump fuse (#48) in IPDM E/R to release fuel pressure.

1. Fuel pump fuse
2. IPDM E/R

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
8. Remove ignition coil and spark plug of the cylinder to be checked.
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.

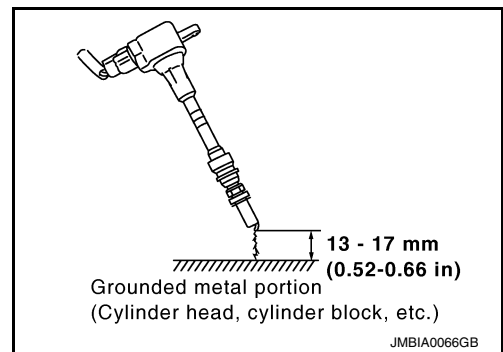


IGNITION SIGNAL

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
- Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

NOTE:

When the gap is less than 13 mm (0.52 in), spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-40, "Removal and Installation"](#).

Component Inspection (Condenser-1)

INFOID:000000012524560

1. CHECK CONDENSER-1

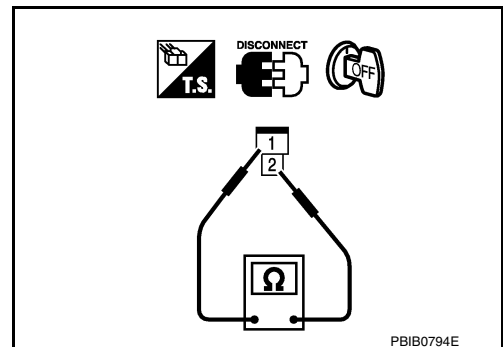
- Turn ignition switch OFF.
- Disconnect condenser harness connector.
- Check resistance between condenser terminals as per the following.

| Condenser-1 | | Resistance |
|-------------|---|-----------------------------|
| + | - | |
| Terminal | | Above 1 MΩ [at 25°C (77°F)] |
| 1 | 2 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.



MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

MALFUNCTION INDICATOR LAMP

Component Function Check

INFOID:000000012524561

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Check that MIL lights up.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-438. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524562

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH COMBINATION METER

Refer to [MWI-17. "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace combination meter. Refer to [MWI-68. "Removal and Installation"](#).
- NO >> Repair or replace.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:000000012524563

1.CHECK ORVR FUNCTION

Check whether the following symptoms are present.

- Fuel odor from EVAP canister is strong.
- Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Are any symptoms present?

- YES >> Proceed to [EC-439, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524564

1.INSPECTION START

Check whether the following symptoms are present.

- A: Fuel odor from EVAP canister is strong.
B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Which symptom is present?

- A >> GO TO 2.
B >> GO TO 8.

2.CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 4.

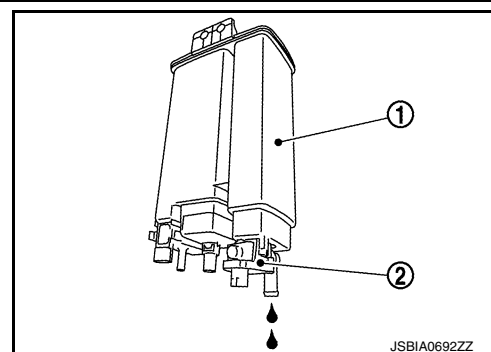
3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

- YES >> GO TO 4.
NO >> GO TO 7.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-13, "Removal and Installation"](#).

>> GO TO 5.

5.CHECK DRAIN FILTER

Refer to [EC-443, "Component Inspection \(Drain filter\)"](#).

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Replace drain filter. Refer to [FL-16, "Removal and Installation"](#).

6.DETECT MALFUNCTIONING PART

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to [FL-16. "Removal and Installation"](#).

7. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-441. "Component Inspection \(Refueling EVAP vapor cut valve\)"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

8. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 10.

9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

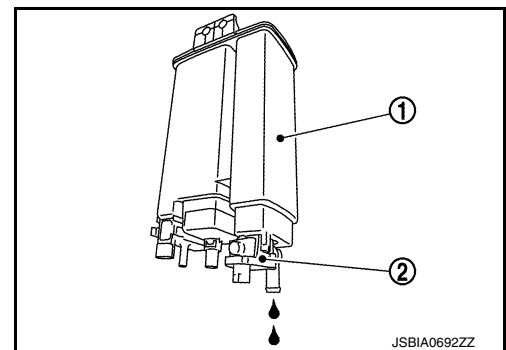
Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 10.

NO >> GO TO 13.



10. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-13. "Removal and Installation"](#).

>> GO TO 11.

11. CHECK DRAIN FILTER

Refer to [EC-443. "Component Inspection \(Drain filter\)"](#).

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace drain filter. Refer to [FL-16. "Removal and Installation"](#).

12. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

13. CHECK RECIRCULATION LINE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace fuel filler tube. Refer to [FL-6. "Removal and Installation"](#).

14. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to [EC-441. "Component Inspection \(Refueling EVAP vapor cut valve\)"](#).

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

15. CHECK FUEL FILLER TUBE

Check fuel filler tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace fuel filler tube. Refer to [FL-13. "Removal and Installation"](#).

16. CHECK ONE-WAY FUEL VALVE-1

Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or replace one-way fuel valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

17. CHECK ONE-WAY FUEL VALVE-2

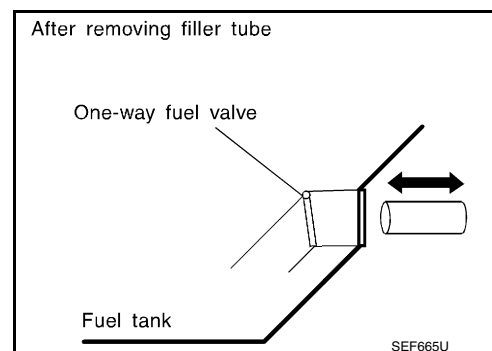
1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as per the following.
When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).



Component Inspection (Refueling EVAP vapor cut valve)

INFOID:0000000012524565

1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK REFUELING EVAP VAPOR CUT VALVE

Ⓜ With CONSULT

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
3. Drain fuel from the tank as follows:
 - Remove fuel feed hose located on the fuel gauge retainer.
 - Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
 - Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as follows.
 - Connect vacuum pump to hose end.
 - Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

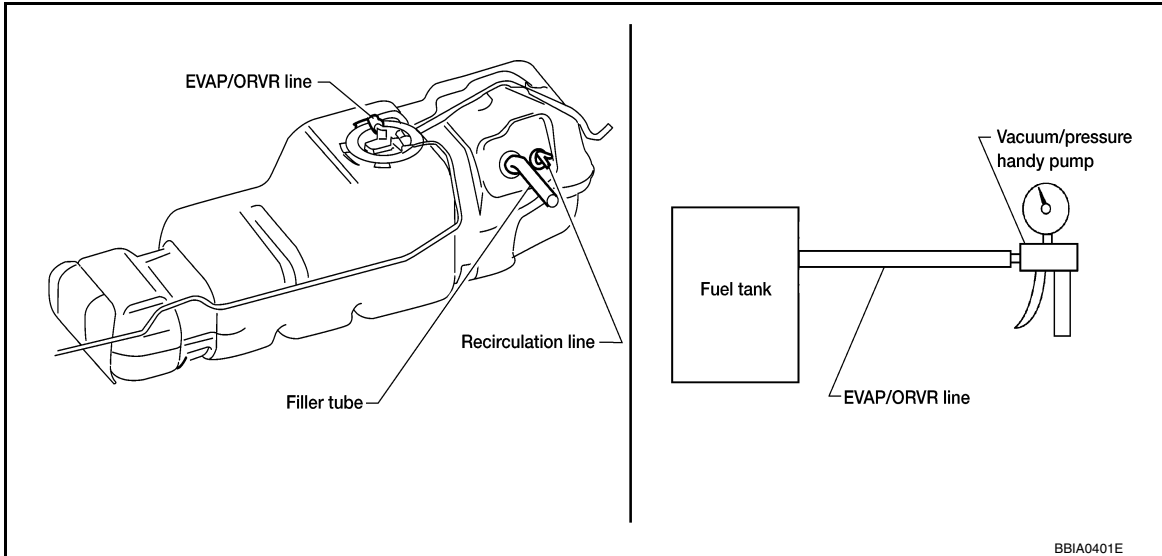
 - Turn fuel tank upside down.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

- Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm³, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



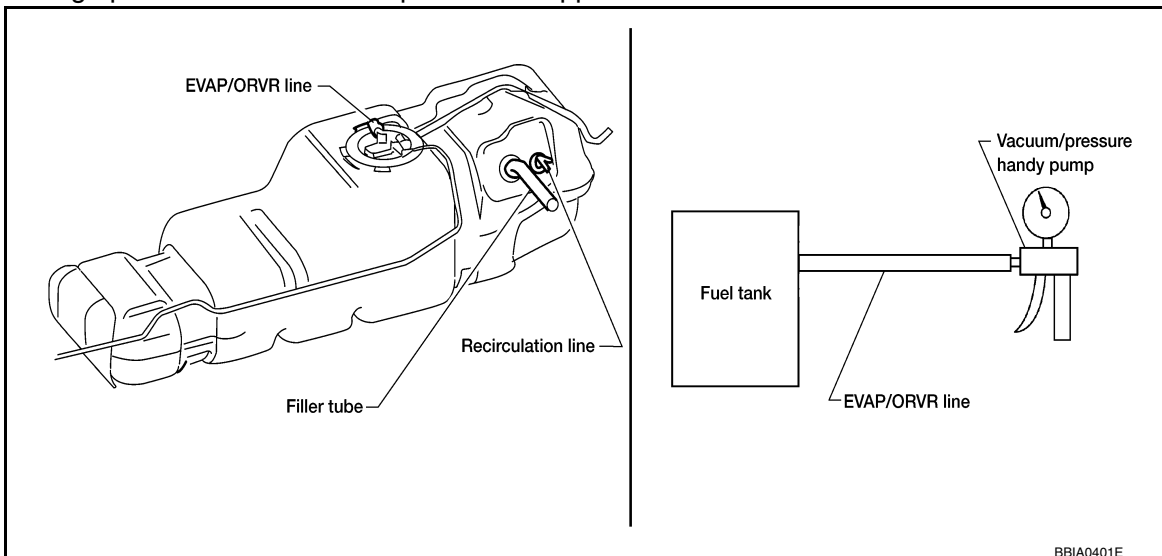
Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace refueling EVAP vapor cut valve with fuel tank.

3. CHECK REFUELING EVAP VAPOR CUT VALVE

⊗ Without CONSULT

1. Turn ignition switch OFF.
 2. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
 3. Drain fuel from the tank as follows:
 - Remove fuel gauge retainer.
 - Drain fuel from the tank using a handy pump into a fuel container.
 4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
 5. Check refueling EVAP vapor cut valve for being stuck to open as follows.
 - Connect vacuum pump to hose end.
 - Remove fuel gauge retainer with fuel gauge unit.
- Always replace O-ring with new one.**
- Turn fuel tank upside down.
 - Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm³, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

Component Inspection (Drain filter)

INFOID:000000012524566

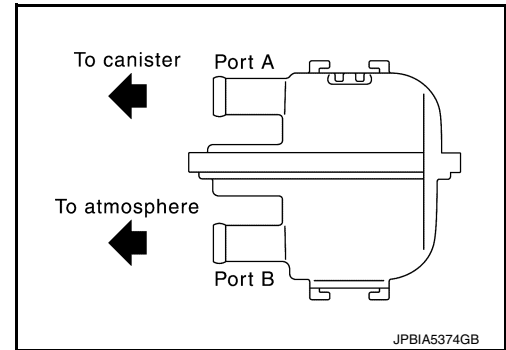
1. CHECK DRAIN FILTER

1. Check visually for insect nests in the drain filter air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Blow air into port A and check that it flows freely out of port B.
5. Block port B.
6. Blow air into port A and check that there is no leakage.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace drain filter.



REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:000000012524567

1. CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check the voltage between ECM harness connector terminals as per the following.

| Connector | ECM | | Voltage (Approx.) |
|-----------|----------|----|----------------------|
| | + | - | |
| | Terminal | | |
| F77 | 63 | 64 | 1.0 - 4.0V |

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-444, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524568

1. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY

1. Turn ignition OFF.
2. Disconnect refrigerant pressure sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between refrigerant pressure sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------------------------|----------|--------|----------------------|
| Refrigerant pressure sensor | | | |
| Connector | Terminal | | |
| E48 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------------------------|----------|-----------|----------|------------|
| Refrigerant pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E48 | 1 | F77 | 96 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

3. CHECK REFRIGERANT PRESSURE SENSOR GROUND

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

REFRIGERANT PRESSURE SENSOR

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | | Continuity |
|-----------------------------|----------|-----------|----------|------------|
| Refrigerant pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E48 | 3 | F77 | 64 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between ECM harness connector and refrigerant pressure sensor harness connector.

| + | | - | | Continuity |
|-----------------------------|----------|-----------|----------|------------|
| Refrigerant pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E48 | 2 | F77 | 63 | Existed |

2. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK INTERMITTENT INCIDENT.

Perform [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to [HA-68, "REFRIGERANT PRESSURE SENSOR : Removal and Installation"](#).

NO >> Repair or replace error-detected parts.

SENSOR POWER SUPPLY2 CIRCUIT

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

SENSOR POWER SUPPLY2 CIRCUIT

Description

INFOID:000000012524569

ECM supplies a voltage of 5 V to some of the sensors systematically divided into 2 groups, respectively. Accordingly, when a short circuit develops in a sensor power source, a malfunction may occur simultaneously in the sensors belonging to the same group as the short-circuited sensor.

SENSOR POWER SUPPLY

Sensor Power Supply 1

- Accelerator pedal position sensor (APP sensor 1)
- EVAP control system pressure sensor
- Power steering pressure sensor
- Refrigerant pressure sensor

NOTE:

If sensor power supply 1 circuit is malfunctioning, DTC P0643 is displayed.

Sensor Power Supply 2

- Accelerator pedal position sensor (APP sensor 2)
- Electric throttle control actuator

Diagnosis Procedure

INFOID:000000012524570

1.CHECK SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| + | | - | | Voltage (Approx.) |
|-----------|----------|-----------|----------|----------------------|
| ECM | | | | |
| Connector | Terminal | Connector | Terminal | |
| E16 | 103 | E16 | 128 | 5 V |
| F54 | 24 | | | |

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> GO TO 2.

2.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

1. Disconnect following sensors harness connector.
2. Check harness for short to power and short to ground, between the following terminals.

| + | | - | | |
|-----------|----------|------------------------------------|-----------|----------|
| ECM | | Sensor | | |
| Connector | Terminal | Name | Connector | Terminal |
| E16 | 103 | APP sensor 2 | E20 | 1 |
| F54 | 24 | Electric throttle control actuator | F50 | 2 |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair short to ground or short to power in harness or connectors.

3.CHECK COMPONENTS

Check the following.

- APP sensor 2 (Refer to [EC-401, "Component Inspection"](#).)
- Electric throttle control actuator (Refer to [EC-207, "Component Inspection"](#).)

Is the inspection result normal?

- YES >> Refer to [GI-43, "Intermittent Incident"](#).

SENSOR POWER SUPPLY2 CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

NO >> Replace malfunctioning component.

A

EC

C

D

E

F

G

H

I

J

K

L

M

N

O

P

VARIABLE INDUCTION AIR CONTROL SYSTEM (VIAS)

< DTC/CIRCUIT DIAGNOSIS >

[VQ40DE]

VARIABLE INDUCTION AIR CONTROL SYSTEM (VIAS)

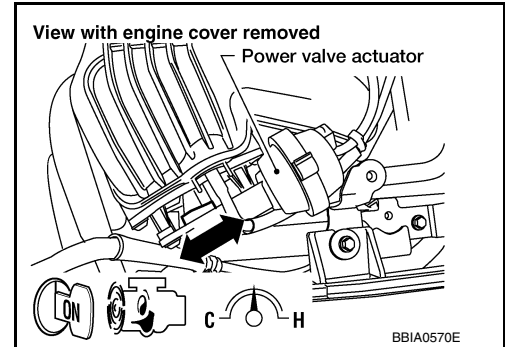
Component Function Check

INFOID:000000012524571

1. CHECK OVERALL FUNCTION

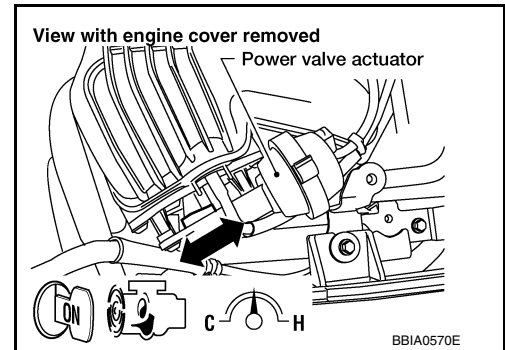
④ With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Perform "VIAS SOL VALVE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Turn VIAS control solenoid valve "ON" and "OFF", and make sure that power valve actuator rod moves.



⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Rev engine up to between 2,200 and 3,300 rpm and make sure that power valve actuator rod moves.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-448. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524572

1. CHECK VACUUM EXISTENCE-I

④ With CONSULT

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Start engine and let it idle.
3. Perform "VIAS SOL VALVE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
4. Turn VIAS control solenoid valve "ON" and "OFF", and check vacuum existence under the following conditions.

| VIAS SOL VALVE | Vacuum |
|----------------|-------------------|
| ON | Should exist. |
| OFF | Should not exist. |

⊗ Without CONSULT

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Disconnect VIAS control solenoid valve harness connector.
3. Start engine and let it idle.

VARIABLE INDUCTION AIR CONTROL SYSTEM (VIAS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check vacuum existence under the following conditions.

| VIAS control solenoid valve | | Condition | Vacuum |
|-----------------------------|---|---------------------------|-------------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | 12V direct current supply | Should exist. |
| | | No supply | Should not exist. |

Is the inspection result normal?

YES >> Repair or replace power valve actuator. Refer to [EC-20, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

NO >> GO TO 2.

2.CHECK VACUUM HOSE

1. Stop engine.
2. Check vacuum hose for crack, clogging, improper connection or disconnection. Refer to [EC-51, "VARIABLE INDUCTION AIR SYSTEM : Vacuum Hose Drawing"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair hoses or tubes.

3.CHECK VACUUM TANK

1. Stop engine and disconnect vacuum hose connected to intake manifold collector.
2. Start engine and let it idle.
3. Check vacuum existence from intake manifold collector.

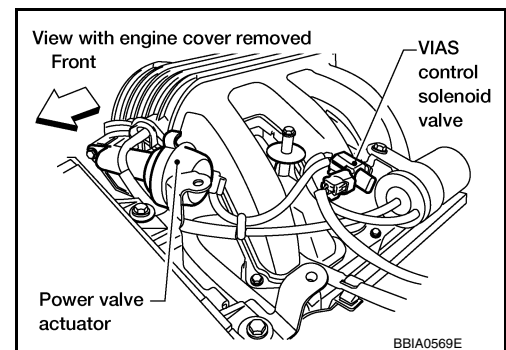
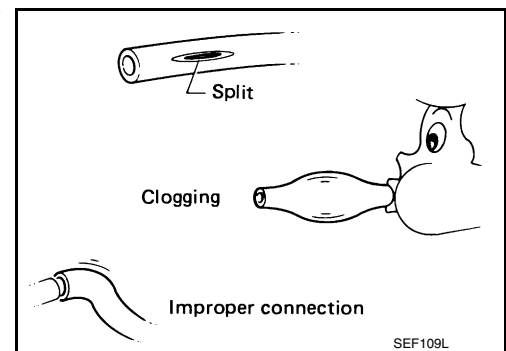
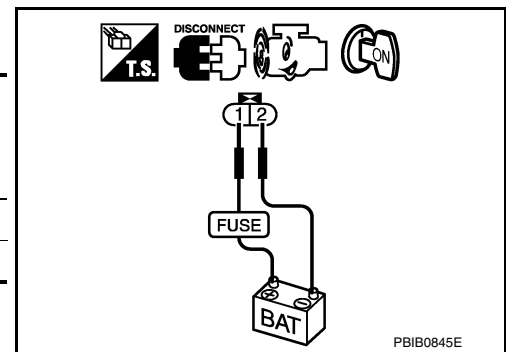
Does vacuum existence from the intake manifold collector?

YES >> GO TO 4.

NO >> Replace intake manifold collector. Refer to [EM-25, "Removal and Installation"](#).

4.CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect VIAS control solenoid valve harness connector.
3. Turn ignition switch ON.



4. Check the voltage between VIAS control solenoid valve harness connector and ground

| + | | - | Voltage |
|-----------------------------|----------|--------|-----------------|
| VIAS control solenoid valve | | | |
| Connector | Terminal | | |
| F75 | 1 | Ground | Battery voltage |

VARIABLE INDUCTION AIR CONTROL SYSTEM (VIAS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair or replace error-detected parts.

5. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM harness connector and VIAS control solenoid valve harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------------------------|----------|------------|
| ECM | | VIAS control solenoid valve | | |
| Connector | Terminal | Connector | Terminal | |
| F54 | 39 | F75 | 2 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK VIAS CONTROL SOLENOID VALVE

Check VIAS control solenoid valve. Refer to [EC-450, "Component Inspection \(VIAS Control Solenoid Valve\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace VIAS control solenoid valve. Refer to [EM-25, "Exploded View"](#).

Component Inspection (VIAS Control Solenoid Valve)

INFOID:0000000012524573

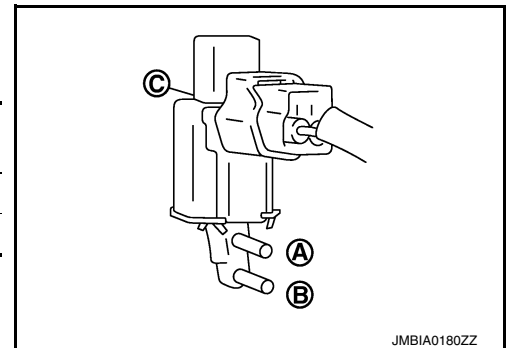
1. CHECK VIAS CONTROL SOLENOID VALVE

With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VIAS SOL VALVE" in "ACTIVE TEST" mode of "ENGINE".
4. Check air passage continuity and operation delay time as per the following conditions.

| VIAS SOL VALVE | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|----------------|--|--|
| ON | Yes | No |
| OFF | No | Yes |

Operation takes less than 1 second.



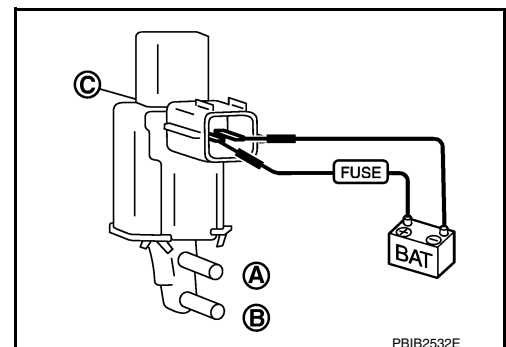
Without CONSULT

Check air passage continuity and operation delay time as per the following conditions.

| Condition | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals 1 and 2 | Yes | No |
| No supply | No | Yes |

Operation takes less than 1 second.

Is the inspection result normal?



VARIABLE INDUCTION AIR CONTROL SYSTEM (VIAS)

[VQ40DE]

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

NO >> Replace VIAS control solenoid valve. Refer to [EM-25, "Exploded View"](#).

Component Inspection (Vacuum Tank)

INFOID:0000000012524574

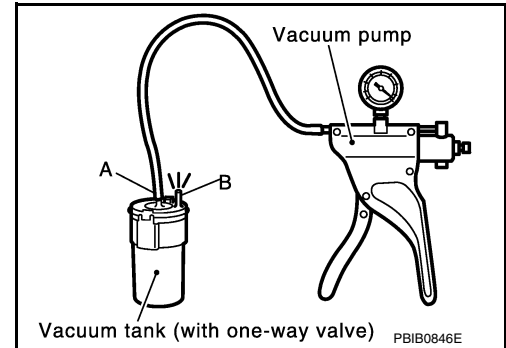
1. CHECK VACUUM TANK

1. Disconnect vacuum hose connected to vacuum tank.
2. Connect a vacuum pump to the port (A) of vacuum tank.
3. Apply vacuum and check that vacuum exists at the port (B).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace vacuum tank. Refer to [EM-25, "Exploded View"](#).



ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000012524575

SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | SYMPTOM | | | | | | | | | | | | Reference page | |
|---|---------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-------------------|--|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | EC-430 |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-146 |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-428 |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | FL-13 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | EC-461 |
| | Incorrect idle speed adjustment | | | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-142 |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | EC-393 , EC-398 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-142 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-433 |
| Main power supply and ground circuit | | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | EC-168 |
| Mass air flow sensor circuit | | 1 | | | 2 | | | | | | | | | | EC-186 , EC-192 |
| Engine coolant temperature sensor circuit | | | | | | | 3 | | | 3 | | | | | EC-203 , EC-209 |
| Air fuel ratio (A/F) sensor 1 circuit | | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-216 , EC-220 , EC-223 , EC-247 , EC-387 |
| Throttle position sensor circuit | | | | | | | 2 | | | 2 | | | | | EC-205 , EC-268 , EC-369 , EC-370 , EC-407 |
| Accelerator pedal position sensor circuit | | | | 3 | 2 | 1 | | | | | | | | | EC-400 , EC-403 , EC-411 |
| Knock sensor circuit | | | | 2 | | | | | | | | 3 | | | EC-278 |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

| | SYMPTOM | | | | | | | | | | | | Reference page | |
|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|----------------|--|
| | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) |
| Warranty symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Crankshaft position sensor (POS) circuit | 2 | 2 | | | | | | | | | | | | EC-280 |
| Camshaft position sensor (PHASE) circuit | 3 | 2 | | | | | | | | | | | | EC-283 |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | EC-338 |
| Power steering pressure sensor circuit | | 2 | | | | | 3 | 3 | | | | | | EC-346 |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | EC-349 , EC-352 |
| Intake valve timing control solenoid valve circuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | EC-184 |
| PNP signal circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-359 |
| VIAS control solenoid valve circuit | | | | | 1 | | | | | | | | | EC-382 |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | EC-444 |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | EC-426 |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | HAC-138 |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | BRC-32 |

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

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ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

| | | SYMPTOM | | | | | | | | | | | | Reference page | | | | | | | | | | | | | |
|-----------------------|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|---------------------------------|----------------------------|---------------------------|----------------|--|--|---|---|---|---|---|---|---|---|--|--|------------------------|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATSWATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) | | | | | | | | | | | | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | | | | | | | | | | | | | |
| Fuel | Fuel tank | 5 | | | | | | | | | | | | | FL-6 | | | | | | | | | | | | |
| | Fuel piping | | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | MA-24 | | | | | | | | | | | | |
| | Vapor lock | | | 5 | | | | | | | | | | | | — | | | | | | | | | | | |
| | Valve deposit | | | | | | | | | | | | | | | — | | | | | | | | | | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | — | | | | | | | | | | | |
| Air | Air duct | | | | | | | | | | | | | | EM-24 | | | | | | | | | | | | |
| | Air cleaner | | | | | | | | | | | | | | EM-24 | | | | | | | | | | | | |
| | Air leakage from air duct (Mass air flow sensor — electric throttle control actuator) | | | 5 | 5 | | 5 | | 5 | 5 | | | 5 | | | EM-24 | | | | | | | | | | | |
| | Electric throttle control actuator | 5 | | | | 5 | | 5 | | | 5 | | | | | EM-25 | | | | | | | | | | | |
| | Air leakage from intake manifold/Collector/Gasket | | | | | | | | | | | | | | | EM-25 , EM-28 | | | | | | | | | | | |
| Cranking | Battery | | | | | | | | | | | | | | PG-86 | | | | | | | | | | | | |
| | Generator circuit | 1 | | 1 | 1 | | 1 | 1 | | | | | | 1 | CHG-10 CHG-13 | | | | | | | | | | | | |
| | Starter circuit | 3 | | | | | | | | | | 1 | | | STR-17 STR-21 | | | | | | | | | | | | |
| | Signal plate | 6 | | | | | | | | | | | | | EM-115 | | | | | | | | | | | | |
| | PNP signal circuit | 4 | | | | | | | | | | | | | TM-88 | | | | | | | | | | | | |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | 3 | | EM-97 | | | | | | | | | | | | |
| | Cylinder head gasket | | | | | | | | | | | | | | | 4 | | | | | | | | | | | |
| | Cylinder block | | | | | | | | | | | | | | | | | | | | | | | | | | EM-115 |
| | Piston | | | | | | | | | | | | | | | | | | | | | | | 4 | | | |
| | Piston ring | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Connecting rod | 6 | | | | | | | | | | | | | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | | | |
| | Bearing | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Crankshaft | | | | | | | | | | | | | | | | | | | | | | | | | | | |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VQ40DE]

| | | SYMPTOM | | | | | | | | | | | | Reference page | |
|---|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|----------------|--|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Valve mechanism | Timing chain | | | | | | | | | | | | | | EM-61 |
| | Camshaft | | | | | | | | | | | | | | EM-78 |
| | Intake valve timing control | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-61 |
| | Intake valve | | | | | | | | | | | | 3 | | EM-97 |
| | Exhaust valve | | | | | | | | | | | | | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-30 , EM-32 , EX-6 |
| | Three way catalyst | | | | | | | | | | | | | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-34 , LU-12 , LU-14 , LU-7 |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | LU-8 |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | CO-17 , CO-18 |
| | Thermostat | | | | | | | | | 5 | | | | | CO-30 |
| | Water pump | | | | | | | | | | | | | | CO-24 |
| | Water gallery | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | CO-7 |
| | Cooling fan | | | | | | | | | | | | | | CO-21 , CO-22 |
| | Coolant level (Low)/Contaminated coolant | | | | | | | | | | 5 | | | | CO-11 |
| IVIS (INFINITI Vehicle Immobilizer System — NATS) | | 1 | 1 | | | | | | | | | | | | SEC-8 |

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS >

[VQ40DE]

NORMAL OPERATING CONDITION

Description

INFOID:000000012524576

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. However, if the engine speed is above 4,500 rpm, fuel will be cut off in a few seconds. Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, [EC-39](#). "[MULTIPOINT FUEL INJECTION SYSTEM : System Description](#)".

PERIODIC MAINTENANCE

IDLE SPEED

Inspection

INFOID:0000000012524577

EC

1. CHECK IDLE SPEED

- ④ With CONSULT
Check idle speed in "DATA MONITOR" mode of "ENGINE" using CONSULT.
- ④ With GST
Check idle speed with Service \$01 of GST.

>> INSPECTION END

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IGNITION TIMING

< PERIODIC MAINTENANCE >

[VQ40DE]

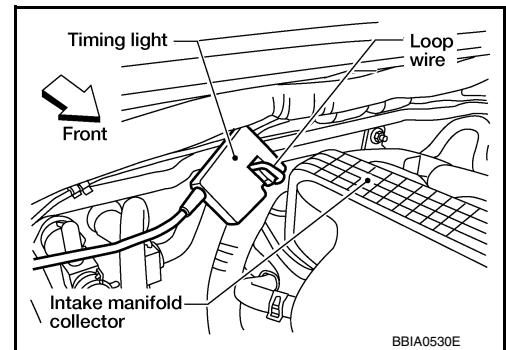
IGNITION TIMING

Inspection

INFOID:000000012524578

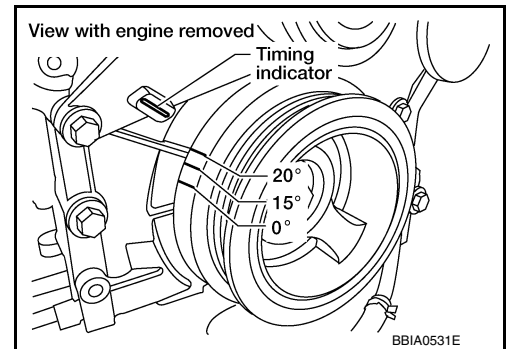
1. CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



2. Check ignition timing.

>> INSPECTION END



EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

[VQ40DE]

EVAP LEAK CHECK

Inspection

INFOID:000000012524579

CAUTION:

- Do not use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

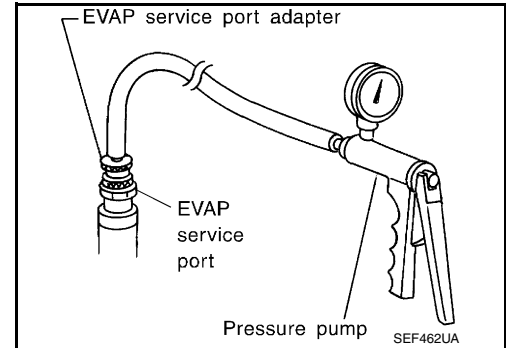
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

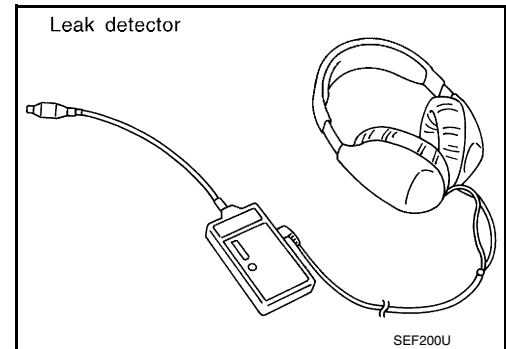
1. EVAP LEAK CHECK

With CONSULT

1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.

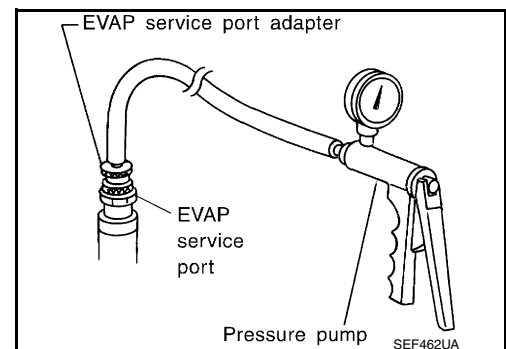


2. Turn ignition switch ON.
3. Select the "EVAP SYSTEM CLOSE" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.
4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter and hose with pressure pump.
7. Locate the leak using a leak detector. Refer to [EC-46, "EVAPO-RATIVE EMISSION SYSTEM : System Diagram"](#).



Without CONSULT

1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi).
4. Remove EVAP service port adapter and hose with pressure pump.



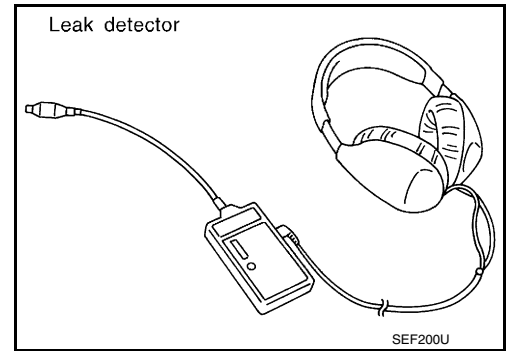
EVAP LEAK CHECK

[VQ40DE]

< PERIODIC MAINTENANCE >

5. Locate the leak using a leak detector. Refer to [EC-46. "EVAPORATIVE EMISSION SYSTEM : System Diagram"](#).

>> INSPECTION END



POSITIVE CRANKCASE VENTILATION

< PERIODIC MAINTENANCE >

[VQ40DE]

POSITIVE CRANKCASE VENTILATION

Inspection

INFOID:000000012524580

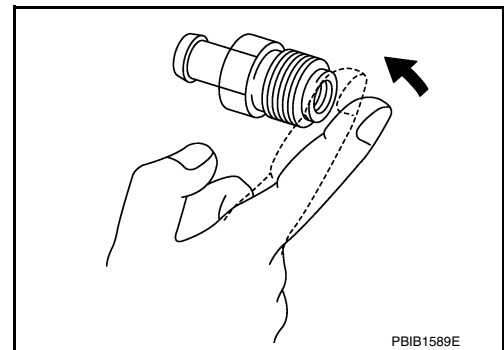
1. CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace PCV valve. Refer to [EM-41, "Exploded View"](#).



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REMOVAL AND INSTALLATION

ECM

Removal and Installation

INFOID:0000000012524581

CAUTION:

Perform **ADDITIONAL SERVICE WHEN REPLACING ECM**. Refer to [EC-134, "Description"](#).

REMOVAL

1. Disconnect ECM harness connectors. Refer to "HARNESS CONNECTOR (LEVER LOCKING TYPE)" in [PG-7, "Harness Connector"](#).
2. Remove ECM bracket bolt.
3. Remove ECM.

INSTALLATION

Install in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ40DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000012524582

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 725 ± 50 rpm |

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:0000000012524583

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 20 ± 5° BTDC |

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000012524584

| Condition | Specification (Using CONSULT or GST) |
|--------------|--------------------------------------|
| At idle | 5 – 35 % |
| At 2,500 rpm | 5 – 35 % |

Mass Air Flow Sensor

INFOID:0000000012524585

| | |
|--------------------------------------|--|
| Supply voltage | Battery voltage (11 – 14 V) |
| Output voltage at idle | 0.7 – 1.2 V* |
| Mass air flow (Using CONSULT or GST) | 2.0 – 6.0 g/s at idle* 7.0 – 20.0 g/s at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no load.

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:000000012524586

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER", used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the SR section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Airbag Diagnosis Sensor Unit or other Airbag System sensors with the Ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.
- When using air or electric power tools or hammers, always switch the Ignition OFF, disconnect the battery and wait at least three minutes before performing any service.

On Board Diagnostic (OBD) System of Engine and A/T

INFOID:000000012524587

The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:

- Always to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)
- Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to [PG-7, "Harness Connector"](#).
- Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.
- Always to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.
- Always to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.

PRECAUTIONS

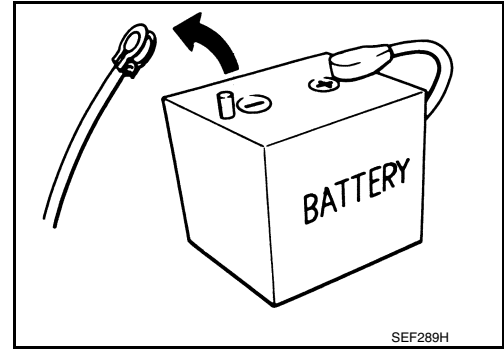
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< PRECAUTION >

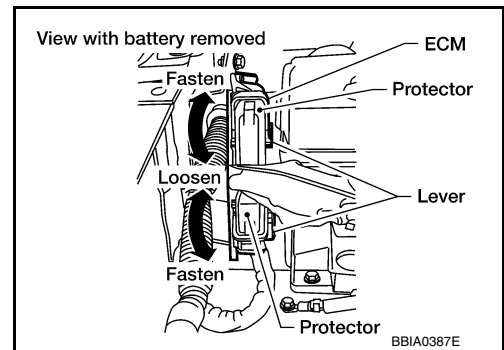
General Precautions

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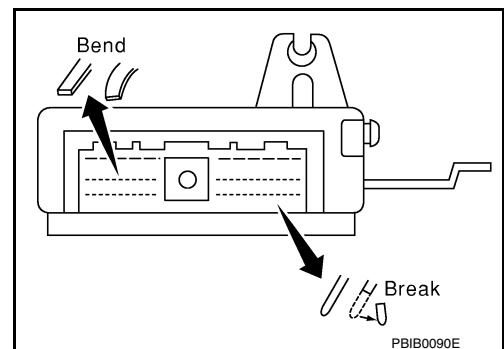
- Always use a 12 volt battery as power source.
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.
- Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.



- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value. The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.
 - Diagnostic trouble codes
 - 1st trip diagnostic trouble codes
 - Freeze frame data
 - 1st trip freeze frame data
 - System readiness test (SRT) codes
 - Test values
- When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown in the figure.



- When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break). Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.
- Keep engine control system parts and harness dry.



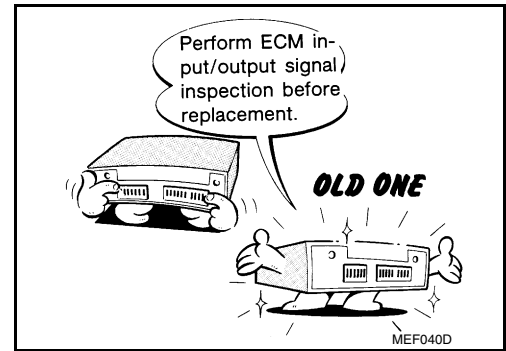
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PRECAUTIONS

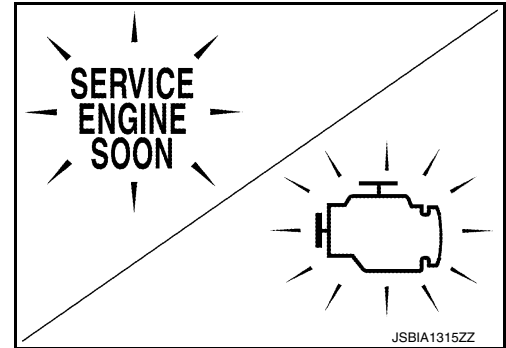
[VK56DE]

< PRECAUTION >

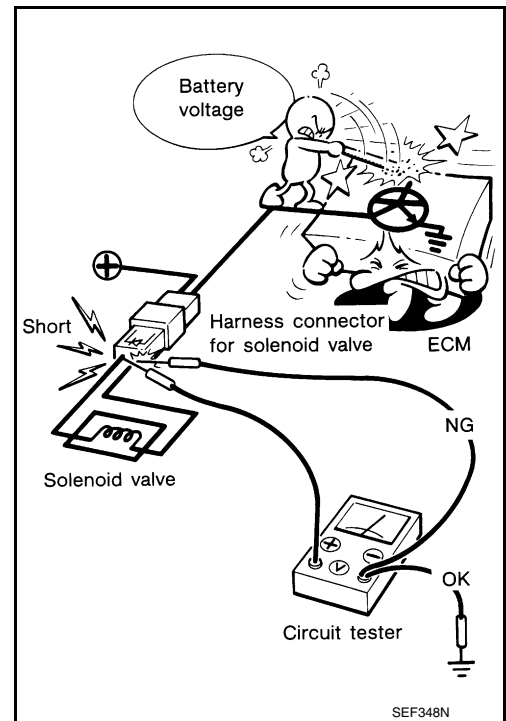
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and check ECM functions properly. Refer to [EC-529. "Reference Value"](#).
- Handle mass air flow sensor carefully to avoid damage.
- Never clean mass air flow sensor with any type of detergent.
- Never disassemble electric throttle control actuator.
- Even a slight leakage in the air intake system can cause serious incidents.
- Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).



- After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.



- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

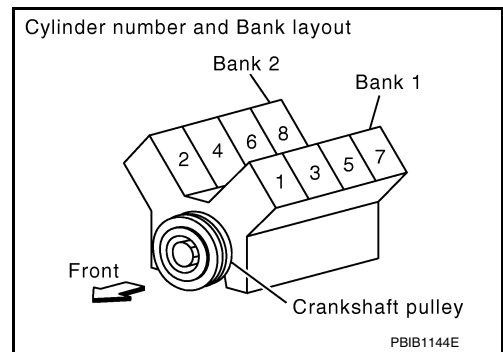


PRECAUTIONS

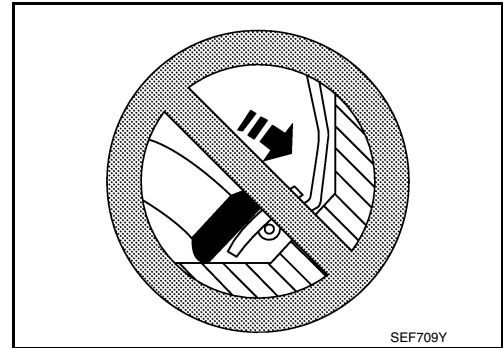
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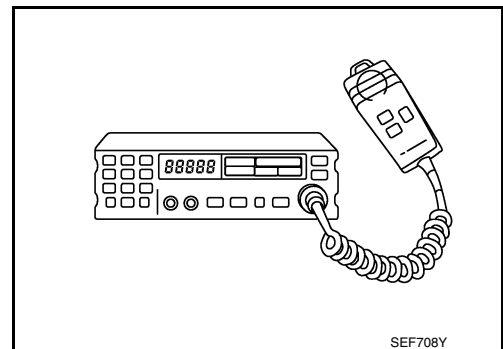
- **B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.**
- **Never operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Never depress accelerator pedal when starting.**
- **Immediately after starting, never rev up engine unnecessarily.**
- **Never rev up engine just prior to shutdown.**



- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
 - **Keep the antenna as far as possible from the electronic control units.**
 - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls. Never let them run parallel for a long distance.**
 - **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**
 - **Be sure to ground the radio to vehicle body.**



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PREPARATION

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[VK56DE]

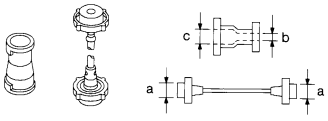
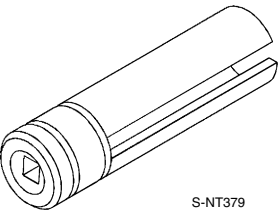
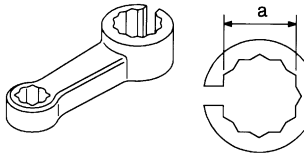
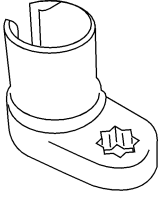
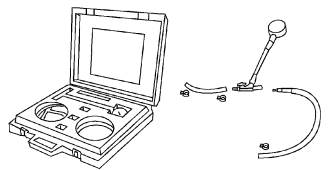
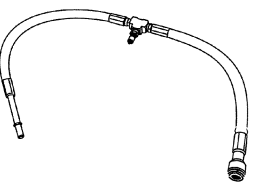
PREPARATION

PREPARATION

Special Service Tools

INFOID:000000012524589


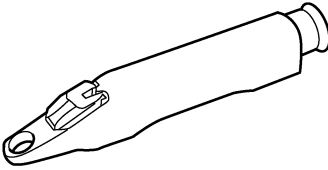
The actual shapes of TechMate tools may differ from those of special service tools illustrated here.

| Tool number (TechMate No.) Tool name | Description |
|---|--|
| EG17650301 (J-33984-A) Radiator cap tester adapter  <p style="text-align: center;">S-NT564</p> | Adapting radiator cap tester to radiator cap and radiator filler neck a: 28 (1.10) dia. b: 31.4 (1.236) dia. c: 41.3 (1.626) dia. Unit: mm (in) |
| KV10117100 (J-36471-A) Heated oxygen sensor wrench  <p style="text-align: center;">S-NT379</p> | Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut |
| KV10114400 (J-38365) Heated oxygen sensor wrench  <p style="text-align: center;">S-NT636</p> | Loosening or tightening heated oxygen sensors a: 22 mm (0.87 in) |
| (J-44626) Air fuel ratio (A/F) sensor wrench  <p style="text-align: center;">LEM054</p> | Loosening or tightening air fuel ratio (A/F) sensor 1 |
| (J-44321) Fuel pressure gauge kit  <p style="text-align: center;">LEC642</p> | Checking fuel pressure |
| (J-44321-6) Fuel pressure adapter  <p style="text-align: center;">LBIA0376E</p> | Connecting fuel pressure gauge to quick connector type fuel lines. |

PREPARATION

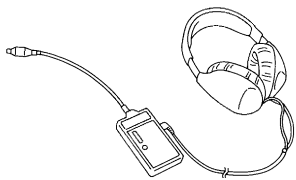
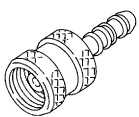
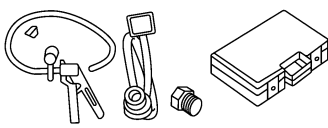
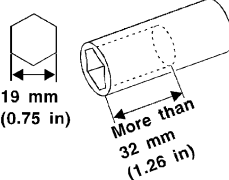
< PREPARATION >

[VK56DE]

| Tool number (TechMate No.) Tool name | Description |
|--|---|
| (J-45488) Quick connector re- lease  PBIC0198E | Remove fuel tube quick connectors in engine room. |
| (J-23688) Engine coolant refrac- tometer  WBIA0539E | Checking concentration of ethylene glycol in engine coolant |

Commercial Service Tools

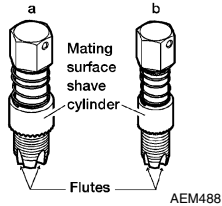

INFOID:000000012524590

| Tool name (TechMate No.) | Description |
|--|--|
| Leak detector i.e.: (J-41416)  S-NT703 | Locates the EVAP leakage |
| EVAP service port adapter i.e.: (J-41413-OB)  S-NT704 | Applies positive pressure through EVAP service port |
| Fuel filler cap adapter i.e.: (J-42909)  ALBIA1353ZZ | Checks fuel tank vacuum relief valve opening pressure |
| Socket wrench  S-NT705 | Removes and installs engine coolant temperature sensor |

PREPARATION

< PREPARATION >

[VK56DE]

| Tool name (TechMate No.) | Description |
|---|---|
| <p>Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)</p>  | <p>Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor b: 12 mm diameter with pitch 1.25 mm for Titanium Oxygen Sensor</p> |
| <p>Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)</p>  | <p>Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.</p> |

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]

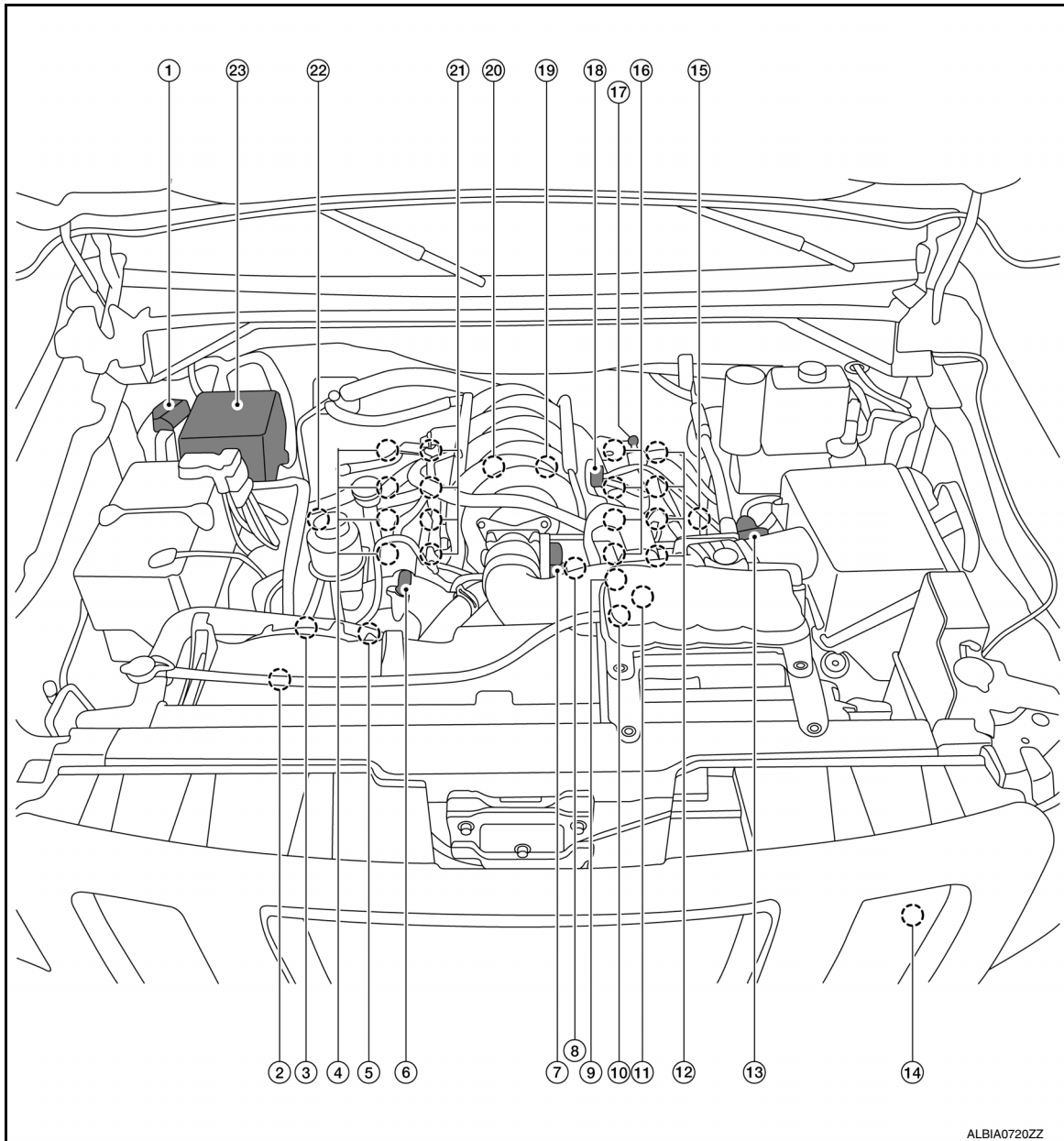
SYSTEM DESCRIPTION

COMPONENT PARTS

ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : Component Parts Location

INFOID:000000012524591



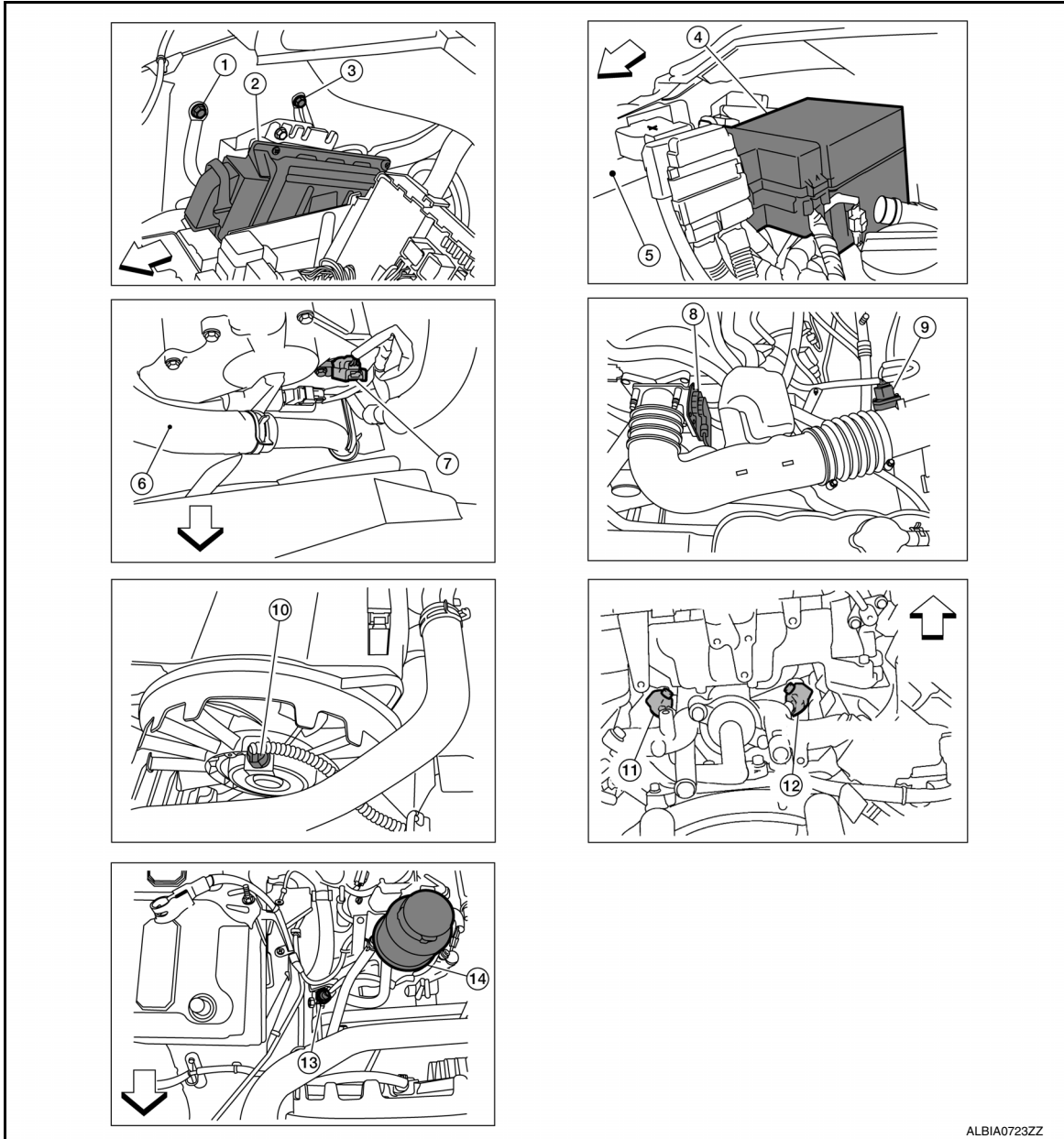
- | | | |
|---|--|---|
| 1. ECM | 2. Cooling fan motor | 3. Power steering pressure sensor |
| 4. Ignition coil (with power transistor) (bank 2) | 5. Intake valve timing control solenoid valve (bank 2) | 6. Intake valve timing control position sensor (bank 2) |
| 7. Electric throttle control actuator | 8. Engine coolant temperature sensor | 9. Intake valve timing control position sensor (bank 1) |
| 10. Intake valve timing control solenoid valve (bank 1) | 11. Camshaft position sensor (PHASE) | 12. Ignition coil (with power transistor) (bank 1) |
| 13. Mass air flow sensor (with intake air temperature sensor) | 14. Refrigerant pressure sensor | 15. Air fuel ratio (A/F) sensor 1 (bank 1) |

COMPONENT PARTS

[VK56DE]

< SYSTEM DESCRIPTION >

- | | | |
|--|---------------------------|---|
| 16. Fuel injector (bank 1) | 17. EVAP service port | 18. EVAP canister purge volume control solenoid valve |
| 19. Knock sensor (bank 1) | 20. Knock sensor (bank 2) | 21. Fuel injector (bank 2) |
| 22. Air fuel ratio (A/F) sensor 1 (bank 2) | 23. IPDM E/R | |



ALBIA0723ZZ

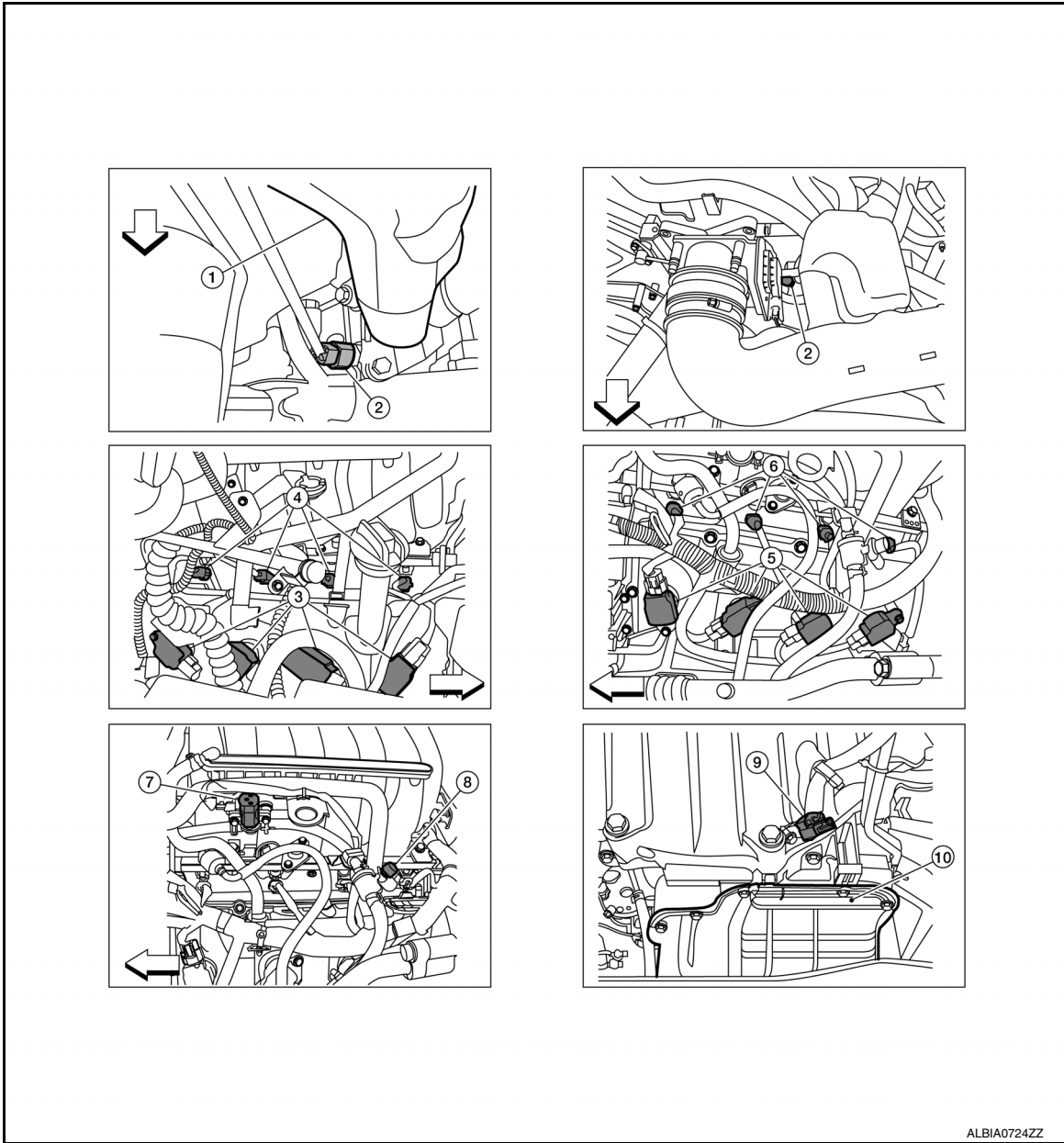
- | | | |
|--|---|--|
| 1. Body ground | 2. ECM | 3. Body ground |
| 4. IPDM E/R | 5. Battery | 6. Radiator hose |
| 7. Camshaft position sensor (PHASE) | 8. Electric throttle control actuator | 9. Mass air flow sensor (with intake air temperature sensor) |
| 10. Cooling fan motor harness connector | 11. Knock sensor (bank 1) (view with engine removed) | 12. Knock sensor (bank 2) (view with engine removed) |
| 13. Power steering pressure sensor (view with battery disconnected) | 14. Power steering fluid reservoir | |

↶ : Vehicle front

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]



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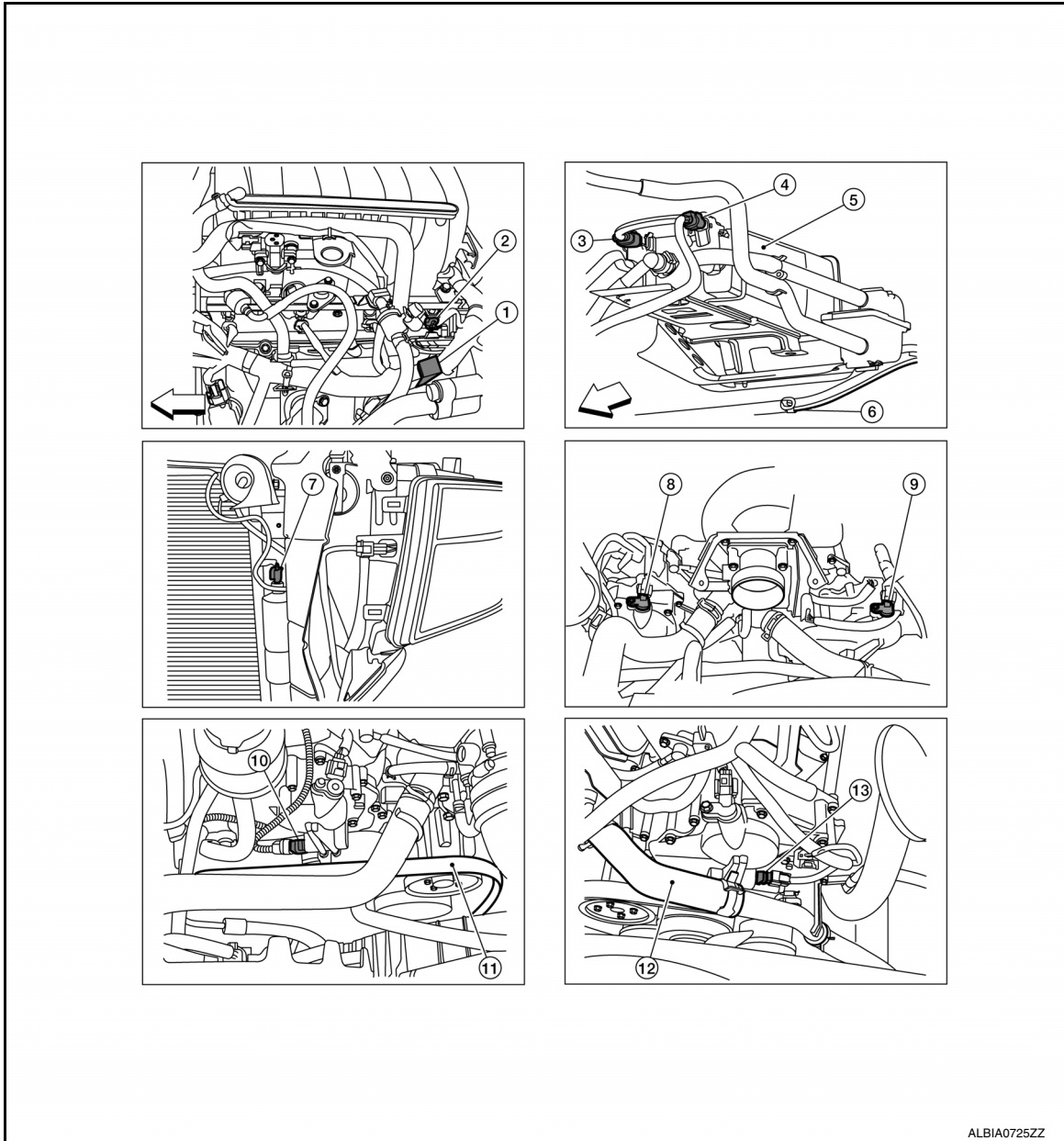
- | | | |
|---|--|---|
| 1. Intake manifold | 2. Engine coolant temperature sensor | 3. Ignition coils (with power transistor) (bank 2) |
| 4. Injector harness connectors (bank 2) | 5. Ignition coils (with power transistor) (bank 1) | 6. Injector harness connectors (bank 1) |
| 7. EVAP canister purge volume control solenoid valve (view with engine cover removed) | 8. EVAP service port | 9. Crankshaft position sensor (POS) (view from under the vehicle) |
| 10. Engine oil pan (view from under the vehicle) | | |

↔ : Vehicle front

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]



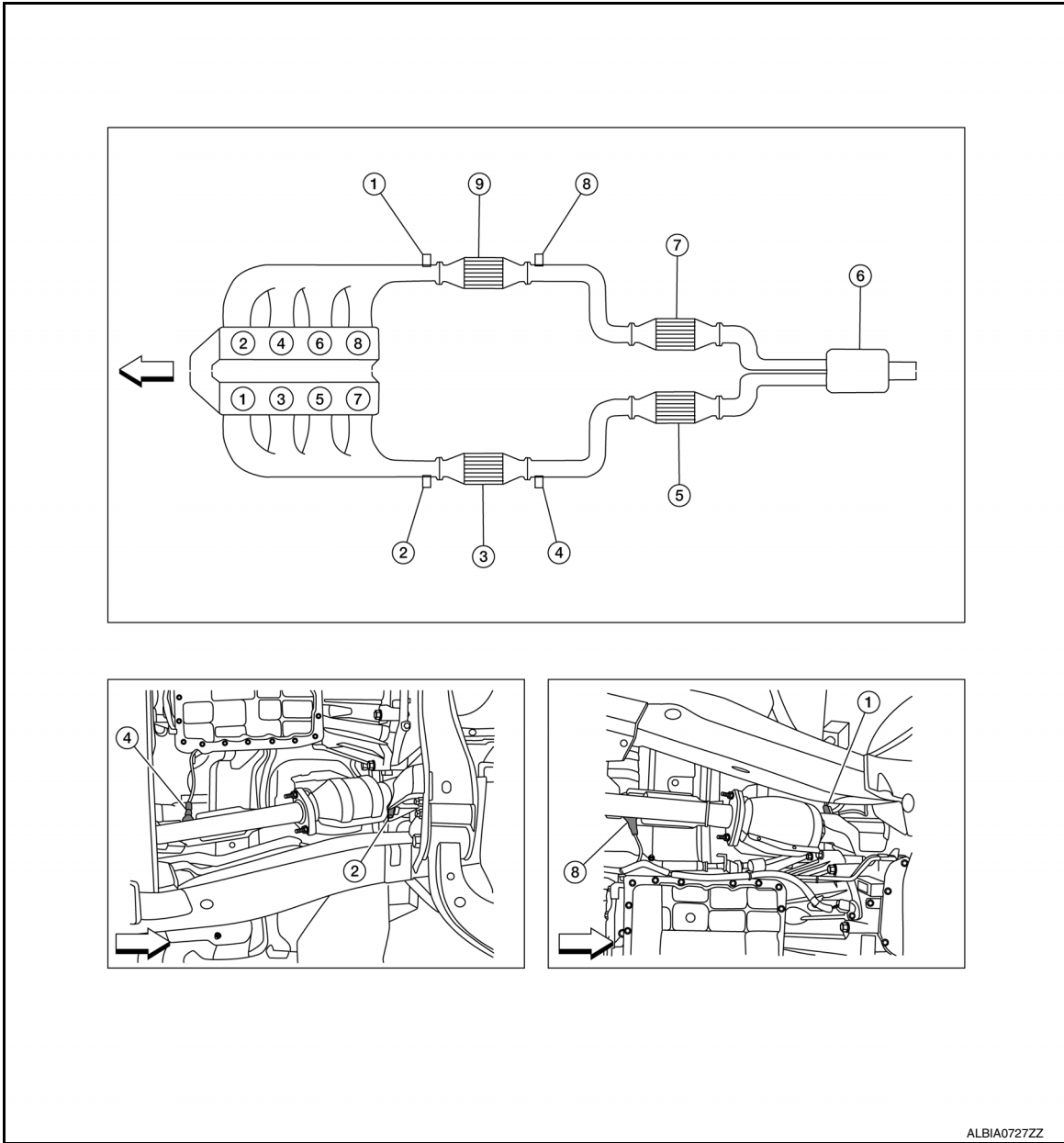
- | | | |
|---|---|---|
| 1. Condenser-1 | 2. Injector #7 | 3. EVAP control system pressure sensor |
| 4. EVAP canister vent control valve | 5. EVAP canister | 6. Rear suspension member |
| 7. Refrigerant pressure sensor (view with front grille removed) | 8. Intake valve timing control position sensor (bank 2) (view with engine cover and intake air duct removed) | 9. Intake valve timing control position sensor (bank 1) |
| 10. Intake valve timing control solenoid valve (bank 2) (view with engine cover and intake air duct removed) | 11. Drive belt | 12. Radiator hose (view with engine cover and intake air duct removed) |
| 13. Intake valve timing control solenoid valve (bank 1) | | |

← : Vehicle front

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]



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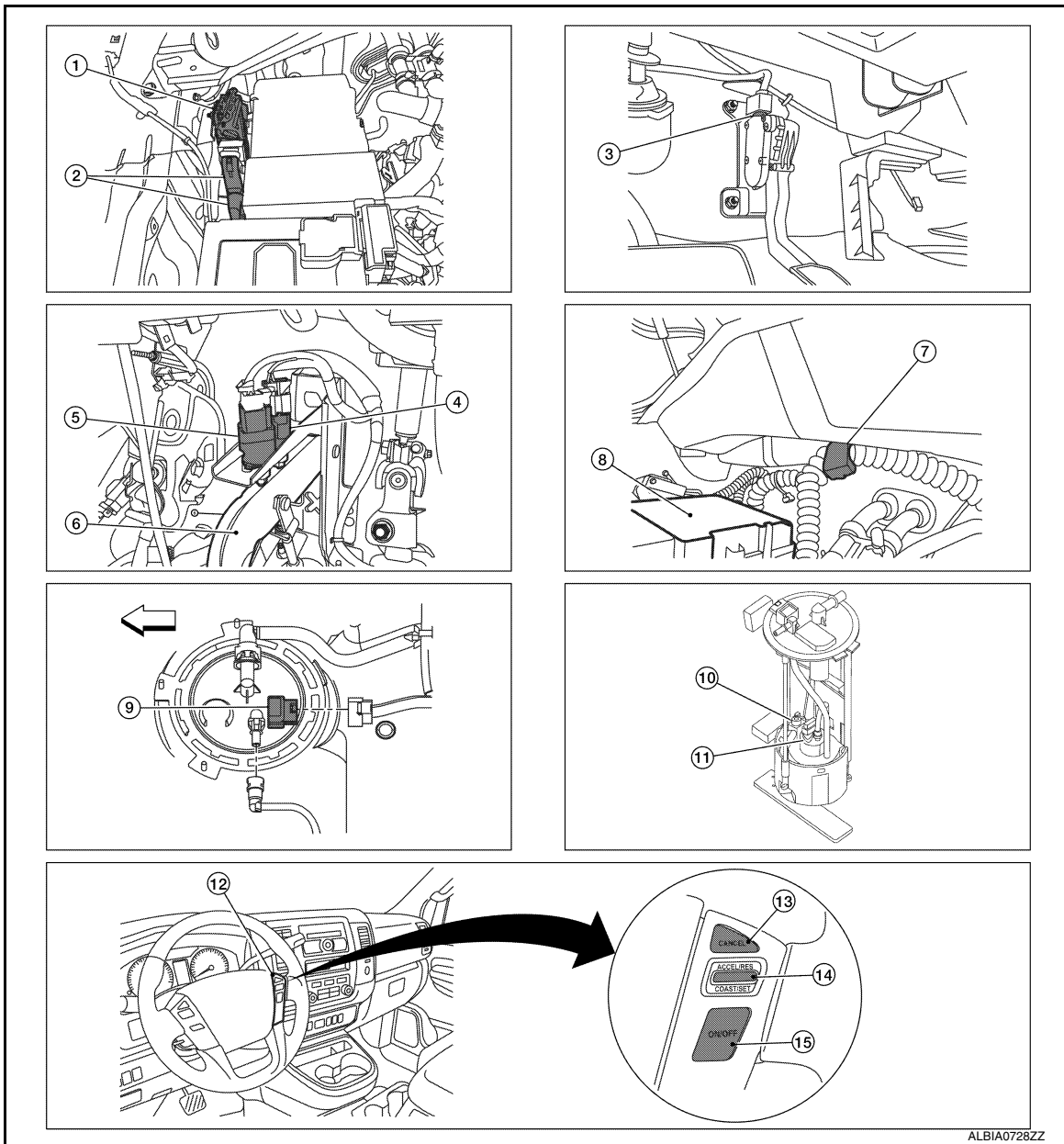
- | | | |
|--|--|---|
| 1. Air fuel ratio (A/F) sensor 1 (bank 2) | 2. Air fuel ratio (A/F) sensor 1 (bank 1) | 3. Three-way catalyst (manifold) (bank 1) |
| 4. Heated oxygen sensor 2 (bank 1) | 5. Three-way catalyst (under floor) (bank 1) | 6. Muffler |
| 7. Three-way catalyst (under floor) (bank 2) | 8. Heated oxygen sensor 2 (bank 2) | 9. Three-way catalyst (manifold) (bank 2) |

← : Vehicle front

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]



ALBIA0728ZZ

- | | | |
|-----------------------------|--|---|
| 1. ECM | 2. ECM harness connectors | 3. Accelerator pedal position sensor |
| 4. ASCD brake switch | 5. Stop lamp switch | 6. Brake pedal |
| 7. Condenser-2 | 8. IPDM E/R | 9. Fuel level sensor unit and fuel pump harness connector |
| 10. Fuel pressure regulator | 11. Fuel pump, fuel level sensor unit, and fuel filter | 12. ASCD steering switch |
| 13. CANCEL switch | 14. ACCELERATE/RESUME switch COAST/SET switch | 15. MAIN switch |

← : Vehicle front

ECM

INFOID:0000000012524592

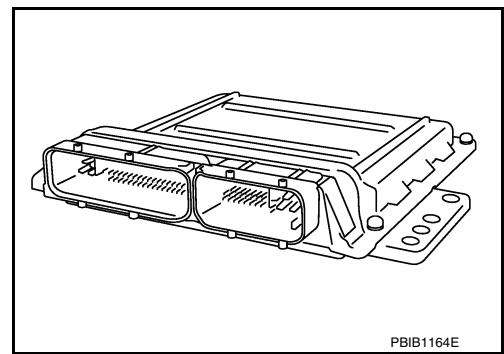
- ECM (Engine Control Module) controls the engine.

COMPONENT PARTS

[VK56DE]

< SYSTEM DESCRIPTION >

- ECM consists of a microcomputer and connectors for signal input and output and for power supply.
- Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.



PBIB1164E

INFOID:000000012524593

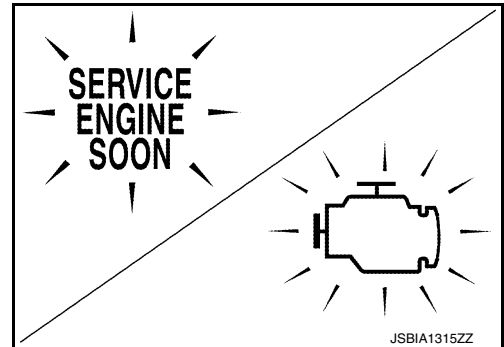
Malfunction Indicator lamp (MIL)

Malfunction Indicator lamp (MIL) is located on the combination meter.

MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.

When the engine is started, MIL should turn OFF. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.

For details, refer to [EC-507, "Diagnosis Description"](#).

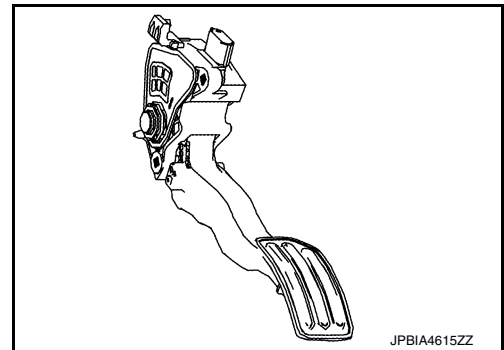


JSBIA1315ZZ

INFOID:000000012524594

Accelerator Pedal Position Sensor

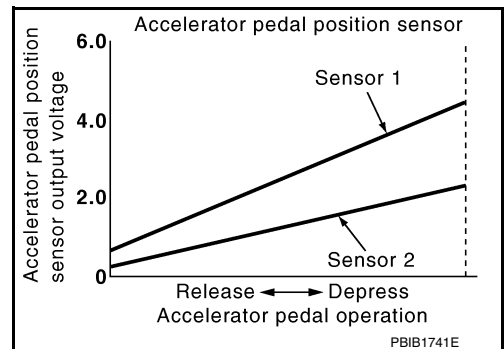
The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.



JPBIA4615ZZ

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



PBIB1741E

INFOID:000000012524595

Electric Throttle Control Actuator

OUTLINE

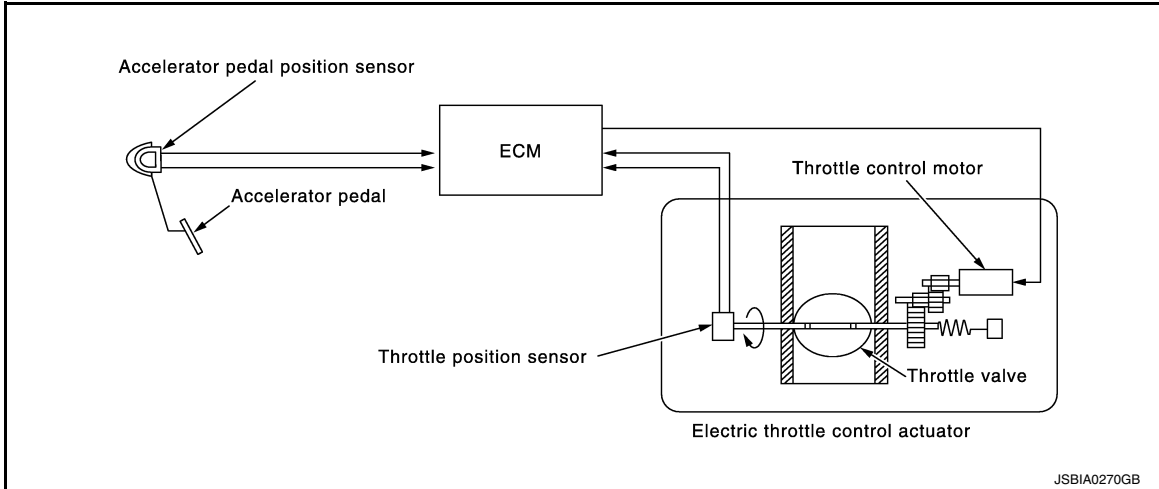
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COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]

Electric throttle control actuator consists of throttle body, throttle valve, throttle control motor and throttle position sensor.

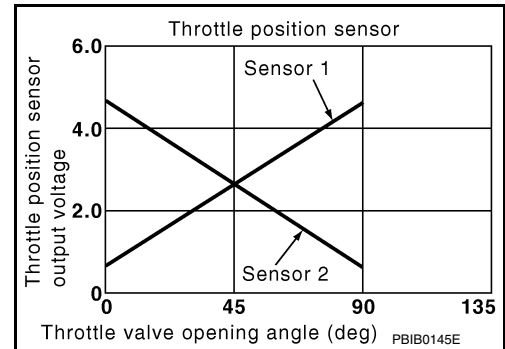


THROTTLE CONTROL MOTOR

The throttle control motor is operated by the ECM and it opens and closes the throttle valve. The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

THROTTLE POSITION SENSOR

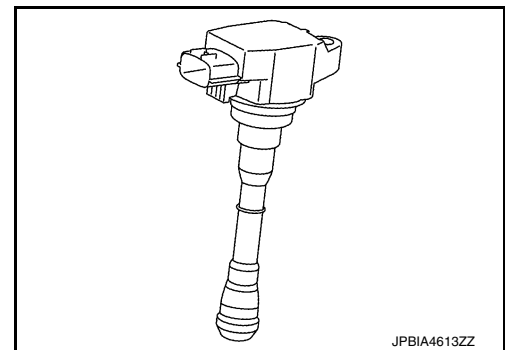
The throttle position sensor responds to the throttle valve movement. The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.



Ignition Coil (With Power Transistor)

INFOID:000000012524596

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.



COMPONENT PARTS

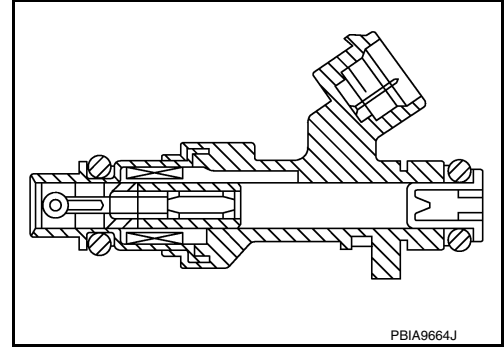
< SYSTEM DESCRIPTION >

[VK56DE]

Fuel Injector

INFOID:0000000112524597

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the fuel injector circuit, the coil in the fuel injector is energized. The energized coil pulls the ball valve back and allows fuel to flow through the fuel injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the fuel injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



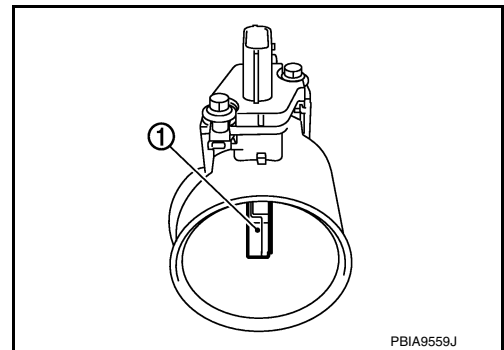
Mass Air Flow Sensor (With Intake Air Temperature Sensor)

INFOID:0000000112524598

MASS AIR FLOW SENSOR

The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



INTAKE AIR TEMPERATURE SENSOR

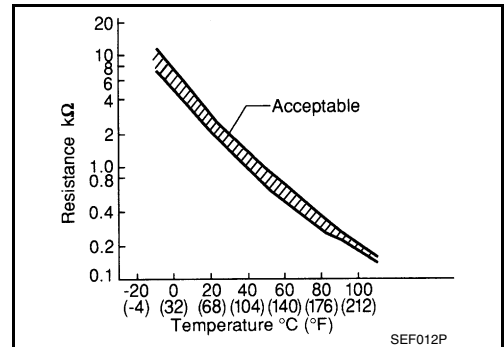
The intake air temperature sensor is built-into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

<Reference data>

| Intake air temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|-------------------------------------|--------------|-----------------|
| 25 (77) | 3.3 | 1.800 - 2.200 |
| 80 (176) | 1.2 | 0.283 - 0.359 |

*: These data are reference values and are measured between ECM terminals.



COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]

Camshaft Position Sensor (PHASE)

INFOID:000000012524599

The camshaft position sensor (PHASE) senses the retraction of intake camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.

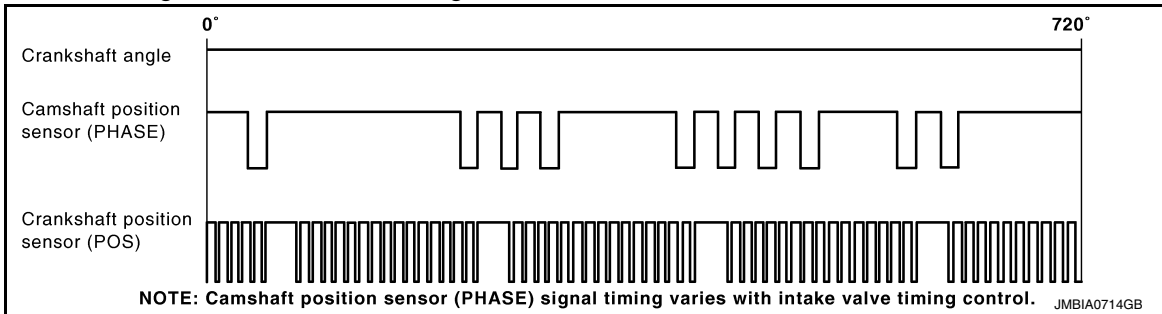
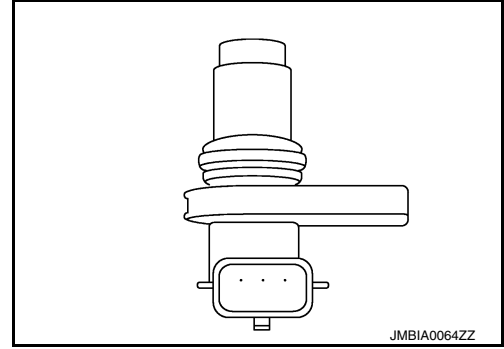
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes. ECM receives the signals as shown in the figure.



Crankshaft Position Sensor (POS)

INFOID:000000012524600

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet and Hall IC.

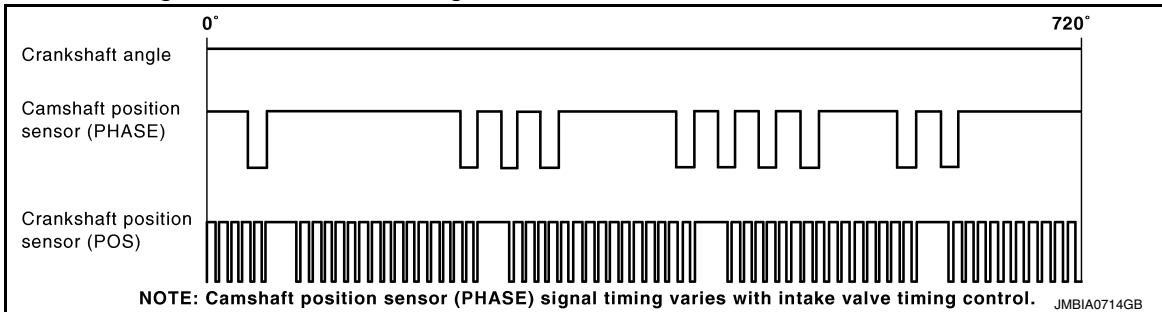
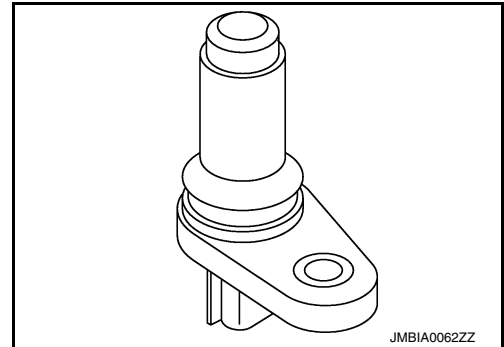
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

ECM receives the signals as shown in the figure.



COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]

Intake Valve Timing Control Solenoid Valve

INFOID:000000012524601

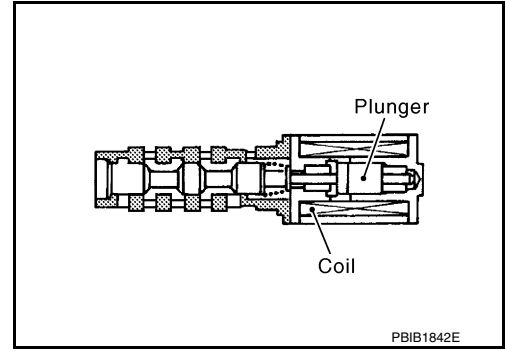
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.

The longer pulse width advances valve angle.

The shorter pulse width retards valve angle.

When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



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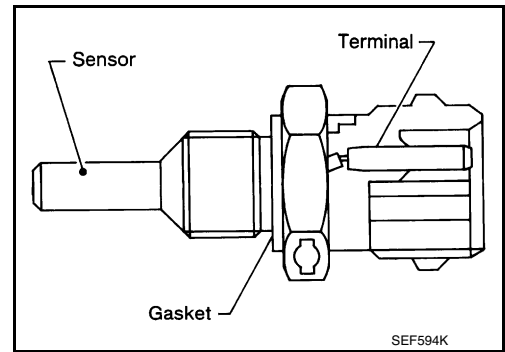
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Engine Coolant Temperature Sensor

INFOID:000000012524602

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



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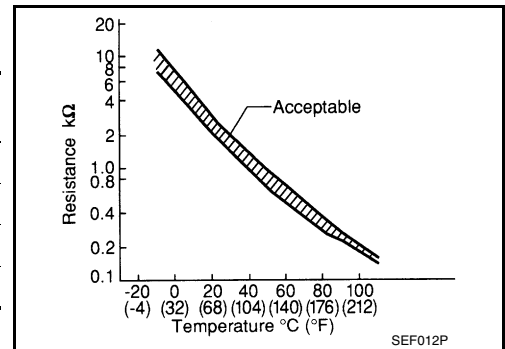
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<Reference data>

| Engine coolant temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|---|--------------|-----------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

*: These data are reference values and are measured between ECM terminals.



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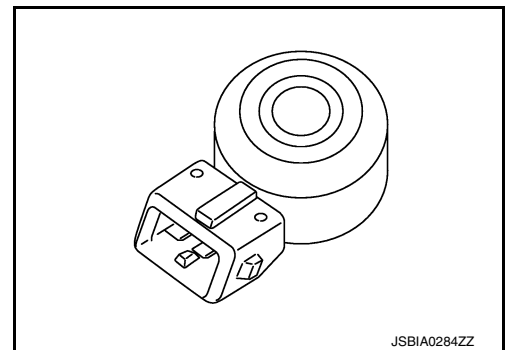
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Knock Sensor

INFOID:000000012524603

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



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COMPONENT PARTS

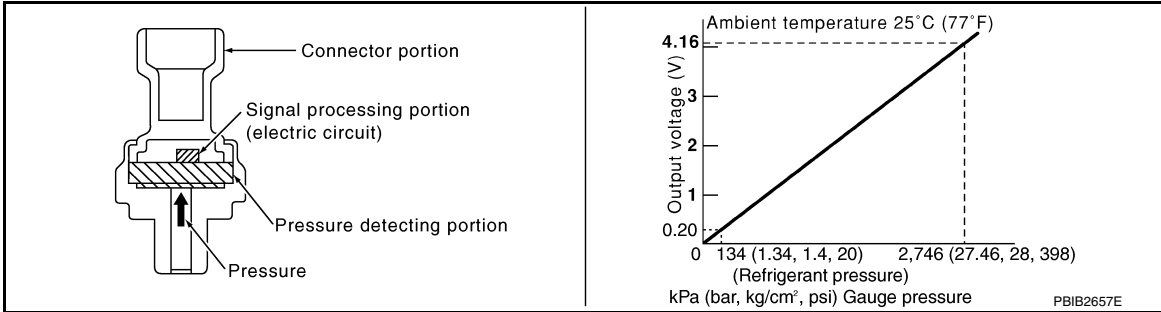
< SYSTEM DESCRIPTION >

[VK56DE]

Refrigerant Pressure Sensor

INFOID:000000012524604

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Power Steering Pressure Sensor

INFOID:000000012524605

Power steering pressure sensor is installed to the power steering high-pressure tube and detects a power steering load.

This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

Cooling Fan

INFOID:000000012524606

DESCRIPTION

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 4-step control [HIGH/MIDDLE/LOW/OFF]. Refer to [EC-497. "COOLING FAN CONTROL : System Description"](#) for cooling fan operation.

COOLING FAN RELAY

Power supply for the cooling fan motor is provided via cooling fan relay.

EVAP Canister

INFOID:000000012524607

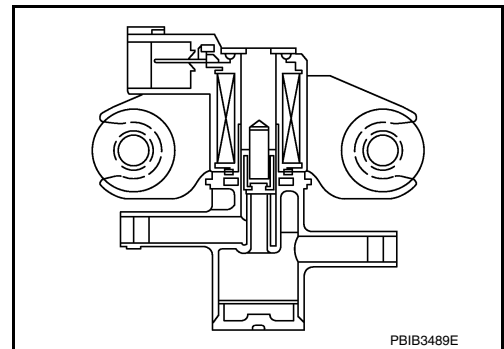
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

For details, refer to [EC-498. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

EVAP Canister Purge Volume Control Solenoid Valve

INFOID:000000012524608

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



COMPONENT PARTS

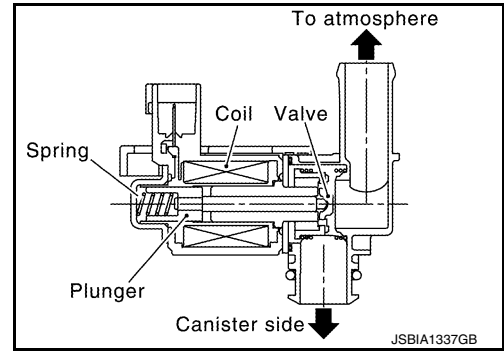
< SYSTEM DESCRIPTION >

[VK56DE]

EVAP Canister Vent Control Valve

INFOID:000000012524609

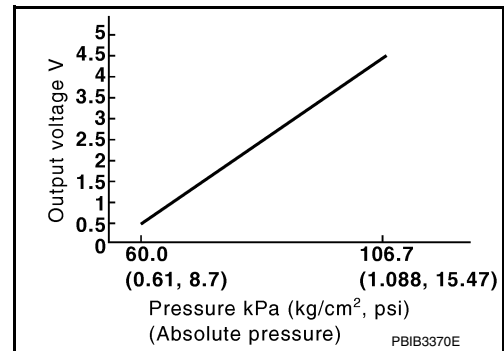
The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent. This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components. This solenoid valve is used only for diagnosis, and usually remains opened. When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



EVAP Control System Pressure Sensor

INFOID:000000012524610

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

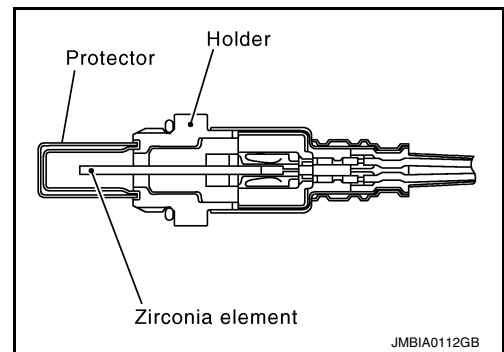


Air Fuel Ratio (A/F) Sensor 1

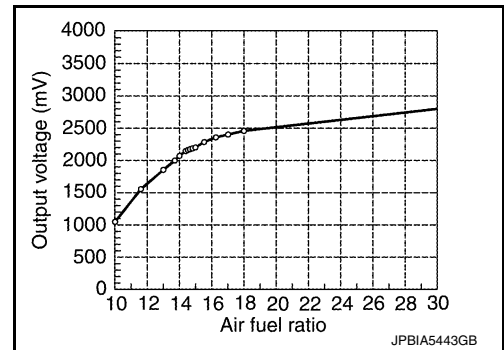
INFOID:000000012524611

DESCRIPTION

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 800°C (1,472°F).



A/F SENSOR 1 HEATER

A/F sensor 1 heater is integrated in the sensor. The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element within the specified range.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]

Heated Oxygen Sensor 2

INFOID:000000012524612

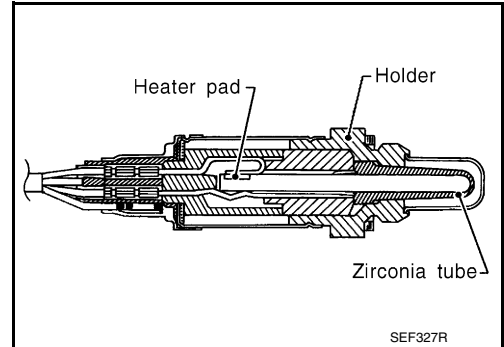
DESCRIPTION

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



HEATED OXYGEN SENSOR 2 HEATER

Heated oxygen sensor 2 heater is integrated in the sensor.

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

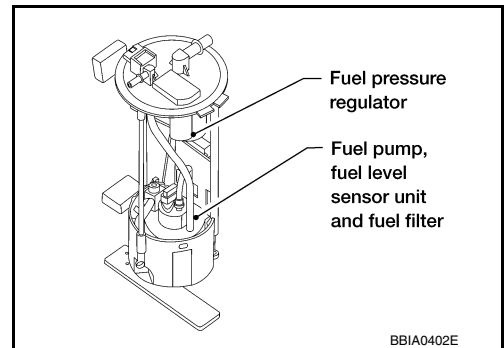
| Engine speed | Heated oxygen sensor 2 heater |
|--|-------------------------------|
| Above 3,600 rpm | OFF |
| Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> • Engine: After warming up • Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | ON |

Fuel Level Sensor Unit and Fuel Pump

INFOID:000000012524613

FUEL PUMP

The ECM activates the fuel pump for 1 second after the ignition switch is turned ON to improve engine start ability. If the ECM receives an engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It sends the control signal to the fuel pump control module, which in turn controls the fuel pump.



| Condition | Fuel pump operation |
|----------------------------------|------------------------|
| Ignition switch is turned to ON. | Operates for 1 second. |
| Engine running and cranking | Operates. |
| When engine is stopped | Stops in 1.5 seconds. |
| Except as shown above | Stops. |

FUEL LEVEL SENSOR

The fuel level sensor is mounted in the fuel level sensor unit.

The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line.

It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

COMPONENT PARTS

< SYSTEM DESCRIPTION >

[VK56DE]

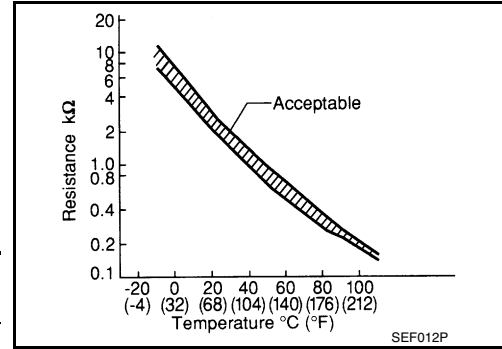
Fuel Tank Temperature Sensor

INFOID:000000012524614

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

| Fluid temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|--------------------------------|-----------------|--------------------|
| 20 (68) | 3.5 | 2.3 - 2.7 |
| 50 (122) | 2.2 | 0.79 - 0.90 |



*: These data are reference values and are measured between ECM terminals 95 (Fuel tank temperature sensor) and ground.

ASCD Steering Switch

INFOID:000000012524615

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.

Refer to [EC-496, "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for the ASCD function.

Stop Lamp Switch & ASCD Brake Switch

INFOID:000000012524616

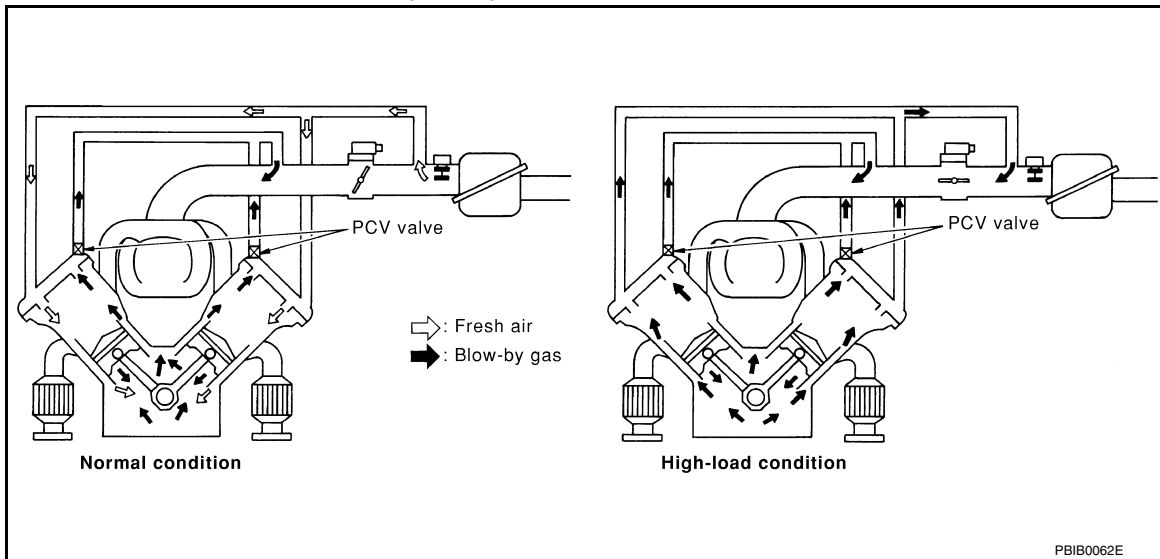
Stop lamp switch and ASCD brake switch are installed to brake pedal bracket. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).

| Brake pedal | ASCD brake switch | Stop lamp switch |
|-------------|-------------------|------------------|
| Released | ON | OFF |
| Depressed | OFF | ON |

STRUCTURE AND OPERATION

Positive Crankcase Ventilation (PCV)

INFOID:000000012524617



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

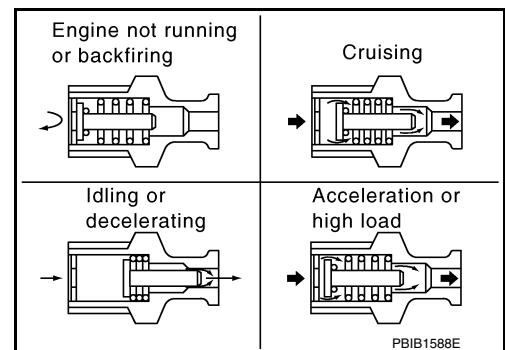
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



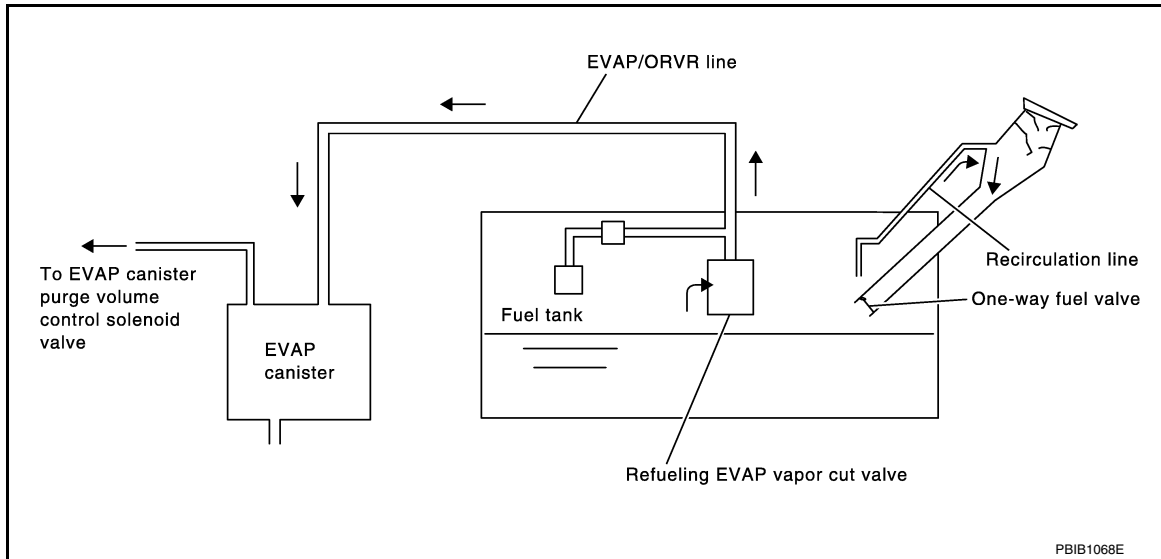
STRUCTURE AND OPERATION

< SYSTEM DESCRIPTION >

[VK56DE]

On Board Refueling Vapor Recovery (ORVR)

INFOID:000000012524618



From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

WARNING:

When conducting inspections below, be sure to observe the following:

- Put a "CAUTION: FLAMMABLE" sign in workshop.
- Never smoke while servicing fuel system. Keep open flames and sparks away from work area.
- Always furnish the workshop with a CO₂ fire extinguisher.

CAUTION:

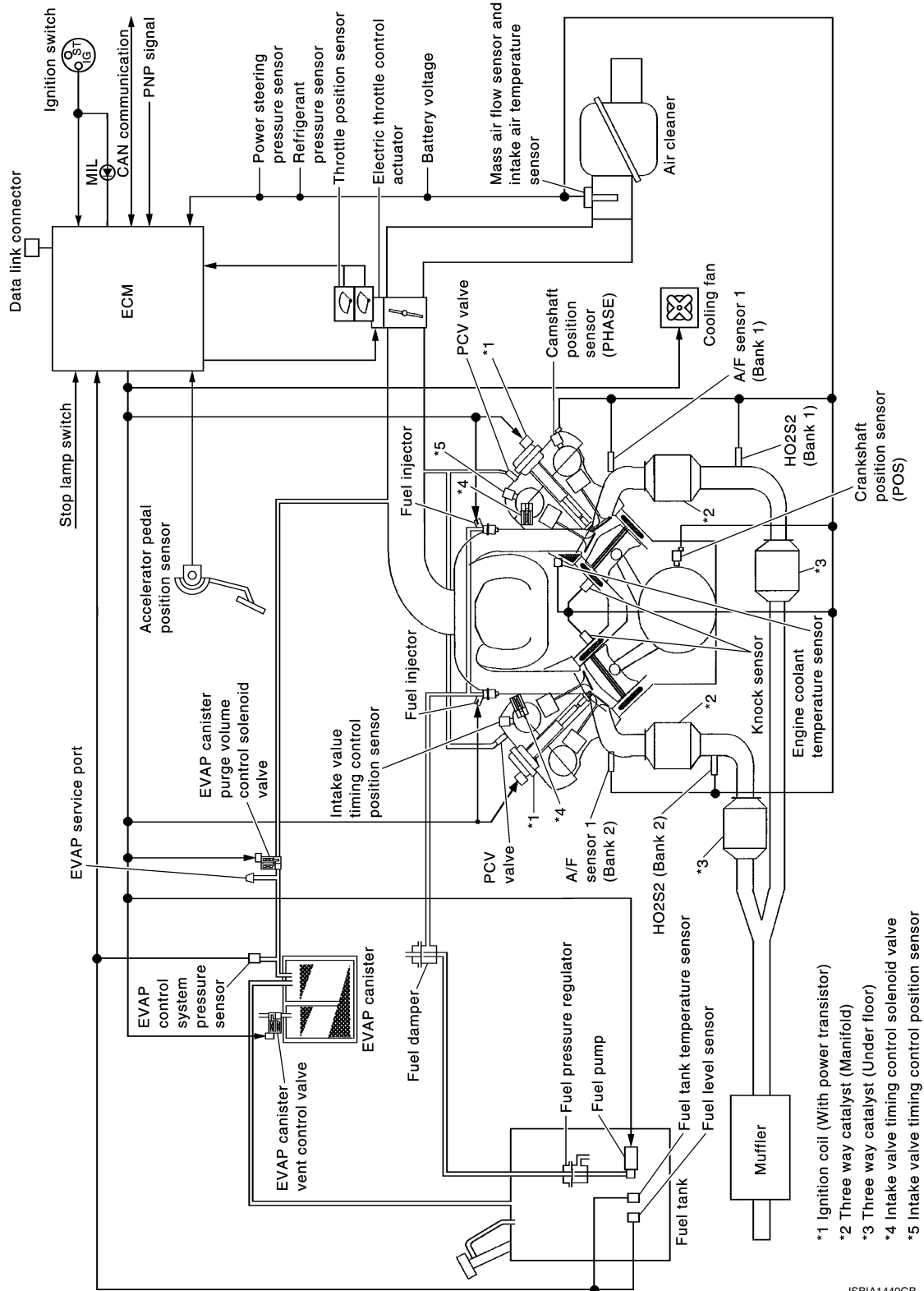
- Before removing fuel line parts, carry out the following procedures:
 - Put drained fuel in an explosion-proof container and put lid on securely.
 - Release fuel pressure from fuel line. Refer to [EC-596, "Work Procedure"](#).
 - Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge retainer is removed.
- Never kink or twist hose and tube when they are installed.
- Never tighten hose and clamps excessively to avoid damaging hoses.
- After installation, run engine and check for fuel leakage at connections.
- Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.

SYSTEM
ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : System Description

INFOID:000000012524619

SYSTEM DIAGRAM



JSBIA1449GB

SYSTEM DESCRIPTION

SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

ECM controls the engine by various functions.

| Function | Reference |
|---------------------------------------|--|
| MULTIPOINT FUEL INJECTION SYSTEM | EC-491. "MULTIPOINT FUEL INJECTION SYSTEM : System Description" |
| ELECTRIC IGNITION SYSTEM | EC-493. "ELECTRIC IGNITION SYSTEM : System Description" |
| AIR CONDITIONING CUT CONTROL | EC-495. "AIR CONDITIONING CUT CONTROL : System Description" |
| AUTOMATIC SPEED CONTROL DEVICE (ASCD) | EC-496. "AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description" |
| COOLING FAN CONTROL | EC-497. "COOLING FAN CONTROL : System Description" |
| EVAPORATIVE EMISSION SYSTEM | EC-498. "EVAPORATIVE EMISSION SYSTEM : System Description" |
| INTAKE VALVE TIMING CONTROL | EC-502. "INTAKE VALVE TIMING CONTROL : System Description" |
| FUEL FILLER CAP WARNING SYSTEM | EC-503. "FUEL FILLER CAP WARNING SYSTEM : System Description" |
| CAN COMMUNICATION | EC-504. "CAN COMMUNICATION : System Description" |

ENGINE CONTROL SYSTEM : Fail-safe

INFOID:0000000012524620

| DTC No. | Detected items | Engine operating condition in fail-safe mode | |
|---|---|---|--|
| P0011 P0021 | Intake valve timing control | The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function. | |
| P0101 P0102 P0103 | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | |
| P0117 P0118 | Engine coolant temperature sensor circuit | Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM. | |
| | | Condition | Engine coolant temperature decided (CONSULT display) |
| | | Just as ignition switch is turned ON or START | 40°C (104°F) |
| | | Approx 4 minutes or more after engine starting | 80°C (176°F) |
| | | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) |
| | | When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running. | |
| P0122 P0123 P0222 P0223 P2135 | Throttle position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor. | |
| P0500 | Vehicle speed sensor | The cooling fan operates (Highest) while engine is running. | |
| P0603 P0607 | ECM | Engine torque may be limited. | |
| P0604 | ECM | <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve • ASCD operation may be deactivated. | |

SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

| DTC No. | Detected items | Engine operating condition in fail-safe mode | | | | | | |
|---|------------------------------------|---|-------------------|-------------------|-----------------------|--------|-------------------|-------------------|
| P0605 P0606 P060B | ECM | <p>NOTE: Fail-safe may not occur depending on malfunction type.</p> <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve • ASCD operation may be deactivated. | | | | | | |
| P060A | ECM | <p>NOTE: Fail-safe may not occur depending on malfunction type.</p> <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve • Engine torque may be limited. • ASCD operation may be deactivated. | | | | | | |
| P0643 | ECM | <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve | | | | | | |
| P1805 | Brake switch | <p>ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: center;">Vehicle condition</th> <th style="width: 50%; text-align: center;">Driving condition</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">When engine is idling</td> <td style="text-align: center;">Normal</td> </tr> <tr> <td style="text-align: center;">When accelerating</td> <td style="text-align: center;">Poor acceleration</td> </tr> </tbody> </table> | Vehicle condition | Driving condition | When engine is idling | Normal | When accelerating | Poor acceleration |
| Vehicle condition | Driving condition | | | | | | | |
| When engine is idling | Normal | | | | | | | |
| When accelerating | Poor acceleration | | | | | | | |
| P2100 P2103 | Throttle control motor relay | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | |
| P2101 | Electric throttle control function | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | |
| P2118 | Throttle control motor | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | | | | | | |
| P2119 | Electric throttle control actuator | <p>(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.</p> <p>(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.</p> <p>(When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually because of fuel cut. After the vehicle stops, the engine stalls. The engine can restart in the N or P position, and engine speed will not exceed 1,000 rpm or more.</p> | | | | | | |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | <p>The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.</p> <p>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.</p> <p>Therefore, the acceleration will be poor.</p> | | | | | | |

MULTIPOINT FUEL INJECTION SYSTEM

SYSTEM

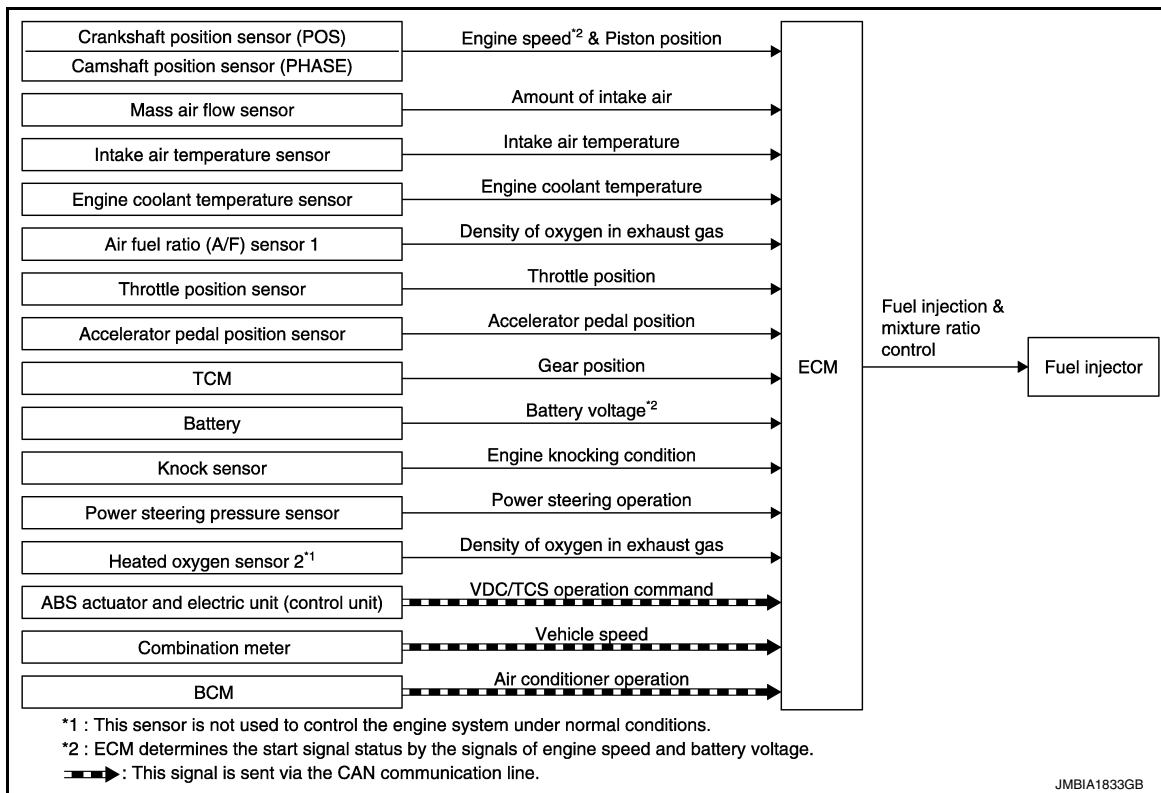
< SYSTEM DESCRIPTION >

[VK56DE]

MULTIPOINT FUEL INJECTION SYSTEM : System Description

INFOID:000000012524621

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|---|--|---------------|
| Crankshaft position sensor (POS) | Engine speed* ³ | Fuel injection & mixture ratio control | Fuel injector |
| Camshaft position sensor (PHASE) | Piston position | | |
| Mass air flow sensor | Amount of intake air | | |
| Intake air temperature sensor | Intake air temperature | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| TCM | Gear position | | |
| Battery | Battery voltage* ³ | | |
| Knock sensor | Engine knocking condition | | |
| Power steering pressure sensor | Power steering operation | | |
| Heated oxygen sensor 2* ¹ | Density of oxygen in exhaust gas | | |
| ABS actuator and electric unit (control unit) | VDC/TCS operation command* ² | | |
| Combination meter | Vehicle speed* ² | | |
| BCM | Air conditioner operation* ² | | |

*1: This sensor is not used to control the engine system under normal conditions.

*2: This signal is sent to the ECM via the CAN communication line.

*3: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from the crankshaft position sensor (POS), camshaft position sensor (PHASE) and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

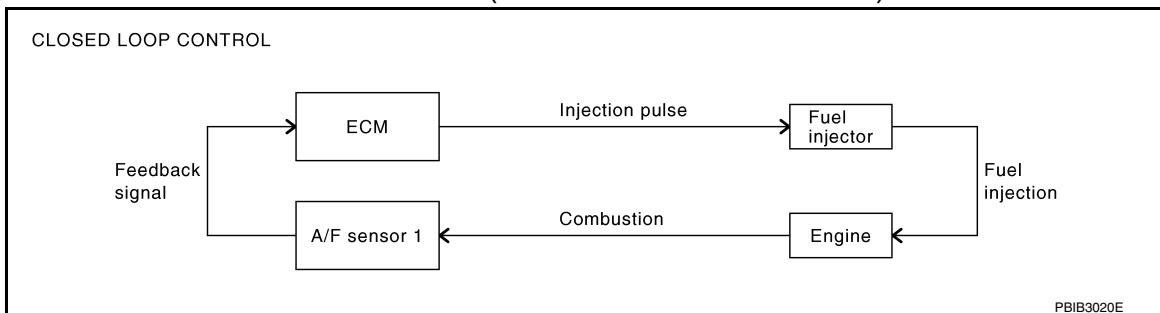
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever position is changed from N to D
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for drive ability and emission control. The three way catalyst (manifold) can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to [EC-483. "Air Fuel Ratio \(A/F\) Sensor 1"](#). This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

• Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of A/F sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.

SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

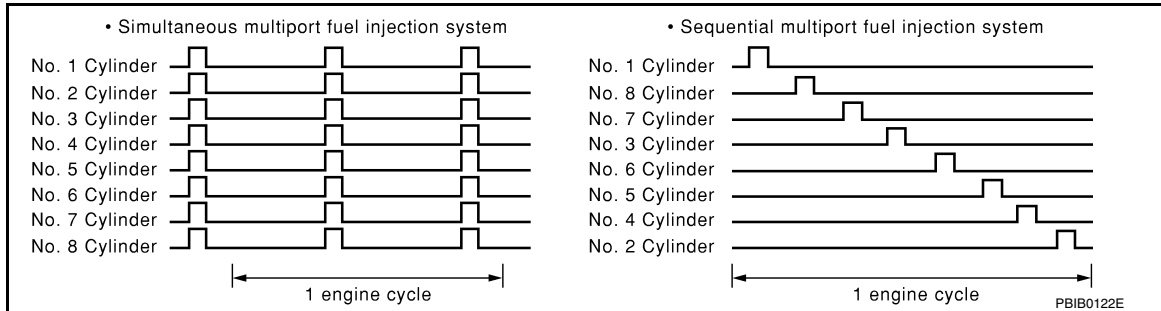
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes "short-term fuel trim" and "long-term fuel trim".

"Short-term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long-term fuel trim" is overall fuel compensation carried out over time to compensate for continual deviation of the "short-term fuel trim" from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

- Sequential Multiport Fuel Injection System
Fuel is injected into each cylinder during each engine cycle according to the ignition order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The six injectors will then receive the signals 2 times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

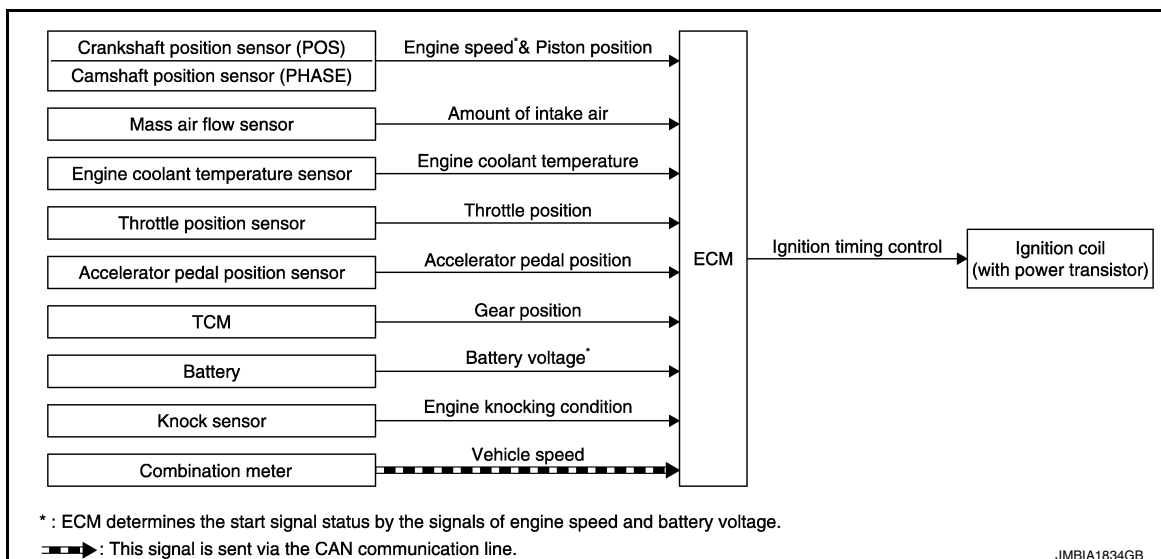
Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM : System Description

INFOID:000000012524622

SYSTEM DIAGRAM



SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|-----------------------------------|----------------------------|-------------------------|---------------------------------------|
| Crankshaft position sensor (POS) | Engine speed*2 | Ignition timing control | Ignition coil (with power transistor) |
| Camshaft position sensor (PHASE) | Piston position | | |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| TCM | Gear position | | |
| Battery | Battery voltage*2 | | |
| Knock sensor | Engine knocking | | |
| Combination meter | Vehicle speed*1 | | |

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

Ignition order: 1 - 8 - 7 - 3 - 6 - 5 - 4 - 2

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

AIR CONDITIONING CUT CONTROL

SYSTEM

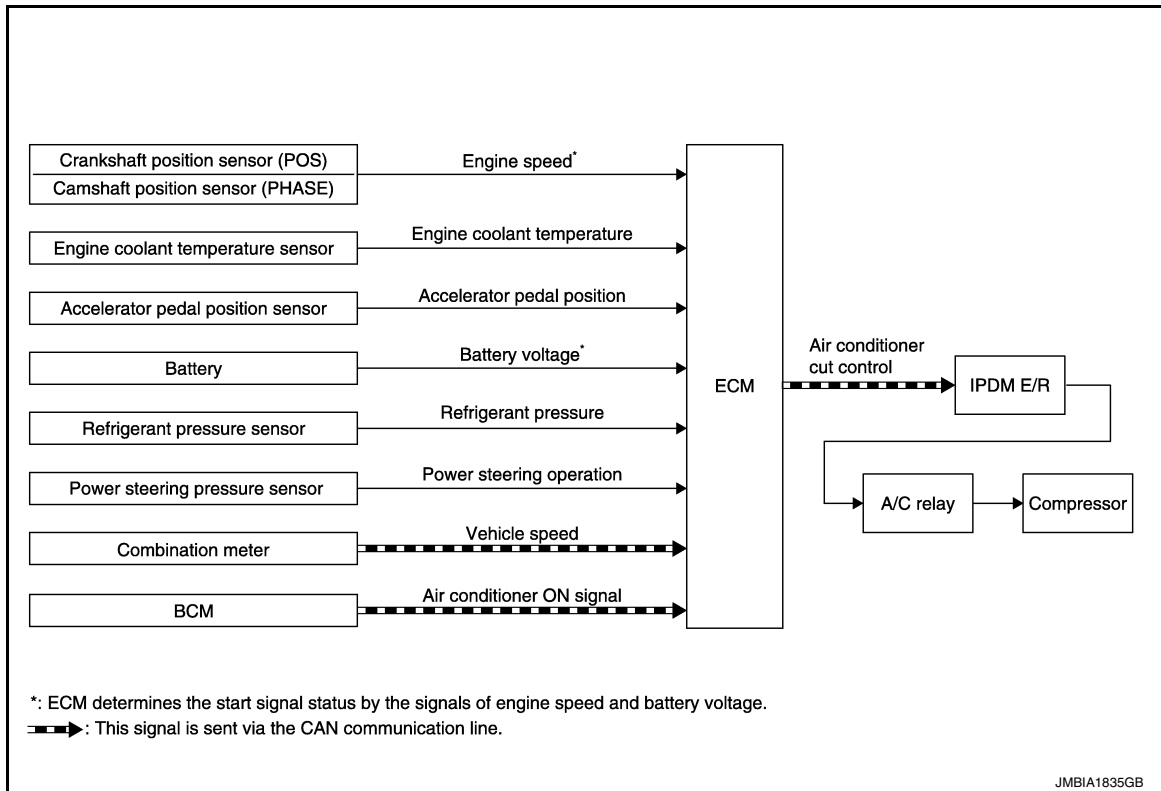
< SYSTEM DESCRIPTION >

[VK56DE]

AIR CONDITIONING CUT CONTROL : System Description

INFOID:000000012524623

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|-----------------------------|-----------------------------|---|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*2 | Air conditioner cut control | IPDM E/R ↓ Air conditioner relay ↓ Compressor |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage*2 | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Power steering pressure sensor | Power steering operation | | |
| Combination meter | Vehicle speed*1 | | |
| BCM | Air conditioner ON signal*1 | | |

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.

Under the following conditions, the air conditioner is turned OFF.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

SYSTEM

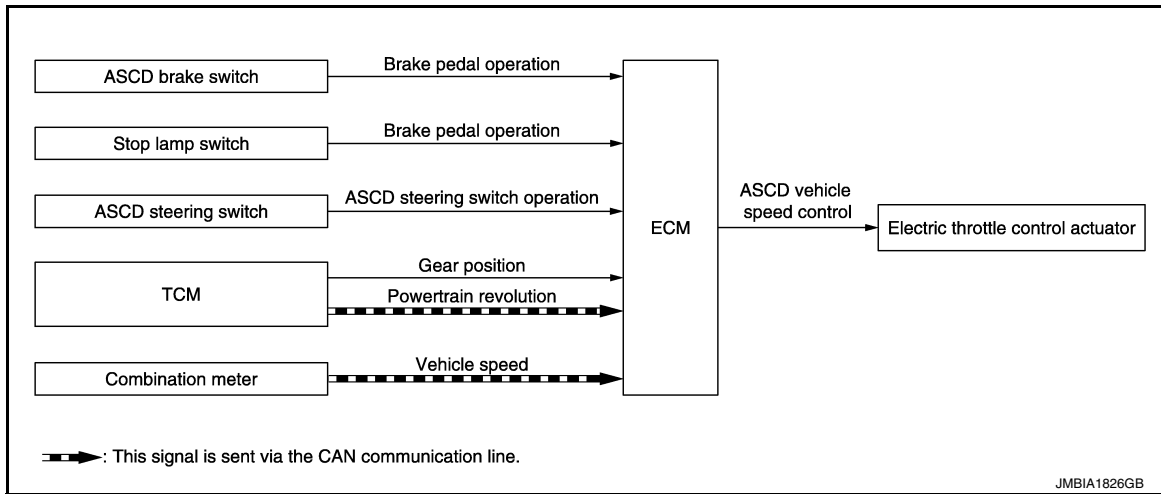
< SYSTEM DESCRIPTION >

[VK56DE]

AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description

INFOID:000000012524624

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|----------------------|--------------------------------|----------------------------|------------------------------------|
| ASCD brake switch | Brake pedal operation | ASCD vehicle speed control | Electric throttle control actuator |
| Stop lamp switch | Brake pedal operation | | |
| ASCD steering switch | ASCD steering switch operation | | |
| TCM | Gear position | | |
| | Powertrain revolution* | | |
| Combination meter | Vehicle speed* | | |

*: This signal is sent to the ECM via the CAN communication line

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).

ECM controls throttle angle of electric throttle control actuator to regulate engine speed.

Operation status of ASCD is indicated by CRUISE on combination meter. If any malfunction occurs in the ASCD system, it automatically deactivates control.

NOTE:

Always drive vehicle in a safe manner according to traffic conditions and obey all traffic laws.

SET OPERATION

Press MAIN switch. (The CRUISE on combination meter illuminates.)

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press COAST/SET switch.

ACCELERATE OPERATION

If the ACCEL/RES switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.

And then ASCD will maintain the new set speed.

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- More than 2 switches on ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Selector lever position changed to N, P or R
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

SYSTEM

[VK56DE]

< SYSTEM DESCRIPTION >

- A/T control system has a malfunction. Refer to [TM-62, "Work Flow"](#).
 - Engine coolant temperature is slightly higher than the normal operating temperature
- When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator lamp.
- Malfunction for some self-diagnoses regarding ASCD control: CRUISE will blink quickly.
- If MAIN switch is turned to OFF while ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

COAST OPERATION

When the COAST/SET switch is pressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will maintain the new set speed.

RESUME OPERATION

When the ACCEL/RES switch is pressed after canceling operation other than pressing the MAIN switch is performed, vehicle speed will return to last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

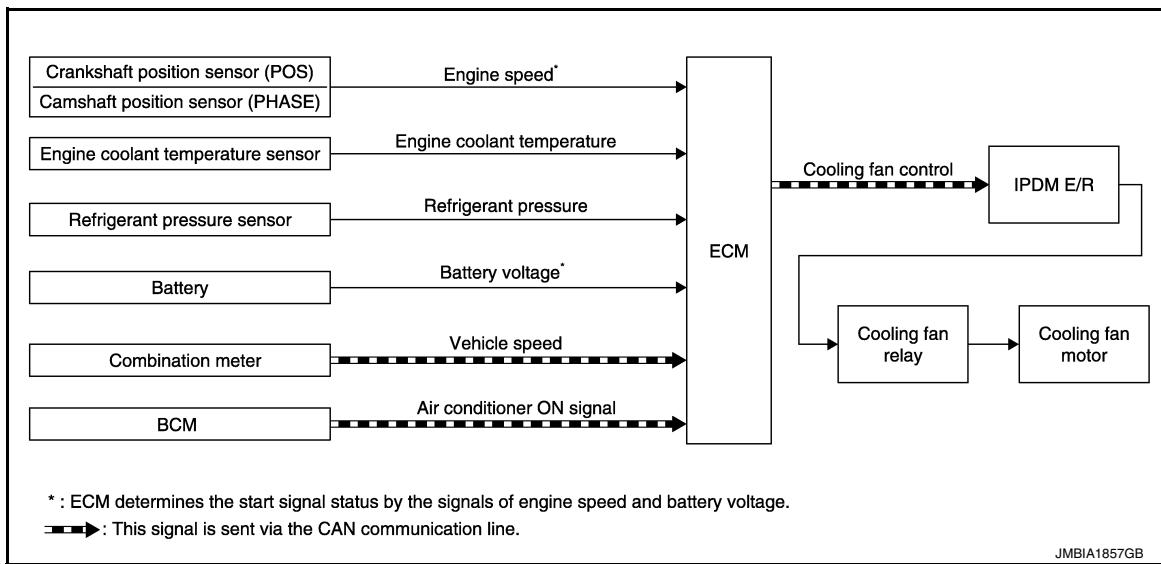
- Brake pedal is released
- Selector lever position is other than P and N
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

COOLING FAN CONTROL

COOLING FAN CONTROL : System Description

INFOID:000000012524625

SYSTEM DIAGRAM



NOTE:

Cooling fan relay is not used.

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|-----------------------------------|---------------------|--|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*1 Piston position | Cooling fan control | IPDM E/R ↓ Cooling fan relay ↓ Cooling fan motor |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Battery | Battery voltage*1 | | |
| Combination meter | Vehicle speed*2 | | |
| BCM | Air conditioner ON signal*2 | | |

*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to ECM via the CAN communication line.

SYSTEM

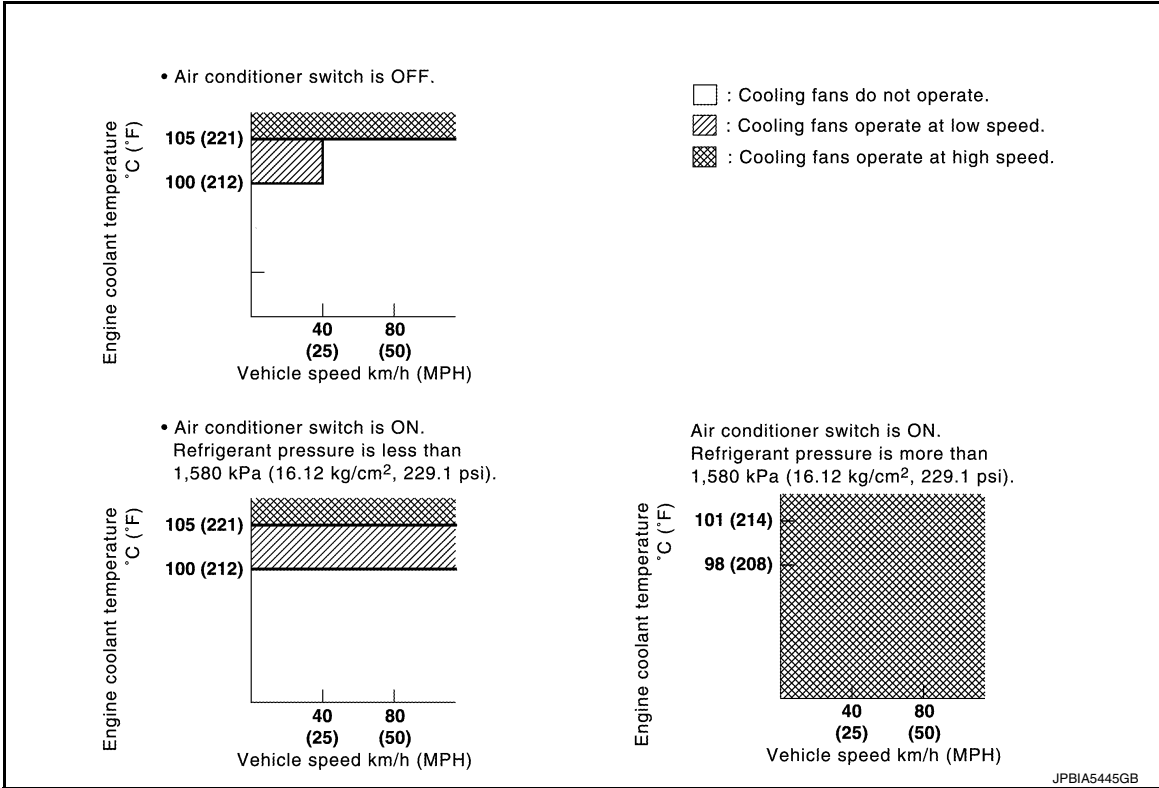
[VK56DE]

< SYSTEM DESCRIPTION >

SYSTEM DESCRIPTION

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

Cooling Fan Operation

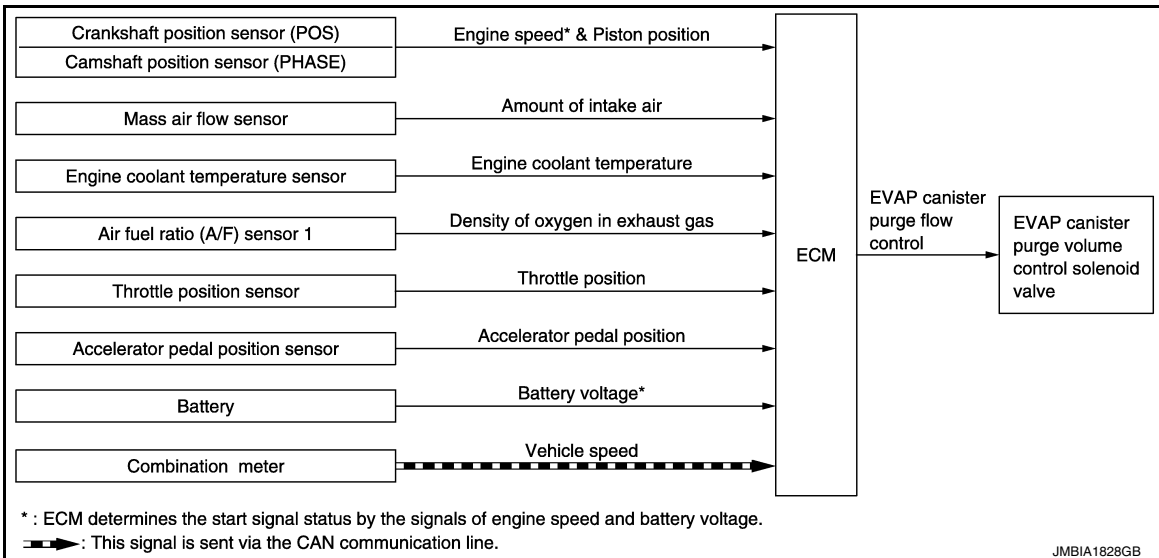


EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM : System Description

INFOID:000000012524626

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

SYSTEM

< SYSTEM DESCRIPTION >

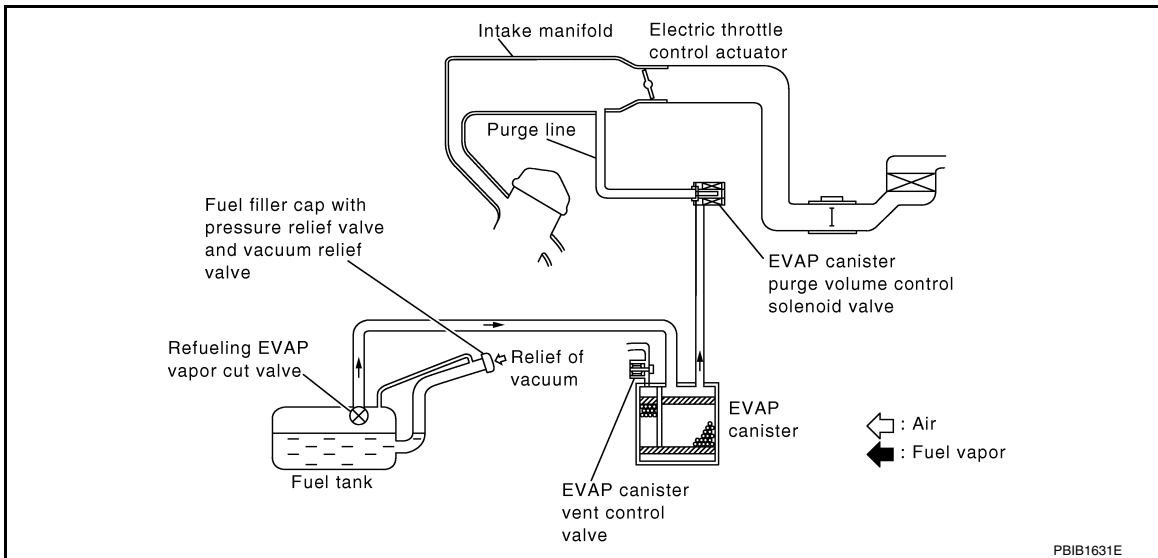
[VK56DE]

| Sensor | Input signal to ECM | ECM function | Actuator |
|-----------------------------------|---|-------------------------------------|--|
| Crankshaft position sensor (POS) | Engine speed*1 Piston position | EVAP canister purge flow control | EVAP canister purge vol- ume control solenoid valve |
| Camshaft position sensor (PHASE) | | | |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Air fuel ratio (A/F) sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage*1 | | |
| Combination meter | Vehicle speed*2 | | |

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION



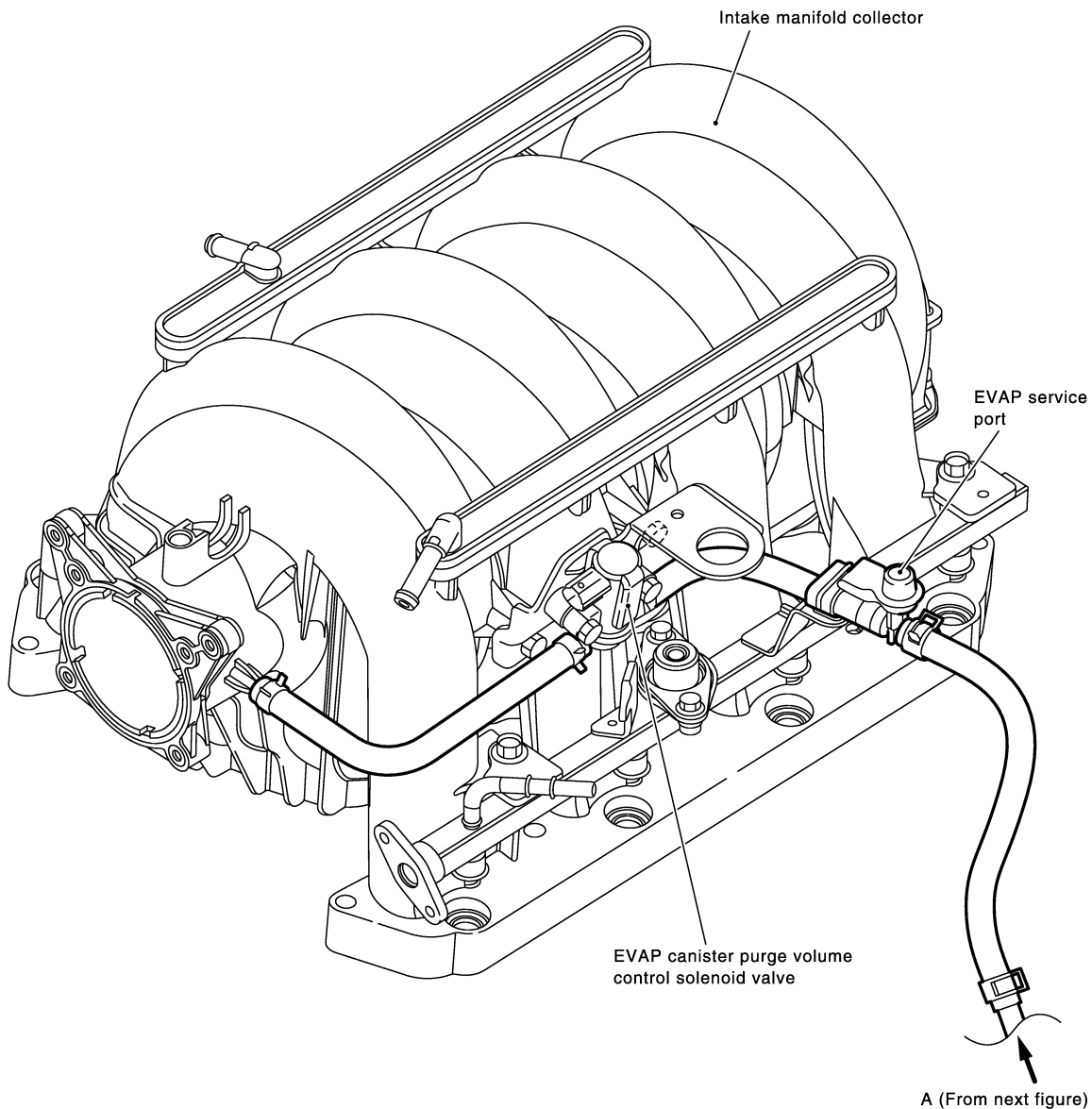
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister. The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank. The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases. EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

SYSTEM

< SYSTEM DESCRIPTION >

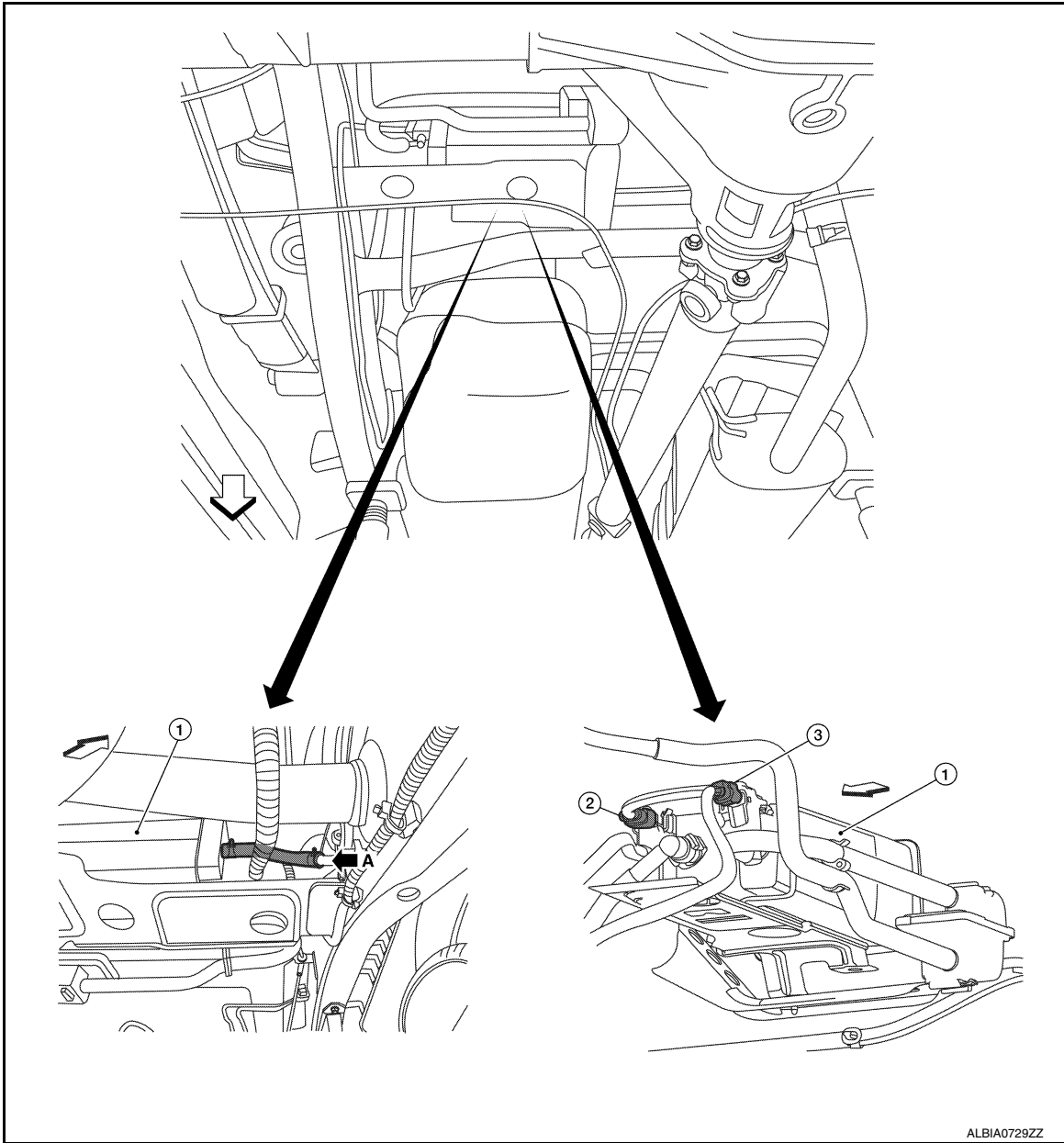
[VK56DE]

EVAPORATIVE EMISSION LINE DRAWING



NOTE:
Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

JMBIA1703GB



- 1. EVAP canister
- 2. EVAP control system pressure sensor
- 3. EVAP canister vent control valve

A : To previous figure

↖ : Vehicle front

INTAKE VALVE TIMING CONTROL

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SYSTEM

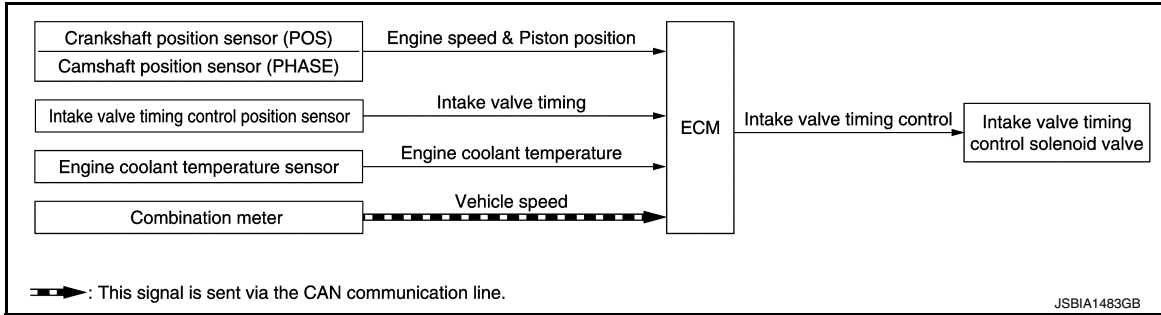
< SYSTEM DESCRIPTION >

[VK56DE]

INTAKE VALVE TIMING CONTROL : System Description

INFOID:000000012524627

SYSTEM DIAGRAM

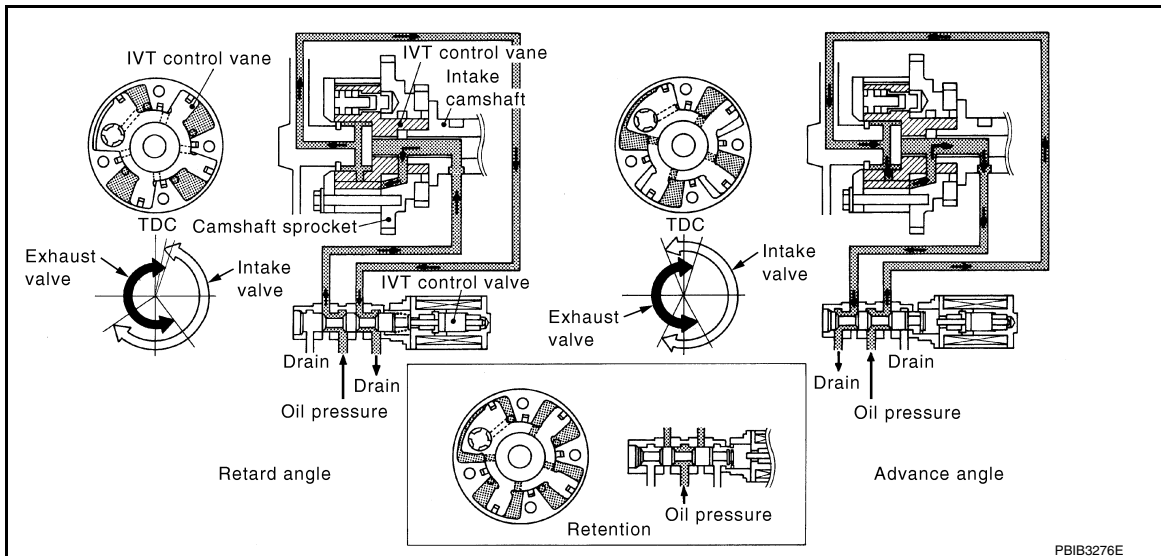


INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|---|----------------------------------|-----------------------------|--|
| Crankshaft position sensor (POS) | Engine speed and piston position | Intake valve timing control | Intake valve timing control solenoid valve |
| Camshaft position sensor (PHASE) | | | |
| Intake valve timing control position sensor | Intake valve timing | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Combination meter | Vehicle speed* | | |

*: This signal is sent to the ECM via the CAN communication line

SYSTEM DESCRIPTION



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

FUEL FILLER CAP WARNING SYSTEM

SYSTEM

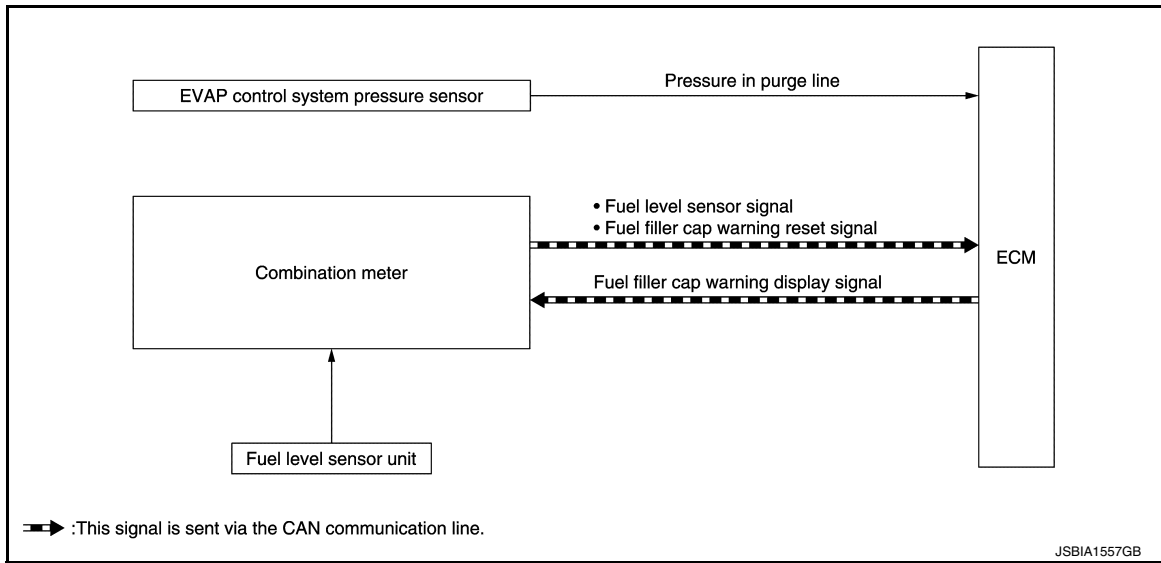
< SYSTEM DESCRIPTION >

[VK56DE]

FUEL FILLER CAP WARNING SYSTEM : System Description

INFOID:000000012524628

SYSTEM DIAGRAM



INPUT/OUTPUT SIGNAL CHART

Input

| Unit/Sensor | Input signal to ECM | ECM function |
|-------------------------------------|---------------------------------------|---------------------------------|
| EVAP control system pressure sensor | Pressure in purge line | Fuel filler cap warning control |
| Combination meter | Fuel level sensor signal* | |
| | Fuel filler cap warning reset signal* | |

*: This signal is sent to the ECM via the CAN communication line.

Output

| Unit | Output signal | Actuator |
|------|---|-------------------|
| ECM | Fuel filler cap warning display signal* | Combination meter |

*: This signal is sent to the combination meter via the CAN communication line.

SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.

ECM judges a refueled state, based on a fuel level sensor signal transmitted from the combination meter via CAN communication.

When a very small leak is detected through the EVAP leak diagnosis performed after judging the refueled state, ECM transmits a fuel filler cap warning display signal (request for display ON) to the combination meter via CAN communication.

When receiving the signal, the combination meter turns ON the fuel filler cap warning display.

CAUTION:

Check fuel filler cap installation condition when the fuel filler cap warning display turns ON.

Reset Operation

The fuel filler cap warning lamp turns OFF, according to any condition listed below:

- Reset operation is performed by operating the "INFO" switch on the combination meter.
- When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.
- DTC erased by using CONSULT.

NOTE:

SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

MIL turns ON if a malfunction is detected in leak diagnosis results again at the trip after the fuel filler cap warning display turns ON/OFF.

CAN COMMUNICATION

CAN COMMUNICATION : System Description

INFOID:0000000012524629

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

Refer to [LAN-30. "CAN COMMUNICATION SYSTEM : CAN Communication Signal Chart"](#), about CAN communication for detail.

OPERATION

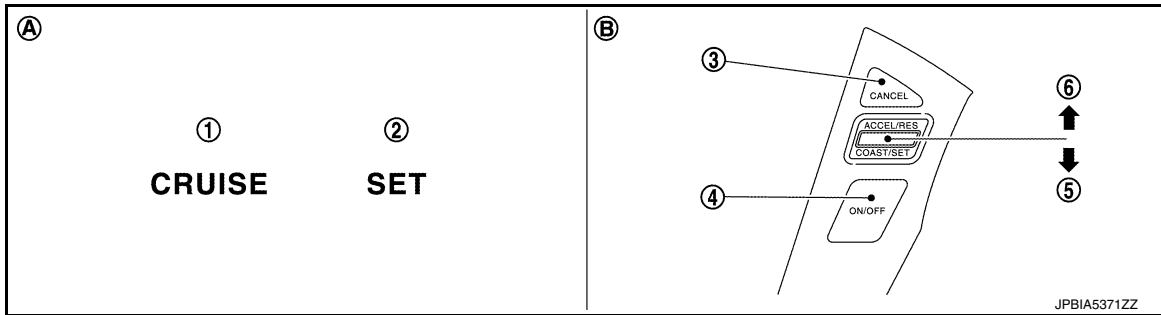
AUTOMATIC SPEED CONTROL DEVICE (ASCD)

AUTOMATIC SPEED CONTROL DEVICE (ASCD) : Switch Name and Function

INFOID:000000012524630

A
EC

SWITCHES AND INDICATORS



- 1. CRUISE indicator
- 2. SET indicator
- 3. CANCEL switch
- 4. ASCD MAIN switch
- 5. COAST/SET switch
- 6. ACCEL/RES switch (ACCELERATE/RESUME)

- A. On the combination meter
- B. On the steering wheel

SET SPEED RANGE

ASCD system can be set the following vehicle speed.

| Minimum speed (Approx.) | Maximum speed (Approx.) |
|-------------------------|-------------------------|
| 40 km/h (25 MPH) | 144 km/h (89 MPH) |

SWITCH OPERATION

| Item | Function |
|--------------------------------------|--|
| CANCEL switch | Cancels the cruise control driving. |
| ACCEL/RES switch (RESUME/ACCELERATE) | <ul style="list-style-type: none"> • Resumes the set speed. • Increases speed incrementally during cruise control driving. |
| COAST/SET switch | <ul style="list-style-type: none"> • Sets desired cruise speed. • Decreases speed incrementally during cruise control driving. |
| ASCD MAIN switch | Master switch to activate the ASCD system. |

CANCEL OPERATION

When any of following conditions exist, cruise operation will be canceled.

- CANCEL switch is pressed
- ASCD MAIN switch pressed (Set speed is cleared)
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Selector lever position is changed to N, P or R
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

When the ECM detects any of the following conditions, the ECM will cancel the cruise operation and inform the driver by blinking indicator.

- Engine coolant temperature is slightly higher than the normal operating temperature, CRUISE indicator may blink slowly.
When the engine coolant temperature decreases to the normal operating temperature, CRUISE indicator will stop blinking and the cruise operation will be able to work by pressing COAST/SET switch or ACCEL/RES switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

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OPERATION

< SYSTEM DESCRIPTION >

[VK56DE]

If MAIN switch is turned to OFF during ASCD is activated, all of ASCD operations will be canceled and vehicle speed memory will be erased.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

[VK56DE]

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:000000012524631

This system is an on board diagnostic system that records exhaust emission-related diagnostic information and detects a sensors/actuator-related malfunction. A malfunction is indicated by the malfunction indicator lamp (MIL) and stored in ECU memory as a DTC. The diagnostic information can be obtained with the diagnostic tool (GST: Generic Scan Tool).

GST (Generic Scan Tool)

INFOID:000000012524632

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to [GI-51, "Description"](#).

NOTE:

Service \$0A is not applied for regions where it is not mandated.

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DIAGNOSIS SYSTEM (ECM)

DIAGNOSIS DESCRIPTION

DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:000000012524633

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

| Items | MIL | | | | DTC | | 1st trip DTC | |
|---|----------|-------------|----------|-------------|---------------------|---------------------|---------------------|---------------------|
| | 1st trip | | 2nd trip | | 1st trip displaying | 2nd trip displaying | 1st trip displaying | 2nd trip displaying |
| | Blinking | Illuminated | Blinking | Illuminated | | | | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected | × | — | — | — | — | — | × | — |
| Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected | — | — | × | — | — | × | — | — |
| One trip detection diagnoses (Refer to EC-545, "DTC Index" .) | — | × | — | — | × | — | — | — |
| Except above | — | — | — | × | — | × | × | — |

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:000000012524634

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is saved in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are saved in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

For malfunctions in which 1st trip DTCs are displayed, refer to [EC-545, "DTC Index"](#). These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

1st trip DTC is specified in Service \$07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to [EC-579, "Work Flow"](#). Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen.

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

| Priority | Items | |
|----------|----------------------------|--|
| 1 | Freeze frame data | Misfire — DTC: P0300 – P0308 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175 |
| 2 | | Except the above items |
| 3 | 1st trip freeze frame data | |

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was saved in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

DIAGNOSIS DESCRIPTION : Counter System

INFOID:000000012524635

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on.
- The MIL will turn OFF after the vehicle is driven 3 times (driving pattern B) with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

COUNTER SYSTEM CHART

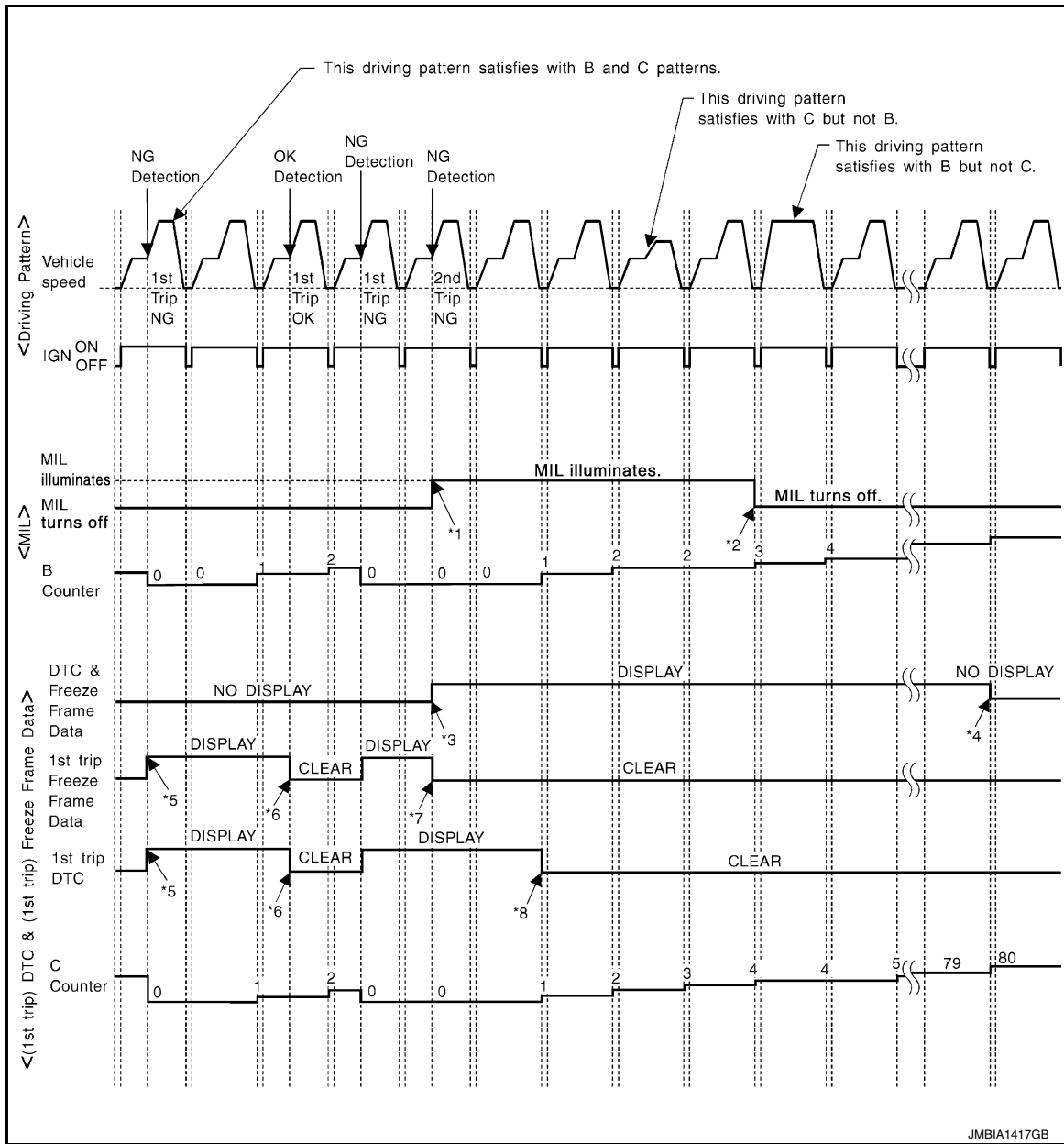
| Items | Fuel Injection System | Misfire | Other |
|-------------------------------------|-----------------------|-------------------|----------------|
| MIL (turns OFF) | 3 (pattern B) | 3 (pattern B) | 3 (pattern B) |
| DTC, Freeze Frame Data (no display) | 80 (pattern C) | 80 (pattern C) | 40 (pattern A) |
| 1st Trip DTC (clear) | 1 (pattern C), *1 | 1 (pattern C), *1 | 1 (pattern B) |
| 1st Trip Freeze Frame Data (clear) | *1, *2 | *1, *2 | 1 (pattern B) |

For details about patterns B and C under “Fuel Injection System” and “Misfire”, see “EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”.

For details about patterns A and B under Other, see “EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”.

- *1: Clear timing is at the moment OK is detected.
- *2: Clear timing is when the same malfunction is detected in the 2nd trip.

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”



- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.
- *3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- *4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)
- *5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- *6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.
- *7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.
- *8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

Explanation for Driving Patterns for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”

Driving Pattern B

Refer to [EC-512. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS SYSTEM (ECM)

[VK56DE]

< SYSTEM DESCRIPTION >

Driving Pattern C

Refer to [EC-512. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Example:

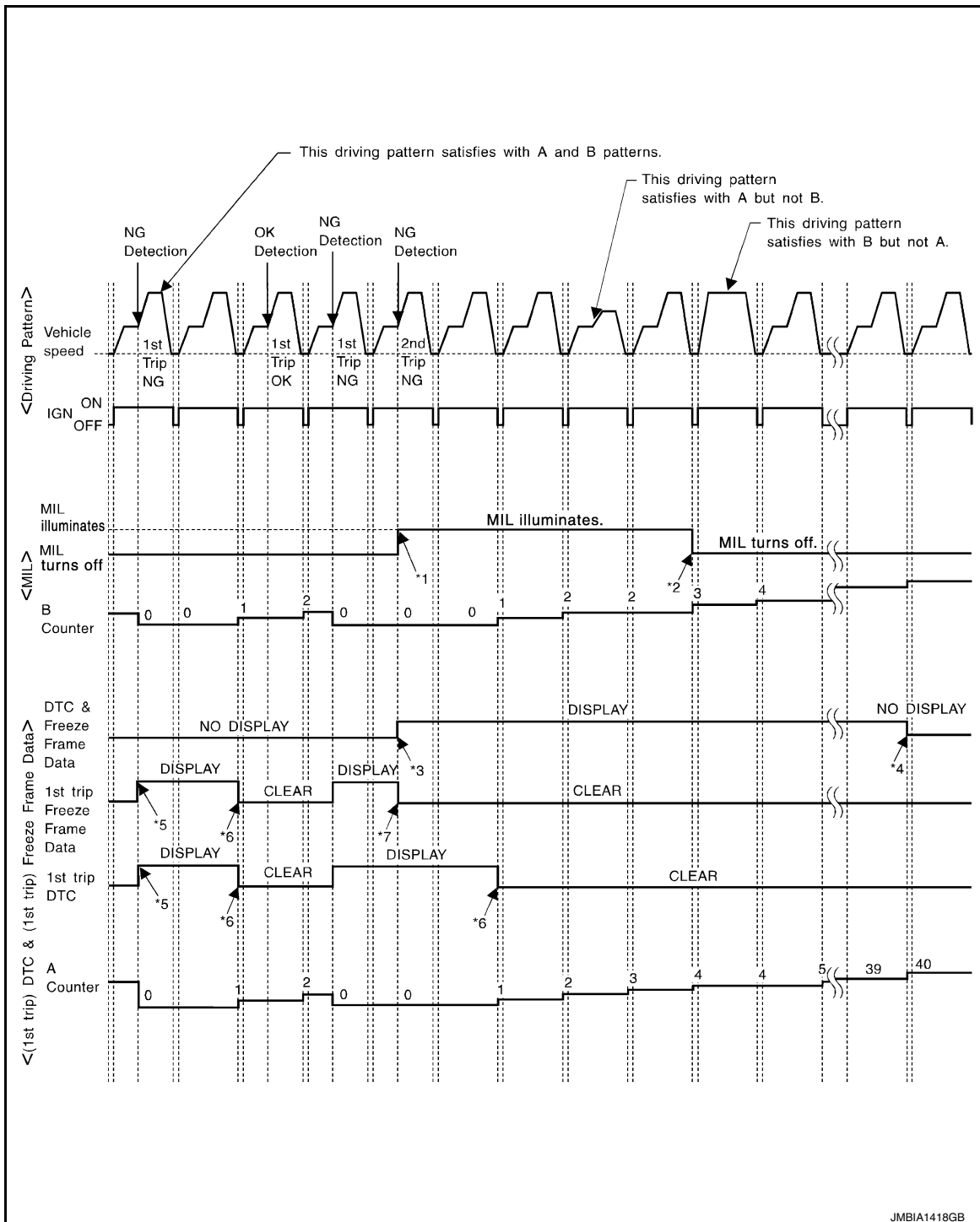
If the stored freeze frame data is as per the following:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 – 1,225 rpm, Calculated load value: 27 – 33%, Engine coolant temperature: more than 70°C (158°F)

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns Except For “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”



< SYSTEM DESCRIPTION >

- | | | |
|---|--|---|
| <p>*1: When the same malfunction is detected in two consecutive trips, MIL will light up.</p> | <p>*2: MIL will turn OFF after vehicle is driven 3 times (pattern B) without any malfunctions.</p> | <p>*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.</p> |
| <p>*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)</p> | <p>*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.</p> | <p>*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.</p> |
| <p>*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.</p> | | |

Explanation for Driving Patterns Except for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”

Driving Pattern A

Refer to [EC-512, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

Driving Pattern B

Refer to [EC-512, "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:000000012524636

CAUTION:

Always drive at a safe speed.

DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern A.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern A.

DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.

- Engine speed reaches 400 rpm or more.
- Engine coolant temperature reaches 70°C (158°F) or more.
- Vehicle speed of 70 – 120 km/h (44 – 75 MPH) is maintained for 60 seconds or more under the control of closed loop.
- Vehicle speed of 30 – 60 km/h (19 – 37 MPH) is maintained for 10 seconds or more under the control of closed loop.
- Under the closed loop control condition, the following state reaches 12 seconds or more in total: Vehicle speed of 4 km/h (2 MPH) or less with idling condition.
- The state of driving at 10 km/h (7 MPH) or more reaches 10 minutes or more in total.
- A lapse of 22 minutes or more after engine start.

NOTE:

- Drive the vehicle at a constant velocity.
- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern B.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern B.

DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:

The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data) ± 375 rpm

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Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]

Engine coolant temperature condition:

- When the freeze frame data shows lower than 70°C (158°F), engine coolant temperature should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), engine coolant temperature should be higher than or equal to 70°C (158°F).

NOTE:

- When the same malfunction is detected regardless of the above vehicle conditions, reset the counter of driving pattern C.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern C.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.

- The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total.
- Idle speed lasts 30 seconds or more.
- A lapse of 600 seconds or more after engine start.

NOTE:

- When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern D.
- When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern D.

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:000000012524637

System Readiness Test (SRT) code is specified in Service §01 of SAE J1979/ISO 15031-5.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

NOTE:

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If permanent DTC is stored or MIL illuminates during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT"), DTC (No DTCs) and permanent DTC (NO permanent DTCs) before the inspection.

SRT SET TIMING

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

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| Self-diagnosis result | | Example | | | | | | | |
|-----------------------|--------|----------------|----------------|---------|--------------|-------------------|------------------------|--------|--|
| | | Diagnosis | Ignition cycle | | | | | | |
| | ← ON → | | OFF | ← ON → | OFF | ← ON → | OFF | ← ON → | |
| All OK | Case 1 | P0400 | OK (1) | — (1) | OK (2) | — (2) | | | |
| | | P0402 | OK (1) | — (1) | — (1) | OK (2) | | | |
| | | P1402 | OK (1) | OK (2) | — (2) | — (2) | | | |
| | | SRT of EGR | “CMPLT” | “CMPLT” | “CMPLT” | “CMPLT” | | | |
| | Case 2 | P0400 | OK (1) | — (1) | — (1) | — (1) | | | |
| | | P0402 | — (0) | — (0) | OK (1) | — (1) | | | |
| | | P1402 | OK (1) | OK (2) | — (2) | — (2) | | | |
| | | SRT of EGR | “INCMP” | “INCMP” | “CMPLT” | “CMPLT” | | | |
| NG exists | Case 3 | P0400 | OK | OK | — | — | | | |
| | | P0402 | — | — | — | — | | | |
| | | P1402 | NG | — | NG | NG | NG (Consecutive NG) | | |
| | | (1st trip) DTC | 1st trip DTC | — | 1st trip DTC | DTC (= MIL ON) | | | |
| | | SRT of EGR | “INCMP” | “INCMP” | “INCMP” | “CMPLT” | | | |

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is NG.

—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses show OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above

When all SRT related self-diagnoses show OK results through several different cycles, the SRT will indicate “CMPLT” at the time the respective self-diagnoses have at least one OK result. → Case 2 above

If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above

The table above shows that the minimum number of cycles for setting SRT as “INCMP” is the number one (1) for each self-diagnosis (Case 1 & 2) or the number two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- During SRT driving pattern, the 1st trip DTC (NG) is detected prior to “CMPLT” of SRT and the self-diagnosis memory must be erased from the ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate “INCMP”.

NOTE:

SRT can be set as “CMPLT” together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates “CMPLT”.

DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)

INFOID:000000012524638

Permanent DTC is defined in SAE J1979/ISO 15031-5 Service \$0A.

ECM stores a DTC issuing a command of turning on MIL as a permanent DTC and keeps storing the DTC as a permanent DTC until ECM judges that there is no presence of malfunction.

Permanent DTCs cannot be erased by using the erase function of CONSULT or Generic Scan Tool (GST) and by disconnecting the battery to shut off power to ECM. This prevents a vehicle from passing the in-use inspection without repairing a malfunctioning part.

When not passing the in-use inspection due to more than one permanent DTC, permanent DTCs should be erased, referring to this manual.

NOTE:

- The important items in in-use inspection are that MIL is not ON, SRT test items are set, and permanent DTCs are not included.
- Permanent DTCs do not apply for regions that permanent DTCs are not regulated by law.

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PERMANENT DTC SET TIMING

The setting timing of permanent DTC is stored in ECM with the lighting of MIL when a DTC is confirmed.

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:0000000012524639

When emission-related ECU detects a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions), it turns on/blinks MIL to inform the driver that a malfunction has been detected.

1. The MIL illuminates when ignition switch is turned ON (engine is not running).

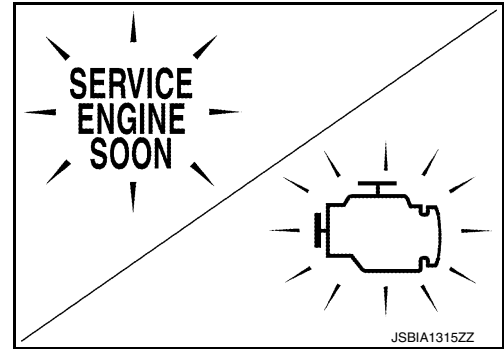
NOTE:

Check the MIL circuit if MIL does not illuminate. Refer to [EC-887, "Component Function Check"](#).

2. When the engine is started, the MIL should go off.

NOTE:

If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission-related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).



On Board Diagnosis Function

INFOID:0000000012524640

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

| Diagnostic test mode | Function |
|--|---|
| Bulb check | MIL can be checked. |
| SRT status | ECM can read if SRT codes are set. |
| Malfunction warning | If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected. |
| Self-diagnostic results | DTCs or 1st trip DTCs stored in ECM can be read. |
| Accelerator pedal released position learning | ECM can learn the accelerator pedal released position. Refer to EC-590, "Description" . |
| Throttle valve closed position learning | ECM can learn the throttle valve closed position. Refer to EC-591, "Description" . |
| Idle air volume learning | ECM can learn the idle air volume. Refer to EC-592, "Description" . |
| Mixture ratio self-learning value clear | Mixture ratio self-learning value can be erased. Refer to EC-594, "Description" . |

BULB CHECK MODE

Description

This function allows damage inspection in the MIL bulb (blown, open circuit, etc.).

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
If it remains OFF, check MIL circuit. Refer to [EC-887, "Diagnosis Procedure"](#).

SRT STATUS MODE

Description

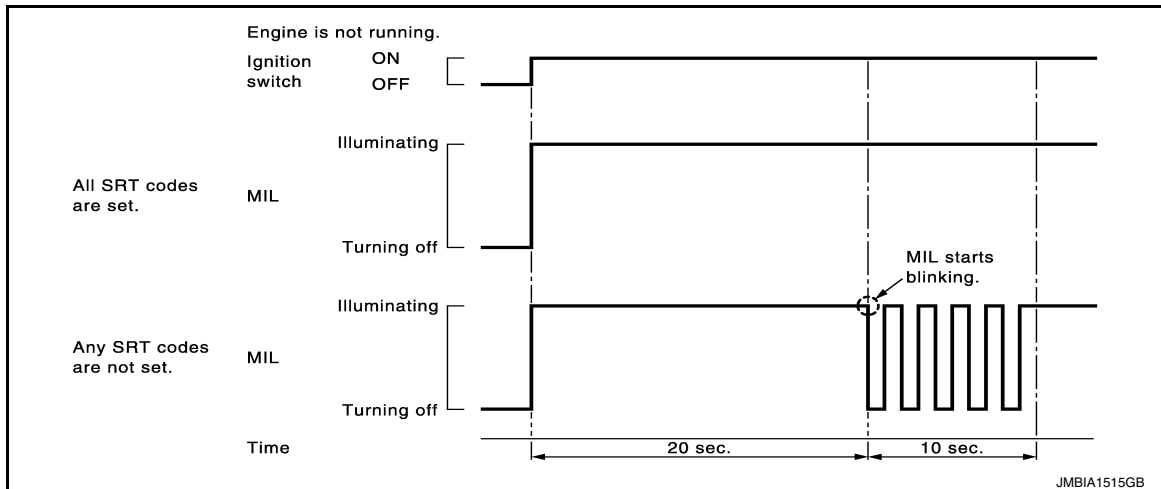
This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to [EC-513, "DIAGNOSIS DESCRIPTION : System Readiness Test \(SRT\) Code"](#).

Operation Procedure

1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown blow.
 - ECM continues to illuminate MIL if all SRT codes are set.

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- ECM blinks MIL for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

In this function ECM turns on or blinks MIL when it detects a malfunction in the emission control system components and/or the powertrain control components (which affect vehicle emissions) to inform the driver that a malfunction has been detected.

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
If it remains OFF, check MIL circuit. Refer to [EC-887, "Diagnosis Procedure"](#).
3. Start engine and let it idle.
 - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
 - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
 - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MIL is blinking.

How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- After ignition switch is turned off, ECM is always released from the "self-diagnostic results" mode.

1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.
3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.

NOTE:

Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.

4. Fully release the accelerator pedal.
ECM has entered to "Self-diagnostic results" mode.

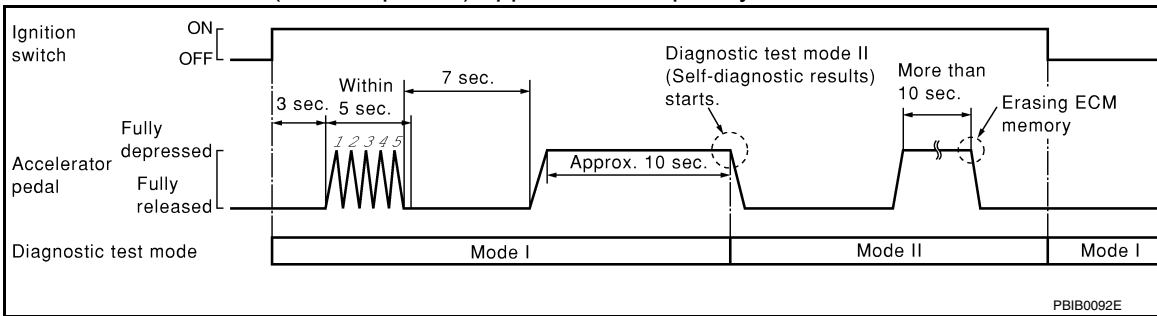
NOTE:

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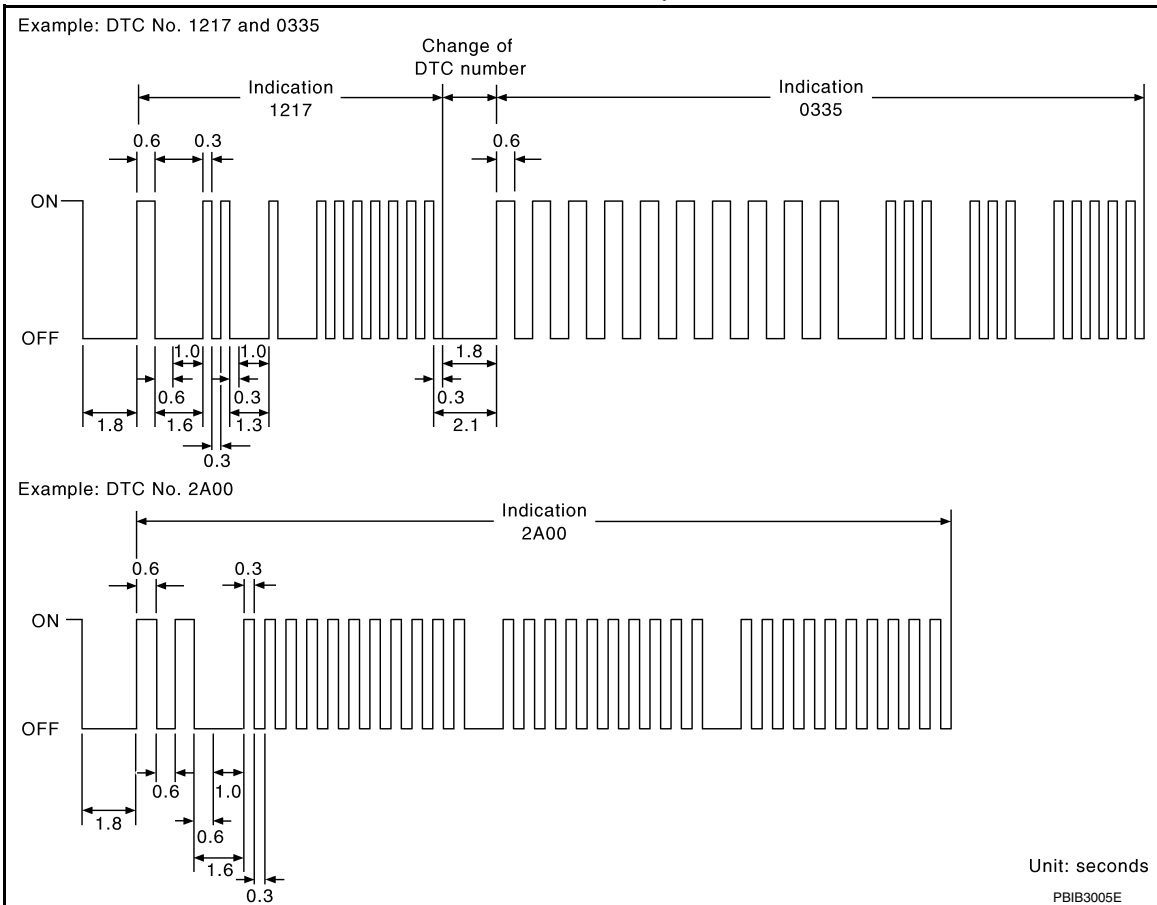
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

The DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in "malfunction warning" mode, it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes per the following.

| Number | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---------|----|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| Flashes | 10 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 11 | 12 | 13 | 14 | 15 | 16 |

The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-seconds) - OFF (0.6-seconds) cycle.

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle.

A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

A change from one trouble code to another occurs at an interval of 1.8-seconds OFF.

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to [EC-545, "DTC Index"](#).

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How to Erase Self-diagnostic Results

By performing this procedure, ECM memory is erased and the following diagnostic information is erased as well.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

NOTE:

Also, if a battery terminal is disconnected, ECM memory is erased and the diagnostic information as listed above is erased. (The amount of time required for erasing may vary from a few seconds to several hours.)

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Set ECM in “self-diagnostic results” mode.
6. The diagnostic information has been erased from the backup memory in the ECM.
Fully depress the accelerator pedal and keep it depressed for more than 10 seconds.
7. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

CONSULT Function

INFOID:000000012524641

FUNCTION

| Diagnostic test mode | Function |
|------------------------|---|
| Self Diagnostic Result | Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.* |
| Data Monitor | Input/Output data in the ECM can be read. |
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit. |
| Active Test | Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range. |
| ECM Identification | ECM part number can be read. |
| DTC Work Support | The status of system monitoring tests and the self-diagnosis status/results can be confirmed. |

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to [EC-545, "DTC Index"](#).

How to Read DTC and 1st Trip DTC

DTCs and 1st trip DTCs related to the malfunction are displayed in “self-diag results”.

- When ECM detects a 1st trip DTC, 1t” is displayed for “TIME”.
- When ECM has detected a current DTC, “0” is displayed for “TIME”.
- If “TIME” is neither “0” nor “1t”, the DTC occurred in the past and ECM shows the number of times the vehicle has been driven since the last detection of the DTC.

How to Erase DTC and 1st Trip DTC

NOTE:

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- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see [EC-545. "DTC Index"](#)), skip step 1.
 1. Erase DTC in TCM. Refer to [TM-48. "DTC Index"](#).
 2. Select "ENGINE" with CONSULT.
 3. Select "SELF-DIAG RESULTS".
 4. Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

| Freeze frame data item* | Description |
|------------------------------|---|
| DIAG TROUBLE CODE [PXXXX] | • The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to EC-545. "DTC Index" .) |
| FUEL SYS-B1 | • "Fuel injection system status" at the moment a malfunction is detected is displayed. |
| FUEL SYS-B2 | • One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enrichment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop |
| CAL/LD VALUE [%] | • The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | • The engine coolant temperature at the moment a malfunction is detected is displayed. |
| L-FUEL TRM-B1 [%] | • "Long-term fuel trim" at the moment a malfunction is detected is displayed. |
| L-FUEL TRM-B2 [%] | • The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| S-FUEL TRM-B1 [%] | • "Short-term fuel trim" at the moment a malfunction is detected is displayed. |
| S-FUEL TRM-B2 [%] | • The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. |
| ENGINE SPEED [rpm] | • The engine speed at the moment a malfunction is detected is displayed. |
| VEHICL SPEED [km/h] or [mph] | • The vehicle speed at the moment a malfunction is detected is displayed. |
| ABSOL TH-P/S [%] | • The throttle valve opening angle at the moment a malfunction is detected is displayed. |
| B/FUEL SCHDL [msec] | • The base fuel schedule at the moment a malfunction is detected is displayed. |
| INT/A TEMP SE [°C] or [°F] | • The intake air temperature at the moment a malfunction is detected is displayed. |
| INT MANI PRES [kPa] | • These items are displayed but are not applicable to this model. |
| COMBUST CONDITION | |

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE

NOTE:

The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.

Monitored Item

For reference values of the following items, refer to [EC-529. "Reference Value"](#).

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×: Applicable

| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|-----------------|---------------|------------------------|--------------|---|---|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| ENG SPEED | rpm | × | × | <ul style="list-style-type: none"> Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). | <ul style="list-style-type: none"> Accuracy becomes poor if engine speed drops below the idle rpm. If the signal is interrupted while the engine is running, an abnormal value may be indicated. |
| MAS A/F SE-B1 | V | × | × | <ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. When engine is running, specification range is indicated in "SPEC". |
| B/FUEL SCHDL | ms | × | × | <ul style="list-style-type: none"> "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | <ul style="list-style-type: none"> When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B1 | % | | | <ul style="list-style-type: none"> The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. This data also includes the data for the air-fuel ratio learning control. When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B2 | | | | | |
| COOLANT TEMP/S | °C or °F | × | × | <ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | <ul style="list-style-type: none"> When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed. |
| A/F SEN1 (B1) | V | × | × | <ul style="list-style-type: none"> The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed. | |
| HO2S2 (B1) | V | × | × | <ul style="list-style-type: none"> The signal voltage of the heated oxygen sensor 2 is displayed. | |
| HO2S2 (B2) | | × | × | | |
| HO2S2 MNTR (B1) | RICH/ LEAN | | × | <ul style="list-style-type: none"> Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| HO2S2 MNTR (B2) | | | × | | |
| VHCL SPEED SE | km/h or mph | × | × | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | |
| BATTERY VOLT | V | | | <ul style="list-style-type: none"> The power supply voltage of ECM is displayed. | |

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| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|----------------|----------|------------------------|--------------|---|---|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| ACCEL SEN 1 | V | | | <ul style="list-style-type: none"> The accelerator pedal position sensor signal voltage is displayed. | <ul style="list-style-type: none"> ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal. |
| ACCEL SEN 2 | | | | | |
| TP SEN 1-B1 | V | × | × | <ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. | <ul style="list-style-type: none"> TP SEN 2-B1 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal. |
| TP SEN 2-B1 | | × | × | | |
| FUEL T/TMP SE | °C or °F | | | <ul style="list-style-type: none"> The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed. | |
| EVAP SYS PRES | V | | | <ul style="list-style-type: none"> The signal voltage of EVAP control system pressure sensor is displayed. | |
| FUEL LEVEL SE | V | × | | <ul style="list-style-type: none"> The signal voltage of the fuel level sensor is displayed. | |
| START SIGNAL | On/Off | | | <ul style="list-style-type: none"> Indicates start signal status [On/Off] computed by the ECM according to the signals of engine speed and battery voltage. | <ul style="list-style-type: none"> After starting the engine, [Off] is displayed regardless of the starter signal. |
| CLSD THL POS | On/Off | × | × | <ul style="list-style-type: none"> Indicates idle position [On/Off] computed by ECM according to the accelerator pedal position sensor signal. | |
| AIR COND SIG | On/Off | × | × | <ul style="list-style-type: none"> Indicates [On/Off] condition of the air conditioner switch as determined by the air conditioner signal. | |
| PW/ST SIGNAL | On/Off | × | × | <ul style="list-style-type: none"> [On/Off] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor) is indicated. | |
| LOAD SIGNAL | On/Off | × | × | <ul style="list-style-type: none"> Indicates [On/Off] condition from the electrical load signal. On: Rear window defogger switch is ON and/or lighting switch is in 2nd position. Off: Both rear window defogger switch and lighting switch are OFF. | |
| IGNITION SW | On/Off | × | × | <ul style="list-style-type: none"> Indicates [On/Off] condition from ignition switch signal. | |
| HEATER FAN SW | On/Off | × | | <ul style="list-style-type: none"> Indicates [On/Off] condition from the heater fan switch signal. | |
| BRAKE SW | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from the stop lamp switch signal. | |
| INJ PULSE-B1 | msec | | | <ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | <ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-B2 | | | | | |
| IGN TIMING | BTDC | | | <ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| CAL/LD VALUE | % | | | <ul style="list-style-type: none"> "Calculated load value" indicates the value of the current air flow divided by peak air flow. | |

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< SYSTEM DESCRIPTION >

[VK56DE]

| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|----------------|-------------|------------------------|--------------|--|---------|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| MASS AIRFLOW | g/s | | | <ul style="list-style-type: none"> Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor. | |
| PURG VOL C/V | % | | | <ul style="list-style-type: none"> Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. The opening becomes larger as the value increases. | |
| INT/V TIM (B1) | °CA | | | <ul style="list-style-type: none"> Indicates [°CA] of intake camshaft advance angle. | |
| INT/V TIM (B2) | | | | | |
| INT/V SOL (B1) | % | | | <ul style="list-style-type: none"> The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. | |
| INT/V SOL (B2) | | | | | |
| AIR COND RLY | On/Off | | | <ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. | |
| FUEL PUMP RLY | On/Off | | | <ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |
| VENT CONT/V | On/Off | | | <ul style="list-style-type: none"> The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. On: Closed Off: Open | |
| THRTL RELAY | On/Off | | | <ul style="list-style-type: none"> Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. | |
| A/F S1 HTR(B2) | % | | | <ul style="list-style-type: none"> Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. | |
| COOLING FAN | Hi/Low/Off | | | <ul style="list-style-type: none"> The control condition of the cooling fan (determined by ECM according to the input signals) is indicated. Hi: High speed operation Low: Low speed operation Off: Stop | |
| HO2S2 HTR (B1) | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals. | |
| HO2S2 HTR (B2) | | | | | |
| I/P PULLY SPD | rpm | | | <ul style="list-style-type: none"> Indicates the engine speed computed from the input speed sensor signal. | |
| VEHICLE SPEED | km/h or mph | | | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from TCM is displayed. | |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|-----------------|-------------|------------------------|--------------|--|---------|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| IDL A/V LEARN | Yet/CM-PLT | | | <ul style="list-style-type: none"> Displays the condition of idle air volume learning Yet: Idle Air Volume Learning has not been performed yet. CMPLT: Idle Air Volume Learning has already been performed successfully. | |
| TRVL AFTER MIL | km or mile | | | <ul style="list-style-type: none"> Distance traveled while MIL is activated. | |
| A/F S1 HTR (B1) | % | | | <ul style="list-style-type: none"> Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. | |
| VHCL SPEED SE | km/h or mph | | | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | |
| SET VHCL SPD | km/h or mph | | | <ul style="list-style-type: none"> The preset vehicle speed is displayed. | |
| MAIN SW | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from MAIN switch signal. | |
| CANCEL SW | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from CANCEL switch signal. | |
| RESUME/ACC SW | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from ACCEL/RES switch signal. | |
| SET SW | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from COAST/SET switch signal. | |
| BRAKE SW1 | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from ASCD brake switch signal or ASCD clutch switch. | |
| BRAKE SW2 | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition of stop lamp switch signal. | |
| VHCL SPD CUT | Non/Cut | | | <ul style="list-style-type: none"> Indicates the vehicle cruise condition. Non: Vehicle speed is maintained at the ASCD set speed. Cut: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off. | |
| LO SPEED CUT | Non/Cut | | | <ul style="list-style-type: none"> Indicates the vehicle cruise condition. Non: Vehicle speed is maintained at the ASCD set speed. Cut: Vehicle speed decreased to excessively low, and ASCD operation is cut off. | |
| AT OD MONITOR | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition of A/T O/D according to the input signal from the TCM. | |
| AT OD CANCEL | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition of A/T O/D cancel request signal. | |
| CRUISE LAMP | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition of CRUISE lamp determined by the ECM according to the input signals. | |
| SET LAMP | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition of SET lamp determined by the ECM according to the input signals. | |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|-------------------|-------------|------------------------|--------------|--|---------|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| A/F ADJ-B1 | — | | | <ul style="list-style-type: none"> Indicates the correction of a factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal. | |
| A/F ADJ-B2 | | | | | |
| P/N POSI SW | On/Off | | | <ul style="list-style-type: none"> Indicates [On/Off] condition from the park/neutral position (PNP) signal. | |
| INT/A TEMP SE | °C or °F | | | <ul style="list-style-type: none"> The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated. | |
| AC PRESS SEN | V | | | <ul style="list-style-type: none"> The signal voltage from the refrigerant pressure sensor is displayed. | |
| A/F SEN1 (B2) | V | | | <ul style="list-style-type: none"> The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed. | |
| VTC DTY EX B2 | % | | | <ul style="list-style-type: none"> The control value of the exhaust valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. | |
| EVAP LEAK DIAG | Yet/CM-PLT | | | <ul style="list-style-type: none"> Indicates the condition of EVAP leak diagnosis. Yet: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully. | |
| EVAP DIAG READY | On/Off | | | <ul style="list-style-type: none"> Indicates the ready condition of EVAP leak diagnosis. On: EVAP leak diagnosis has been ready condition. Off: EVAP leak diagnosis has not been ready condition. | |
| THRTL STK CNT B1* | — | | | — | |
| HO2 S2 DIAG1 (B1) | INCMP/CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (delayed response) condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG1 (B2) | INCMP/CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (delayed response) condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG2 (B1) | INCMP/CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P0139 self-diagnosis (slow response) condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete. | |
| HO2 S2 DIAG2 (B2) | INCMP/CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P0159 self-diagnosis (slow response) condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete. | |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|---------------------------|-----------------|------------------------|--------------|--|---------|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| A/F SEN1 DIAG1 (B1) | INCMP/ CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P015A or P015B self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | A EC |
| A/F SEN1 DIAG1 (B2) | INCMP/ CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P015C or P015D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | C |
| A/F SEN1 DIAG2 (B1) | INCMP/ CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P014C or P014D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | D |
| A/F SEN1 DIAG2 (B2) | INCMP/ CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P014E or P014F self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | E F |
| A/F SEN1 DIAG3 (B1) | ABSNT/ PRSNT | | | <ul style="list-style-type: none"> Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the diagnosis range. PRSNT: The vehicle condition is within the diagnosis range. | G |
| A/F SEN1 DIAG3 (B2) | ABSNT/ PRSNT | | | <ul style="list-style-type: none"> Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the diagnosis range. PRSNT: The vehicle condition is within the diagnosis range. | H I |
| A/F-S ATMSPHRC CRCT B1 | — | | | Displays a determined value of atmospheric correction factor necessary for correcting an A/F sensor signal input to ECM. The signal used for the correction is an A/F sensor signal transmitted while driving under atmospheric pressure. | J |
| A/F-S ATMSPHRC CRCT B2 | — | | | Displays a determined value of atmospheric correction factor necessary for correcting an A/F sensor signal input to ECM. The signal used for the correction is an A/F sensor signal transmitted while driving under atmospheric pressure. | K L |
| A/F-S ATMSPHRC CRCT UP B1 | count | | | Displays the number of updates of the A/F sensor atmospheric correction factor. | M |
| A/F-S ATMSPHRC CRCT UP B2 | count | | | Displays the number of updates of the A/F sensor atmospheric correction factor. | N |
| SYSTEM 1 DIAGNOSIS A B1 | INCMP/ CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P219A self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis | O |
| SYSTEM 1 DIAGNOSIS A B2 | INCMP/ CMPLT | | | <ul style="list-style-type: none"> Indicates DTC P219B self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis | P |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

| Monitored item | Unit | Monitor Item Selection | | Description | Remarks |
|-------------------------|--------------|------------------------|--------------|---|---------|
| | | ECU INPUT SIGNALS | MAIN SIGNALS | | |
| SYSTEM 1 DIAGNOSIS B B1 | ABSNT/ PRSNT | | | <ul style="list-style-type: none"> Indicates DTC P219A self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis | |
| SYSTEM 1 DIAGNOSIS B B2 | ABSNT/ PRSNT | | | <ul style="list-style-type: none"> Indicates DTC P219B self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis | |

*: The item is indicated, but not used.

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

WORK SUPPORT MODE

Work Item

| Work item | Condition | Usage |
|----------------------------|---|--|
| IDLE AIR VOL LEARN | <ul style="list-style-type: none"> The idle air volume that keeps the engine within the specified range is memorized in ECM. | When learning the idle air volume |
| EVAP SYSTEM CLOSE | Close the EVAP canister vent control valve in order to make EVAP system close under the following conditions. <ul style="list-style-type: none"> Ignition switch ON Engine not running Ambient temperature is above 0°C (32°F). No vacuum and no high pressure in EVAP system Fuel tank temperature is more than 0°C (32°F). Within 10 minutes after starting "EVAP SYSTEM CLOSE" When trying to execute "EVAP SYSTEM CLOSE" under the condition except above, CONSULT will discontinue it and display appropriate instruction. <p>NOTE: When starting engine, CONSULT may display "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", even in using charged battery.</p> | When detecting EVAP vapor leak point of EVAP system |
| FUEL PRESSURE RELEASE | <ul style="list-style-type: none"> Fuel pump will stop by touching "START" during idling. Crank a few times after engine stalls. | When releasing fuel pressure from fuel line |
| SELF-LEARNING CONT | <ul style="list-style-type: none"> The coefficient of self-learning control mixture ratio returns to the original coefficient. | When clearing the coefficient of self-learning control value |
| TARGET IDLE RPM ADJ* | <ul style="list-style-type: none"> Idle condition | When setting target idle speed |
| VIN REGISTRATION | <ul style="list-style-type: none"> In this mode, VIN is registered in ECM | When registering VIN in ECM |
| TARGET IGN TIM ADJ* | <ul style="list-style-type: none"> Idle condition | When adjusting target ignition timing |
| CLSD THL POS LEARN | <ul style="list-style-type: none"> Ignition on and engine stopped. | When learning the throttle valve closed position |
| SAVING DATA FOR REPLC CPU | In this mode, save data that is in ECM. | When ECM is replaced. |
| WRITING DATA FOR REPLC CPU | In this mode, write data stored by "SAVE DATA FOR CPU REPLC" in work support mode to ECM. | When ECM is replaced. |

*: This function is not necessary in the usual service procedure.

ACTIVE TEST MODE

Test Item

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

| Test item | Condition | Judgment | Check item (Remedy) | |
|------------------|--|--|---|-------------|
| FUEL INJECTION | <ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change the amount of fuel injection using CONSULT. | If malfunctioning symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1 | A EC |
| ENG COOLANT TEMP | <ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change the engine coolant temperature using CONSULT. | If malfunctioning symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Harness and connectors Engine coolant temperature sensor Fuel injector | C |
| PURG VOL CONT/V | <ul style="list-style-type: none"> Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | <ul style="list-style-type: none"> Harness and connectors Solenoid valve | D |
| FUEL/T TEMP SEN | <ul style="list-style-type: none"> Change the fuel tank temperature using CONSULT. | | | E |
| FUEL PUMP RELAY | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound. | Fuel pump relay makes the operating sound. | <ul style="list-style-type: none"> Harness and connectors Fuel pump relay | F |
| IGNITION TIMING | <ul style="list-style-type: none"> Engine: Return to the original non-standard condition Timing light: Set Retard the ignition timing using CONSULT. | If malfunctioning symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Perform Idle Air Volume Learning. | G |
| POWER BALANCE | <ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch OFF Selector lever: P or N position Cut off each injector signal one at a time using CONSULT. | Engine runs rough or stops. | <ul style="list-style-type: none"> Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil | H I J |
| COOLING FAN* | <ul style="list-style-type: none"> Ignition switch: ON Turn the cooling fan "HI", "LOW" and "OFF" using CONSULT. | Cooling fan moves and stops. | <ul style="list-style-type: none"> Harness and connectors Cooling fan motor IPDM E/R | K |
| VENT CONTROL/V | <ul style="list-style-type: none"> Ignition switch: ON (Engine stopped) Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> Harness and connectors Solenoid valve | L |
| V/T ASSIGN ANGLE | <ul style="list-style-type: none"> Engine: Return to the original non-standard condition Change intake valve timing using CONSULT. | If malfunctioning symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Harness and connectors Intake valve timing control solenoid valve | M N |

DTC WORK SUPPORT MODE

Test Item

| Test mode | Test item | Corresponding DTC No. | Reference page |
|--------------------|---------------------------|-----------------------|------------------------|
| EVAPORATIVE SYSTEM | PURG FLOW P0441 | P0441 | EC-742 |
| | PURG VOL CN/V P1444 | P0443 | EC-748 |
| A/F SEN1 | A/F SEN1 (B1) P1278/P1279 | — | |
| | A/F SEN1 (B1) P1276 | P0130 | EC-669 |
| | A/F SEN1 (B2) P1288/P1289 | — | |
| | A/F SEN1 (B2) P1286 | P0150 | EC-669 |

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VK56DE]

| Test mode | Test item | Corresponding DTC No. | Reference page |
|-----------|------------------|-----------------------|------------------------|
| HO2S2 | HO2S2 (B1) P1146 | P0138 | EC-685 |
| | HO2S2 (B1) P1147 | P0137 | EC-679 |
| | HO2S2 (B1) P0139 | P0139 | EC-693 |
| | HO2S2 (B2) P1166 | P0158 | EC-685 |
| | HO2S2 (B2) P1167 | P0157 | EC-679 |
| | HO2S2 (B2) P0159 | P0159 | EC-693 |

SRT & P-DTC MODE

SRT STATUS Mode

- For items whose SRT codes are set, “CMPLT” is displayed on the CONSULT screen; for items whose SRT codes are not set, “INCMP” is displayed.
- “SRT STATUS” provides the presence or absence of permanent DTCs stored in ECM memory.

PERMANENT DTC STATUS Mode

How to display permanent DTC status

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select “PERMANENT DTC STATUS” in “DTC & SRT CONFIRMATION” mode with CONSULT.

NOTE:

Permanent DTCs stored in ECM memory are displayed on the CONSULT screen to show if a driving pattern required for erasing permanent DTCs is complete (CMPLT) or incomplete (INCMP).

CAUTION:

Since the “PERMANENT DTC STATUS” screen displays the previous trip information, repeat the following twice to update the information: “Ignition switch OFF”, “Wait for more than 10 seconds” and “Ignition switch ON”.

| PERMANENT DTC & SRT CONFIRMATION : PERMANENT DTC STATUS | | |
|--|-------------------|-------------------|
| <p>CAUTION: Turn ignition switch from ON to OFF twice to update the information on the status screen.</p> | | |
| PERMANENT DTC | DRIVING PATTERN B | DRIVING PATTERN D |
| XXXX | INCMP | INCMP |
| XXXX | CMPLT | INCMP |
| XXXX | INCMP | CMPLT |
| XXXX | CMPLT | INCMP |
| XXXX | INCMP | INCMP |
| XXXX | INCMP | INCMP |
| <p>The previous trip information is displayed. </p> | | |

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NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

SRT WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

PERMANENT DTC WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to complete the driving pattern that is required for erasing permanent DTC.

NOTE:

This mode is not used in regions that permanent DTCs are not regulated by law.

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

INFOID:0000000012524642

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- Numerical values in the following table are reference values.
- These values are input/output values that ECM receives/transmits and may differ from actual operations.

Example:

The ignition timing shown by the timing light may differ from the ignition timing displayed on the data monitor. This occurs because the timing light shows a value calculated by ECM according to signals received from the cam shaft position sensor and other sensors related to ignition timing.

- For outlines of following items, refer to [EC-518. "CONSULT Function"](#).

| Monitor item | Condition | | Specification |
|------------------------------------|---|---------------------------------------|---|
| ENG SPEED | • Run engine and compare CONSULT value with the tachometer indication. | | Almost the same speed as the tachometer indication. |
| MAS A/F SE-B1 | See EC-610 . | | |
| B/FUEL SCHDL | See EC-610 . | | |
| A/F ALPHA-B1 A/F ALPHA-B2 | See EC-610 . | | |
| COOLANT TEMP/S | • Engine: After warming up | | More than 70°C (158°F) |
| A/F SEN1 (B1) | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| HO2S2 (B1) HO2S2 (B2) | <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - Keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | 0 - 0.3 V ↔ Approx. 0.6 - 1.0 V |
| HO2S2 MNTR (B1) HO2S2 MNTR (B2) | <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. - Engine: After warming-up - Keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | | LEAN ↔ RICH |
| VHCL SPEED SE | • Turn drive wheels and compare CONSULT value with the speedometer indication. | | Almost the same speed as the speedometer indication |
| BATTERY VOLT | • Ignition switch: ON (Engine stopped) | | 11 - 14 V |
| ACCEL SEN 1 | • Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | 0.5 - 1.0 V |
| | | Accelerator pedal: Fully depressed | 4.2 - 4.8 V |
| ACCEL SEN 2*1 | • Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | 0.5 - 1.0 V |
| | | Accelerator pedal: Fully depressed | 4.2 - 4.8 V |
| TP SEN 1-B1 TP SEN 2-B1 | <ul style="list-style-type: none"> • Ignition switch: ON (Engine stopped) • Selector lever: D | Accelerator pedal: Fully released | More than 0.36 V |
| | | Accelerator pedal: Fully depressed | Less than 4.75 V |
| FUEL T/TMP SE | • Ignition switch: ON | | Indicates fuel tank temperature |
| EVAP SYS PRES | • Ignition switch: ON | | Approx. 1.8 - 4.8 V |
| FUEL LEVEL SE | • Ignition switch: ON | | Depending on fuel level of fuel tank |
| START SIGNAL | • Ignition switch: ON → START → ON | | Off → On → Off |
| CLSD THL POS | • Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | On |
| | | Accelerator pedal: Slightly depressed | Off |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Monitor item | Condition | Specification | |
|----------------------------------|--|---|--------------------|
| AIR COND SIG | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Air conditioner switch: OFF | Off |
| | | Air conditioner switch: ON (Compressor: Operates) | On |
| PW/ST SIGNAL | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Steering wheel: Not being turned (Forward direction) | Off |
| | | Steering wheel: Being turned | On |
| LOAD SIGNAL | <ul style="list-style-type: none"> Ignition switch: ON | Rear window defogger switch is ON and/or lighting switch is in 2nd. | On |
| | | Rear window defogger switch is OFF and lighting switch is OFF. | Off |
| IGNITION SW | <ul style="list-style-type: none"> Ignition switch: ON → OFF → ON | | On → Off → On |
| HEATER FAN SW | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Heater fan control switch: ON | On |
| | | Heater fan control switch: OFF | Off |
| BRAKE SW | <ul style="list-style-type: none"> Ignition switch: ON | Brake pedal: Fully released | Off |
| | | Brake pedal: Slightly depressed | On |
| INJ PULSE-B1 INJ PULSE-B2 | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 2.0 - 2.8 msec |
| | | 2,000 rpm | 1.9 - 2.9 msec |
| IGN TIMING | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 10° - 20° BTDC |
| | | 2,000 rpm | 25° - 45° BTDC |
| CAL/LD VALUE | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 14% - 33% |
| | | 2,500 rpm | 12% - 25% |
| MASS AIRFLOW | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 3.0 - 9.0 g/s |
| | | 2,500 rpm | 9.0 - 28.0 g/s |
| PURG VOL C/V | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle (Accelerator pedal: Not depressed even slightly, after engine starting.) | 0% |
| | | 2,000 rpm | — |
| INT/V TIM (B1) INT/V TIM (B2) | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | -5° - 5°CA |
| | | 2,000 rpm | Approx. 0° - 20°CA |
| INT/V SOL (B1) INT/V SOL (B2) | <ul style="list-style-type: none"> Engine: After warming up Selector lever: P or N Air conditioner switch: OFF No load | Idle | 0% - 2% |
| | | 2,000 rpm | Approx. 25% - 50% |
| AIR COND RLY | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | Air conditioner switch: OFF | Off |
| | | Air conditioner switch: ON (Compressor: Operates) | On |
| FUEL PUMP RLY | <ul style="list-style-type: none"> For 1 second after turning ignition switch ON Engine running or cranking | | On |
| | <ul style="list-style-type: none"> Except above conditions | | Off |
| VENT CONT/V | <ul style="list-style-type: none"> Ignition switch: ON | | Off |
| THRTL RELAY | <ul style="list-style-type: none"> Ignition switch: ON | | On |
| A/F S1 HTR (B2) | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | | 4 - 100% |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Monitor item | Condition | | Specification | |
|----------------------------------|--|---|---|----|
| COOLING FAN | <ul style="list-style-type: none"> Engine: After warming up, idle the engine Air conditioner switch: OFF | Engine coolant temperature: 99°C (210°F) or less | Off | A |
| | | Engine coolant temperature: 100°C (212°F) or more | Hi | EC |
| HO2S2 HTR (B1) HO2S2 HTR (B2) | <ul style="list-style-type: none"> Engine speed: Below 3,600 rpm after the following conditions are met. <ul style="list-style-type: none"> Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load Engine speed: Above 3,600 rpm | | On | C |
| | | | Off | |
| I/P PULLY SPD | <ul style="list-style-type: none"> Vehicle speed: More than 20 km/h (12 MPH) | | Almost the same speed as the tachometer indication | D |
| VEHICLE SPEED | <ul style="list-style-type: none"> Turn drive wheels and compare CONSULT value with the speedometer indication. | | Almost the same speed as the speedometer indication | E |
| IDL A/V LEARN | <ul style="list-style-type: none"> Engine: Running | Idle air volume learning has not been performed yet. | Yet | |
| | | Idle air volume learning has already been performed successfully. | CMPLT | F |
| TRVL AFTER MIL | <ul style="list-style-type: none"> Ignition switch: ON | Vehicle has traveled after MIL has turned ON. | 0 - 65,535 km (0 - 40,723 mile) | G |
| A/F S1 HTR (B1) | <ul style="list-style-type: none"> Engine: After warming up, idle the engine | | 4 - 100% | |
| VHCL SPEED SE | <ul style="list-style-type: none"> Turn drive wheels and compare CONSULT value with the speedometer indication. | | Almost the same speed as the speedometer indication | H |
| SET VHCL SPD | <ul style="list-style-type: none"> Engine: Running | ASCD: Operating. | The preset vehicle speed is displayed. | |
| MAIN SW | <ul style="list-style-type: none"> Ignition switch: ON | MAIN switch: Pressed | On | I |
| | | MAIN switch: Released | Off | |
| CANCEL SW | <ul style="list-style-type: none"> Ignition switch: ON | CANCEL switch: Pressed | On | J |
| | | CANCEL switch: Released | Off | |
| RESUME/ACC SW | <ul style="list-style-type: none"> Ignition switch: ON | RESUME/ACCELERATE switch: Pressed | On | K |
| | | RESUME/ACCELERATE switch: Released | Off | |
| SET SW | <ul style="list-style-type: none"> Ignition switch: ON | SET/COAST switch: Pressed | On | L |
| | | SET/COAST switch: Released | Off | |
| BRAKE SW1 | <ul style="list-style-type: none"> Ignition switch: ON | Brake pedal: Fully released | On | |
| | | Brake pedal: Slightly depressed | Off | M |
| BRAKE SW2 | <ul style="list-style-type: none"> Ignition switch: ON | Brake pedal: Fully released | Off | |
| | | Brake pedal: Slightly depressed | On | N |
| VHCL SPD CUT | <ul style="list-style-type: none"> Ignition switch: ON | | Non | |
| LO SPEED CUT | <ul style="list-style-type: none"> Ignition switch: ON | | Non | |
| AT OD MONITOR | <ul style="list-style-type: none"> Ignition switch: ON | | Off | O |
| AT OD CANCEL | <ul style="list-style-type: none"> Ignition switch: ON | | Off | |
| CRUISE LAMP | <ul style="list-style-type: none"> Ignition switch: ON | MAIN switch: Pressed at the 1st time → at the 2nd time | On → Off | P |
| SET LAMP | <ul style="list-style-type: none"> MAIN switch: ON Vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH) | ASCD: Operating | On | |
| | | ASCD: Not operating | Off | |
| A/F ADJ-B1 | <ul style="list-style-type: none"> Engine: Running | | -0.330 - 0.330 | |
| A/F ADJ-B2 | <ul style="list-style-type: none"> Engine: Running | | -0.330 - 0.330 | |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Monitor item | Condition | | Specification |
|---------------------------|--|---------------------------------------|---|
| P/N POSI SW | • Ignition switch: ON | Selector lever: P or N | On |
| | | Selector lever: Except above | Off |
| INT/A TEMP SE | • Ignition switch: ON | | Indicates intake air temperature |
| AC PRESS SEN | • Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates.) | | 1.0 - 4.0 V |
| A/F SEN1 (B2) | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| VTC DTY EX B2* | — | | — |
| HO2 S2 DIAG1 (B1) | DTC P0139 self-diagnosis (delayed response) has not been performed yet. | | INCMP |
| | DTC P0139 self-diagnosis (delayed response) has already been performed successfully. | | CMPLT |
| HO2 S2 DIAG1 (B2) | DTC P0159 self-diagnosis (delayed response) has not been performed yet. | | INCMP |
| | DTC P0159 self-diagnosis (delayed response) has already been performed successfully. | | CMPLT |
| HO2 S2 DIAG2 (B1) | DTC P0139 self-diagnosis (slow response) has not been performed yet. | | INCMP |
| | DTC P0139 self-diagnosis (slow response) has already been performed successfully. | | CMPLT |
| HO2 S2 DIAG2 (B2) | DTC P0159 self-diagnosis (slow response) has not been performed yet. | | INCMP |
| | DTC P0159 self-diagnosis (slow response) has already been performed successfully. | | CMPLT |
| A/F SEN1 DIAG1 (B1) | DTC P015A and P015B self-diagnosis is incomplete. | | INCMP |
| | DTC P015A and P015B self-diagnosis is complete. | | CMPLT |
| A/F SEN1 DIAG1 (B2) | DTC P015C and P015D self-diagnosis is incomplete. | | INCMP |
| | DTC P015C and P015D self-diagnosis is complete. | | CMPLT |
| A/F SEN1 DIAG2 (B1) | DTC P014C and P014D self-diagnosis is incomplete. | | INCMP |
| | DTC P014C and P014D self-diagnosis is complete. | | CMPLT |
| A/F SEN1 DIAG2 (B2) | DTC P014E and P014F self-diagnosis is incomplete. | | INCMP |
| | DTC P014E and P014F self-diagnosis is complete. | | CMPLT |
| A/F SEN1 DIAG3 (B1) | The vehicle condition is not within the diagnosis range of DTC P014C, P014D, P015A or P015B. | | ABSNT |
| | The vehicle condition is within the diagnosis range of DTC P014C, P014D, P015A or P015B. | | PRSNT |
| A/F SEN1 DIAG3 (B2) | The vehicle condition is not within the diagnosis range of DTC P014E, P014F, P015C or P015D. | | ABSNT |
| | The vehicle condition is within the diagnosis range of DTC P014E, P014F, P015C or P015D. | | PRSNT |
| EVAP LEAK DIAG | • Ignition switch: ON | | Indicates the condition of EVAP leak diagnosis. |
| EVAP DIAG READY | • Ignition switch: ON | | Indicates the ready condition of EVAP leak diagnosis. |
| THRTL STK CNT B1 | Not used. | | — |
| A/F-S ATMSPHRC CRCT B1 | Engine: After warming up, idle the engine | | Varies depending on vehicle environment. |
| A/F-S ATMSPHRC CRCT B2 | Engine: After warming up, idle the engine | | Varies depending on vehicle environment. |
| A/F-S ATMSPHRC CRCT UP B1 | Engine: Running | | Varies depending on the number of updates. |
| A/F-S ATMSPHRC CRCT UP B2 | Engine: Running | | Varies depending on the number of updates. |

ECM

< ECU DIAGNOSIS INFORMATION >

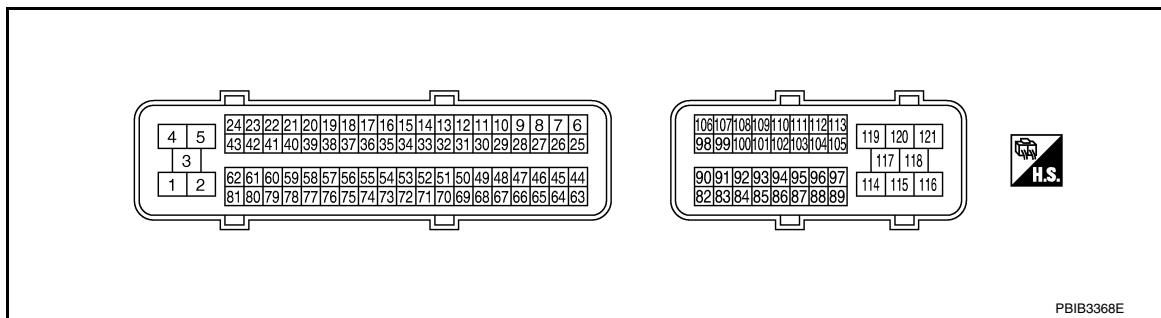
[VK56DE]

| Monitor item | Condition | Specification |
|-------------------------|--|---------------|
| SYSTEM 1 DIAGNOSIS A B1 | DTC P219A self-diagnosis is incomplete. | INCMP |
| | DTC P219A self-diagnosis is complete. | CMPLT |
| SYSTEM 1 DIAGNOSIS A B2 | DTC P219B self-diagnosis is incomplete. | INCMP |
| | DTC P219B self-diagnosis is complete. | CMPLT |
| SYSTEM 1 DIAGNOSIS B B1 | DTC P219A self-diagnosis is on standby. | ABSENT |
| | DTC P219A self-diagnosis is under diagnosis. | PRSENT |
| SYSTEM 1 DIAGNOSIS B B2 | DTC P219B self-diagnosis is on standby. | ABSENT |
| | DTC P219B self-diagnosis is under diagnosis. | PRSENT |

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: The item is indicated, but not used.

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

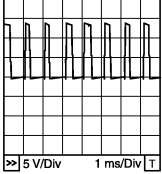
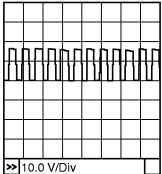
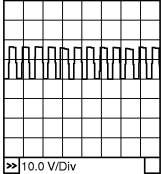
- ECM is located in the engine room left side near battery.
- Specification data are reference values.
- Pulse signal is measured by CONSULT.

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|-------------------------------------|------------------|--|--------------------------------|
| + | - | Signal name | Input/ Output | | |
| 1 (B) | — | ECM ground | — | [Engine is running] • Idle speed | Body ground |
| 2 (B) | 116 (B) | A/F sensor 1 heater (bank 1) | Output | [Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★ PBIAB148J |
| 3 (L) | 116 (B) | Throttle control motor power supply | Input | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 4 (L/W) | 116 (B) | Throttle control motor (Close) | Output | [Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released | 0 - 14 V★ PBIAB1104E |

ECM

< ECU DIAGNOSIS INFORMATION >

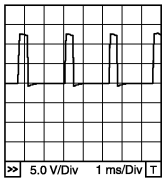
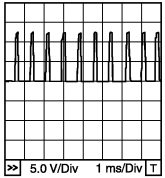
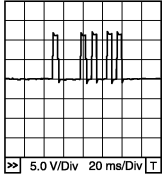
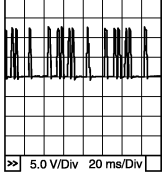
[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|---|------------------|---|--|
| + | - | Signal name | Input/ Output | | |
| 5 (L/B) | 116 (B) | Throttle control motor (Open) | Output | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully de-pressed | 0 - 14 V★  <small>PBIB1105E</small> |
| 6 (LG) | 116 (B) | Heated oxygen sensor 2 heater (bank 1) | Output | [Engine is running] <ul style="list-style-type: none"> • Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped [Engine is running] <ul style="list-style-type: none"> • Engine speed: Above 3,600 rpm | Battery voltage (11 - 14 V) |
| 10 (W) | 116 (B) | Intake valve timing control solenoid valve (bank 1) | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | Battery voltage (11 - 14 V) |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000rpm | 7 - 12 V★  <small>PBIB1790E</small> |
| 11 (LG) | 116 (B) | Intake valve timing control solenoid valve (bank 2) | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | Battery voltage (11 - 14 V) |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000rpm | 7 - 12 V★  <small>PBIB1790E</small> |
| 12 (R) | 67 (B) | Power steering pressure sensor | Input | [Engine is running] <ul style="list-style-type: none"> • Steering wheel: Being turned | 0.5 - 4.5 V |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Steering wheel: Not being turned | 0.4 - 0.8 V |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

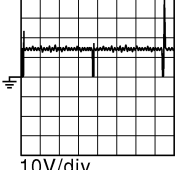
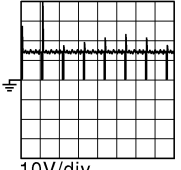
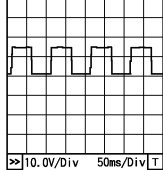
| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|-------------------------------------|------------------|--|---|
| + | - | Signal name | Input/ Output | | |
| 13 (W) | 116 (B) | Crankshaft position sensor (POS) | Input | <p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p> | <p>10 V★</p>  <p style="text-align: right; font-size: small;">PBIB1041E</p> |
| | | | | <p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: 2,000 rpm | <p>10 V★</p>  <p style="text-align: right; font-size: small;">PBIB1042E</p> |
| 14 (Y) | 116 (B) | Camshaft position sensor (PHASE) | Input | <p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Idle speed <p>NOTE: The pulse cycle changes depending on rpm at idle</p> | <p>1.0 - 4.0 V★</p>  <p style="text-align: right; font-size: small;">PBIB1039E</p> |
| | | | | <p>[Engine is running]</p> <ul style="list-style-type: none"> • Engine speed: 2,000 rpm | <p>1.0 - 4.0 V★</p>  <p style="text-align: right; font-size: small;">PBIB1040E</p> |
| 15 (W) | 116 (B) | Knock sensor (bank 2) | Input | <p>[Engine is running]</p> <ul style="list-style-type: none"> • Idle speed | <p>2.5 V</p> |
| 16 (G) | 116 (B) | A/F sensor 1 (bank 2) | Input | <p>[Engine is running]</p> <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | <p>2.2 V</p> <p>Output voltage varies with air fuel ratio.</p> |

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< ECU DIAGNOSIS INFORMATION >

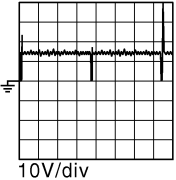
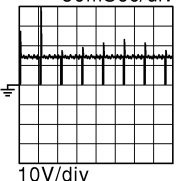
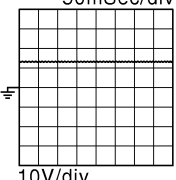
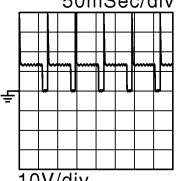
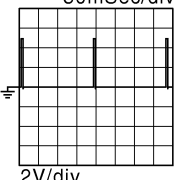
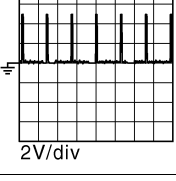
[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|------------|--|------------------|---|---|
| + | - | Signal name | Input/ Output | | |
| 21 (SB) 22 (BR) 23 (LG) 44 (O) | 116 (B) | Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1 Fuel injector No. 7 | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | Battery voltage (11 - 14 V)★ 50mSec/div  10V/div <small>JMBIA0047GB</small> |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | Battery voltage (11 - 14 V)★ 50mSec/div  10V/div <small>JMBIA0048GB</small> |
| 24 (BR) 43 (BR) | 116 (B) | A/F sensor 1 heater (bank 2) | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★  <small>>>10.0V/Div 50ms/Div T</small> <small>PBIA8148J</small> |
| 25 (GR) | 116 (B) | Heated oxygen sensor 2 heater (bank 2) | Output | [Engine is running] <ul style="list-style-type: none"> • Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped [Engine is running] <ul style="list-style-type: none"> • Engine speed: Above 3,600 rpm | Battery voltage (11 - 14 V) |
| 32 (L) | 67 (B) | EVAP control system pressure sensor | Input | [Ignition switch: ON] | 1.8 - 4.8 V |
| 34 (V) | 67 (B) | Intake air temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with intake air temperature. |
| 35 (O) | 116 (B) | A/F sensor 1 (bank 1) | Input | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,000 rpm | 2.2 V Output voltage varies with air fuel ratio. |
| 36 (W) | 115 (B) | Knock sensor (bank 1) | Input | [Engine is running] <ul style="list-style-type: none"> • Idle speed | 2.5 V |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|------------|--|------------------|---|---|
| + | - | Signal name | Input/ Output | | |
| 40 (Y) 41 (P) 42 (L) 63 (G) | 116 (B) | Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2 Fuel injector No. 8 | Output | [Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | Battery voltage (11 - 14 V)★ 50mSec/div  10V/div JMBIA0047GB |
| | | | | [Engine is running] • Warm-up condition • Engine speed: 2,000 rpm | Battery voltage (11 - 14 V)★ 50mSec/div  10V/div JMBIA0048GB |
| 45 (SB) | 116 (B) | EVAP canister purge volume control solenoid valve | Output | [Engine is running] • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting | Battery voltage (11 - 14 V)★ 50mSec/div  10V/div JMBIA0039GB |
| | | | | [Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine) | Battery voltage (11 - 14 V)★ 50mSec/div  10V/div JMBIA0040GB |
| 46 (R) 60 (GR) 61 (L) 62 (Y) | 116 (B) | Ignition signal No. 7 Ignition signal No. 5 Ignition signal No. 3 Ignition signal No. 1 | Output | [Engine is running] • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.3 V★ 50mSec/div  2V/div JMBIA0035GB |
| | | | | [Engine is running] • Warm-up condition • Engine speed: 2,500 rpm | 0.1 - 0.6 V★ 50mSec/div  2V/div JMBIA0036GB |
| 47 (W) | 66 (R) | Sensor power supply (Throttle position sensor) | — | [Ignition switch: ON] | 5 V |

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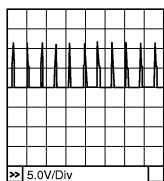
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< ECU DIAGNOSIS INFORMATION >

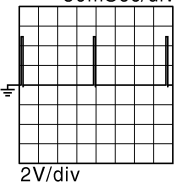
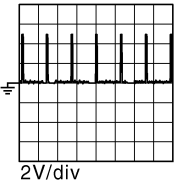
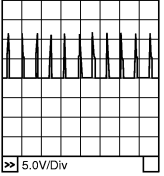
[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|---|------------------|-----------|--|
| + | - | Signal name | Input/ Output | | |
| 48 (SB) | 67 (B) | Sensor power supply (EVAP control system pressure sensor) | | — | [Ignition switch: ON] 5 V |
| 49 (O) | 67 (B) | Sensor power supply (Refrigerant pressure sensor) | | — | [Ignition switch: ON] 5 V |
| 50 (B) | 66 (R) | Throttle position sensor 1 | | Input | [Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released More than 0.36 V |
| | | | | | [Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully de- pressed Less than 4.75 V |
| 51 (W) | 67 (B) | Mass air flow sensor | | Input | [Engine is running] • Warm-up condition • Idle speed 0.9 - 1.3 V |
| | | | | | [Engine is running] • Warm-up condition • Engine speed: 2,500 rpm 1.7 - 2.1V |
| 53 (L) | 116 (B) | Intake valve timing control posi- tion sensor (Bank 2) | | Input | [Engine is running] • Warm-up condition • Idle speed 0 - 1.0 V |
| | | | | | [Engine is running] • Engine speed: 2,000 rpm  0 - 1.0 V★ PBIB2046E |
| 55 (R) | 78 (B) | Heated oxygen sensor 2 (bank 1) | | Input | [Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following con- ditions are met. - Engine: After warming up - Keeping the engine speed be- tween 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute un- der no load 0 - 1.0 V |
| 56 (W) | 116 (B) | A/F sensor 1 (bank 1) | | Input | [Ignition switch: ON] 1.8 V |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|---|------------|--|------------------|--|--|
| + | - | Signal name | Input/ Output | | |
| 65 (BR) 79 (V) 80 (W) 81 (G) | 116 (B) | Ignition signal No. 8 Ignition signal No. 6 Ignition signal No. 4 Ignition signal No. 2 | Output | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.3 V★ 50mSec/div  2V/div JMBIA0035GB |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Engine speed: 2,500 rpm | 0.1 - 0.6 V★ 50mSec/div  2V/div JMBIA0036GB |
| 66 (R) | — | Sensor ground (Throttle position sensor) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 67 (B) | — | Sensor ground | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 68 (SB) | 67 (B) | Sensor power supply (PSP sensor) | — | [Ignition switch: ON] | 5 V |
| 69 (W) | 66 (R) | Throttle position sensor 2 | Input | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released | Less than 4.75 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed | More than 0.36 V |
| 70 (GR) | 67 (B) | Refrigerant pressure sensor | Input | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Both A/C switch and blower fan switch: ON (Compressor operates.) | 1.0 - 4.0 V |
| 72 (Y) | 116 (B) | Intake valve timing control position sensor (Bank 1) | Input | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 - 1.0 V |
| | | | | [Engine is running] <ul style="list-style-type: none"> • Engine speed: 2,000 rpm | 0 - 1.0 V★  5.0V/Div PBIB2046E |
| 73 (Y) | 67 (B) | Engine coolant temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine coolant temperature. |

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ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|---|------------------|--|--------------------------------|
| + | - | Signal name | Input/ Output | | |
| 74 (R) | 78 (B) | Heated oxygen sensor 2 (bank 2) | Input | [Engine is running] <ul style="list-style-type: none"> • Revving engine from idle to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | 0 - 1.0 V |
| 75 (L) | 116 (B) | A/F sensor 1 (bank 2) | Input | [Ignition switch: ON] | 1.8 V |
| 78 (B) | — | Sensor ground (Heated oxygen sensor 2) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 82 (R) | — | Sensor ground (APP sensor 1) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 83 (Y) | — | Sensor ground (APP sensor 2) | — | [Engine is running] <ul style="list-style-type: none"> • Warm-up condition • Idle speed | 0 V |
| 85 (O) | — | Data link connector | Input/ output | — | — |
| 86 (P) | — | CAN communication line | Input/ output | — | — |
| 90 (L) | 82 (R) | Sensor power supply (APP sensor 1) | — | [Ignition switch: ON] | 5 V |
| 91 (W) | 83 (Y) | Sensor power supply (APP sensor 2) | — | [Ignition switch: ON] | 5 V |
| 94 (L) | — | CAN communication line | Input/ output | — | — |
| 98 (LG) | 83 (Y) | Accelerator pedal position sensor 2 | Input | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Accelerator pedal: Fully released | 0.25 - 0.50 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Engine: Stopped • Accelerator pedal: Fully depressed | 2.0 - 2.5 V |
| 99 (R) | 67 (B) | ASCDC steering switch | Input | [Ignition switch: ON] <ul style="list-style-type: none"> • ASCDC steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • MAIN switch: Pressed | 0 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • CANCEL switch: Pressed | 1 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • RESUME/ACCELERATE switch: Pressed | 3 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • SET/COAST switch: Pressed | 2 V |
| 100 (BR) | 116 (B) | PNP signal | Input | [Ignition switch: ON] <ul style="list-style-type: none"> • Selector lever: P or N position | 0 V |
| | | | | [Ignition switch: ON] <ul style="list-style-type: none"> • Except the above gear position | Battery voltage (11 - 14 V) |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Terminal No. (Wire color) | | Description | | Condition | Value (Approx.) |
|------------------------------|------------|-------------------------------------|------------------|--|--|
| + | - | Signal name | Input/ Output | | |
| 101 (LG) | 116 (B) | Stop lamp switch | Input | [Ignition switch: OFF] • Brake pedal: Fully released | 0 V |
| | | | | [Ignition switch: OFF] • Brake pedal: Slightly depressed | Battery voltage (11 - 14 V) |
| 104 (O) | 116 (B) | Throttle control motor relay | Output | [Ignition switch: OFF] | Battery voltage (11 - 14 V) |
| | | | | [Ignition switch: ON] | 0 - 1.0 V |
| 106 (BR) | 82 (R) | Accelerator pedal position sensor 1 | Input | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released | 0.5 - 1.0 V |
| | | | | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed | 4.2 - 4.8 V |
| 107 (Y) | 116 (B) | Fuel tank temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with fuel tank temperature. |
| 108 (BR) | 116 (B) | ASCD brake switch | Input | [Ignition switch: ON] • Brake pedal: Slightly depressed | 0 V |
| | | | | [Ignition switch: ON] • Brake pedal: Fully released | Battery voltage (11 - 14 V) |
| 109 (W) | 116 (B) | Ignition switch | Input | [Ignition switch: OFF] | 0 V |
| | | | | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 111 (W) | 116 (B) | ECM relay (Self shut-off) | Output | [Engine is running] [Ignition switch: OFF] • For a few seconds after turning ignition switch OFF | 0 - 1.5 V |
| | | | | [Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF | Battery voltage (11 - 14 V) |
| 113 (GR) | 116 (B) | Fuel pump relay | Input | [Ignition switch: ON] • For 1 second after turning ignition switch ON | 0 - 1.5 V |
| | | | | [Engine is running] [Ignition switch: ON] • More than 1 second after turning ignition switch ON | Battery voltage (11 - 14 V) |
| 115 (B) 116 (B) | — | ECM ground | — | [Engine is running] • Idle speed | Body ground |
| 117 (G) | 116 (B) | EVAP canister vent control valve | Output | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 119 (BR) 120 (BR) | 116 (B) | Power supply for ECM | — | [Ignition switch: ON] | Battery voltage (11 - 14 V) |
| 121 (R) | 116 (B) | Power supply for ECM (Back-up) | — | [Ignition switch: OFF] | Battery voltage (11 - 14 V) |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to [PG-86, "How to Handle Battery"](#).

Fail-safe

| DTC No. | Detected items | Engine operating condition in fail-safe mode | |
|---|---|---|--|
| P0011 P0021 | Intake valve timing control | The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function. | |
| P0101 P0102 P0103 | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | |
| P0117 P0118 | Engine coolant temperature sensor circuit | Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM. | |
| | | Condition | Engine coolant temperature decided (CONSULT display) |
| | | Just as ignition switch is turned ON or START | 40°C (104°F) |
| | | Approx 4 minutes or more after engine starting | 80°C (176°F) |
| | | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) |
| When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running. | | | |
| P0122 P0123 P0222 P0223 P2135 | Throttle position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor. | |
| P0500 | Vehicle speed sensor | The cooling fan operates (Highest) while engine is running. | |
| P0603 P0607 | ECM | Engine torque may be limited. | |
| P0604 | ECM | <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve • ASCD operation may be deactivated. | |
| P0605 P0606 P060B | ECM | <p>NOTE: Fail-safe may not occur depending on malfunction type.</p> <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve • ASCD operation may be deactivated. | |
| P060A | ECM | <p>NOTE: Fail-safe may not occur depending on malfunction type.</p> <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve • Engine torque may be limited. • ASCD operation may be deactivated. | |
| P0643 | ECM | <ul style="list-style-type: none"> • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (Approx. 5 degrees) by the return spring. • The position of the following components is fixed. <ul style="list-style-type: none"> - Intake valve timing control solenoid valve | |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| DTC No. | Detected items | Engine operating condition in fail-safe mode | |
|---|------------------------------------|---|-------------------|
| P1805 | Brake switch | ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor. | |
| | | Vehicle condition | Driving condition |
| | | When engine is idling | Normal |
| | | When accelerating | Poor acceleration |
| P2100 P2103 | Throttle control motor relay | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | |
| P2101 | Electric throttle control function | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | |
| P2118 | Throttle control motor | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. | |
| P2119 | Electric throttle control actuator | (When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm. | |
| | | (When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less. | |
| | | (When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually because of fuel cut. After the vehicle stops, the engine stalls. The engine can restart in the N or P position, and engine speed will not exceed 1,000 rpm or more. | |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor. | |

DTC Inspection Priority Chart

INFOID:000000012524644

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

< ECU DIAGNOSIS INFORMATION >

| Priority | Detected items (DTC) |
|----------|---|
| 1 | <ul style="list-style-type: none"> • U0100 U0101 U1001 CAN communication line • P0101 P0102 P0103 Mass air flow sensor • P0111 P0112 P0113 P0127 Intake air temperature sensor • P0116 P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 Camshaft position sensor (PHASE) • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0603 P0604 P0605 P0606 P0607 P060A P060B ECM • P0643 Sensor power supply • P0705 Transmission range switch • P0850 Park/Neutral position (PNP) switch • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor |
| 2 | <ul style="list-style-type: none"> • P0030 P0031 P0032 P0036 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P014C P014D P014E P014F P0150 P0151 P0152 P015A P015B P015C P015D P2096 P2097 P2098 P2099 Air fuel ratio (A/F) sensor 1 • P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 • P0441 EVAP control system purge flow monitoring • P0443 P0444 P0445 EVAP canister purge volume control solenoid valve • P0447 P0448 EVAP canister vent control valve • P0451 P0452 P0453 EVAP control system pressure sensor • P0550 Power steering pressure sensor • P0700 P0710 P0717 P0720 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P1730 P1752 P1757 P1762 P1767 P1772 P1774 A/T related sensors, solenoid valves and switches • P1140 P1145 Intake valve timing control position sensor • P1217 Engine over temperature (OVERHEAT) • P1805 Brake switch • P2100 P2103 Throttle control motor relay • P2101 Electric throttle control function • P2118 Throttle control motor |
| 3 | <ul style="list-style-type: none"> • P0011 P0021 Intake valve timing control • P0171 P0172 P0174 P0175 Fuel injection system function • P0300 - P0308 Misfire • P0420 P0430 Three way catalyst function • P0456 EVAP control system (SMALL LEAK, VERY SMALL LEAK) • P0506 P0507 Idle speed control system • P050A P050E Cold start control • P1148 P1168 Closed loop control • P1211 TCS control unit • P1212 TCS communication line • P1564 ASCD steering switch • P1572 ASCD brake switch • P1574 ASCD vehicle speed sensor • P1715 Primary speed sensor • P2119 Electric throttle control actuator • P219A P219B Air fuel ratio |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

INFOID:000000012524645

DTC Index

×:Applicable —: Not applicable

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Refer- ence page | EC |
|------------------|-------------|---|-------------|------|-------------------|--------------------------|------------------------|----|
| CONSULT GST*2 | ECM*3 | | | | | | | |
| U0100 | 0100*5 | LOST COMM (ECM A) | — | 1 | × | B | TM-83 | C |
| U0101 | 0101*5 | LOST COMM (TCM) | — | 1 | × | B | EC-622 | |
| U1001 | 1001*5 | CAN COMM CIRCUIT | — | 2 | — | — | EC-623 | D |
| P0000 | 0000 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | — | — | Blinking*8 | — | — | |
| P0011 | 0011 | INT/V TIM CONT-B1 | — | 2 | × | B | EC-624 | E |
| P0021 | 0021 | INT/V TIM CONT-B2 | — | 2 | × | B | EC-624 | |
| P0030 | 0030 | A/F SEN1 HTR (B1) | — | 2 | × | B | EC-630 | F |
| P0031 | 0031 | A/F SEN1 HTR (B1) | — | 2 | × | B | EC-630 | |
| P0032 | 0032 | A/F SEN1 HTR (B1) | — | 2 | × | B | EC-630 | |
| P0036 | 0036 | A/F SEN1 HTR (B2) | — | 2 | × | B | EC-630 | G |
| P0037 | 0037 | HO2S2 HTR (B1) | — | 2 | × | B | EC-633 | |
| P0038 | 0038 | HO2S2 HTR (B1) | — | 2 | × | B | EC-633 | H |
| P0051 | 0051 | A/F SEN1 HTR (B2) | — | 2 | × | B | EC-630 | I |
| P0052 | 0052 | A/F SEN1 HTR (B2) | — | 2 | × | B | EC-630 | |
| P0057 | 0057 | HO2S2 HTR (B2) | — | 2 | × | B | EC-633 | J |
| P0058 | 0058 | HO2S2 HTR (B2) | — | 2 | × | B | EC-633 | |
| P0075 | 0075 | INT/V TIM V/CIR-B1 | — | 2 | × | B | EC-636 | K |
| P0081 | 0081 | INT/V TIM V/CIR-B2 | — | 2 | × | B | EC-636 | |
| P0101 | 0101 | MAF SEN/CIRCUIT-B1 | — | 2 | × | B | EC-639 | L |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | — | 1 | × | B | EC-645 | |
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | — | 1 | × | B | EC-645 | M |
| P0111 | 0111 | IAT SENSOR 1 B1 | — | 2 | × | A | EC-650 | |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | — | 2 | × | B | EC-652 | N |
| P0113 | 0113 | IAT SEN/CIRCUIT-B1 | — | 2 | × | B | EC-652 | |
| P0116 | 0116 | ECT SEN/CIRC | — | 2 | × | A | EC-654 | O |
| P0117 | 0117 | ECT SEN/CIRC | — | 1 | × | B | EC-656 | |
| P0118 | 0118 | ECT SEN/CIRC | — | 1 | × | B | EC-656 | P |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | — | 1 | × | B | EC-658 | |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | — | 1 | × | B | EC-658 | |
| P0125 | 0125 | ECT SENSOR | — | 2 | × | B | EC-662 | |
| P0127 | 0127 | IAT SENSOR-B1 | — | 2 | × | B | EC-664 | |
| P0128 | 0128 | THERMSTAT FNCTN | — | 2 | × | A | EC-666 | |
| P0130 | 0130 | A/F SENSOR1 (B1) | — | 2 | × | A | EC-669 | |
| P0131 | 0131 | A/F SENSOR1 (B1) | — | 2 | × | B | EC-673 | |
| P0132 | 0132 | A/F SENSOR1 (B1) | — | 2 | × | B | EC-676 | |
| P0137 | 0137 | HO2S2 (B1) | × | 2 | × | A | EC-679 | |
| P0138 | 0138 | HO2S2 (B1) | × | 2 | × | A | EC-685 | |
| P0139 | 0139 | HO2S2 (B1) | × | 2 | × | A | EC-693 | |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Refer- ence page |
|------------------|-------|---------------------------------|-------------|--------|-----|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| P014C | 014C | A/F SENSOR1 (B1) | × | 2 | × | A | EC-699 |
| P014D | 014D | A/F SENSOR1 (B1) | × | 2 | × | A | EC-699 |
| P014E | 014E | A/F SENSOR1 (B2) | × | 2 | × | A | EC-699 |
| P014F | 014F | A/F SENSOR1 (B2) | × | 2 | × | A | EC-699 |
| P0150 | 0150 | A/F SENSOR1 (B2) | — | 2 | × | A | EC-669 |
| P0151 | 0151 | A/F SENSOR1 (B2) | — | 2 | × | B | EC-673 |
| P0152 | 0152 | A/F SENSOR1 (B2) | — | 2 | × | B | EC-676 |
| P0157 | 0157 | HO2S2 (B2) | × | 2 | × | A | EC-679 |
| P0158 | 0158 | HO2S2 (B2) | × | 2 | × | A | EC-685 |
| P0159 | 0159 | HO2S2 (B2) | × | 2 | × | A | EC-693 |
| P015A | 015A | A/F SENSOR1 (B1) | × | 2 | × | A | EC-699 |
| P015B | 015B | A/F SENSOR1 (B1) | × | 2 | × | A | EC-699 |
| P015C | 015C | A/F SENSOR1 (B2) | × | 2 | × | A | EC-699 |
| P015D | 015D | A/F SENSOR1 (B2) | × | 2 | × | A | EC-699 |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | — | 2 | × | B | EC-705 |
| P0172 | 0172 | FUEL SYS-RICH-B1 | — | 2 | × | B | EC-709 |
| P0174 | 0174 | FUEL SYS-LEAN-B2 | — | 2 | × | B | EC-705 |
| P0175 | 0175 | FUEL SYS-RICH-B2 | — | 2 | × | B | EC-709 |
| P0181 | 0181 | FTT SENSOR | — | 2 | × | A and B | EC-485 |
| P0182 | 0182 | FTT SEN/CIRCUIT | — | 2 | × | B | EC-717 |
| P0183 | 0183 | FTT SEN/CIRCUIT | — | 2 | × | B | EC-717 |
| P0222 | 0222 | TP SEN 1/CIRC-B1 | — | 1 | × | B | EC-720 |
| P0223 | 0223 | TP SEN 1/CIRC-B2 | — | 1 | × | B | EC-720 |
| P0300 | 0300 | MULTI CYL MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0301 | 0301 | CYL 1 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0302 | 0302 | CYL 2 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0303 | 0303 | CYL 3 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0304 | 0304 | CYL 4 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0305 | 0305 | CYL 5 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0306 | 0306 | CYL 6 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0307 | 0307 | CYL 7 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0308 | 0308 | CYL 8 MISFIRE | — | 1 or 2 | × | B | EC-723 |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | — | 2 | — | — | EC-729 |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | — | 2 | — | — | EC-729 |
| P0332 | 0332 | KNOCK SEN/CIRC-B2 | — | 2 | — | — | EC-729 |
| P0333 | 0333 | KNOCK SEN/CIRC-B2 | — | 2 | — | — | EC-729 |
| P0335 | 0335 | CKP SEN/CIRCUIT | — | 2 | × | B | EC-731 |
| P0340 | 0340 | CMP SEN/CIRC-B1 | — | 2 | × | B | EC-734 |
| P0420 | 0420 | TW CATALYST SYS-B1 | × | 2 | × | A | EC-737 |
| P0430 | 0430 | TW CATALYST SYS-B2 | × | 2 | × | A | EC-737 |
| P0441 | 0441 | EVAP PURG FLOW/MON | × | 2 | × | A | EC-742 |
| P0443 | 0443 | PURG VOLUME CONT/V | — | 2 | × | A | EC-482 |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Refer- ence page |
|------------------|-------|---------------------------------|----------------|--------|--------|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| P0444 | 0444 | PURG VOLUME CONT/V | — | 2 | × | B | EC-753 |
| P0445 | 0445 | PURG VOLUME CONT/V | — | 2 | × | B | EC-753 |
| P0447 | 0447 | VENT CONTROL VALVE | — | 2 | × | B | EC-483 |
| P0448 | 0448 | VENT CONTROL VALVE | — | 2 | × | B | EC-760 |
| P0451 | 0451 | EVAP SYS PRES SEN | — | 2 | × | A | EC-483 |
| P0452 | 0452 | EVAP SYS PRES SEN | — | 2 | × | B | EC-768 |
| P0453 | 0453 | EVAP SYS PRES SEN | — | 2 | × | B | EC-771 |
| P0456 | 0456 | EVAP VERY SML LEAK | × ⁷ | 2 | × | A | EC-775 |
| P0460 | 0460 | FUEL LEV SEN SLOSH | — | 2 | × | A | EC-781 |
| P0461 | 0461 | FUEL LEVEL SENSOR | — | 2 | × | B | EC-782 |
| P0462 | 0462 | FUEL LEVL SEN/CIRC | — | 2 | × | B | EC-784 |
| P0463 | 0463 | FUEL LEVL SEN/CIRC | — | 2 | × | B | EC-784 |
| P0500 | 0500 | VEH SPEED SEN/CIRC*6 | — | 2 | × | B | EC-785 |
| P0506 | 0506 | ISC SYSTEM | — | 2 | × | B | EC-787 |
| P0507 | 0507 | ISC SYSTEM | — | 2 | × | B | EC-789 |
| P050A | 050A | COLD START CONTROL | — | 2 | × | A | EC-791 |
| P050E | 050E | COLD START CONTROL | — | 2 | × | A | EC-791 |
| P0550 | 0550 | PW ST P SEN/CIRC | — | 2 | — | — | EC-793 |
| P0603 | 0603 | ECM BACK UP/CIRCUIT | — | 1 | × or — | B | EC-796 |
| P0604 | 0604 | ECM | — | 1 | × | B | EC-797 |
| P0605 | 0605 | ECM | — | 1 | × | B | EC-798 |
| P0606 | 0606 | CONTROL MODULE | — | 1 | × or — | B | EC-799 |
| P0607 | 0607 | ECM | — | 1 or 2 | × or — | B | EC-800 |
| P060A | 060A | CONTROL MODULE | — | 1 or 2 | × | B | EC-801 |
| P060B | 060B | CONTROL MODULE | — | 1 | × | B | EC-802 |
| P0643 | 0643 | SENSOR POWER/CIRC | — | 1 | × | B | EC-803 |
| P0700 | 0700 | TRANSMISSION CONT | — | 1 | × | B | TM-87 |
| P0705 | 0705 | T/M RANGE SENSOR A | — | 2 | × | B | TM-88 |
| P0710 | 0710 | FLUID TEMP SENSOR A*9 | — | 2 | × | B | TM-111 |
| P0717 | 0717 | INPUT SPEED SENSOR A | — | 2 | × | B | TM-88 |
| P0720 | 0720 | OUTPUT SPEED SEN- SOR*6 | — | 2 | × | B | TM-92 |
| P0731 | 0731 | 1GR INCORRECT RATIO | — | 2 | × | B | TM-97 |
| P0732 | 0732 | 2GR INCORRECT RATIO | — | 2 | × | B | TM-99 |
| P0733 | 0733 | 3GR INCORRECT RATIO | — | 2 | × | B | TM-101 |
| P0734 | 0734 | 4GR INCORRECT RATIO | — | 2 | × | B | TM-103 |
| P0735 | 0735 | 5GR INCORRECT RATIO | — | 2 | × | B | TM-105 |
| P0740 | 0740 | TORQUE CONVERTER | — | 2 | × | B | TM-107 |
| P0744 | 0744 | TORQUE CONVERTER | — | 2 | × | B | TM-108 |
| P0745 | 0745 | PC SOLENOID A | — | 2 | × | B | TM-109 |
| P0850 | 0850 | P-N POS SW/CIRCUIT | — | 2 | × | B | EC-805 |
| P1140 | 1140 | INTK TIM S/CIRC-B1 | — | 2 | × | B | EC-808 |

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[VK56DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Refer- ence page |
|------------------|-------|---------------------------------|-------------|------|-----|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| P1145 | 1145 | INTK TIM S/CIRC-B2 | — | 2 | × | B | EC-808 |
| P1148 | 1148 | CLOSED LOOP-B1 | — | 1 | × | A | EC-812 |
| P1168 | 1168 | CLOSED LOOP-B2 | — | 1 | × | A | EC-812 |
| P1211 | 1211 | TCS C/U FUNCTN | — | 2 | — | — | EC-813 |
| P1212 | 1212 | TCS/CIRC | — | 2 | — | — | EC-814 |
| P1217 | 1217 | ENG OVER TEMP | — | 1 | × | B | EC-815 |
| P1225 | 1225 | CTP LEARNING-B1 | — | 2 | — | — | EC-819 |
| P1226 | 1226 | CTP LEARNING-B2 | — | 2 | — | — | EC-820 |
| P1564 | 1564 | ASCD SW | — | 1 | — | — | EC-821 |
| P1572 | 1572 | ASCD BRAKE SW | — | 1 | — | — | EC-824 |
| P1574 | 1574 | ASCD VHL SPD SEN | — | 1 | — | — | EC-829 |
| P1610 | 1610 | LOCK MODE | — | 2 | — | — | SEC-50 |
| P1611 | 1611 | ID DISCORD, IMM-ECM | — | 2 | — | — | SEC-51 |
| P1612 | 1612 | CHAIN OF ECM-IMMU | — | 2 | — | — | SEC-53 |
| P1614 | 1614 | CHAIN OF IMMU-KEY | — | 2 | — | — | SEC-54 |
| P1615 | 1615 | DIFFERENCE OF KEY | — | 2 | — | — | SEC-56 |
| P1715 | 1715 | IN PULY SPEED | — | 2 | — | — | EC-831 |
| P1730 | 1730 | INTERLOCK | — | 1 | × | B | TM-116 |
| P1752 | 1752 | INPUT CLUTCH SOL | — | 1 | × | B | TM-119 |
| P1757 | 1757 | FR BRAKE SOLENOID | — | 1 | × | B | TM-120 |
| P1762 | 1762 | DRCT CLUTCH SOL | — | 1 | × | B | TM-121 |
| P1767 | 1767 | HLR CLUTCH SOLENOID | — | 1 | × | B | TM-123 |
| P1772 | 1772 | L C BRAKE SOLENOID | — | 1 | × | B | TM-124 |
| P1774 | 1774 | L C BRAKE SOLENOID | — | 1 | × | B | TM-125 |
| P1805 | 1805 | BRAKE SW/CIRCUIT | — | 2 | — | — | EC-832 |
| P2096 | 2096 | A/F SENSOR1 (B1) | — | 2 | × | A | EC-834 |
| P2097 | 2097 | A/F SENSOR1 (B1) | — | 2 | × | A | EC-834 |
| P2098 | 2098 | A/F SENSOR1 (B2) | — | 2 | × | A | EC-834 |
| P2099 | 2099 | A/F SENSOR1 (B2) | — | 2 | × | A | EC-834 |
| P2100 | 2100 | ETC MOT PWR-B1 | — | 1 | × | B | EC-838 |
| P2101 | 2101 | ETC FNCTN/CIRC-B1 | — | 1 | × | B | EC-841 |
| P2103 | 2103 | ETC MOT PWR | — | 1 | × | B | EC-838 |
| P2118 | 2118 | ETC MOT-B1 | — | 1 | × | B | EC-844 |
| P2119 | 2119 | ETC ACTR-B1 | — | 1 | × | B | EC-846 |
| P2122 | 2122 | APP SEN 1/CIRC | — | 1 | × | B | EC-848 |
| P2123 | 2123 | APP SEN 1/CIRC | — | 1 | × | B | EC-848 |
| P2127 | 2127 | APP SEN 2/CIRC | — | 1 | × | B | EC-851 |
| P2128 | 2128 | APP SEN 2/CIRC | — | 1 | × | B | EC-851 |
| P2135 | 2135 | TP SENSOR-B1 | — | 1 | × | B | EC-855 |
| P2138 | 2138 | APP SENSOR | — | 1 | × | B | EC-858 |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| DTC*1 | | Items (CONSULT screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Refer- ence page |
|------------------|-------|----------------------------------|-------------|------|-----|--------------------------|------------------------|
| CONSULT GST*2 | ECM*3 | | | | | | |
| P219A | 219A | AIR FUEL RATIO IMBAL- ANCE B1 | — | 2 | × | A | EC-863 |
| P219B | 219B | AIR FUEL RATIO IMBAL- ANCE B2 | — | 2 | × | A | EC-863 |

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by SAE J2012/ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: Refer to [EC-604, "Description"](#), "HOW TO ERASE PERMANENT DTC".

*5: The troubleshooting for this DTC needs CONSULT.

*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.

*7: SRT code will not be set if the self-diagnostic result is NG.

*8: When the ECM is in the mode displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status".

*9: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:000000012933423

The following is the information specified in Service \$06 of SAE J1979/ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.

The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------|---------|--|----------------|---|---------------------|---|
| | | | | TID | Unit and Scaling ID | |
| HO2S | 01H | Air fuel ratio (A/F) sensor 1 (Bank 1) | P0131 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0131 | 84H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0130 | 85H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0130 | 86H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0133 | 87H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0133 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2A00 or P2096 | 89H | 84H | The amount of shift in air fuel ratio (too lean) |
| | | | P2A00 or P2097 | 8AH | 84H | The amount of shift in air fuel ratio (too rich) |
| | | | P0130 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0133 | 8CH | 83H | Response gain at the limited frequency |
| | | | P014C | 8DH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014C | 8EH | 04H | O2 sensor slow response - Rich to lean bank 1 sensor 1 |
| | | | P014D | 8FH | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P014D | 90H | 84H | O2 sensor slow response - Lean to rich bank 1 sensor 1 |
| | | | P015A | 91H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015A | 92H | 01H | O2 sensor delayed response - Rich to lean bank 1 sensor 1 |
| | | | P015B | 93H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P015B | 94H | 01H | O2 sensor delayed response - Lean to rich bank 1 sensor 1 |
| | | | P0133 | 95H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0133 | 96H | 84H | Response rate: Response ratio (rich to lean) |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------|---------|--|----------------|---|---------------------|---|
| | | | | TID | Unit and Scaling ID | |
| HO2S | 02H | Heated oxygen sensor 2 (Bank 1) | P0138 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0137 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0138 | 80H | 0CH | Sensor output voltage |
| | | | P0139 | 81H | 0CH | Difference in sensor output voltage |
| | | | P0139 | 82H | 11H | Rear O2 sensor delay response diagnosis |
| | 03H | Heated oxygen sensor 3 (Bank 1) | P0143 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0144 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0146 | 80H | 0CH | Sensor output voltage |
| | | | P0145 | 81H | 0CH | Difference in sensor output voltage |
| | 05H | Air fuel ratio (A/F) sensor 1 (Bank 2) | P0151 | 83H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0151 | 84H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0150 | 85H | 0BH | Minimum sensor output voltage for test cycle |
| | | | P0150 | 86H | 0BH | Maximum sensor output voltage for test cycle |
| | | | P0153 | 87H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0153 | 88H | 04H | Response rate: Response ratio (rich to lean) |
| | | | P2A03 or P2098 | 89H | 84H | The amount of shift in air fuel ratio (too lean) |
| | | | P2A03 or P2099 | 8AH | 84H | The amount of shift in air fuel ratio (too rich) |
| | | | P0150 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0153 | 8CH | 83H | Response gain at the limited frequency |
| | | | P014E | 8DH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 |
| | | | P014E | 8EH | 04H | O2 sensor slow response - Rich to lean bank 2 sensor 1 |
| | | | P014F | 8FH | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 |
| | | | P014F | 90H | 84H | O2 sensor slow response - Lean to rich bank 2 sensor 1 |
| | | | P015C | 91H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 |
| | | | P015C | 92H | 01H | O2 sensor delayed response - Rich to lean bank 2 sensor 1 |
| | | | P015D | 93H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------------|----------|--|-------------------------------------|---|---------------------|--|
| | | | | TID | Unit and Scaling ID | |
| HO2S | 05H | Air fuel ratio (A/F) sensor 1 (Bank 2) | P015D | 94H | 01H | O2 sensor delayed response - Lean to rich bank 2 sensor 1 |
| | | | P0153 | 95H | 04H | Response rate: Response ratio (lean to rich) |
| | | | P0153 | 96H | 84H | Response rate: Response ratio (rich to lean) |
| | 06H | Heated oxygen sensor 2 (Bank 2) | P0158 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0157 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0158 | 80H | 0CH | Sensor output voltage |
| | | | P0159 | 81H | 0CH | Difference in sensor output voltage |
| | | | P0159 | 82H | 11H | Rear O2 sensor delay response diagnosis |
| | 07H | Heated oxygen sensor 3 (Bank2) | P0163 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | | | P0164 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0166 | 80H | 0CH | Sensor output voltage |
| | | | P0165 | 81H | 0CH | Difference in sensor output voltage |
| | CATALYST | 21H | Three way catalyst function (Bank1) | P0420 | 80H | 01H |
| P0420 | | | | 82H | 01H | Switching time lag engine exhaust index value |
| P2423 | | | | 83H | 0CH | Difference in 3rd O2 sensor output voltage |
| P2423 | | | | 84H | 84H | O2 storage index in HC trap catalyst |
| 22H | | Three way catalyst function (Bank2) | P0430 | 80H | 01H | O2 storage index |
| | | | P0430 | 82H | 01H | Switching time lag engine exhaust index value |
| | | | P2424 | 83H | 0CH | Difference in 3rd O2 sensor output voltage |
| | | | P2424 | 84H | 84H | O2 storage index in HC trap catalyst |
| EGR SYSTEM | 31H | EGR function | P0400 | 80H | 96H | Low flow faults: EGR temp change rate (short term) |
| | | | P0400 | 81H | 96H | Low flow faults: EGR temp change rate (long term) |
| | | | P0400 | 82H | 96H | Low flow faults: Difference between max EGR temp and EGR temp under idling condition |
| | | | P0400 | 83H | 96H | Low flow faults: Max EGR temp |
| | | | P1402 | 84H | 96H | High Flow Faults: EGR temp increase rate |
| | | | P0402 | 85H | FCH | EGR differential pressure high flow |
| | | | P0401 | 86H | 37H | EGR differential pressure low flow |
| | | | P2457 | 87H | 96H | EGR temperature |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|-------------|-------------------|--|------------------------------------|---|---|---|
| | | | | TID | Unit and Scaling ID | |
| VVT SYSTEM | 35H | VVT Monitor (Bank1) | P0011 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | | | P0014 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | | | P0011 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0014 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | | | P100A | 84H | 10H | VEL slow response diagnosis |
| | | | P1090 | 85H | 10H | VEL servo system diagnosis |
| | | | P0011 | 86H | 9DH | VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis) |
| | | | Advanced: P052A Retarded: P052B | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis) |
| | 36H | VVT Monitor (Bank2) | P0021 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | | | P0024 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | | | P0021 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0024 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | | | P100B | 84H | 10H | VEL slow response diagnosis |
| | | | P1093 | 85H | 10H | VEL servo system diagnosis |
| P0021 | | | 86H | 9DH | VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis) | |
| | | Advanced: P052C Retarded: P052D | 87H | 9DH | VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis) | |
| EVAP SYSTEM | 39H | EVAP control system leak (Cap Off) | P0455 | 80H | 0CH | Difference in pressure sensor output voltage before and after pull down |
| | 3BH | EVAP control system leak (Small leak) | P0442 | 80H | 05H | Leak area index (for more than 0.04 inch) |
| | 3CH | EVAP control system leak (Very small leak) | P0456 | 80H | 05H | Leak area index (for more than 0.02 inch) |
| | | | P0456 | 81H | FDH | Maximum internal pressure of EVAP system during monitoring |
| | | | P0456 | 82H | FDH | Internal pressure of EVAP system at the end of monitoring |
| 3DH | Purge flow system | P0441 | 83H | 0CH | Difference in pressure sensor output voltage before and after vent control valve close | |

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| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description | |
|------------------------------|---------------|--|---------------------------------------|---|---------------------|---|--|
| | | | | TID | Unit and Scaling ID | | |
| O2 SENSOR HEATER | 41H | A/F sensor 1 heater (Bank 1) | Low Input: P0031 High Input: P0032 | 81H | 0BH | Converted value of heater electric current to voltage | |
| | | | P0030 | 83H | 0BH | A/F sensor heater circuit malfunction | |
| | 42H | Heated oxygen sensor 2 heater (Bank 1) | Low Input: P0037 High Input: P0038 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | | | P0141 | 81H | 14H | Rear O2 sensor internal impedance | |
| | 43H | Heated oxygen sensor 3 heater (Bank 1) | P0043 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | 45H | A/F sensor 1 heater (Bank 2) | Low Input: P0051 High Input: P0052 | 81H | 0BH | Converted value of heater electric current to voltage | |
| | | | P0036 | 83H | 0BH | A/F sensor heater circuit malfunction | |
| | 46H | Heated oxygen sensor 2 heater (Bank 2) | Low Input: P0057 High Input: P0058 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | | | P0161 | 81H | 14CH | Rear O2 sensor internal impedance | |
| | 47H | Heated oxygen sensor 3 heater (Bank 2) | P0063 | 80H | 0CH | Converted value of heater electric current to voltage | |
| | SECONDARY AIR | 71H | Secondary air system | P0411 | 80H | 01H | Secondary air injection system incorrect flow detected |
| | | | | Bank1: P0491 Bank2: P0492 | 81H | 01H | Secondary air injection system insufficient flow |
| P2445 | | | | 82H | 01H | Secondary air injection system pump stuck off | |
| P2448 | | | | 83H | 01H | Secondary air injection system high airflow | |
| Bank1: P2440 Bank2: P2442 | | | | 84H | 01H | Secondary air injection system switching valve stuck open | |
| P2440 | | | | 85H | 01H | Secondary air injection system switching valve stuck open | |
| P2444 | | | | 86H | 01H | Secondary air injection system pump stuck on | |

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< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|-------------|---------|---|---|---|---------------------|---|
| | | | | TID | Unit and Scaling ID | |
| FUEL SYSTEM | 81H | Fuel injection system function (Bank 1) | P0171 or P0172 | 80H | 2FH | Long term fuel trim |
| | | | P0171 or P0172 | 81H | 24H | The number of lambda control clamped |
| | | | P117A / P219A | 82H | 03H | Cylinder A/F imbalance monitoring |
| | | | P219C | 83H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #1 cylinder parameter |
| | | | P219D | 84H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #2 cylinder parameter |
| | | | P219E | 85H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #3 cylinder parameter |
| | | | P219F | 86H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #4 cylinder parameter |
| | | | P21A0 | 87H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #5 cylinder parameter |
| | | | P21A2 | 89H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #7 cylinder parameter |
| | 82H | Fuel injection system function (Bank 2) | P0174 or P0175 | 80H | 2FH | Long term fuel trim |
| | | | P0174 or P0175 | 81H | 24H | The number of lambda control clamped |
| | | | P117B / P219B | 82H | 03H | Cylinder A/F imbalance monitoring |
| | | | P219D | 84H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #2 cylinder parameter |
| | | | P219F | 86H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #4 cylinder parameter |
| | | | P21A1 | 88H | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #6 cylinder parameter |
| P21A3 | 8AH | 83H | Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #8 cylinder parameter | | | |

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[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|---------|---------|----------------------------|-------|---|---------------------|--|
| | | | | TID | Unit and Scaling ID | |
| MISFIRE | A1H | Multiple cylinder misfires | P0301 | 80H | 24H | Misfiring counter at 1000 revolution of the first cylinder |
| | | | P0302 | 81H | 24H | Misfiring counter at 1000 revolution of the second cylinder |
| | | | P0303 | 82H | 24H | Misfiring counter at 1000 revolution of the third cylinder |
| | | | P0304 | 83H | 24H | Misfiring counter at 1000 revolution of the fourth cylinder |
| | | | P0305 | 84H | 24H | Misfiring counter at 1000 revolution of the fifth cylinder |
| | | | P0306 | 85H | 24H | Misfiring counter at 1000 revolution of the sixth cylinder |
| | | | P0307 | 86H | 24H | Misfiring counter at 1000 revolution of the seventh cylinder |
| | | | P0308 | 87H | 24H | Misfiring counter at 1000 revolution of the eighth cylinder |
| | | | P0300 | 88H | 24H | Misfiring counter at 1000 revolution of the multiple cylinders |
| | | | P0301 | 89H | 24H | Misfiring counter at 200 revolution of the first cylinder |
| | | | P0302 | 8AH | 24H | Misfiring counter at 200 revolution of the second cylinder |
| | | | P0303 | 8BH | 24H | Misfiring counter at 200 revolution of the third cylinder |
| | | | P0304 | 8CH | 24H | Misfiring counter at 200 revolution of the fourth cylinder |
| | | | P0305 | 8DH | 24H | Misfiring counter at 200 revolution of the fifth cylinder |
| | | | P0306 | 8EH | 24H | Misfiring counter at 200 revolution of the sixth cylinder |
| | | | P0307 | 8FH | 24H | Misfiring counter at 200 revolution of the seventh cylinder |
| | | | P0308 | 90H | 24H | Misfiring counter at 200 revolution of the eighth cylinder |
| | | | P0300 | 91H | 24H | Misfiring counter at 1000 revolution of the single cylinder |
| | | | P0300 | 92H | 24H | Misfiring counter at 200 revolution of the single cylinder |
| | | | P0300 | 93H | 24H | Misfiring counter at 200 revolution of the multiple cylinders |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56DE]

| Item | OBD-MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|---------|---------|---------------------------|-------|---|---------------------|--|
| | | | | TID | Unit and Scaling ID | |
| MISFIRE | A2H | No. 1 cylinder misfire | P0301 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0301 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A3H | No. 2 cylinder misfire | P0302 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0302 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A4H | No. 3 cylinder misfire | P0303 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0303 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A5H | No. 4 cylinder misfire | P0304 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0304 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A6H | No. 5 cylinder misfire | P0305 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0305 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A7H | No. 6 cylinder misfire | P0306 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0306 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A8H | No. 7 cylinder misfire | P0307 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0307 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A9H | No. 8 cylinder misfire | P0308 | 0BH | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0308 | 0CH | 24H | Misfire counts for last/current driving cycles |

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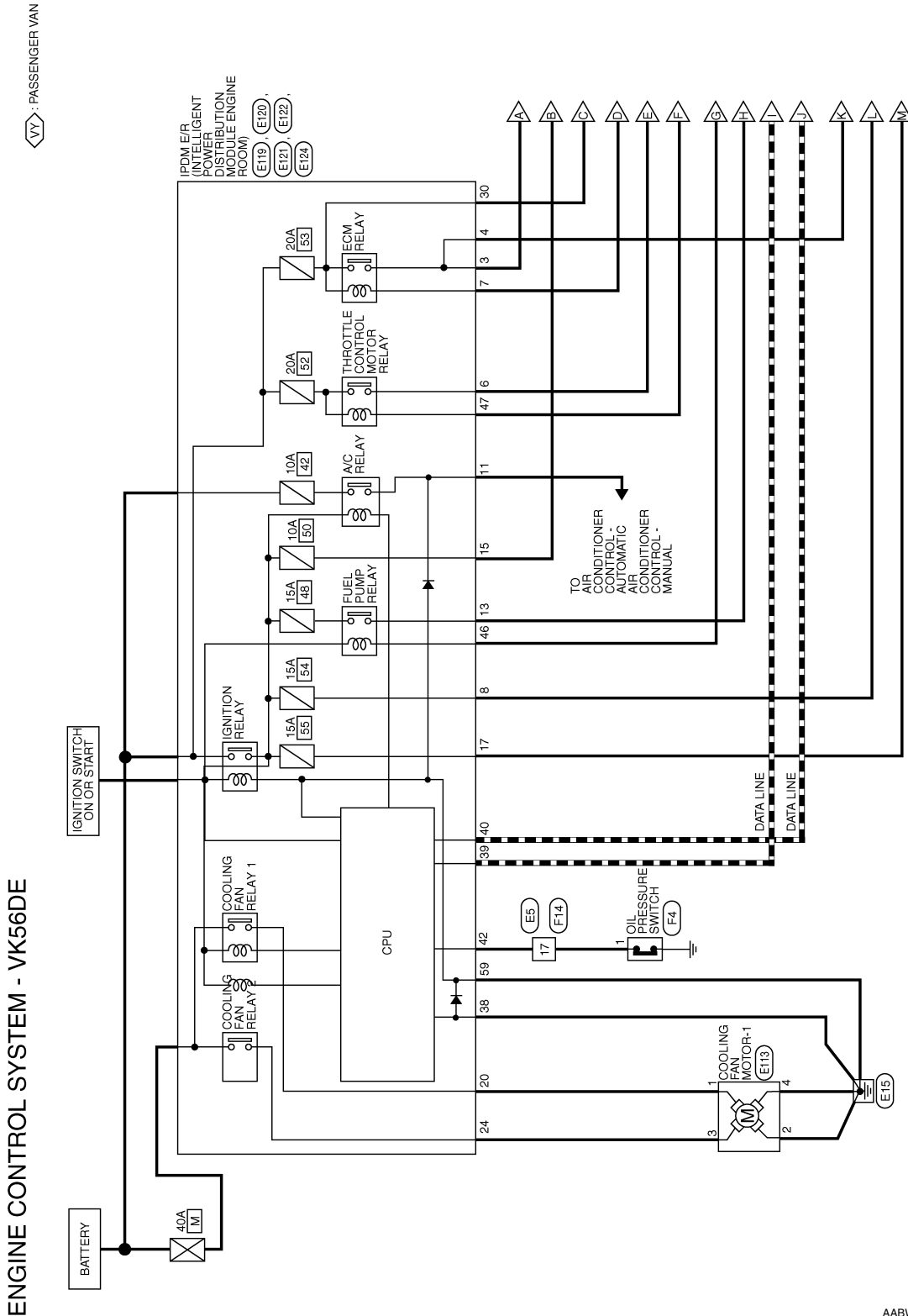
< WIRING DIAGRAM >

WIRING DIAGRAM

ENGINE CONTROL SYSTEM

Wiring Diagram—ENGINE CONTROL SYSTEM—

INFOID:000000012524647

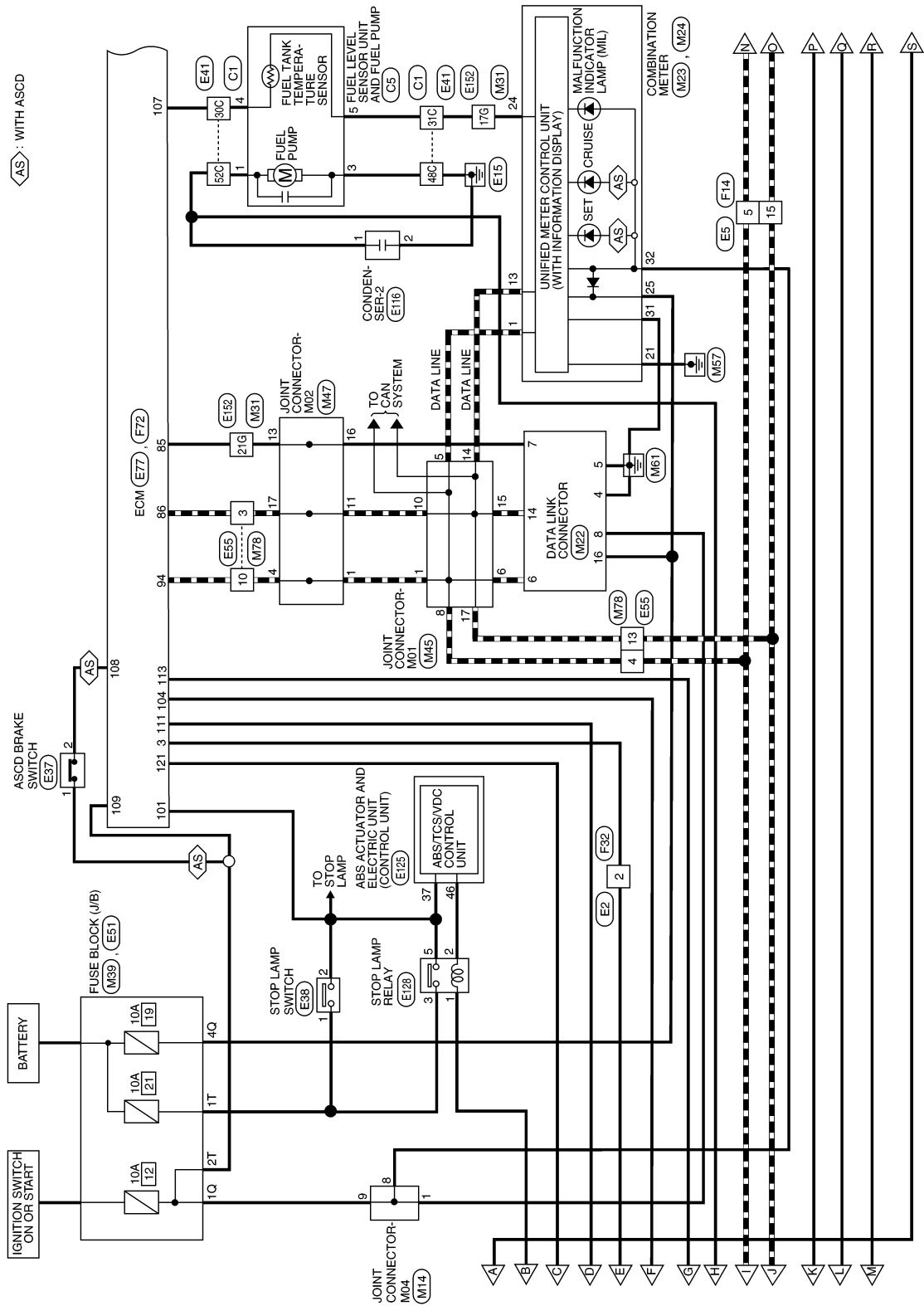


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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]



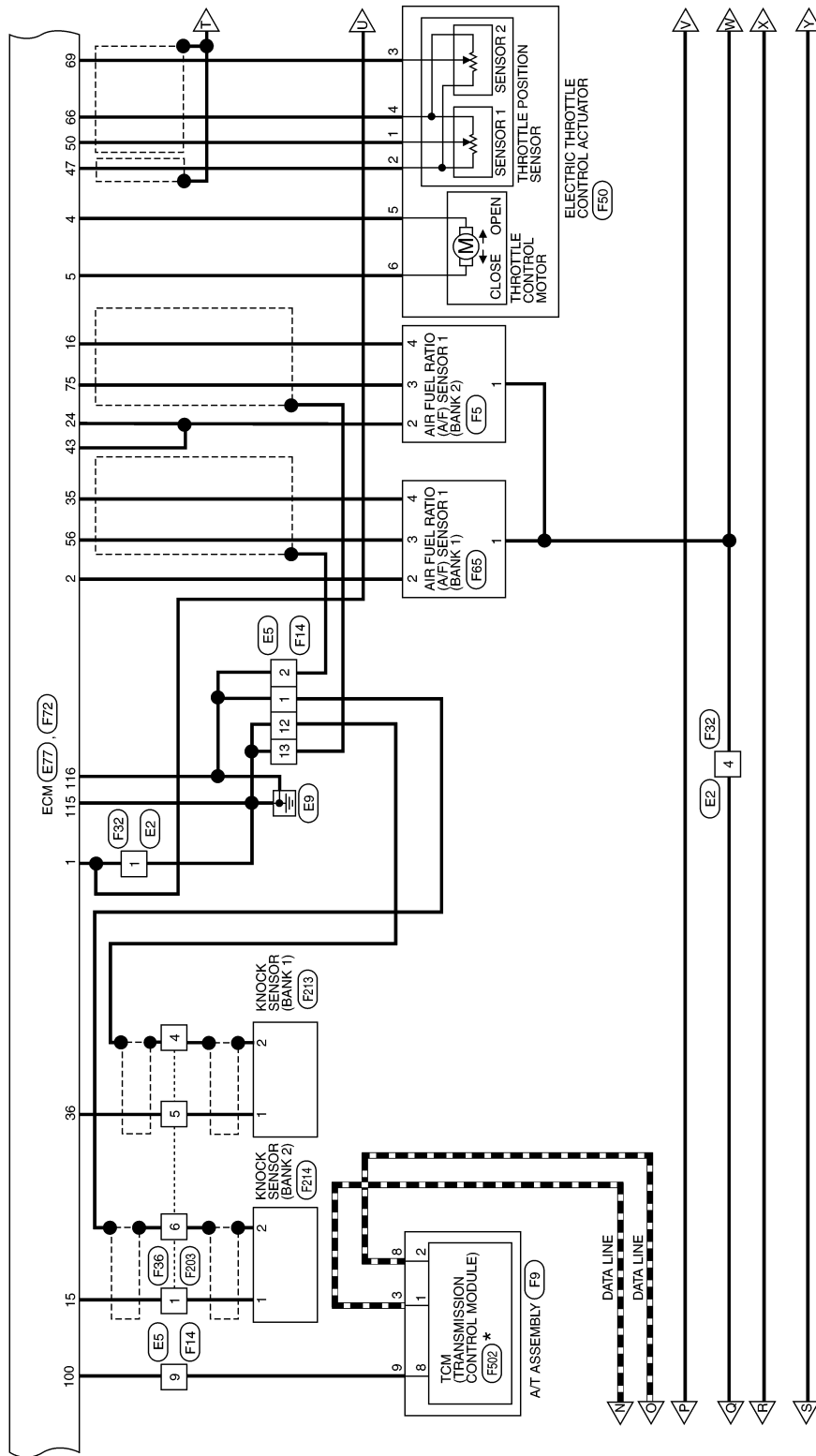
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]



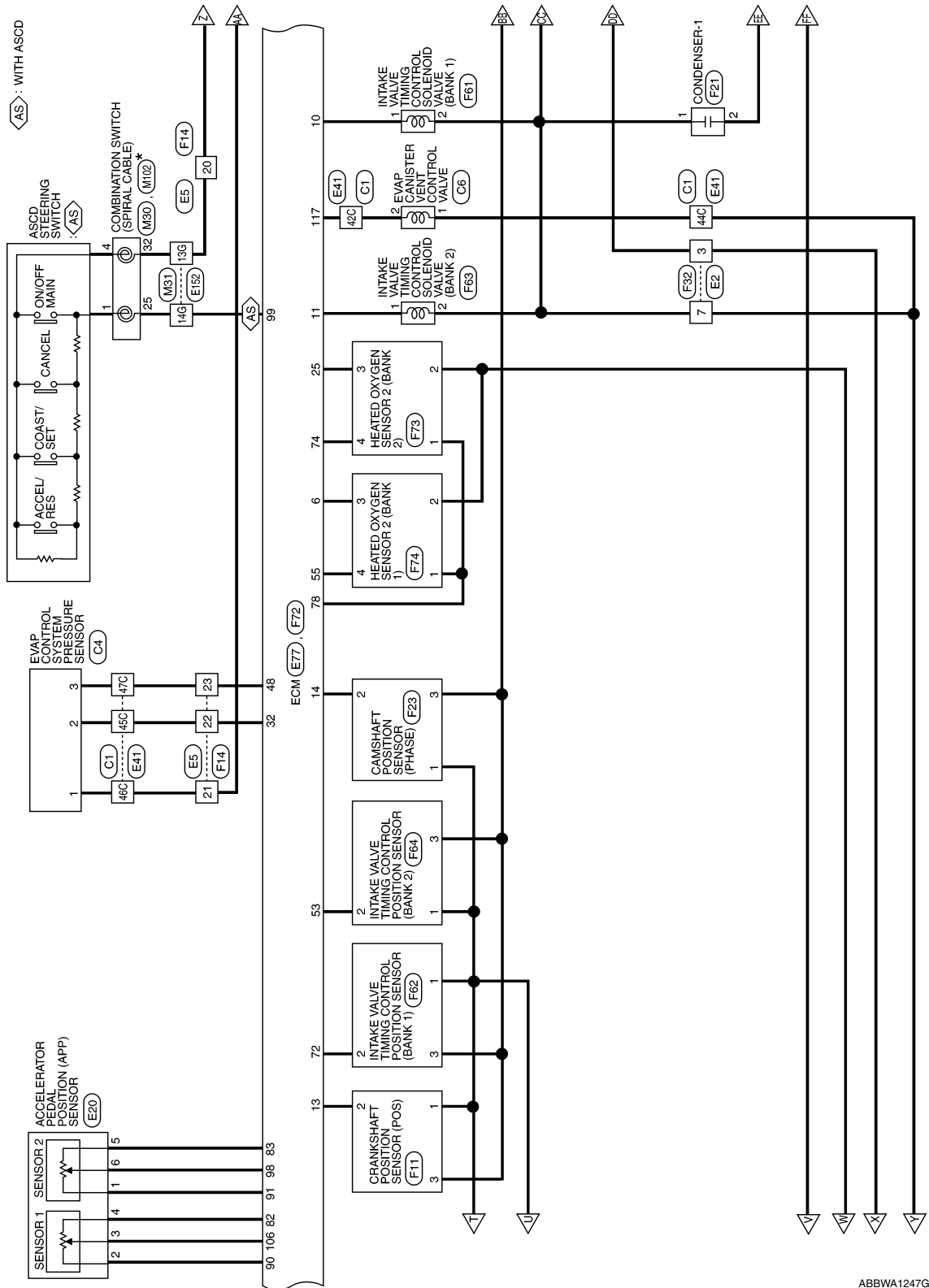
* : THIS CONNECTOR IS NOT SHOWN IN "HARNES LAYOUT" OF PG SECTION.

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]



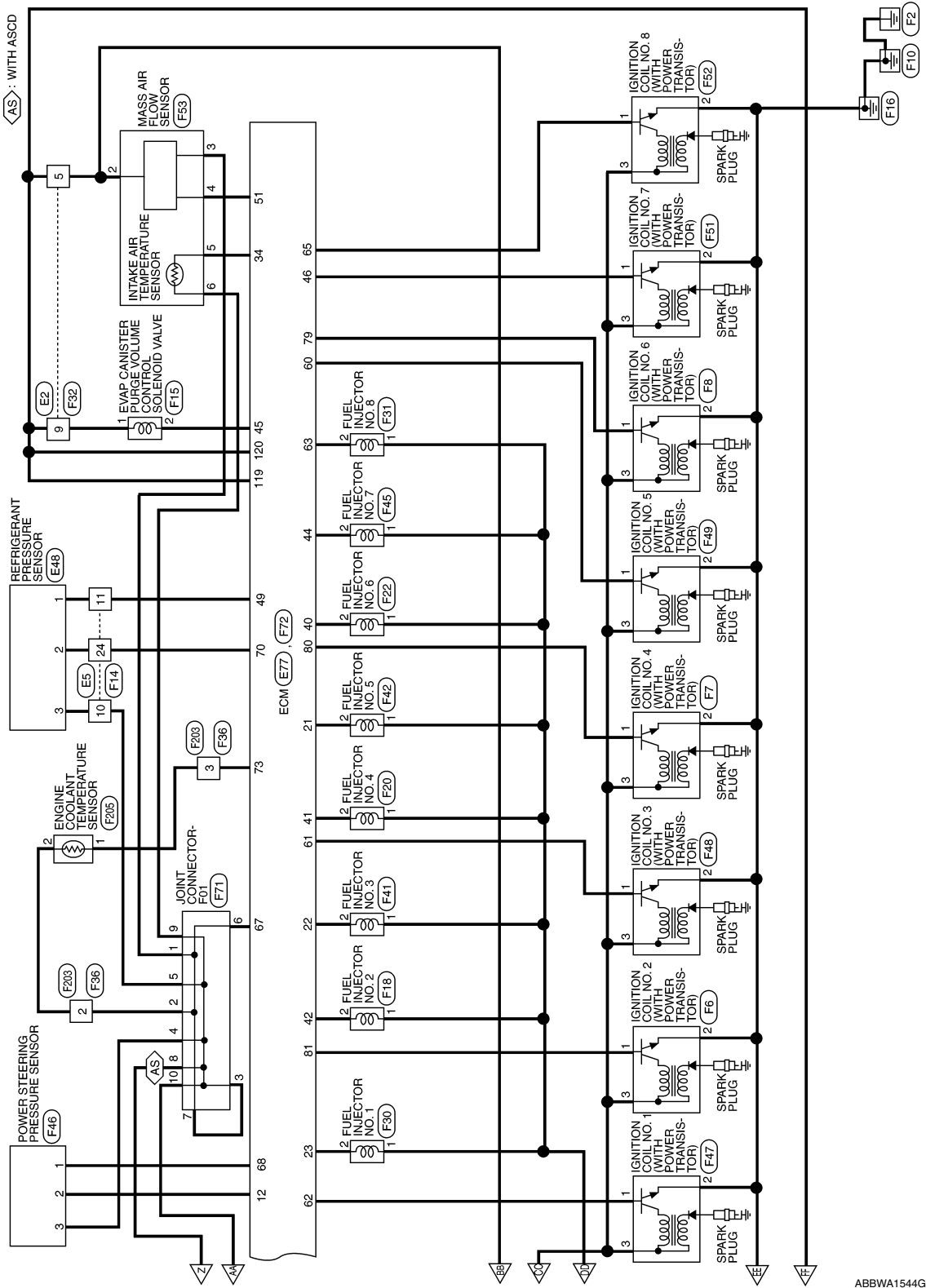
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ENGINE CONTROL SYSTEM

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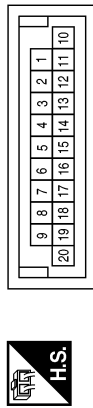
[VK56DE]



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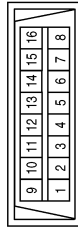
ENGINE CONTROL SYSTEM CONNECTORS - VK56DE

| | |
|-----------------|---------------------|
| Connector No. | M14 |
| Connector Name | JOINT CONNECTOR-M04 |
| Connector Color | BLUE |



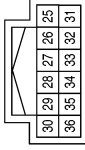
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 8 | R | - |
| 9 | R | - |

| | |
|-----------------|---------------------|
| Connector No. | M22 |
| Connector Name | DATA LINK CONNECTOR |
| Connector Color | WHITE |



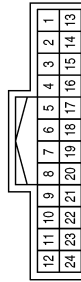
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 4 | B | - |
| 5 | B | - |
| 6 | L | - |
| 7 | O | - |
| 8 | R | - |
| 14 | P | - |
| 16 | Y | - |

| | |
|-----------------|-------------------|
| Connector No. | M23 |
| Connector Name | COMBINATION METER |
| Connector Color | WHITE |



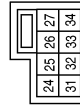
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 25 | Y | BATTERY |
| 31 | B | GND (POWER) |
| 32 | R | RUN START |

| | |
|-----------------|-------------------|
| Connector No. | M24 |
| Connector Name | COMBINATION METER |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------------|
| 1 | L | CAN-H |
| 13 | P | CAN-L |
| 21 | B | GND (ILL) |
| 24 | LG | FUEL LEVEL GROUND |

| | |
|-----------------|-----------------------------------|
| Connector No. | M30 |
| Connector Name | COMBINATION SWITCH (SPIRAL CABLE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 25 | R | - |
| 32 | B | - |

ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

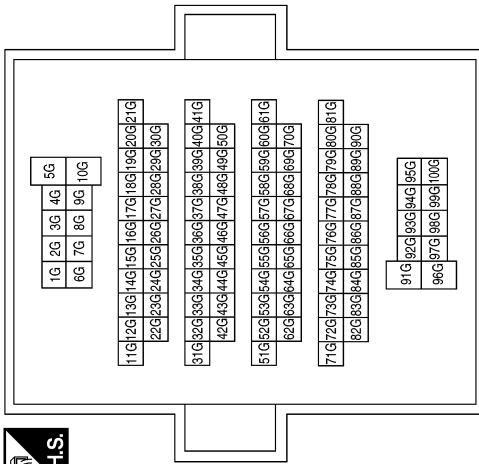
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| Connector No. | M39 |
| Connector Name | FUSE BLOCK (J/B) |
| Connector Color | WHITE |



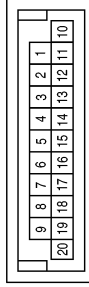
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1Q | R | - |
| 4Q | Y | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 13G | B | - |
| 14G | R | - |
| 17G | LG | - |
| 21G | O | - |

| | |
|-----------------|--------------|
| Connector No. | M31 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



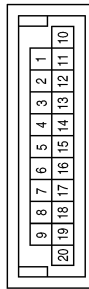
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| Connector No. | M47 |
| Connector Name | JOINT CONNECTOR-M02 |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | - |
| 4 | L | - |
| 11 | P | - |
| 13 | O | - |
| 16 | O | - |
| 17 | P | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | - |
| 5 | L | - |
| 6 | L | - |
| 8 | L | - |
| 10 | P | - |
| 14 | P | - |
| 15 | P | - |
| 17 | P | - |

| | |
|-----------------|---------------------|
| Connector No. | M45 |
| Connector Name | JOINT CONNECTOR-M01 |
| Connector Color | BLUE |



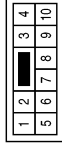
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

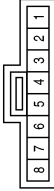
[VK56DE]

| | |
|-----------------|--------------|
| Connector No. | E2 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



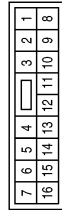
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | W | - |
| 4 | V | - |
| 5 | BR | - |
| 7 | O | - |
| 9 | BR | - |

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|-----------------|-----------------------------------|
| Connector No. | M102 |
| Connector Name | COMBINATION SWITCH (SPIRAL CABLE) |
| Connector Color | GRAY |



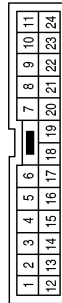
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 4 | B | - |

| | |
|-----------------|--------------|
| Connector No. | M78 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | P | - |
| 4 | L | - |
| 10 | L | - |
| 13 | P | - |

| | |
|-----------------|--------------|
| Connector No. | E5 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | B | - |
| 5 | L | - |
| 9 | BR | - |
| 10 | B | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 11 | O | - |
| 12 | B | - |
| 13 | B | - |
| 15 | P | - |
| 17 | SB | - |
| 20 | B | - |
| 21 | B | - |
| 22 | L | - |
| 23 | SB | - |
| 24 | GR | - |

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ENGINE CONTROL SYSTEM

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[VK56DE]

| | |
|-----------------|------------------|
| Connector No. | E38 |
| Connector Name | STOP LAMP SWITCH |
| Connector Color | WHITE |



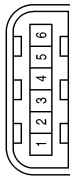
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | LG | - |

| | |
|-----------------|-------------------|
| Connector No. | E37 |
| Connector Name | ASCD BRAKE SWITCH |
| Connector Color | BROWN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | BR | - |

| | |
|-----------------|---|
| Connector No. | E20 |
| Connector Name | ACCELERATOR PEDAL POSITION (APP) SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | L | - |
| 3 | BR | - |
| 4 | R | - |
| 5 | Y | - |
| 6 | LG | - |

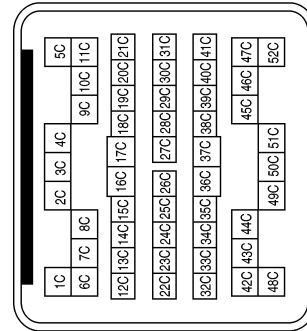
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| Connector No. | E48 |
| Connector Name | REFRIGERANT PRESSURE SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | GR | - |
| 3 | B | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30C | Y | - |
| 31C | LG | - |
| 42C | G | - |
| 44C | O | - |
| 45C | L | - |
| 46C | B | - |
| 47C | SB | - |
| 48C | B | - |
| 52C | R | - |

| | |
|-----------------|--------------|
| Connector No. | E41 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GRAY |



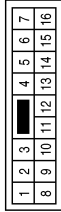
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

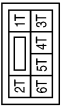
[VK56DE]

| | |
|-----------------|--------------|
| Connector No. | E55 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | P | - |
| 4 | L | - |
| 10 | L | - |
| 13 | P | - |

| | |
|-----------------|------------------|
| Connector No. | E51 |
| Connector Name | FUSE BLOCK (J/B) |
| Connector Color | WHITE |

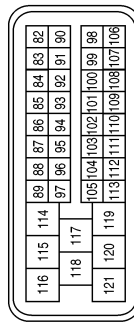


| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1T | O | - |
| 2T | W | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 106 | BR | APS1 |
| 107 | Y | TF |
| 108 | BR | BNC SW |
| 109 | W | IGN SW |
| 110 | - | - |
| 111 | W | SSOFF |
| 112 | - | - |
| 113 | GR | FPR |
| 114 | - | - |
| 115 | B | GND |
| 116 | B | GND |
| 117 | G | CDCV |
| 118 | - | - |
| 119 | BR | VB |
| 120 | BR | VB |
| 121 | R | BATT |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 89 | - | - |
| 90 | L | AVCC |
| 91 | W | AVCC2 |
| 92 | - | - |
| 93 | - | - |
| 94 | L | CAN-H |
| 95 | - | - |
| 96 | - | - |
| 97 | - | - |
| 98 | LG | APS2 |
| 99 | R | ASCD SW |
| 100 | BR | NEUT H |
| 101 | LG | BRAKE |
| 102 | - | - |
| 103 | - | - |
| 104 | O | MOT RLY |
| 105 | - | - |

| | |
|-----------------|-------------------|
| Connector No. | E77 |
| Connector Name | ECM (WITH VK56DE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 82 | R | GND-A |
| 83 | Y | GND-A2 |
| 84 | - | - |
| 85 | O | K-LINE |
| 86 | P | CAN-L |
| 87 | - | - |
| 88 | - | - |

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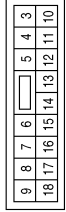
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

| | |
|-----------------|--|
| Connector No. | E119 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|---------------|
| 3 | O | IGN COIL |
| 4 | BR | ECM VB |
| 6 | L | ETC |
| 7 | W | ECM RLY CONT |
| 8 | V | O2 SENS IGN |
| 11 | W | A/C CLUTCH |
| 13 | R | FUEL PUMP MTR |
| 15 | GR | ABS ECU IGN |
| 17 | W | INJECTOR |

| | |
|-----------------|-------------|
| Connector No. | E116 |
| Connector Name | CONDENSER-2 |
| Connector Color | WHITE |



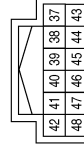
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 2 | B | - |

| | |
|-----------------|---------------------|
| Connector No. | E113 |
| Connector Name | COOLING FAN MOTOR-1 |
| Connector Color | GRAY |



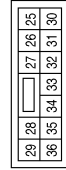
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | B | - |
| 3 | W | - |
| 4 | B | - |

| | |
|-----------------|--|
| Connector No. | E122 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | WHITE |



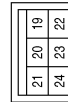
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-----------------|
| 38 | B | GND (SIGNAL) |
| 39 | L | CAN-H |
| 40 | P | CAN-L |
| 42 | SB | OIL PRESSURE SW |
| 46 | GR | FUEL RLY CONT |
| 47 | O | ETC RLY CONT |

| | |
|-----------------|--|
| Connector No. | E121 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | BROWN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30 | R | ECM BAT |

| | |
|-----------------|--|
| Connector No. | E120 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 20 | Y | MOTOR FAN 1 |
| 24 | W | MOTOR FAN 2 |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

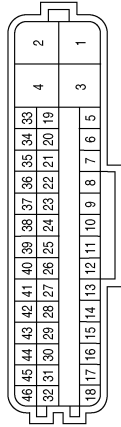
[VK56DE]

| | |
|-----------------|-----------------|
| Connector No. | E128 |
| Connector Name | STOP LAMP RELAY |
| Connector Color | BLUE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | GR | - |
| 2 | W | - |
| 3 | O | - |
| 5 | LG | - |

| | |
|-----------------|---|
| Connector No. | E125 |
| Connector Name | ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 37 | LG | STP |
| 46 | W | STPO |

| | |
|-----------------|--|
| Connector No. | E124 |
| Connector Name | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 59 | B | GND (POWER) |

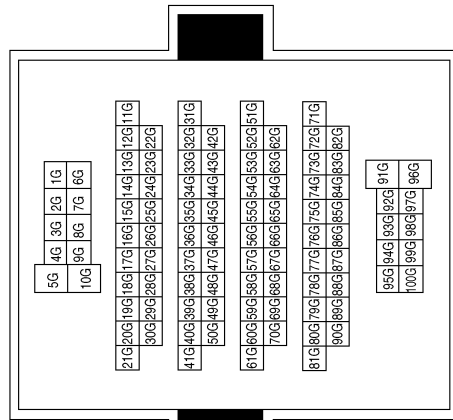
| | |
|-----------------|-----------------------------------|
| Connector No. | F4 |
| Connector Name | OIL PRESSURE SWITCH (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | SB | - |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 13G | B | - |
| 14G | R | - |
| 17G | LG | - |
| 21G | O | - |

| | |
|-----------------|--------------|
| Connector No. | E152 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

| | |
|-----------------|--|
| Connector No. | F7 |
| Connector Name | IGNITION COIL NO. 4 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|--|
| Connector No. | F6 |
| Connector Name | IGNITION COIL NO. 2 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | G | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|---|
| Connector No. | F5 |
| Connector Name | AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | BR | - |
| 3 | L | - |
| 4 | G | - |

| | |
|-----------------|--|
| Connector No. | F11 |
| Connector Name | CRANKSHAFT POSITION SENSOR (POS) (WITH VK56DE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | W | - |
| 3 | BR | - |

| | |
|-----------------|--------------|
| Connector No. | F9 |
| Connector Name | A/T ASSEMBLY |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 3 | L | - |
| 8 | P | - |
| 9 | BR | - |

| | |
|-----------------|--|
| Connector No. | F8 |
| Connector Name | IGNITION COIL NO. 6 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | B | - |
| 3 | O | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

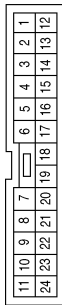
| | |
|-----------------|---|
| Connector No. | F15 |
| Connector Name | EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|----------------|
| 1 | BR | -(WITH VK56DE) |
| 2 | SB | -(WITH VK56DE) |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 9 | BR | - |
| 10 | B | - |
| 11 | O | - |
| 12 | B | - |
| 13 | B | - |
| 15 | P | - |
| 17 | SB | - |
| 20 | B | - |
| 21 | B | - |
| 22 | L | - |
| 23 | SB | - |
| 24 | GR | - |

| | |
|-----------------|--------------|
| Connector No. | F14 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | B | - |
| 5 | L | - |

| | |
|-----------------|-------------|
| Connector No. | F21 |
| Connector Name | CONDENSER-1 |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | B | - |

| | |
|-----------------|---------------------|
| Connector No. | F20 |
| Connector Name | FUEL INJECTOR NO. 4 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | P | - |

| | |
|-----------------|---------------------|
| Connector No. | F18 |
| Connector Name | FUEL INJECTOR NO. 2 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | L | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

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|-----------------|--------------------------------------|
| Connector No. | F30 |
| Connector Name | FUEL INJECTOR NO. 1 (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | LG | - |

| | |
|-----------------|-------------------------------------|
| Connector No. | F23 |
| Connector Name | CAMSHAFT POSITION SENSOR (PHASE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | Y | - |
| 3 | BR | - |

| | |
|-----------------|---------------------|
| Connector No. | F22 |
| Connector Name | FUEL INJECTOR NO. 6 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | Y | - |

| | |
|-----------------|--------------|
| Connector No. | F36 |
| Connector Name | WIRE TO WIRE |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |
| 3 | Y | - |
| 4 | B | - |
| 5 | W | - |
| 6 | B | - |

| | |
|-----------------|--------------|
| Connector No. | F32 |
| Connector Name | WIRE TO WIRE |
| Connector Color | WHITE |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | W | - |
| 4 | V | - |
| 5 | BR | - |
| 7 | O | - |
| 9 | BR | - |

| | |
|-----------------|---------------------|
| Connector No. | F31 |
| Connector Name | FUEL INJECTOR NO. 8 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | G | - |

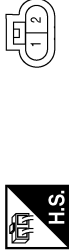
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

| | |
|-----------------|---------------------|
| Connector No. | F45 |
| Connector Name | FUEL INJECTOR NO. 7 |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | O | - |

| | |
|-----------------|--------------------------------------|
| Connector No. | F42 |
| Connector Name | FUEL INJECTOR NO. 5 (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | SB | - |

| | |
|-----------------|--------------------------------------|
| Connector No. | F41 |
| Connector Name | FUEL INJECTOR NO. 3 (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | BR | - |

| | |
|-----------------|--|
| Connector No. | F48 |
| Connector Name | IGNITION COIL NO. 3 (WITH POWER TRANSISTOR) (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | L | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|--|
| Connector No. | F47 |
| Connector Name | IGNITION COIL NO. 1 (WITH POWER TRANSISTOR) (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|--------------------------------|
| Connector No. | F46 |
| Connector Name | POWER STEERING PRESSURE SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | SB | - |
| 2 | R | - |
| 3 | B | - |

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ENGINE CONTROL SYSTEM

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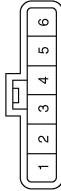
[VK56DE]

| | |
|-----------------|--|
| Connector No. | F51 |
| Connector Name | IGNITION COIL NO. 7 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|------------------------------------|
| Connector No. | F50 |
| Connector Name | ELECTRIC THROTTLE CONTROL ACTUATOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | W | - |
| 3 | W | - |
| 4 | R | - |
| 5 | L/W | - |
| 6 | L/B | - |

| | |
|-----------------|--|
| Connector No. | F49 |
| Connector Name | IGNITION COIL NO. 5 (WITH POWER TRANSISTOR) (WITH VK56DE) |
| Connector Color | GRAY |



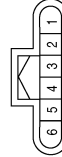
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | GR | - |
| 2 | B | - |
| 3 | O | - |

| | |
|-----------------|---|
| Connector No. | F61 |
| Connector Name | INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1) (WITH VK56DE) |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | O | - |

| | |
|-----------------|----------------------|
| Connector No. | F53 |
| Connector Name | MASS AIR FLOW SENSOR |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 2 | BR | - |
| 3 | B | - |
| 4 | W | - |
| 5 | V | - |
| 6 | B | - |

| | |
|-----------------|--|
| Connector No. | F52 |
| Connector Name | IGNITION COIL NO. 8 (WITH POWER TRANSISTOR) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | BR | - |
| 2 | B | - |
| 3 | O | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

| | |
|-----------------|--|
| Connector No. | F64 |
| Connector Name | INTAKE VALVE TIMING CONTROL POSITION SENSOR (BANK 2) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | BR | - |

| | |
|-----------------|---|
| Connector No. | F63 |
| Connector Name | INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) (WITH VK56DE) |
| Connector Color | GREEN |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | LG | - |
| 2 | O | - |

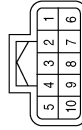
| | |
|-----------------|--|
| Connector No. | F62 |
| Connector Name | INTAKE VALVE TIMING CONTROL POSITION SENSOR (BANK 1) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | Y | - |
| 3 | BR | - |

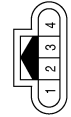
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 6 | B | - |
| 7 | B | - |
| 8 | B | - |
| 9 | B | - |
| 10 | B | - |

| | |
|-----------------|---------------------|
| Connector No. | F71 |
| Connector Name | JOINT CONNECTOR-F01 |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | B | - |
| 3 | B | - |
| 4 | B | - |
| 5 | B | - |

| | |
|-----------------|--|
| Connector No. | F65 |
| Connector Name | AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | V | - |
| 2 | B | - |
| 3 | W | - |
| 4 | O | - |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|---------------|
| 52 | - | - |
| 53 | L | VTCPLUS (R) |
| 54 | - | - |
| 55 | R | O2SRL |
| 56 | W | A/F-1 |
| 57 | - | - |
| 58 | - | - |
| 59 | - | - |
| 60 | GR | IGN#5 |
| 61 | L | IGN#3 |
| 62 | Y | IGN#1 |
| 63 | G | INJ#8 |
| 64 | - | - |
| 65 | BR | IGN#8 |
| 66 | R | GND-A2 |
| 67 | B | GND-A |
| 68 | SB | AVCC (PSPRES) |
| 69 | W | TPS2 |
| 70 | GR | PD PRESS |
| 71 | - | - |
| 72 | Y | VTS PUS (L) |
| 73 | Y | TW |
| 74 | R | O2SRR |
| 75 | L | A/F-2 |
| 76 | - | - |
| 77 | - | - |
| 78 | B | GND O2 |
| 79 | V | IGN#6 |
| 80 | W | IGN#4 |
| 81 | G | IGN#2 |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|---------------|
| 22 | BR | INJ#3 |
| 23 | LG | INJ#1 |
| 24 | BR | AF-H2 |
| 25 | GR | O2HRR |
| 26 | - | - |
| 27 | - | - |
| 28 | - | - |
| 29 | - | - |
| 30 | - | - |
| 31 | - | - |
| 32 | L | FTPRS |
| 33 | - | - |
| 34 | V | TA |
| 35 | O | A/F+1 |
| 36 | W | KNK2 |
| 37 | - | - |
| 38 | - | - |
| 39 | - | - |
| 40 | Y | INJ#6 |
| 41 | P | INJ#4 |
| 42 | L | INJ#2 |
| 43 | BR | AF-H2 |
| 44 | O | INJ#7 |
| 45 | SB | EVAP |
| 46 | R | IGN#7 |
| 47 | W | AVCC2 |
| 48 | SB | AVCC |
| 49 | O | AVCC (PDPRES) |
| 50 | B | TPS1 |
| 51 | W | QA+ |

| | |
|-----------------|-------------------|
| Connector No. | F72 |
| Connector Name | ECM (WITH VK56DE) |
| Connector Color | BLACK |



| | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|---|
| 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 2 | 1 |
| 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 3 | |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 5 | 4 |
| 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | | |

| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | GND |
| 2 | B | AF-H1 |
| 3 | L | VMOT |
| 4 | LW | MOTOR 2 |
| 5 | L/B | MOTOR 1 |
| 6 | LG | O2HRL |
| 7 | - | - |
| 8 | - | - |
| 9 | - | - |
| 10 | W | C-VTC (L) |
| 11 | LG | C-VTC (R) |
| 12 | R | PS-PRESS |
| 13 | W | POS |
| 14 | Y | PHASE |
| 15 | W | KNK1 |
| 16 | G | A/F+2 |
| 17 | - | - |
| 18 | - | - |
| 19 | - | - |
| 20 | - | - |
| 21 | SB | INJ#5 |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

[VK56DE]

| | |
|-----------------|--------------|
| Connector No. | F203 |
| Connector Name | WIRE TO WIRE |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |
| 3 | Y | - |
| 4 | B | - |
| 5 | W | - |
| 6 | B | - |

| | |
|-----------------|---|
| Connector No. | F74 |
| Connector Name | HEATED OXYGEN SENSOR 2 (BANK 1) (WITH VK56DE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | V | - |
| 3 | LG | - |
| 4 | R | - |

| | |
|-----------------|---|
| Connector No. | F73 |
| Connector Name | HEATED OXYGEN SENSOR 2 (BANK 2) (WITH VK56DE) |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | V | - |
| 3 | GR | - |
| 4 | R | - |

| | |
|-----------------|-----------------------|
| Connector No. | F214 |
| Connector Name | KNOCK SENSOR (BANK 2) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |

| | |
|-----------------|-----------------------|
| Connector No. | F213 |
| Connector Name | KNOCK SENSOR (BANK 1) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | W | - |
| 2 | B | - |

| | |
|-----------------|---|
| Connector No. | F205 |
| Connector Name | ENGINE COOLANT TEMPERATURE SENSOR (WITH VK56DE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | Y | - |
| 2 | B | - |

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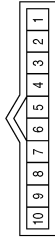
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM >

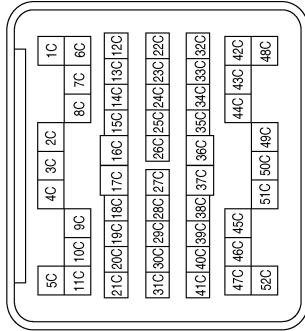
[VK56DE]

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|-----------------|-----------------------------------|
| Connector No. | F502 |
| Connector Name | TCM (TRANSMISSION CONTROL MODULE) |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | BR | CAN-H |
| 2 | L/Y | CAN-L |
| 8 | G | START-RLY |

| | |
|-----------------|--------------|
| Connector No. | C1 |
| Connector Name | WIRE TO WIRE |
| Connector Color | GRAY |



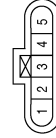
| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 30C | Y | - |
| 31C | LG | - |
| 42C | G | - |
| 44C | O | - |
| 45C | L | - |
| 46C | B | - |
| 47C | SB | - |
| 48C | B | - |
| 52C | R | - |

| | |
|-----------------|-------------------------------------|
| Connector No. | C4 |
| Connector Name | EVAP CONTROL SYSTEM PRESSURE SENSOR |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | B | - |
| 2 | L | - |
| 3 | SB | - |

| | |
|-----------------|--------------------------------------|
| Connector No. | C5 |
| Connector Name | FUEL LEVEL SENSOR UNIT AND FUEL PUMP |
| Connector Color | GRAY |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | R | - |
| 3 | B | - |
| 4 | Y | - |
| 5 | LG | - |

| | |
|-----------------|----------------------------------|
| Connector No. | C6 |
| Connector Name | EVAP CANISTER VENT CONTROL VALVE |
| Connector Color | BLACK |



| Terminal No. | Color of Wire | Signal Name |
|--------------|---------------|-------------|
| 1 | O | - |
| 2 | G | - |

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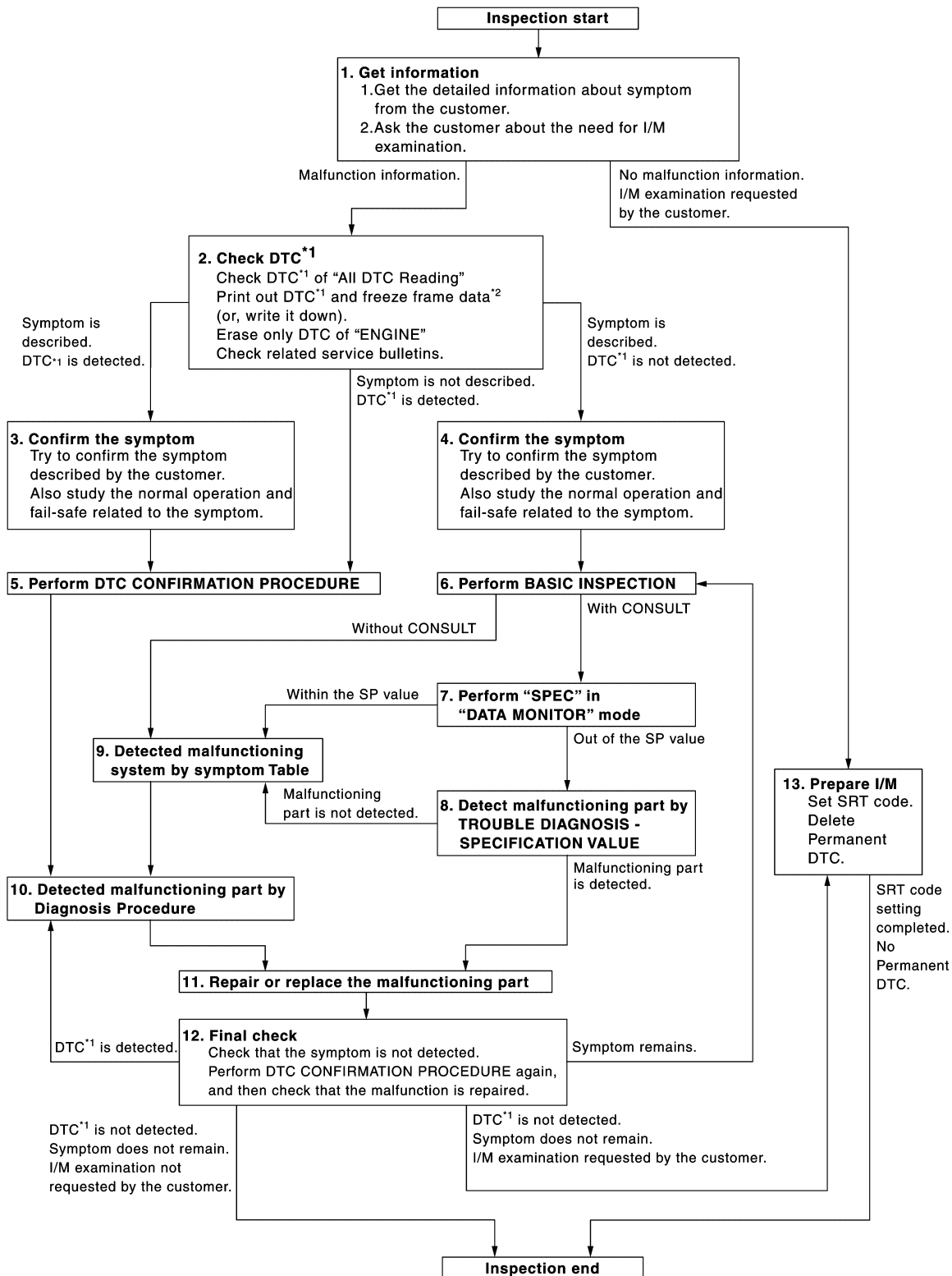
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:000000012524648

OVERALL SEQUENCE



JSBIA0123GB

DIAGNOSIS AND REPAIR WORKFLOW

[VK56DE]

< BASIC INSPECTION >

*1: Include 1st trip DTC.

*2: Include 1st trip freeze frame data.

DETAILED FLOW

1. GET INFORMATION FOR SYMPTOM

1. Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the "Diagnostic Work Sheet". (Refer to [EC-582. "Diagnostic Work Sheet"](#).)
2. Ask if the customer requests I/M examination.

Malfunction information, obtained>>GO TO 2.

No Malfunction information, but a request for I/M examination>>GO TO 13.

2. CHECK DTC

1. Check DTC of "All DTC Reading".
2. Perform the following procedure if DTC is displayed.
 - Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
 - Erase only DTC of "ENGINE".
 - ⊗ With CONSULT: Refer to "How to Erase DTC and 1st Trip DTC" in [EC-518. "CONSULT Function"](#).
 - ⊗ Without CONSULT: Refer to "How to Erase Self-diagnostic Results" in [EC-515. "On Board Diagnosis Function"](#).
 - Turn ignition switch OFF.
 - Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to [EC-894. "Symptom Table"](#).)
3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

Symptom is described, DTC is detected>>GO TO 3.

Symptom is described, DTC is not detected>>GO TO 4.

Symptom is not described, DTC is detected>>GO TO 5.

3. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).

Also study the normal operation and fail-safe related to the symptom. Refer to [EC-898. "Description"](#) and [EC-542. "Fail-safe"](#).

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4. CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.

Also study the normal operation and fail-safe related to the symptom. Refer to [EC-898. "Description"](#) and [EC-542. "Fail-safe"](#).

Diagnosis Work Sheet is useful to verify the incident.

Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5. PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.

If two or more DTCs are detected, refer to [EC-543. "DTC Inspection Priority Chart"](#) and determine trouble diagnosis order.

NOTE:

- Freeze frame data is useful if the DTC is not detected.

DIAGNOSIS AND REPAIR WORKFLOW

[VK56DE]

< BASIC INSPECTION >

- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.
If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

- YES >> GO TO 10.
- NO >> Check according to [GI-43, "Intermittent Incident"](#).

6. PERFORM BASIC INSPECTION

Perform [EC-584, "Work Procedure"](#).

Do you have CONSULT?

- YES >> GO TO 7.
- NO >> GO TO 9.

7. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT

Make sure that "MAS A/F SE-B1", "MAS A/F SE-B2", "B/FUEL SCHDL", "A/F ALPHA-B1" and "A/F ALPHA-B2" are within the SP value using CONSULT "SPEC" in "DATA MONITOR" mode of "ENGINE". Refer to [EC-610, "Component Function Check"](#).

Is the measurement value within the SP value?

- YES >> GO TO 9.
- NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to [EC-611, "Diagnosis Procedure"](#).

Is a malfunctioning part detected?

- YES >> GO TO 11.
- NO >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to [EC-894, "Symptom Table"](#) based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptoms.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.



NOTE:

The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to [GI-45, "Circuit Inspection"](#).

Is a malfunctioning part detected?

- YES >> GO TO 11.
- NO >> Monitor input data from related sensors or check voltage of related ECM terminals using CONSULT. Refer to [EC-529, "Reference Value"](#).

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it.
 -  With CONSULT: Refer to "How to Erase DTC and 1st Trip DTC" in [EC-518, "CONSULT Function"](#).
 -  Without CONSULT: Refer to "How to Erase Self-diagnostic Results" in [EC-515, "On Board Diagnosis Function"](#).

>> GO TO 12.

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

[VK56DE]

12.FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been completely repaired.

When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.

YES-2 >> Symptom remains: GO TO 6.

NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (⊗ With CONSULT: Refer to "How to Read DTC and 1st Trip DTC" in [EC-518, "CONSULT Function"](#), ⊗ Without CONSULT: Refer to "How to Read Self-diagnostic Results" in [EC-515, "On Board Diagnosis Function"](#)).

NO-2 >> I/M examination, requested from the customer: GO TO 13.

13.PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to [EC-598, "Description"](#).
2. Erase permanent DTCs. Refer to [EC-604, "Description"](#).

>> INSPECTION END.

Diagnostic Work Sheet

INFOID:0000000012524649

DESCRIPTION

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

In general, each customer feels differently about symptoms. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the WORKSHEET SAMPLE below in order to organize all the information for troubleshooting.

Some conditions may cause the MIL to illuminate or blink, and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.

KEY POINTS

WHAT Vehicle & engine model
WHEN Date, Frequencies
WHERE..... Road conditions
HOW Operating conditions,
Weather conditions,
Symptoms

SEF907L

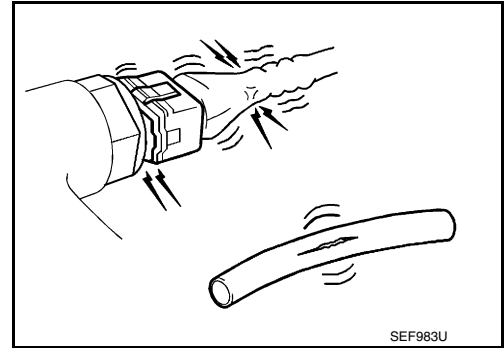
BASIC INSPECTION

Work Procedure

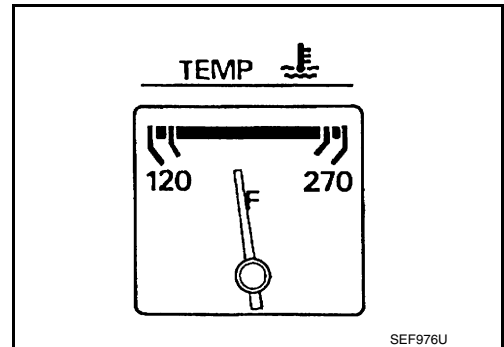
INFOID:000000012524650

1.INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
 - Harness connectors for improper connections
 - Wiring harness for improper connections, pinches and cut
 - Vacuum hoses for splits, kinks and improper connections
 - Hoses and ducts for leakage
 - Air cleaner clogging
 - Gasket
3. Check that electrical or mechanical loads are not applied.
 - Head lamp switch is OFF.
 - Air conditioner switch is OFF.
 - Rear window defogger switch is OFF.
 - Steering wheel is in the straight-ahead position, etc.



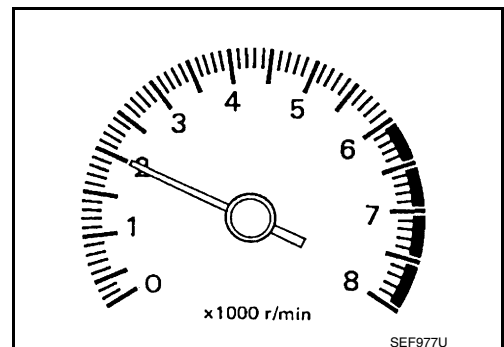
4. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
Check that engine stays below 1,000 rpm.



5. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.
6. Check that no DTC is displayed with CONSULT or GST.

Are any DTCs detected?

- YES >> GO TO 2.
NO >> GO TO 3.



2.REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3

3.CHECK TARGET IDLE SPEED

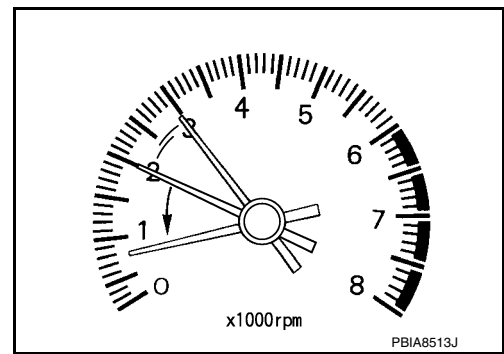
1. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.

BASIC INSPECTION

[VK56DE]

< BASIC INSPECTION >

- Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.
- Check idle speed.
For procedure, refer to [EC-899, "Inspection"](#).
For specification, refer to [EC-905, "Idle Speed"](#).



Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 4.

4.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform [EC-590, "Description"](#).

>> GO TO 5.

5.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-591, "Description"](#).

>> GO TO 6.

6.PERFORM IDLE AIR VOLUME LEARNING

Perform [EC-592, "Description"](#).

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 7.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

7.CHECK IDLE SPEED AGAIN

- Start engine and warm it up to normal operating temperature.
- Check idle speed.
For procedure, refer to [EC-899, "Inspection"](#).
For specification, refer to [EC-905, "Idle Speed"](#).

Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the Following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-734, "Diagnosis Procedure"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-731, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 9.
NO >> Repair or replace malfunctioning part. Then GO TO 4.

9.CHECK ECM FUNCTION

- Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
- Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [SEC-40, "ECM RE-COMMUNICATING FUNCTION : Special Repair Requirement"](#).

>> GO TO 4.

10.CHECK IGNITION TIMING

- Run engine at idle.
- Check ignition timing with a timing light.
For procedure, refer to [EC-900, "Inspection"](#).

BASIC INSPECTION

[VK56DE]

< BASIC INSPECTION >

For specification, refer to [EC-905, "Ignition Timing"](#).

Is the inspection result normal?

- YES >> GO TO 19.
NO >> GO TO 11.

11.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform [EC-590, "Description"](#).

>> GO TO 12.

12.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform [EC-591, "Description"](#).

>> GO TO 13.

13.PERFORM IDLE AIR VOLUME LEARNING

Perform [EC-592, "Description"](#).

Is Idle Air Volume Learning carried out successfully?

- YES >> GO TO 14.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

14.CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
For procedure, refer to [EC-899, "Inspection"](#).
For specification, refer to [EC-905, "Idle Speed"](#).

Is the inspection result normal?

- YES >> GO TO 15.
NO >> GO TO 17.

15.CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
For procedure, refer to [EC-900, "Inspection"](#).
For specification, refer to [EC-905, "Ignition Timing"](#).

Is the inspection result normal?

- YES >> GO TO 19.
NO >> GO TO 16.

16.CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to [EM-194, "Removal and Installation"](#).

Is the inspection result normal?

- YES >> GO TO 17.
NO >> Repair the timing chain installation. Then GO TO 4.

17.DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to [EC-734, "Diagnosis Procedure"](#).
- Check crankshaft position sensor (POS) and circuit. Refer to [EC-731, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 18.
NO >> Repair or replace malfunctioning part. Then GO TO 4.

18.CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)

BASIC INSPECTION

< BASIC INSPECTION >

[VK56DE]

2. Perform initialization of NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to [EC-588, "Description"](#).

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>> GO TO 4.

19.INSPECTION END

EC

If ECM is replaced during this BASIC INSPECTION procedure, perform [EC-588, "Description"](#).

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>> INSPECTION END

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ADDITIONAL SERVICE WHEN REPLACING ECM

< BASIC INSPECTION >

[VK56DE]

ADDITIONAL SERVICE WHEN REPLACING ECM

Description

INFOID:000000012524651

When replacing ECM, the following procedure must be performed. (For details, refer to [EC-588, "Work Procedure."](#))

PROGRAMMING OPERATION

NOTE:

After replacing with a blank ECM, programming is required to write ECM information. Be sure to follow the procedure to perform the programming.

Work Procedure

INFOID:000000012524652

1. SAVE ECM DATA

Ⓟ With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Select "SAVING DATA FOR REPLC CPU" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.
5. Follow the instruction of CONSULT display.

NOTE:

- Necessary data in ECM is copied and saved to CONSULT.
- Go to Step 2 regardless of with or without success in saving data.

>> GO TO 2.

2. CHECK ECM PART NUMBER

Check ECM part number to see whether it is blank ECM or not.

NOTE:

- Part number of blank ECM is 23703 - xxxxxx.
- Check part number when ordering ECM or the one included in the label on the container box.

Is the ECM a blank ECM?

- YES >> GO TO 3.
NO >> GO TO 5.

3. SAVE ECM PART NUMBER

Read out the part number from the old ECM and save the number, following the programming instructions. Refer to CONSULT Operation Manual.

NOTE:

- The ECM part number is saved in CONSULT.
- Even when ECM part number is not saved in CONSULT, go to 4.

>> GO TO 4.

4. PERFORM ECM PROGRAMMING

After replacing ECM, perform the ECM programming. Refer to CONSULT Operation Manual.

NOTE:

- Refer to [EC-904, "Removal and Installation"](#) for replacement of ECM.
- During programming, maintain the following conditions:
 - Ignition switch: ON
 - Electric load: OFF
 - Brake pedal: Not depressed
 - Battery voltage: 12 – 13.5 V (Be sure to check the value of battery voltage by selecting "BATTERY VOLT" in "Data monitor" of CONSULT.)

>> GO TO 6.

5. REPLACE ECM

ADDITIONAL SERVICE WHEN REPLACING ECM

[VK56DE]

< BASIC INSPECTION >

Replace ECM. Refer to [EC-904. "Removal and Installation"](#).

>> GO TO 6.

6.PERFORM INITIALIZATION OF IVIS (NATS) SYSTEM AND REGISTRATION OF ALL IVIS (NATS) IGNITION KEY IDS

Refer to [SEC-40. "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement"](#).

>> GO TO 7.

7.CHECK ECM DATA STATUS

Check if the data is successfully copied from the ECM at Step 1 (before replacement) and saved in CONSULT.
Is the data saved successfully?

YES >> GO TO 8.

NO >> GO TO 9.

8.WRITE ECM DATA

ⓂWith CONSULT

1. Select "WRITING DATA FOR REPLC CPU" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.

2. Follow the instruction of CONSULT display.

NOTE:

The data saved by "SAVING DATA FOR REPLC CPU" is written to ECM.

>> GO TO 10.

9.PERFORM VIN REGISTRATION

Refer to [EC-595. "Description"](#).

>> GO TO 10.

10.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to [EC-590. "Description"](#).

>> GO TO 11.

11.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to [EC-591. "Description"](#).

>> GO TO 12.

12.PERFORM IDLE AIR VOLUME LEARNING

Refer to [EC-592. "Description"](#).

>> END

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ACCELERATOR PEDAL RELEASED POSITION LEARNING

< BASIC INSPECTION >

[VK56DE]

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description

INFOID:000000012524653

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected. (For details, refer to [EC-590, "Work Procedure"](#).)

Work Procedure

INFOID:000000012524654

1. START

1. Check that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.

>> END

THROTTLE VALVE CLOSED POSITION LEARNING

< BASIC INSPECTION >

[VK56DE]

THROTTLE VALVE CLOSED POSITION LEARNING

Description

INFOID:000000012524655

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time the harness connector of the electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned. (For details, refer to [EC-591, "Work Procedure"](#).)

Work Procedure

INFOID:000000012524656

1. START

Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Select "CLSD THL POS LEARN" in "WORK SUPPORT" mode.
3. Follow the instructions on the CONSULT display.
4. Turn ignition switch OFF and wait at least 10 seconds.
Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

ⓧ Without CONSULT

1. Start the engine.
NOTE:
Engine coolant temperature is 25°C (77°F) or less before engine starts.
2. Warm up the engine.
NOTE:
Raise engine coolant temperature until it reaches 65°C (149°F) or more.
3. Turn ignition switch OFF and wait at least 10 seconds.
Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

>> END

IDLE AIR VOLUME LEARNING

Description

INFOID:000000012524657

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within the specific range. It must be performed under the following conditions:

- Each time the electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of the specification.

(For details, refer to [EC-592, "Work Procedure"](#).)

Work Procedure

INFOID:000000012524658

1. PRECONDITIONING

Check that all of the following conditions are satisfied.

Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- Selector lever position: P or N
- Electric load switch: OFF

(Air conditioner, head lamp, rear window defogger)

On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the head lamp will not illuminate.

- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up

- With CONSULT: Drive vehicle until "ATF TEMP SEN" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9 V.

- Without CONSULT: Drive vehicle for 10 minutes.

Will CONSULT be used?

YES >> GO TO 2.

NO >> GO TO 3.

2. PERFORM IDLE AIR VOLUME LEARNING

With CONSULT

1. Perform [EC-590, "Description"](#).
2. Perform [EC-591, "Description"](#).
3. Start engine and warm it up to normal operating temperature.
4. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
5. Touch "START" and wait 20 seconds.

Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> GO TO 5.

3. PERFORM IDLE AIR VOLUME LEARNING

Without CONSULT

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.

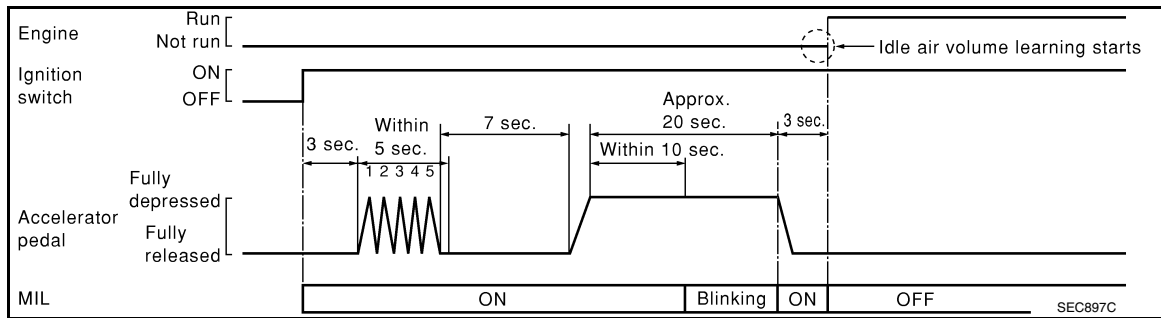
1. Perform [EC-590, "Description"](#).
2. Perform [EC-591, "Description"](#).
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly 5 times within 5 seconds.
 - Fully depress the accelerator pedal.
 - Fully release the accelerator pedal.
7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and turns ON.

IDLE AIR VOLUME LEARNING

[VK56DE]

< BASIC INSPECTION >

8. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.
9. Start engine and let it idle.
10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine 2 or 3 times and check that idle speed and ignition timing are within the specifications. For procedure, refer to [EC-899. "Inspection"](#) and [EC-900. "Inspection"](#). For specifications, refer to [EC-905. "Idle Speed"](#) and [EC-905. "Ignition Timing"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART-I

Check the following

- Check that throttle valve is fully closed.
- Check PCV valve operation.
- Check that downstream of throttle valve is free from air leakage.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace malfunctioning part.

6. DETECT MALFUNCTIONING PART-II

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.

It is useful to perform "TROUBLE DIAGNOSIS - SPECIFICATION VALUE". Refer to [EC-610. "Description"](#).

If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:

- Engine stalls.
- Incorrect idle.

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

< BASIC INSPECTION >

[VK56DE]

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description

INFOID:000000012524659

This describes show to erase the mixture ratio self-learning value. (For details, refer to [EC-594, "Work Procedure."](#))

Work Procedure

INFOID:000000012524660

1.START

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT.
3. Clear mixture ratio self-learning value by touching "CLEAR".

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Select Service \$03 with GST. Check that DTC P0102 is detected.
7. Select Service \$04 with GST to erase the DTC P0102.

>> END

VIN REGISTRATION

< BASIC INSPECTION >

[VK56DE]

VIN REGISTRATION

Description

INFOID:0000000012524661

VIN Registration is an operation to register VIN in ECM. It must be performed each time ECM is replaced. (For details, refer to [EC-595, "Work Procedure"](#).)

NOTE:

Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

Work Procedure

INFOID:0000000012524662

1. CHECK VIN

Check the VIN of the vehicle and note it. Refer to [GI-24, "Identification Number"](#).

>> GO TO 2.

2. PERFORM VIN REGISTRATION

With CONSULT

1. Turn ignition switch ON with engine stopped.
2. Select "VIN REGISTRATION" in "WORK SUPPORT" mode.
3. Follow the instructions on the CONSULT display.

>> END

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FUEL PRESSURE

Work Procedure

INFOID:000000012524663

FUEL PRESSURE RELEASE

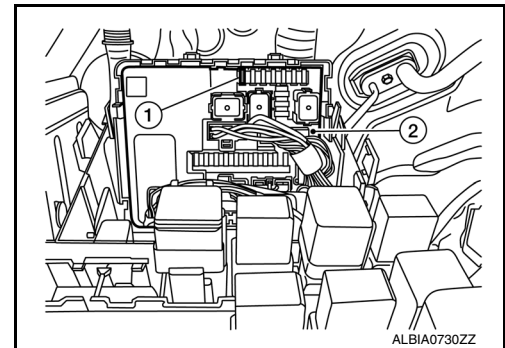
1. FUEL PRESSURE RELEASE

Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode of "ENGINE" using CONSULT.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.

ⓧ Without CONSULT

1. Remove fuel pump fuse (1) located in IPDM E/R (2). Refer to [PCS-25, "Removal and Installation"](#).
2. Start engine.
3. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.



>> END

FUEL PRESSURE CHECK

CAUTION:

- Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.
- Be careful not to scratch or get the fuel hose connection area dirty when servicing, so that the quick connector o-ring maintains sealability.
- Use Fuel Pressure Gauge Kit [— (J-44321)] and Fuel Pressure Adapter [— (J-44321-6)] to check fuel pressure.
- Do not perform fuel pressure check with electrical system operating (i.e. lights, rear defog, A/C, etc.). Fuel pressure gauge may indicate false readings due to varying engine loads and changes in manifold vacuum.
- Before disconnecting Fuel Pressure Gauge Kit [— (J-44321)] and Fuel Pressure Adapter [— (J-44321-6)], release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because this models do not have fuel return system.

1. FUEL PRESSURE CHECK

1. Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
2. Remove engine cover. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Remove fuel hose using Quick Connector Release [— (J-45488)]. Refer to [EM-181, "Removal and Installation"](#).

CAUTION:

- Do not twist or kink fuel hose because it is plastic hose.
- Do not remove fuel hose from quick connector.
- Keep fuel hose connections clean.

FUEL PRESSURE

[VK56DE]

< BASIC INSPECTION >

4. Install Fuel Pressure Adapter [— (J-44321-6)] and Fuel Pressure Gauge kit [— (J-44321)] as shown in figure.

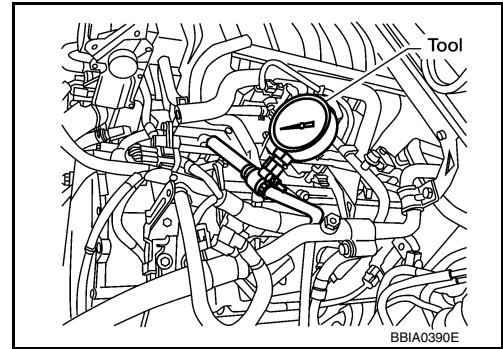
CAUTION:

- Do not distort or bend fuel rail tube when installing fuel pressure gauge adapter.
- When reconnecting fuel hose, check the original fuel hose for damage and abnormality.

5. Turn ignition switch ON (reactivate fuel pump), and check for fuel leakage.
6. Start engine and check for fuel leakage.
7. Read the indication of fuel pressure gauge.

CAUTION:

During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.



At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

- YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK FUEL HOSES

Check the following.

- Fuel hoses and fuel tubes for clogging
- Fuel filter for clogging
- Fuel pump
- Fuel pressure regulator for clogging

Is the inspection result normal?

- YES >> Replace fuel pressure regulator. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
- NO >> Repair or replace error-detected parts.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

HOW TO SET SRT CODE

Description

INFOID:000000012524664

OUTLINE

In order to set all SRTs, the self-diagnoses as in the "SRT ITEM" table must have been performed at least once. Each diagnosis may require actual driving for a long period of time under various conditions.

SRT ITEM

The table below shows required self-diagnostic items to set the SRT to "CMPLT".

| SRT item* (CONSULT indication) | Required self-diagnostic items to set the SRT to "CMPLT" | Corresponding DTC No. |
|-----------------------------------|--|--|
| CATALYST | Three way catalyst function | P0420, P0430 |
| EVAP SYSTEM | EVAP control system purge flow monitoring | P0441 |
| | EVAP control system | P0456 |
| HO2S | Air fuel ratio (A/F) sensor 1 | P014C, P014D P014E, P014F P015A, P015B P015C, P015D |
| | Heated oxygen sensor 2 | P0137, P0157 |
| | Heated oxygen sensor 2 | P0138, P0158 |
| | Heated oxygen sensor 2 | P0139, P0159 |
| EGR/VVT SYSTEM | Intake valve timing control function | P0011, P0021 |

*: Though displayed on the CONSULT screen, "HO2S HTR" is not SRT item.

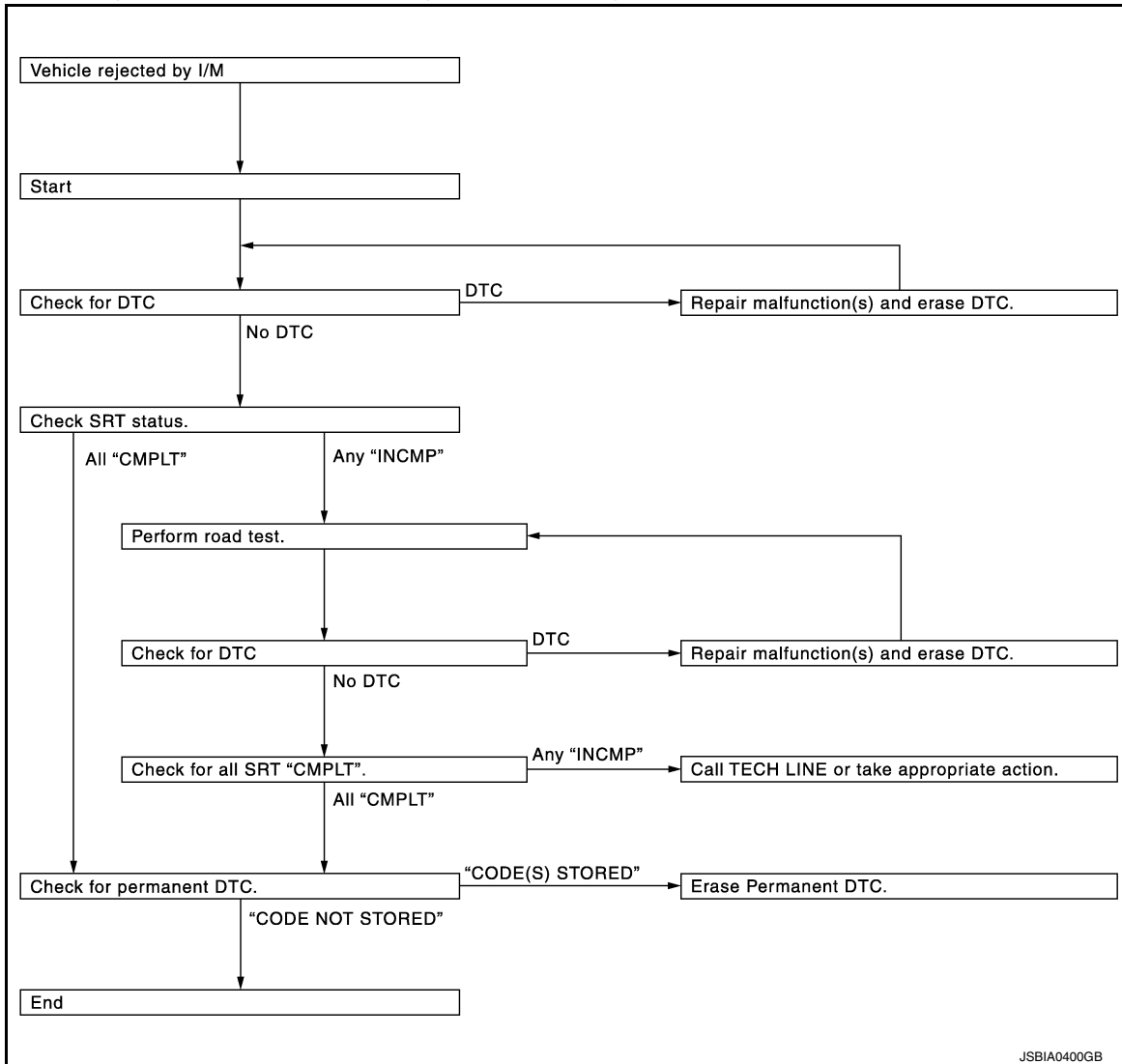
SRT SERVICE PROCEDURE

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence, referring to the following flowchart.



SRT Set Driving Pattern

INFOID:000000012524665

CAUTION:

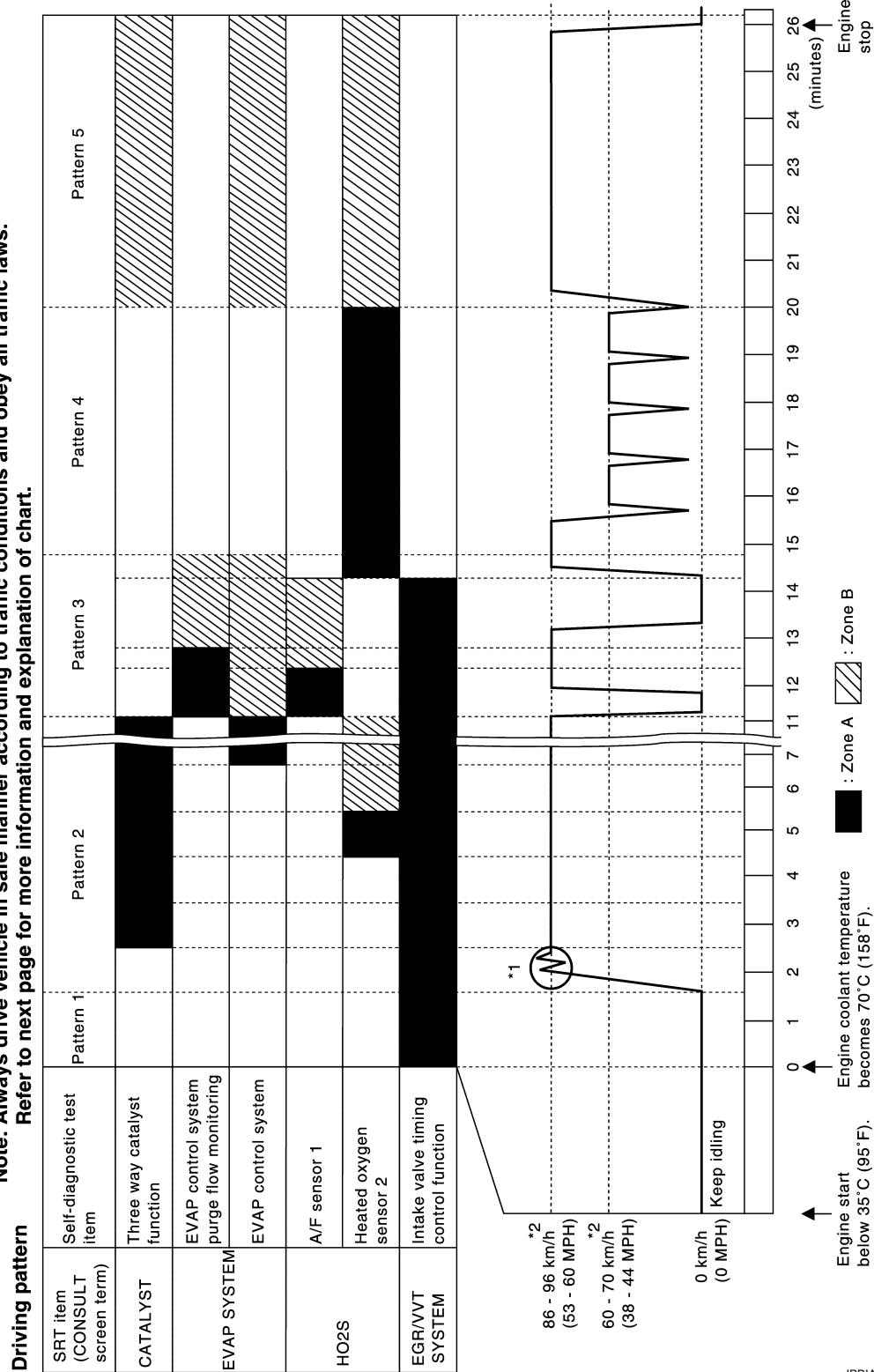
HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.

Note: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws. Refer to next page for more information and explanation of chart.



JPBIA5322GB

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

*2: Checking the vehicle speed with GST is advised.

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
- "Zone A" is the fastest time where required for the diagnosis under normal conditions*. If the diagnosis is not completed within "Zone A", the diagnosis can still be performed within "Zone B".

HOW TO SET SRT CODE

[VK56DE]

< BASIC INSPECTION >

- *: Normal conditions
- Sea level
- Flat road
- Ambient air temperature: 20 – 30°C (68 – 86°F)

NOTE:

Diagnosis is performed as quickly as possible under normal conditions. However, under other conditions, diagnosis may also be performed. [For example: ambient air temperature other than 20 – 30°C (68 – 86°F)]

Work Procedure

INFOID:000000012524666

1.CHECK DTC

Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-545, "DTC Index"](#).
- NO >> GO TO 2.

2.CHECK SRT STATUS

With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

Without CONSULT

Perform "SRT status" mode with [EC-515, "On Board Diagnosis Function"](#).

With GST

Select Service \$01 with GST.

Is SRT code(s) set?

- YES >> GO TO 10.
- NO-1 >> With CONSULT: GO TO 3.
- NO-2 >> Without CONSULT: GO TO 4.

3.DTC CONFIRMATION PROCEDURE

1. Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT.
2. For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" according to the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-598, "Description"](#).
3. Check DTC.

Is any DTC detected?

- YES >> Repair malfunction(s) and erase DTC. Refer to [EC-545, "DTC Index"](#).
- NO >> GO TO 10.

4.PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to [EC-598, "Description"](#).
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to [EC-599, "SRT Set Driving Pattern"](#).

In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

1. Check the vehicle condition;
 - Engine coolant temperature is –10 to 35°C (14 to 95°F).
 - Fuel tank temperature is more than 0°C (32°F).
2. Start the engine.
3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:

ECM terminal voltage is follows;

- Engine coolant temperature
 - –10 to 35°C (14 to 95°F): 3.0 – 4.3 V
 - 70°(158°F): Less than 4.1 V
- Fuel tank temperature: Less than 1.4 V

Refer to [EC-529, "Reference Value"](#).

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

>> GO TO 6.

6.PATTERN 2

1. Drive the vehicle. And depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds.
2. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

NOTE:

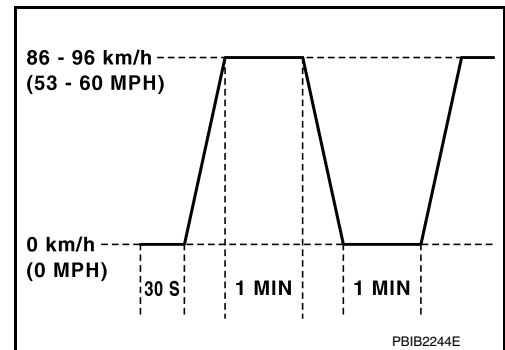
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

7.PATTERN 3

- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).

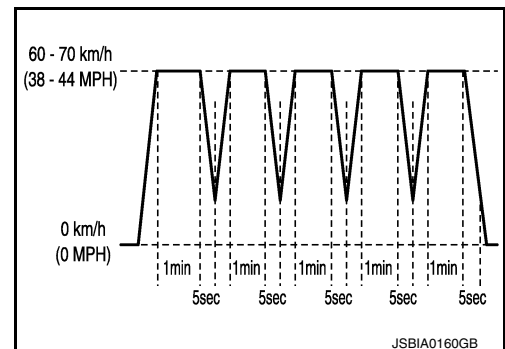
>> GO TO 8.



8.PATTERN 4

- Operate vehicle, following the driving pattern shown in the figure.
- Drive the vehicle in a proper gear at 60 km/h (38 MPH) and maintain the speed.
- Release the accelerator pedal fully at least 5 seconds.
- Repeat the above two steps at least 5 times.

>> GO TO 9.



9.PATTERN 4

- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted again.

>> GO TO 10.

10.CHECK SRT STATUS

With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

Without CONSULT

Perform "SRT status" mode with [EC-515, "On Board Diagnosis Function"](#).

With GST

Select Service \$01 with GST.

Is SRT(s) set?

YES >> GO TO 11.

NO >> Call TECH LINE or take appropriate action.

HOW TO SET SRT CODE

< BASIC INSPECTION >

[VK56DE]

11.CHECK PERMANENT DTC

NOTE:

Permanent DTC cannot be checked with a tool other than CONSULT or GST.

 With CONSULT

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT.

 With GST

Select Service \$0A with GST.

Is permanent DTC(s) detected?

YES >> Go to [EC-604. "Description"](#).

NO >> END

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HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

[VK56DE]

HOW TO ERASE PERMANENT DTC

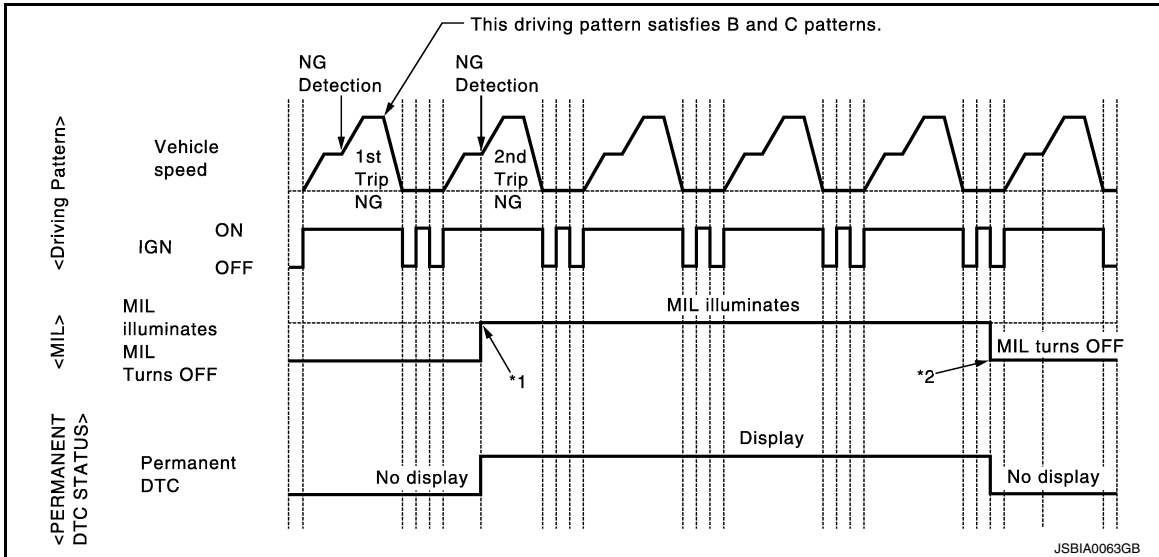
Description

INFOID:000000012524667

OUTLINE

When a DTC is stored in ECM

When a DTC is stored in ECM and MIL is ON, a permanent DTC is erased with MIL shutoff if the same malfunction is not detected after performing the driving pattern for MIL shutoff three times in a row.



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: MIL will turn off after vehicle is driven 3 times (driving pattern B) without any malfunctions.

When a DTC is not stored in ECM

The erasing method depends on a permanent DTC stored in ECM. Refer to the following table.

NOTE:

If the applicable permanent DTC includes multiple groups, perform the procedure of Group B first. If the permanent DTC is not erased, perform the procedure of Group A.

×: Applicable —: Not applicable

| Group * | Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs. | Driving pattern | | Reference |
|---------|---|-----------------|---|--|
| | | B | D | |
| A | × | — | — | EC-605. "Work Procedure (Group A)" |
| B | — | × | × | EC-607. "Work Procedure (Group B)" |

*: For group, refer to [EC-545. "DTC Index"](#).

PERMANENT DTC ITEM

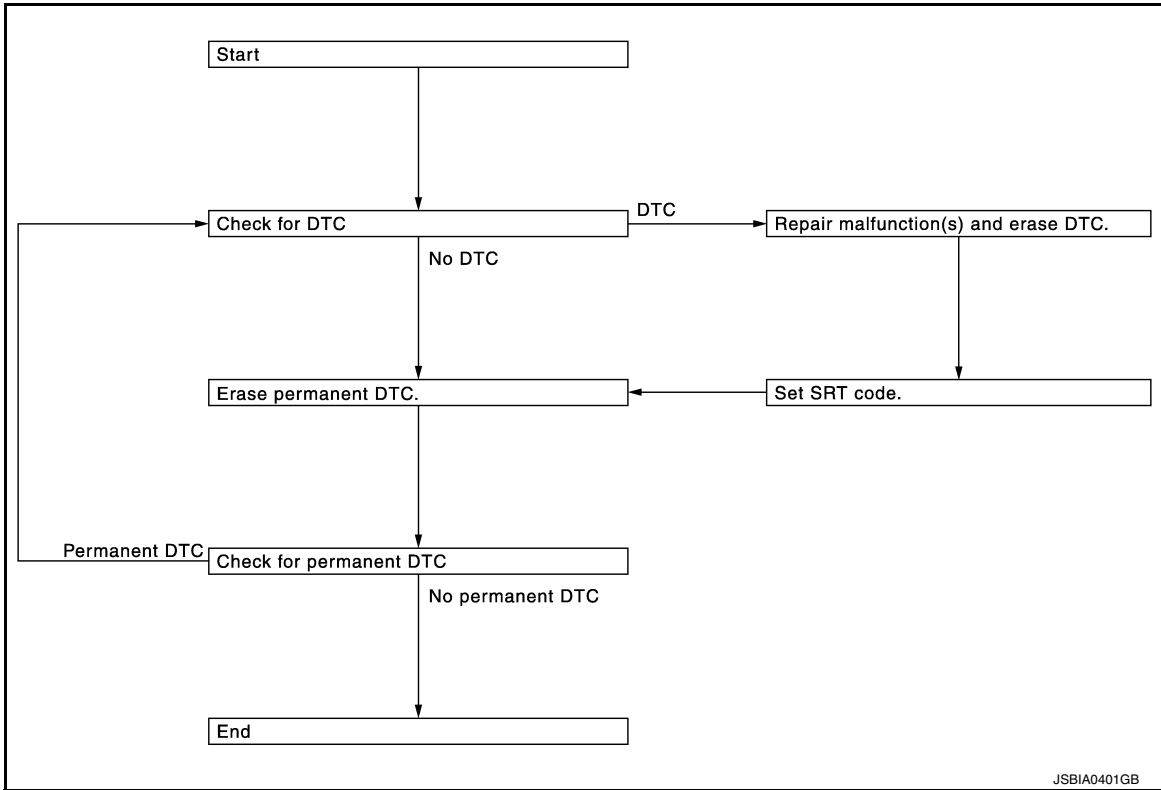
For permanent DTC items, MIL turns ON. Refer to [EC-545. "DTC Index"](#).

HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

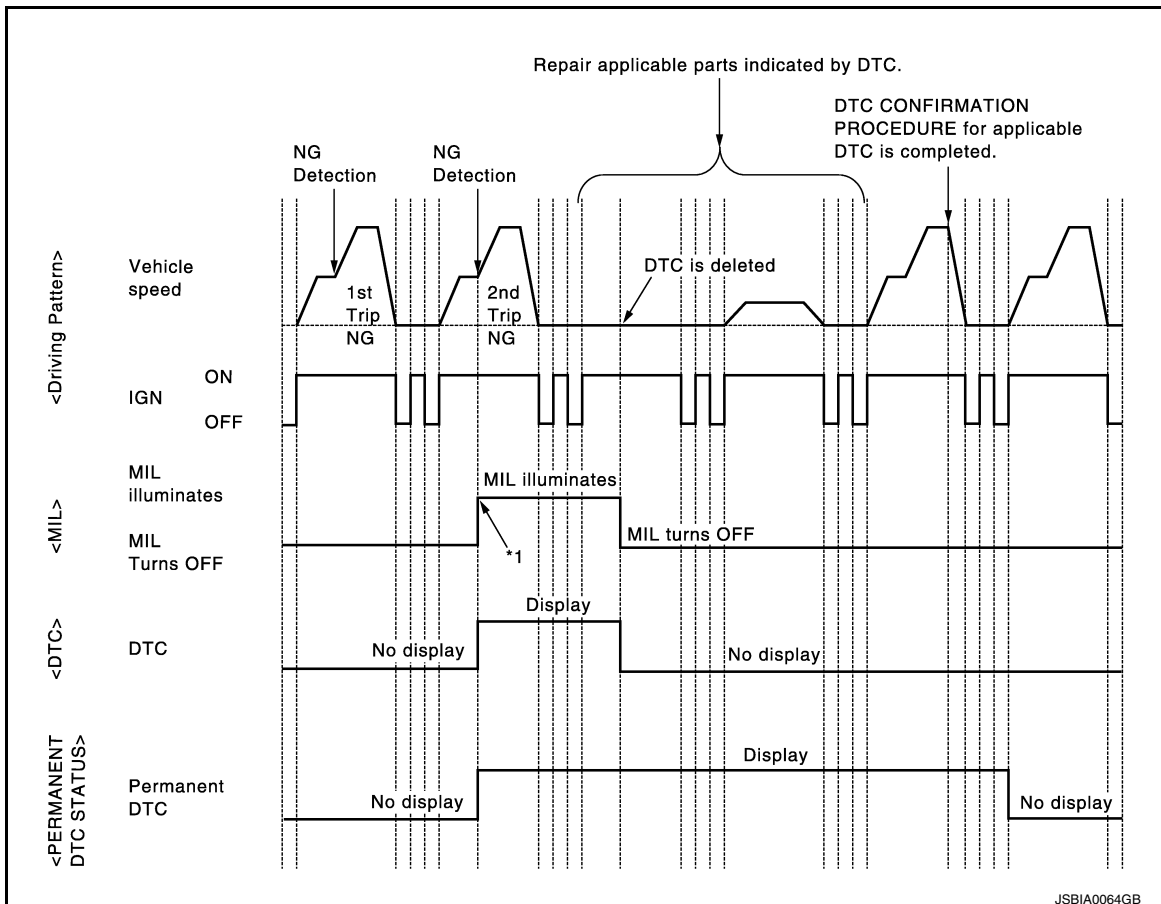
[VK56DE]

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:000000012524668



HOW TO ERASE PERMANENT DTC

[VK56DE]

< BASIC INSPECTION >

*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

1. CHECK DTC


Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-515, "On Board Diagnosis Function"](#) or [EC-518, "CONSULT Function"](#).

NO >> GO TO 2.

2. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

3. PERFORM DTC CONFIRMATION PROCEDURE

Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in ECM. Refer to [EC-545, "DTC Index"](#).

>> GO TO 4.

4. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

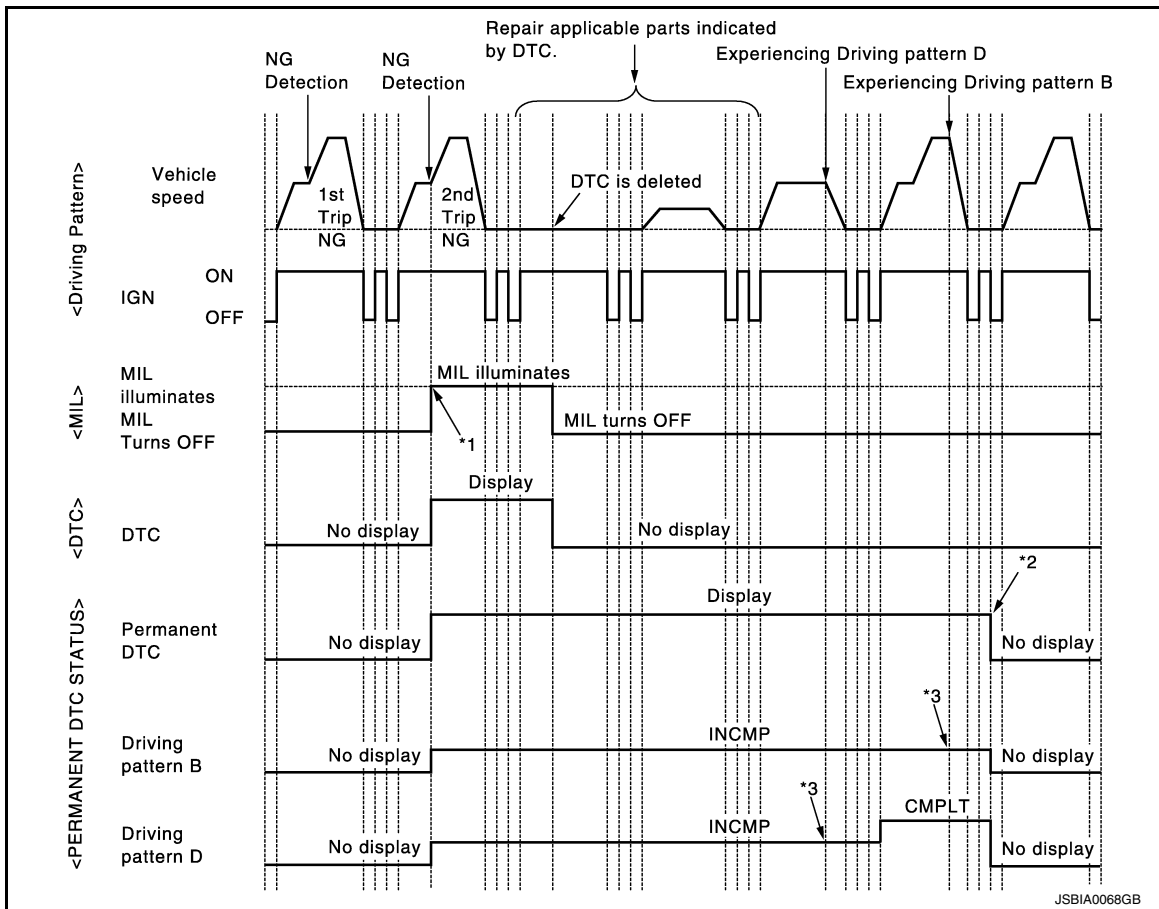
HOW TO ERASE PERMANENT DTC

< BASIC INSPECTION >

[VK56DE]

Work Procedure (Group B)

INFOID:000000012524669



*1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.

*2: After experiencing driving pattern B and D, permanent DTC is erased.

*3: Indication does not change unless the ignition switch is turned from ON to OFF twice even after experiencing driving pattern B or D.

NOTE:

- Drive the vehicle according to only driving patterns indicating "INCMP" in driving patterns B and D on the "PERMANENT DTC STATUS" screen.
- When experiencing both driving pattern B and D during the same trip, the experience of driving pattern D is counted by priority.

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to [EC-515, "On Board Diagnosis Function"](#) or [EC-518, "CONSULT Function"](#).

NO >> GO TO 2.

2. CHECK PERMANENT DTC

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

With GST

1. Turn ignition switch OFF and wait at least 10 seconds.

HOW TO ERASE PERMANENT DTC

[VK56DE]

< BASIC INSPECTION >

2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service \$0A with GST.

Is any permanent DTC detected?

- YES >> GO TO 3.
NO >> END

3. DRIVE DRIVING PATTERN D

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.
- If self-diagnosis results are erased during the trip of driving pattern B or D, an experience of driving pattern B and D during the same trip is not counted up.

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle according to driving pattern D. Refer to [EC-512. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 4.

4. DRIVE DRIVING PATTERN B

CAUTION:

- Always drive at a safe speed.
- Never erase self-diagnosis results.
- If self-diagnosis results are erased during the trip of driving pattern B or D, the counter of driving pattern B and D is reset.
- If self-diagnosis results are erased during the trip of driving pattern B or D, an experience of driving pattern B and D during the same trip is not counted up.

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Use "PERMANENT DTC WORK SUPPORT" mode with CONSULT to drive the vehicle according to driving pattern B. Refer to [EC-512. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

 With GST


1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Drive the vehicle according to driving pattern B. Refer to [EC-512. "DIAGNOSIS DESCRIPTION : Driving Pattern"](#).

>> GO TO 5.

5. CHECK PERMANENT DTC

 With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select "PERMANENT DTC STATUS" mode with CONSULT.

 With GST

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.

HOW TO ERASE PERMANENT DTC

[VK56DE]

< BASIC INSPECTION >

5. Select Service \$0A with GST.

Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

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DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000012524670

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" in "DATA MONITOR" mode of CONSULT during normal operation of the Engine Control System. When the value in "SPEC" in "DATA MONITOR" mode is within the SP value, the Engine Control System is confirmed OK. When the value in "SPEC" in "DATA MONITOR" mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.

The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Component Function Check

INFOID:0000000012524671

1. START

Check that all of the following conditions are satisfied.

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm², 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle until "ATF TEMP SE 1" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle

>> GO TO 2.

2. PERFORM "SPEC" OF "DATA MONITOR" MODE

With CONSULT

NOTE:

Perform "SPEC" in "DATA MONITOR" mode in maximum scale display.

1. Perform "[EC-584. "Work Procedure"](#)".
2. Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2" and "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode with CONSULT.
3. Check that monitor items are within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Proceed to [EC-611. "Diagnosis Procedure"](#).

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

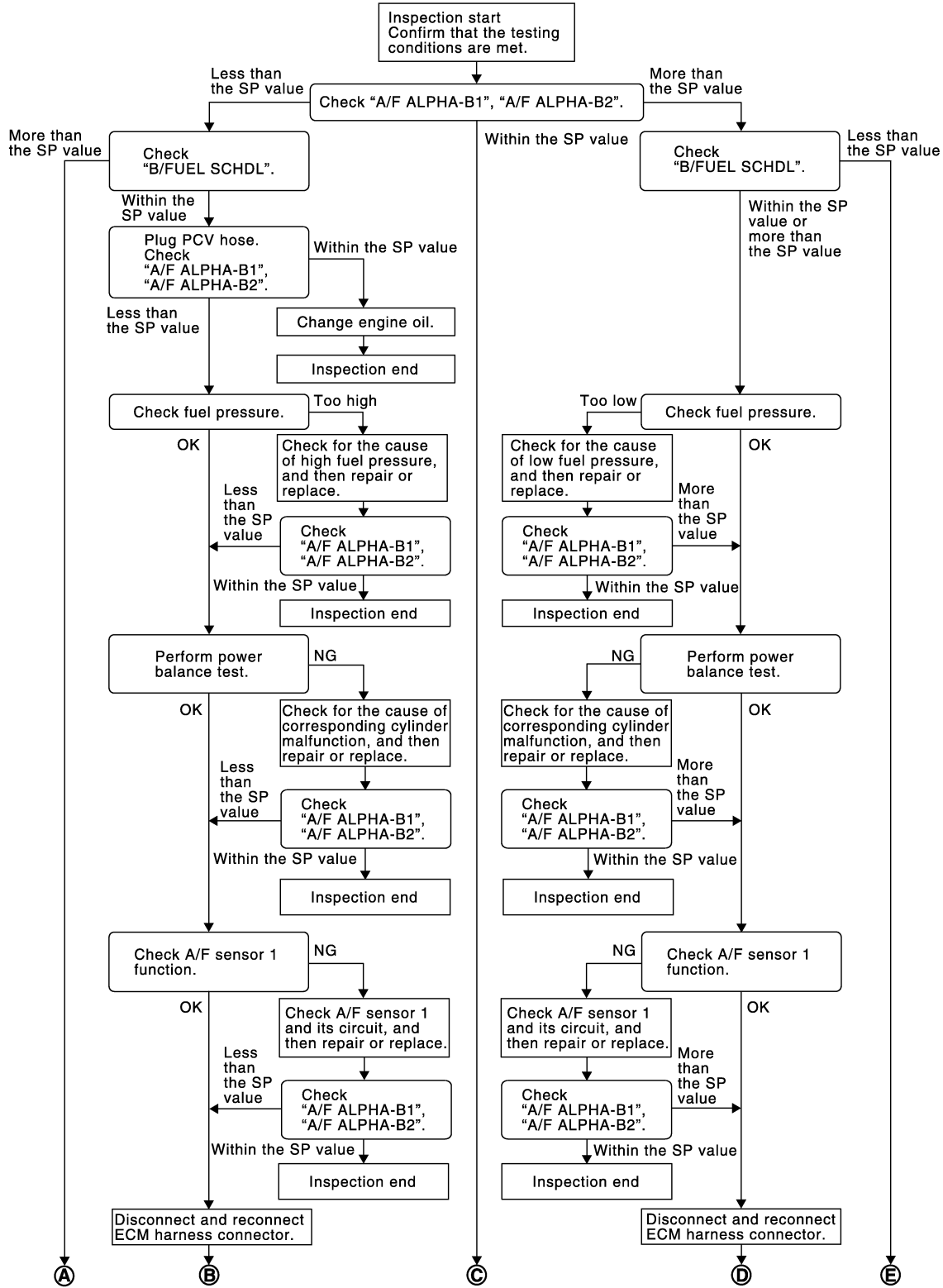
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Diagnosis Procedure

INFOID:000000012524672

OVERALL SEQUENCE

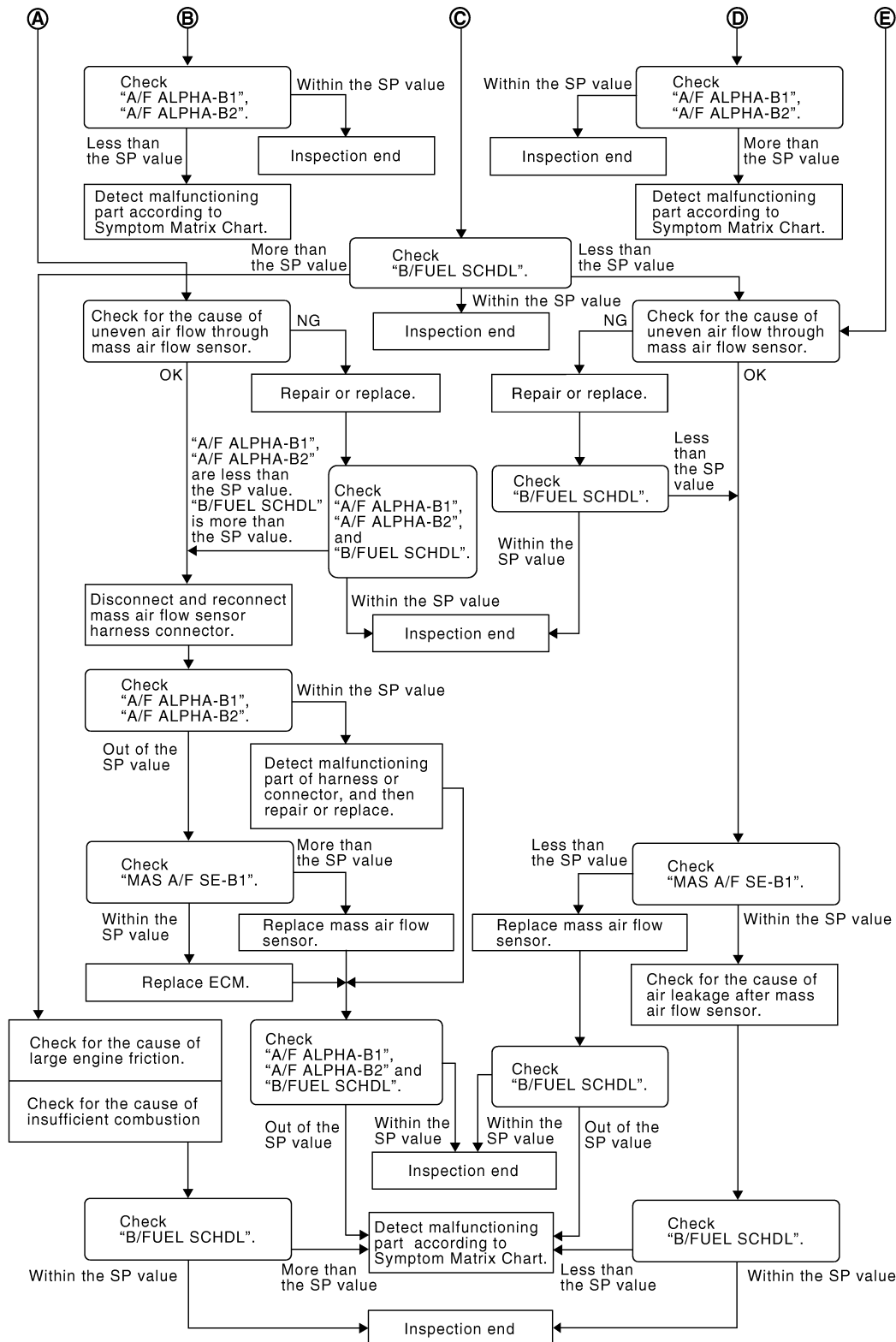


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TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]



PBIB3214E

DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

ⓑ With CONSULT

1. Start engine.
2. Confirm that the testing conditions are met. Refer to [EC-610, "Component Function Check"](#).
3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

NOTE:

Check "A/F ALPHA-B1", "A/F ALPHA-B2" for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

YES >> GO TO 17.

NO-1 >> Less than the SP value: GO TO 2.

NO-2 >> More than the SP value: GO TO 3.

2.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 4.

NO >> More than the SP value: GO TO 19.

3.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 6.

NO-1 >> More than the SP value: GO TO 6.

NO-2 >> Less than the SP value: GO TO 25.

4.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Stop the engine.

2. Disconnect PCV hose, and then plug it.

3. Start engine.

4. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 5.

NO >> GO TO 6.

5.CHANGE ENGINE OIL

1. Stop the engine.

2. Change engine oil.

NOTE:

This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving conditions.

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to [EC-596, "Work Procedure"](#).)

Is the inspection result normal?

YES >> GO TO 9.

NO-1 >> Fuel pressure is too high: Replace "fuel filter and fuel pump assembly", refer to [FL-11, "Removal and Installation"](#), and then GO TO 8.

NO-2 >> Fuel pressure is too low: GO TO 7.

7.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly", refer to [FL-11, "Removal and Installation"](#), and then GO TO 8.

NO >> Repair or replace malfunctioning part and then GO TO 8.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

8. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

- YES >> INSPECTION END
NO >> GO TO 9.

9. PERFORM POWER BALANCE TEST

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Check that the each cylinder produces a momentary engine speed drop.

Is the inspection result normal?

- YES >> GO TO 12.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following below.

- Ignition coil and its circuit (Refer to [EC-882, "Component Function Check"](#).)
- Fuel injector and its circuit (Refer to [EC-877, "Component Function Check"](#).)
- Intake air leakage
- Low compression pressure (Refer to [EM-163, "Checking Compression Pressure"](#).)

Is the inspection result normal?

- YES >> Replace fuel injector, refer to [EM-181, "Exploded View"](#), and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.

11. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

- YES >> INSPECTION END
NO >> GO TO 12.

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.

- For DTC P0130, P0150, refer to [EC-669, "DTC Logic"](#).
- For DTC P0131, P0151, refer to [EC-673, "DTC Logic"](#).
- For DTC P0132, P0152, refer to [EC-676, "DTC Logic"](#).
- For DTC P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, refer to [EC-699, "DTC Logic"](#).
- For DTC P2096, P2097, P2098, P2099, refer to [EC-834, "DTC Logic"](#).

Are any DTCs detected?

- YES >> GO TO 15.
NO >> GO TO 13.

13. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnostic Procedure according to corresponding DTC.

>> GO TO 14.

14. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

- YES >> INSPECTION END
NO >> GO TO 15.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.

>> GO TO 16.

16. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to [EC-894. "Symptom Table"](#).

17. CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO-1 >> More than the SP value: GO TO 18.

NO-2 >> Less than the SP value: GO TO 25.

18. DETECT MALFUNCTIONING PART

1. Check for the cause of large engine friction. Refer to the following.
 - Engine oil level is too high
 - Engine oil viscosity
 - Belt tension of power steering, alternator, A/C compressor, etc. is excessive
 - Noise from engine
 - Noise from transmission, etc.
2. Check for the cause of insufficient combustion. Refer to the following.
 - Valve clearance malfunction
 - Intake valve timing control function malfunction
 - Camshaft sprocket installation malfunction, etc.

>> Repair or replace malfunctioning part, and then GO TO 30.

19. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

Is the inspection result normal?

YES >> GO TO 21.

NO >> Repair or replace malfunctioning part, and then GO TO 20.

20. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> "B/FUEL SCHDL" is more, "A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value: GO TO 21.

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

1. Stop the engine.

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect mass air flow sensor harness connector. Check pin terminal and connector for damage and then reconnect it again.

>> GO TO 22.

22.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

1. Start engine.
2. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to [EC-645, "Diagnosis Procedure"](#). Then GO TO 29.

NO >> GO TO 23.

23.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 24.

NO >> More than the SP value: Replace mass air flow sensor, refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#), and then GO TO 29.

24.REPLACE ECM

1. Replace ECM. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
2. Refer to [EC-588, "Description"](#).

>> GO TO 29.

25.CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal in air cleaner element
- Uneven dirt in air cleaner element
- Improper specification in intake air system

Is the inspection result normal?

YES >> GO TO 27.

NO >> Repair or replace malfunctioning part, and then GO TO 26.

26.CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Less than the SP value: GO TO 27.

27.CHECK "MAS A/F SE-B1"

Select "MAS A/F SE-B1" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 28.

NO >> Less than the SP value: Replace mass air flow sensor, refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#), and then GO TO 30.

28.CHECK INTAKE SYSTEM

Check for the cause of air leakage after the mass air flow sensor. Refer to the following.

- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Open stuck, breakage, hose disconnection, or cracks in PCV valve
- Disconnection or cracks in EVAP purge hose, stuck open EVAP canister purge volume control solenoid valve
- Malfunctioning seal in rocker cover gasket
- Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts
- Malfunctioning seal in intake air system, etc.

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>> GO TO 30.

29. CHECK "A/F ALPHA-B1", "A/F ALPHA-B2", AND "B/FUEL SCHDL"

C

Select "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

D

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to [EC-894. "Symptom Table"](#).

E

30. CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then check that the indication is within the SP value.

F

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Detect malfunctioning part according to [EC-894. "Symptom Table"](#).

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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:000000012524673

1.CHECK FUSE

Check that the following fuse is not blown.

| Location | Fuse No. | Capacity |
|------------------|----------|----------|
| FUSE BLOCK (J/B) | #12 | 10 A |
| IPDM E/R | #53 | 20 A |

Is the inspection result normal?

- YES >> Replace the fuse after repairing the applicable circuit. (If the replaced fuse is blown again, check the power supply circuit upstream of IPDM E/R or fuse box [J/B].)
 NO >> GO TO 2.

2.CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection E9. Refer to [GI-45, "Circuit Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair or replace ground connection.

3.CHECK ECM GROUND CIRCUIT

- Disconnect ECM harness connectors.
- Check the continuity between ECM harness connector and ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| F72 | 1 | Ground | Existed |
| E77 | 115 | | |
| | 116 | | |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Repair or replace error-detected parts.

4.CHECK ECM POWER SUPPLY (MAIN)-I

- Reconnect ECM harness connector.
- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals.

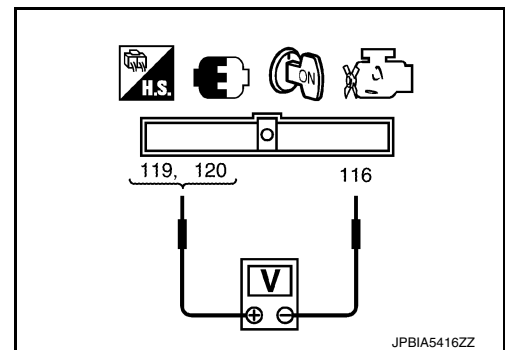
| Connector | ECM | | Voltage |
|-----------|----------|-----|-----------------|
| | + | - | |
| | Terminal | | |
| E77 | 119 | 116 | Battery voltage |
| | 120 | | |

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> GO TO 6.

5.CHECK ECM POWER SUPPLY (MAIN)-II

- Turn ignition switch OFF and wait at least 10 seconds.



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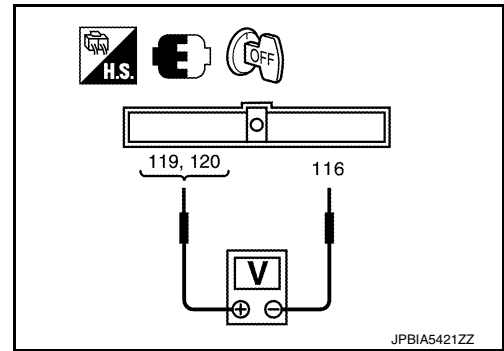
POWER SUPPLY AND GROUND CIRCUIT

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | Condition | Voltage (V) |
|-----------|----------|-----|---|-----------|-------------|
| Connector | Terminal | | | | |
| | + | - | | | |
| E77 | 119 | 116 | After turning ignition switch OFF, battery voltage will exist for a few seconds | Drop to 0 | |
| | 120 | | | | |



Is the inspection result normal?

- YES >> GO TO 9.
NO >> GO TO 7.

6.CHECK ECM POWER SUPPLY (MAIN) CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connectors.
- Disconnect IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 119 | E119 | 4 | Existed |
| | 120 | | | |

- Also check harness for short to ground.

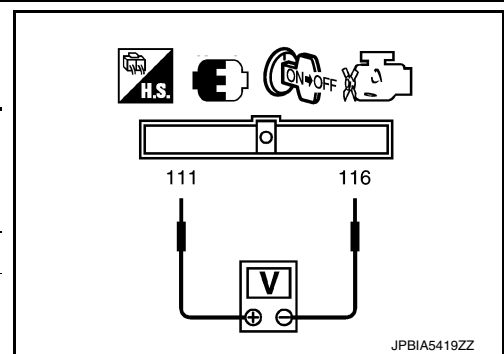
Is the inspection result normal?

- YES >> Perform the trouble diagnosis for IPDM E/R power supply circuit.
NO >> Repair or replace error-detected parts.

7.CHECK ECM RELAY CONTROL SIGNAL

Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | Condition | Voltage (V) |
|-----------|----------|-----------|----------|--|-----------------|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| E77 | 111 | E77 | 116 | Ignition switch ON | Approx. 0 |
| | | | | Turn ignition switch OFF and wait at least 10 seconds. | Battery voltage |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
NO >> GO TO 8.

8.CHECK ECM RELAY CONTROL SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 111 | E119 | 7 | Existed |

5. Also check harness for short to ground and to power.

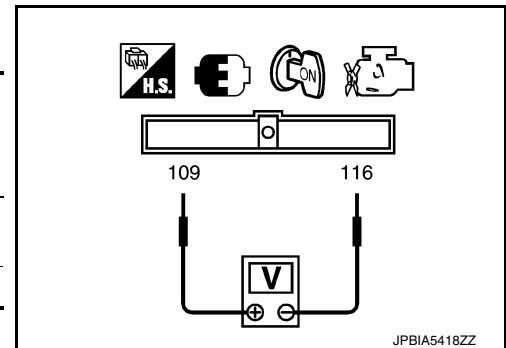
Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to [PCS-25. "Removal and Installation"](#).
- NO >> Repair or replace error-detected parts.

9. CHECK IGNITION SWITCH SIGNAL

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| Connector | ECM | | Condition | Voltage (V) |
|-----------|-----|-----|---------------------|-----------------|
| | + | - | | |
| Terminal | | | | |
| E77 | 109 | 116 | Ignition switch OFF | Approx. 0 |
| | | | Ignition switch ON | Battery voltage |



Is the inspection result normal?

- YES >> GO TO 11.
- NO >> GO TO 10.

10. CHECK IGNITION SWITCH SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect fuse block (J/B) harness connector.
4. Check the continuity between ECM harness connector and fuse block (J/B) harness connector.

| + | | - | | Continuity |
|-----------|----------|------------------|----------|------------|
| ECM | | FUSE BLOCK (J/B) | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 109 | E51 | 2T | Existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

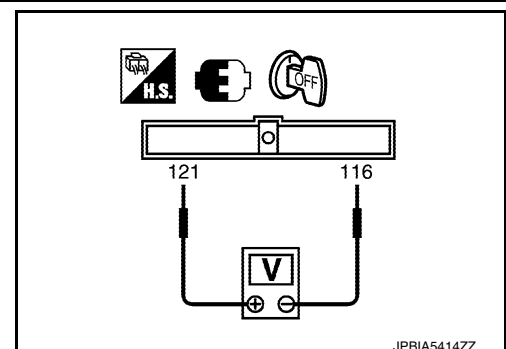
11. CHECK ECM POWER SUPPLY (BACK-UP)

Check the voltage between ECM harness connector terminals.

| ECM | | | | Voltage |
|-----------|----------|-----------|----------|-----------------|
| + | | - | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 121 | E77 | 116 | Battery voltage |

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> GO TO 12.



12. CHECK ECM POWER SUPPLY (BACK-UP) CIRCUIT

POWER SUPPLY AND GROUND CIRCUIT

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 121 | E121 | 30 | Existed |

5. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for IPDM E/R power supply circuit.
NO >> Repair or replace error-detected parts.

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U0101 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

U0101 CAN COMM CIRCUIT

Description

INFOID:000000012524674

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

DTC Logic

INFOID:000000012524675

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| U0101 | LOST COMM (TCM) (Lost communication with TCM) | When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) with TCM for 2 seconds or more. | <ul style="list-style-type: none">• CAN communication line between TCM and ECM• CAN communication line open or shorted |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-622, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524676

Perform the trouble diagnosis for CAN communication system. Refer to [LAN-16, "Trouble Diagnosis Flow Chart"](#).

U1001 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

U1001 CAN COMM CIRCUIT

Description

INFOID:0000000012524677

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

DTC Logic

INFOID:0000000012524678

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| U1001 | CAN COMM CIRCUIT (CAN communication line) | When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more. | <ul style="list-style-type: none">Harness or connectors (CAN communication line is open or shorted) |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-623, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524679

Perform the trouble diagnosis for CAN communication system. Refer to [LAN-16, "Trouble Diagnosis Flow Chart"](#).

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0011, P0021 IVT CONTROL

DTC Logic

INFOID:000000012524680

DTC DETECTION LOGIC

NOTE:

- If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to [EC-636, "DTC Logic"](#).
- If DTC P0011 or P0021 is displayed with DTC P1140 or P1145, first perform the trouble diagnosis for DTC P1140, P1145. Refer to [EC-808, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | Detecting condition | Possible cause |
|---------|---|--|---|
| P0011 | INT/V TIM CONT-B1 [Intake valve timing control performance (bank 1)] | There is a gap between angle of target and phase-control angle degree. | <ul style="list-style-type: none"> • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Intake valve control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control |
| P0021 | INT/V TIM CONT-B2 [Intake valve timing control performance (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

1. Turn ignition switch ON and select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds. Hold the accelerator pedal as steady as possible.

| | |
|----------------|------------------------|
| ENG SPEED | 1200 - 2,000 rpm |
| COOLAN TEMP/S | More than 60°C (140°F) |
| Selector lever | P or N position |

4. Let engine idle for 10 seconds.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-625, "Diagnosis Procedure"](#)
 NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

1. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| | |
|------------------|---|
| ENG SPEED | 1,700 - 3,175 rpm (A constant rotation is maintained.) |
| COOLAN TEMP/S | More than 70°C (158°F) |
| Selector lever | 1st or 2nd position |
| Driving location | Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) |

CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-625, "Diagnosis Procedure"](#)
- NO >> INSPECTION END

Diagnosis Procedure

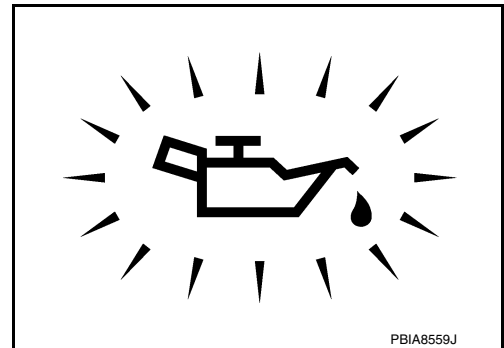
INFOID:000000012524681

1.CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check oil pressure warning lamp and confirm it is not illuminated.

Is oil pressure warning lamp illuminated?

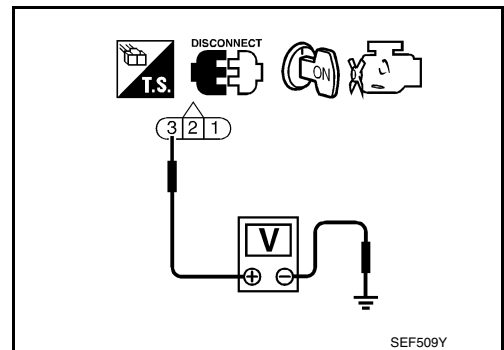
- YES >> Check the engine oil level. Refer to [LU-25, "Inspection"](#).
- NO >> GO TO 2.



2.CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control position sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between intake valve timing control position sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|--------------|----------|--------|-------------------|
| Connector | Terminal | | |
| F62 (Bank 1) | 3 | Ground | Battery voltage |
| F64 (Bank 2) | 3 | | |



Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between intake valve timing control position sensor harness connector and ground.

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | Continuity |
|---|----------|--------|------------|
| Intake valve timing control position sensor | | | |
| Connector | Terminal | Ground | Existed |
| F62 (Bank 1) | 1 | | |
| F64 (Bank 2) | 1 | | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between intake valve timing control position sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| Intake valve timing control position sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| F62 (Bank 1) | 2 | F72 | 72 | |
| F64 (Bank 2) | 2 | | 53 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

Check intake valve timing control position sensor. Refer to [EC-810, "Component Inspection \(Intake Valve Timing Control Position Sensor\)"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning intake valve timing control position sensor. Refer to [EM-186, "Intake Valve Timing Control Position Sensor \(LH\)"](#) or [EM-186, "Intake Valve Timing Control Position Sensor \(RH\)"](#).

6. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Disconnect intake valve timing control solenoid valve harness connectors.
2. Turn ignition switch ON.
3. Check the voltage between intake valve timing control solenoid valve harness connector and ground.

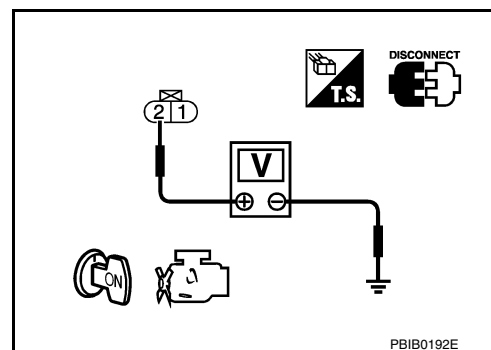
| + | | - | Voltage (Approx.) |
|--|----------|--------|-------------------|
| Intake valve timing control solenoid valve | | | |
| Connector | Terminal | Ground | Battery voltage |
| F61 (Bank 1) | 2 | | |
| F63 (Bank 2) | 2 | | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE INPUT SIGNAL CIRCUIT FOR OPEN AND



P0011, P0021 IVT CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

| + | | - | | Continuity |
|--|----------|-----------|----------|------------|
| Intake valve timing control solenoid valve | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F61 (Bank 1) | 1 | F72 | 10 | Existed |
| F63 (Bank 2) | 1 | | 11 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Check intake valve timing control solenoid valve. Refer to [EC-628, "Component Inspection \(Intake Valve Timing Control Solenoid Valve\)"](#).

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).

9.CHECK CRANKSHAFT POSITION SENSOR (POS)

Check crankshaft position sensor (POS). Refer to [EC-733, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace crankshaft position sensor (POS). Refer to [EM-230, "Exploded View"](#).

10.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Check camshaft position sensor (PHASE). Refer to [EC-736, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-187, "Camshaft Position Sensor \(PHASE\)"](#).

11.CHECK CAMSHAFT (INTAKE)

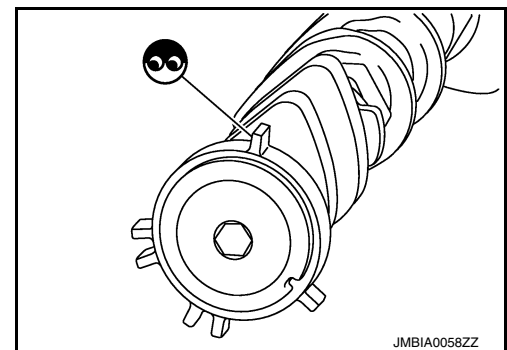
Check the following.

- Accumulation of debris on the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 12.

NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to [EM-200, "Exploded View"](#).



12.CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misalignment.

Are there any service records that may cause timing chain misalignment?

YES >> Check timing chain installation. Refer to [EM-194, "Removal and Installation"](#).

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 13.

13. CHECK LUBRICATION CIRCUIT

Check lubrication circuit. Refer to [LU-23, "Lubrication Circuit"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Clean lubrication line.

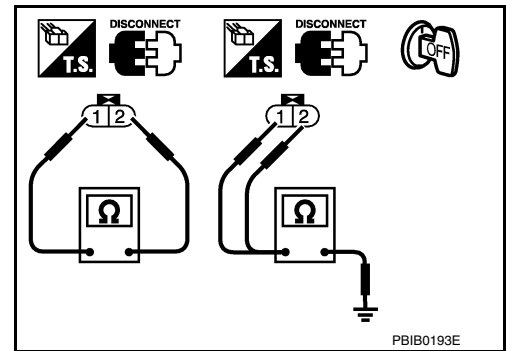
Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000012524682

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as per the following.

| Intake valve timing control solenoid valve | | Resistance (Ω) |
|--|--------|-------------------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | 7.1 - 7.7 Ω [at 20°C (68°F)] |
| 1 | Ground | ∞Ω (Continuity should not exist) |
| 2 | | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

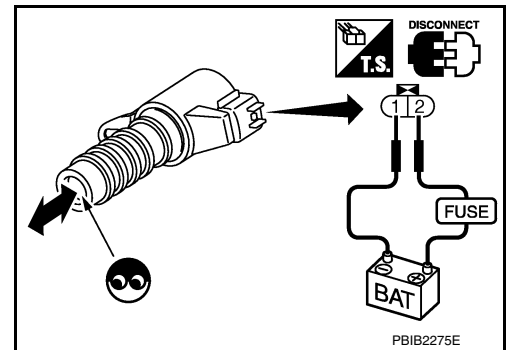
NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Remove intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).



Component Inspection (Intake Valve Timing Control Position Sensor)

INFOID:0000000012524683

1. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

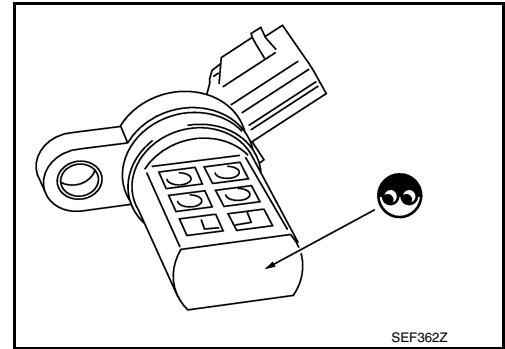
1. Turn ignition switch OFF.
2. Disconnect intake valve timing control position sensor harness connector.
3. Remove intake valve timing control position sensor. Refer to [EM-186, "Intake Valve Timing Control Position Sensor \(LH\)"](#) or [EM-186, "Intake Valve Timing Control Position Sensor \(RH\)"](#).

P0011, P0021 IVT CONTROL

[VK56DE]

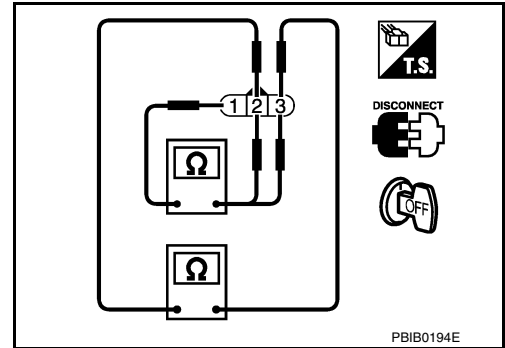
< DTC/CIRCUIT DIAGNOSIS >

4. Visually check the sensor for chipping.



5. Check resistance between intake valve timing control position sensor terminals as per the following.

| Intake valve timing control position sensor | | Resistance (Ω) [at 25°C (77°F)] |
|---|---|--|
| + | - | |
| Terminal | | Except 0 or ∞ |
| 3 | 1 | |
| 2 | 1 | |
| 3 | 2 | |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control position sensor. Refer to [EM-186, "Intake Valve Timing Control Position Sensor \(LH\)"](#) or [EM-186, "Intake Valve Timing Control Position Sensor \(RH\)"](#).

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P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

DTC Logic

INFOID:000000012524684

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0030 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 1) performance] | Deterioration in A/F sensor 1 heater performance. (Voltage signal transmitted from A/F sensor 1 heater to ECM is higher/lower than voltage in the normal range .) | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0031 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit low] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0032 | A/F SEN1 HTR (B1) [Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit high] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 heater circuit is shorted.)• A/F sensor 1 heater |
| P0036 | A/F SEN1 HTR (B2) [Air fuel ratio (A/F) sensor 1 heater (bank 2) performance] | Deterioration in A/F sensor 1 heater performance. (Voltage signal transmitted from A/F sensor 1 heater to ECM is higher/lower than voltage in the normal range .) | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0051 | A/F SEN1 HTR (B2) [Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit low] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)• A/F sensor 1 heater |
| P0052 | A/F SEN1 HTR (B2) [Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit high] | The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.) | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 heater circuit is shorted.)• A/F sensor 1 heater |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-630. "Diagnosis Procedure"](#).
NG >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524685

1.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

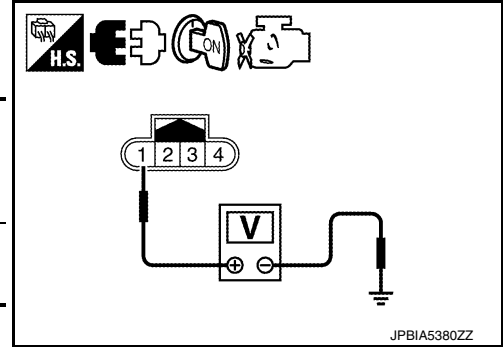
1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.

P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between A/F sensor 1 harness connector and ground.



| DTC | + | | | - | Voltage |
|---------------------|--------------|-----------|----------|--------|-----------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0030, P0031, P0032 | 1 | F65 | 1 | Ground | Battery voltage |
| P0036, P0051, P0052 | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector.
- Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|---------------------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0030, P0031, P0032 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0036, P0051, P0052 | 2 | F5 | 1 | | | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check harness continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|---------------------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0030, P0031, P0032 | 1 | F65 | 2 | F72 | 2 | Existed |
| P0036, P0051, P0052 | 2 | F5 | 2 | | 24 | |
| | | | | | 43 | |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK A/F SENSOR 1 HEATER

Check A/F sensor 1 heater. Refer to [EC-631, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-170, "Exploded View"](#).

Component Inspection

INFOID:000000012524686

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1

- Turn ignition switch OFF.

P0030, P0031, P0032, P0036, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

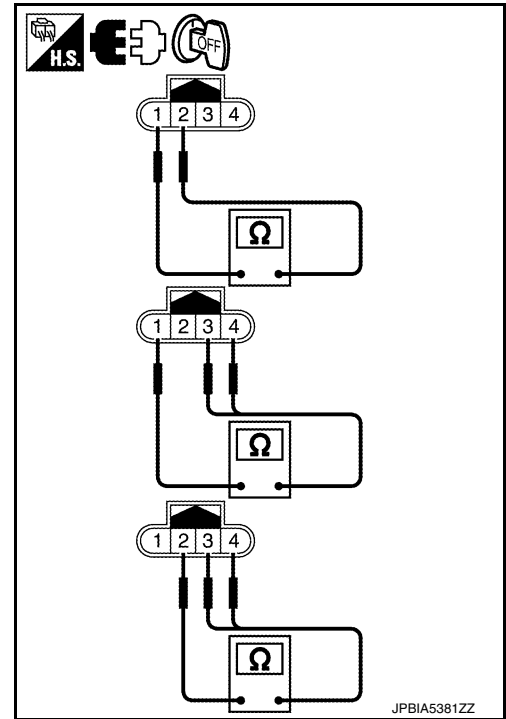
2. Disconnect A/F sensor 1 harness connector.
3. Check resistance between A/F sensor 1 terminals as follows.

| + | - | Resistance (Ω) |
|--------------|---|---|
| A/F sensor 1 | | |
| Terminal | | |
| 1 | 2 | 1.98 - 2.66 [at 25°C (77°F)] |
| | 3 | ∞ (Continuity should not exist) |
| | 4 | |
| 2 | 3 | ∞ (Continuity should not exist) |
| | 4 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning air fuel ratio (A/F) sensor 1.
Refer to [EM-170, "Exploded View"](#).



P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0037, P0038, P0057, P0058 HO2S2 HEATER

DTC Logic

INFOID:000000012524687

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0037 | HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit low] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)• Heated oxygen sensor 2 heater |
| P0038 | HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit high] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)• Heated oxygen sensor 2 heater |
| P0057 | HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit low] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)• Heated oxygen sensor 2 heater |
| P0058 | HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit high] | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | <ul style="list-style-type: none">• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)• Heated oxygen sensor 2 heater |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-633, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524688

1. CHECK HO2S2 POWER SUPPLY

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
2. Turn ignition switch ON.

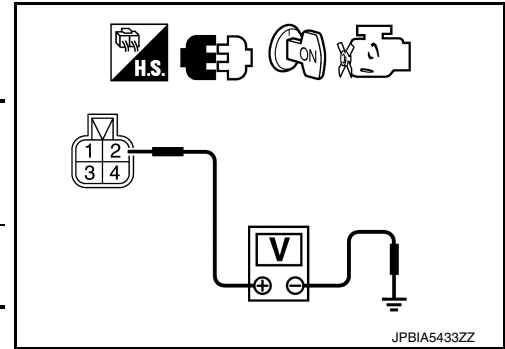
P0037, P0038, P0057, P0058 HO2S2 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between HO2S2 harness connector and ground.

| DTC | + | | | - | Voltage (Approx.) |
|--------------|-------|-----------|----------|--------|-------------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0037, P0038 | 1 | F74 | 2 | Ground | Battery voltage |
| P0057, P0058 | 2 | F73 | 2 | | |



Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. CHECK HO2S2 POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect HO2S2 harness connector.
- Check the continuity between HO2S2 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|--------------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0037, P0038 | 1 | F74 | 2 | E119 | 8 | Existed |
| P0057, P0058 | 2 | F73 | 2 | | | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK HO2S2 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|--------------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0037, P0038 | 1 | F74 | 3 | F72 | 6 | Existed |
| P0057, P0058 | 2 | F73 | 3 | | 25 | |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2 HEATER

Check heated oxygen sensor 2 heater. Refer to [EC-634. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

Component Inspection

INFOID:0000000012524689

1. CHECK HEATED OXYGEN SENSOR 2 HEATER

- Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 harness connector.

P0037, P0038, P0057, P0058 HO2S2 HEATER

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

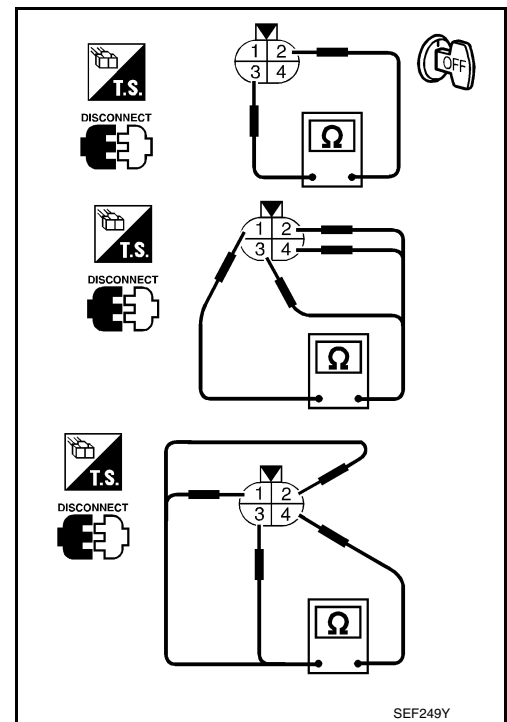
3. Check resistance between HO2S2 terminals as follows.

| Heated oxygen sensor 2 | | Resistance (Ω) |
|------------------------|---|---|
| + | - | |
| Terminal | | |
| 2 | 3 | 8 - 10 [at 25°C (77°F)] |
| 1 | 2 | ∞ (Continuity should not exist) |
| | 3 | |
| 4 | 1 | |
| | 2 | |
| | 3 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).



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P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0075, P0081 IVT CONTROL SOLENOID VALVE

DTC Logic

INFOID:000000012524690

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0075 | INT/V TIM V/CIR-B1 [Intake valve timing control solenoid valve (bank 1) circuit] | An improper voltage is sent to the ECM through intake valve timing control solenoid valve. | <ul style="list-style-type: none"> • Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve |
| P0081 | INT/V TIM V/CIR-B2 [Intake valve timing control solenoid valve (bank 2) circuit] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-636, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

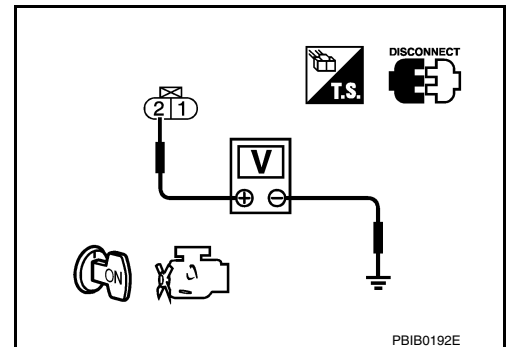
Diagnosis Procedure

INFOID:000000012524691

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between intake valve timing control solenoid valve harness connector and ground with CONSULT or tester.

| DTC | + | | | - | Voltage (Approx.) |
|-------|----------------------------|-----------|----------|--------|-------------------|
| | IVT control solenoid valve | | | | |
| | Bank | Connector | Terminal | | |
| P0075 | 1 | F61 | 2 | Ground | Battery voltage |
| P0081 | 2 | F63 | 2 | | |



Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

P0075, P0081 IVT CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|----------------------------|-----------|----------|-----------|----------|------------|
| | IVT control solenoid valve | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0075 | 1 | F61 | 1 | F72 | 10 | Existed |
| P0081 | 2 | F63 | 1 | | 11 | |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Check intake valve timing control solenoid valve. Refer to [EC-637, "Component Inspection \(Intake Valve Timing Control Solenoid Valve\)"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).

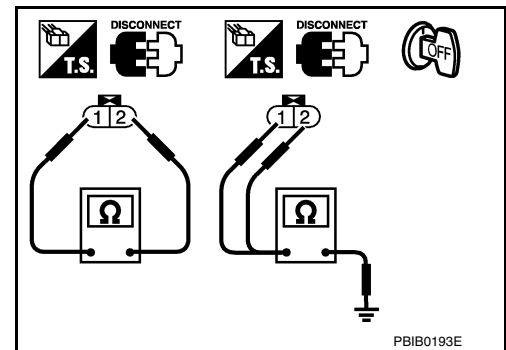
Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:000000012524692

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

- Turn ignition switch OFF.
- Disconnect intake valve timing control solenoid valve harness connector.
- Check resistance between intake valve timing control solenoid valve terminals as per the following.

| Intake valve timing control solenoid valve | | Resistance (Ω) |
|--|--------|-------------------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | 7.1 - 7.7 Ω [at 20°C (68°F)] |
| 1 | Ground | ∞Ω (Continuity should not exist) |
| 2 | | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- Remove intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).

P0075, P0081 IVT CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

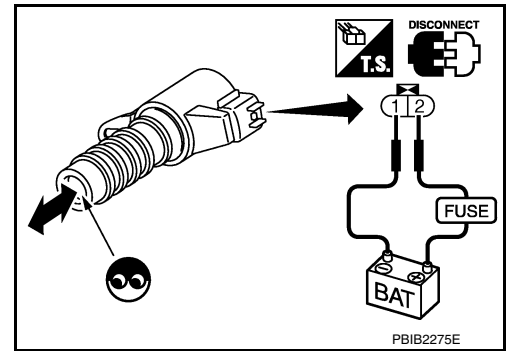
NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Remove intake valve timing control solenoid valve. Refer to [EM-185, "Intake Valve Timing Control Solenoid Valve \(LH\)"](#) or [EM-185, "Intake Valve Timing Control Solenoid Valve \(RH\)"](#).



P0101 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0101 MAF SENSOR

DTC Logic

INFOID:000000012524693

DTC DETECTION LOGIC

NOTE:

If DTC P0101 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0101 | MAF SEN/CIRCUIT-B1 [Mass air flow (MAF) sensor circuit range/performance] | <ul style="list-style-type: none">A high voltage from the sensor is sent to ECM under light load driving condition.A low voltage from the sensor is sent to ECM under heavy load driving condition. | <ul style="list-style-type: none">Harness or connectors (The sensor circuit is open or shorted.)Intake air leaks (e.g. poor connection)MAF sensorEVAP control system pressure sensorIntake air temperature sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and warm it up to normal operating temperature.
- Drive the vehicle for at least 5 seconds under the following conditions:

CAUTION:

Always drive vehicle at safe speed.

| | |
|----------------|--------------------------|
| Selector lever | Suitable position |
| Vehicle speed | 40 km/h (25 MPH) or more |

NOTE:

- The gear must be fixed while driving the vehicle.
- Keep the accelerator pedal as steady as possible during cruising.

- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-639, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524694

1. CHECK INTAKE SYSTEM

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Reconnect the parts.

2. CHECK GROUND CONNECTION

P0101 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Check ground connection E9. Refer to Ground Inspection in [GI-45, "Circuit Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair or replace ground connection.

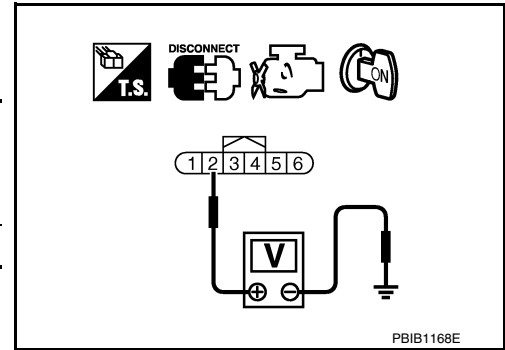
3. CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect MAF sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| MAF sensor | | | |
| Connector | Terminal | | |
| F53 | 2 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 3 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.
 NO >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 4 | F72 | 51 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 7.
 NO >> Repair open circuit or short to ground or short to power in harness or connectors.

P0101 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

7. CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to [EC-641, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace MAF sensor (with intake air temperature sensor). Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-766, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-17, "Removal and Installation"](#).

9. CHECK MAF SENSOR

Check MAF sensor. Refer to [EC-641, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace MAF sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

10. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

>> INSPECTION END

Component Inspection

INFOID:0000000012524695

1. CHECK MASS AIR FLOW (MAF) SENSOR-I

Ⓜ With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start the engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode.
5. Select "MAS A/F SE-B1" and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Ⓧ Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start the engine and warm it up to normal operating temperature.

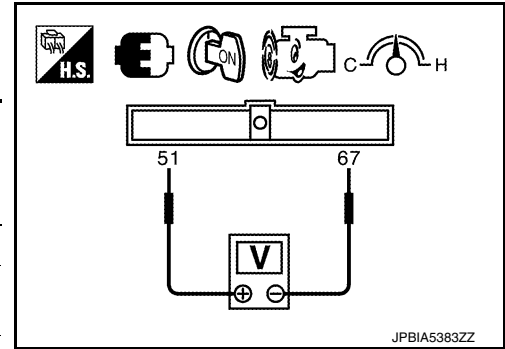
P0101 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage (V) |
|-----------|----------|----|--|---------------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 51 | 67 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | | | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |



*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MAF SENSOR

- Turn ignition switch OFF.
- Check for the cause of uneven air flow through MAF sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Intake valve deposits
 - Improper specification of intake air system parts

Is the inspection result normal?

- YES >> GO TO 4.
NO >> GO TO 3.

3.CHECK MAF SENSOR-II

④ With CONSULT

- Repair or replace malfunctioning part.
- Start the engine and warm it up to normal operating temperature.
- Connect CONSULT and select "DATA MONITOR" mode.
- Select "MAS A/F SE-B1" and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

⊗ Without CONSULT

- Repair or replace malfunctioning part.
- Start the engine and warm it up to normal operating temperature.

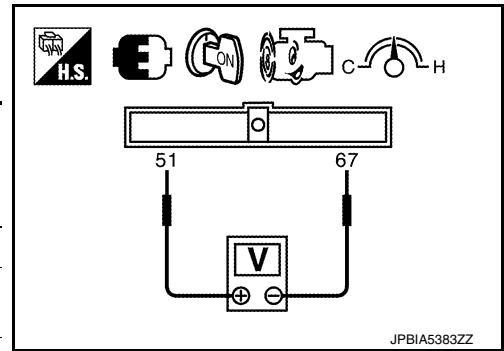
P0101 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage (V) |
|-----------|----------|----|--|---------------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 51 | 67 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | | | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |



*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK MAF SENSOR-III

Ⓜ With CONSULT

- Turn ignition switch OFF.
- Disconnect MAF sensor harness connector and reconnect it again.
- Start the engine and warm it up to normal operating temperature.
- Connect CONSULT and select "DATA MONITOR" mode.
- Select "MAS A/F SE-B1" and check the indication.

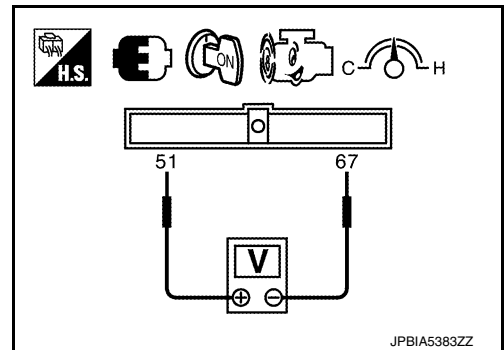
| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

ⓧ Without CONSULT

- Turn ignition switch OFF.
- Disconnect MAF sensor harness connector and reconnect it again.
- Start the engine and warm it up to normal operating temperature.
- Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage (V) |
|-----------|----------|----|--|---------------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 51 | 67 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | | | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |



*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

P0101 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

NO >> Clean or replace MAF sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0102, P0103 MAF SENSOR

DTC Logic

INFOID:000000012524696

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0102 | MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Intake air leakage• Mass air flow sensor |
| P0103 | MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted.)• Mass air flow sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Which DTC is detected?

P0102 >> GO TO 2.

P0103 >> GO TO 3.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Proceed to [EC-645, "Diagnosis Procedure"](#).

NO >> INSPECTION END

3. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-I

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Proceed to [EC-645, "Diagnosis Procedure"](#).

NO >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-II

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Proceed to [EC-645, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524697

1. INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

P0102 >> GO TO 2.

P0103 >> GO TO 3.

2. CHECK INTAKE SYSTEM

P0102, P0103 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the following for connection.

- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold

Is the inspection result normal?

YES >> GO TO 3.

NO >> Reconnect the parts.

3. CHECK MAF SENSOR POWER SUPPLY

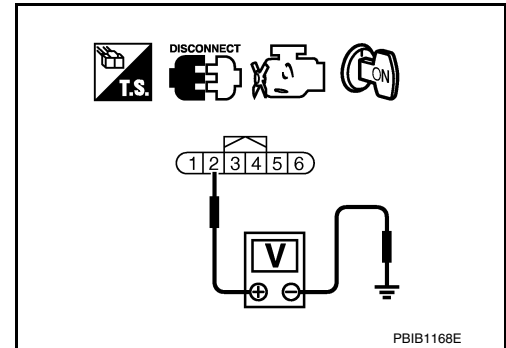
1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| MAF sensor | | | |
| Connector | Terminal | | |
| F53 | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.



4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between MAF sensor harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 2 | E119 | 4 | Existed |

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

5. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAF sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 3 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

P0102, P0103 MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 4 | F72 | 51 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit, short to GND or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor. Refer to [EC-647, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace mass air flow sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Component Inspection

INFOID:000000012936136

1. CHECK MASS AIR FLOW (MAF) SENSOR-I

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start the engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode.
5. Select "MAS A/F SE-B1" and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

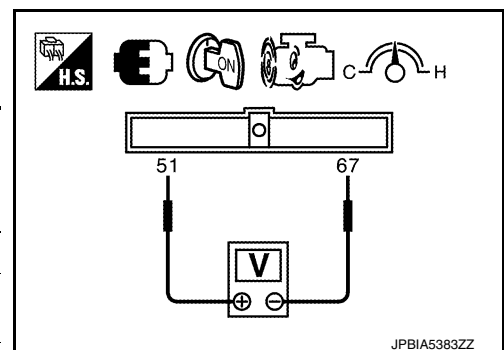
Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start the engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage (V) |
|-----------|----------|----|--|---------------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 51 | 67 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | | | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?



P0102, P0103 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 4.
- NO >> GO TO 2.

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MAF SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through MAF sensor. Refer to the following.
 - Crushed air ducts
 - Malfunctioning seal of air cleaner element
 - Uneven dirt of air cleaner element
 - Intake valve deposits
 - Improper specification of intake air system parts

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> GO TO 3.

3.CHECK MAF SENSOR-II

④ With CONSULT

1. Repair or replace malfunctioning part.
2. Start the engine and warm it up to normal operating temperature.
3. Connect CONSULT and select "DATA MONITOR" mode.
4. Select "MAS A/F SE-B1" and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

⊗ Without CONSULT

1. Repair or replace malfunctioning part.
2. Start the engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage (V) |
|-----------|----------|----|--|---------------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 51 | 67 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | | | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

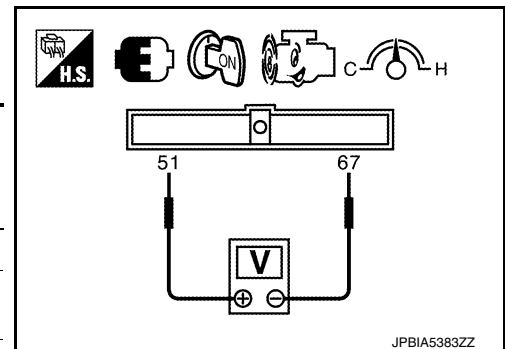
Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 4.

4.CHECK MAF SENSOR-III

④ With CONSULT

1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector and reconnect it again.
3. Start the engine and warm it up to normal operating temperature.
4. Connect CONSULT and select "DATA MONITOR" mode.



P0102, P0103 MAF SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Select "MAS A/F SE-B1" and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| MAS A/F SE-B1 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

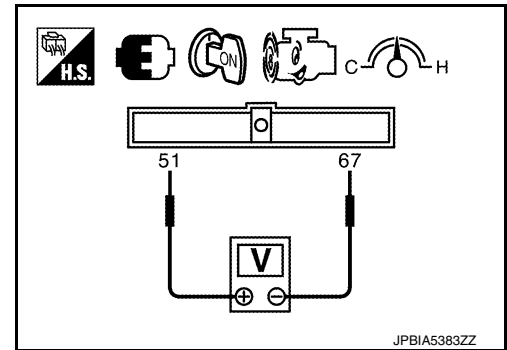
*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector and reconnect it again.
3. Start the engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage (V) |
|-----------|----|----|--|---------------------------|
| Connector | + | - | | |
| F72 | 51 | 67 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.9 – 1.3 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 – 2.1 |
| | | | Idle to about 4,000 rpm | 0.9 – 1.3 to Approx. 2.4* |

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Clean or replace MAF sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

P0111 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

P0111 IAT SENSOR

DTC Logic

INFOID:000000012524699

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0111 | IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/perfor- mance] | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor and FTT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | <ul style="list-style-type: none">• Harness or connectors (High or low resistance in the IAT sensor circuit)• IAT sensor |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 3.
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-651, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the IAT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-651, "Diagnosis Procedure"](#).

3.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

P0111 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-651. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Component Function Check

INFOID:0000000012524700

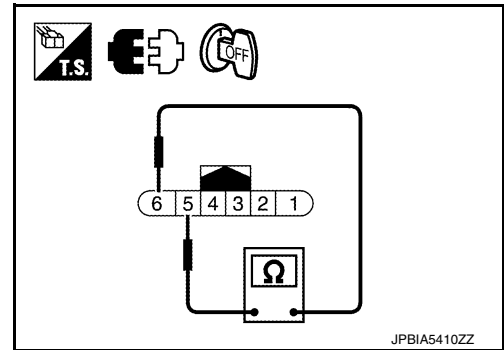
1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

| Mass air flow sensor | | Condition | | Resistance (kΩ) |
|----------------------|---|-----------------------|---------|-----------------|
| + | - | | | |
| Terminal | | | | |
| 5 | 6 | Temperature [°C (°F)] | 25 (77) | 1.800 – 2.200 |

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Proceed to [EC-651. "Diagnosis Procedure"](#).



Diagnosis Procedure

INFOID:0000000012524701

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to [EC-651. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to [EC-471. "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Component Inspection

INFOID:0000000012524702

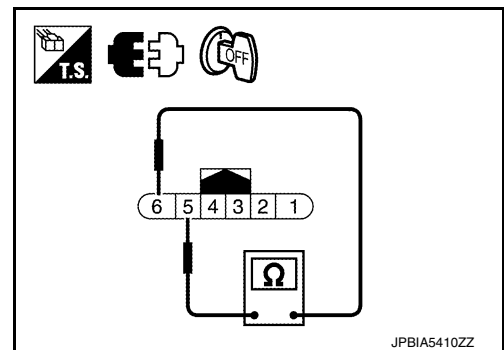
1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

| Mass air flow sensor | | Condition | | Resistance (kΩ) |
|----------------------|---|-----------------------|---------|-----------------|
| + | - | | | |
| Terminal | | | | |
| 5 | 6 | Temperature [°C (°F)] | 25 (77) | 1.800 – 2.200 |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to [EC-471. "ENGINE CONTROL SYSTEM : Component Parts Location"](#).



P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0112, P0113 IAT SENSOR

DTC Logic

INFOID:000000012524703

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0112 | IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor |
| P0113 | IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-652, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524704

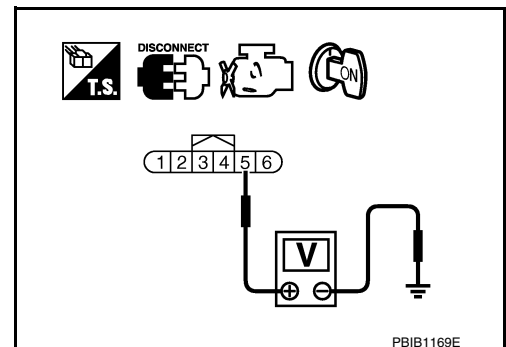
1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY

1. Disconnect mass air flow sensor (with intake air temperature sensor) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between mass air flow sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| MAF sensor | | | |
| Connector | Terminal | | |
| F53 | 5 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.



2. CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between mass air flow sensor harness connector and ECM harness connector.

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| MAF sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F53 | 6 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to [EC-653, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Component Inspection

INFOID:000000012524705

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

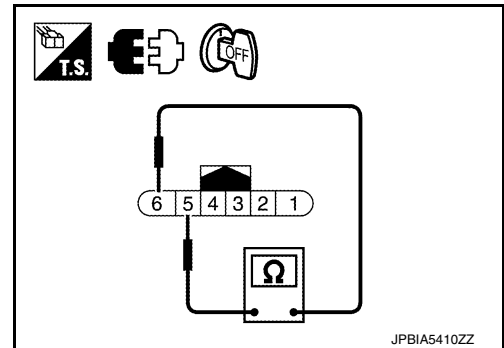
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

| Mass air flow sensor | | Condition | Resistance (k Ω) |
|----------------------|---|---|--------------------------|
| + | - | | |
| Terminal | | | |
| 5 | 6 | Temperature [$^{\circ}$ C ($^{\circ}$ F)] | 25 (77) 1.800 – 2.200 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).



P0116 ECT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

P0116 ECT SENSOR

DTC Logic

INFOID:000000012524706

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0116 | ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/per- formance] | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor and FTT sensor) shows that the voltage signal of the ECT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | <ul style="list-style-type: none">• Harness or connectors (High or low resistance in the ECT sensor circuit)• ECT sensor |

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 3.

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-655, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the ECT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-655, "Diagnosis Procedure"](#).

3. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

< DTC/CIRCUIT DIAGNOSIS >

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-655, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

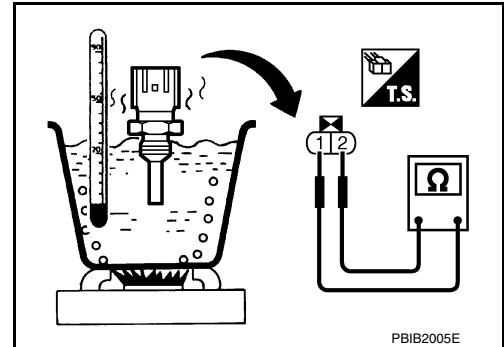
Component Function Check

INFOID:0000000012524707

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to [EM-217, "Exploded View"](#).
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|--------------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 90 (194) |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Proceed to [EC-655, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524708

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to [EC-655, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace ECT sensor. Refer to [EM-217, "Exploded View"](#).

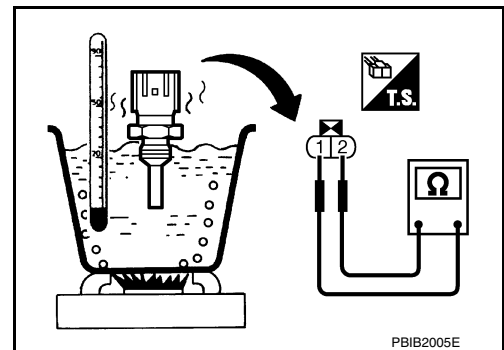
Component Inspection

INFOID:0000000012524709

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).
4. Check resistance between engine coolant temperature sensor terminals as per the following.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|--------------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 90 (194) |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0117, P0118 ECT SENSOR

DTC Logic

INFOID:000000012524710

DTC DETECTION LOGIC

| DTC No. | Trouble Diagnosis Name (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|--|---|---|
| P0117 | ECT SEN/CIRC (Engine coolant temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor |
| P0118 | ECT SEN/CIRC (Engine coolant temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-656. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524711

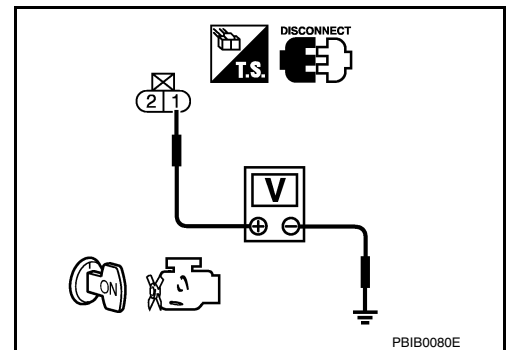
1. CHECK ECT SENSOR POWER SUPPLY

1. Disconnect engine coolant temperature (ECT) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between ECT sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| ECT sensor | | | |
| Connector | Terminal | | |
| F205 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.



2. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

P0117, P0118 ECT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check the continuity between ECT sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| ECT sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F205 | 2 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor. Refer to [EC-657, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

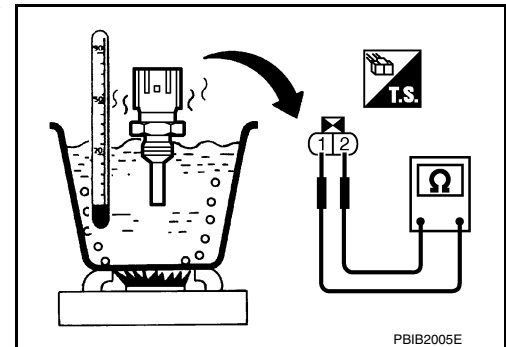
Component Inspection

INFOID:0000000012524712

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).
4. Check resistance between engine coolant temperature sensor terminals as per the following.

| ECT sensor | | Condition | Resistance (kΩ) | |
|------------|---|--------------------------|-----------------|---------------|
| + | - | | | |
| Terminal | | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) | 2.10 – 2.90 |
| | | | 50 (122) | 0.68 – 1.00 |
| | | | 90 (194) | 0.236 – 0.260 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0122, P0123 TP SENSOR

DTC Logic

INFOID:000000012524713

DTC DETECTION LOGIC

NOTE:

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0122 | TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit low input) | An excessively low voltage from the TP sensor 2 is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (TP sensor 2 circuit is open or shorted.) Electric throttle control actuator (TP sensor 2) |
| P0123 | TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit high input) | An excessively high voltage from the TP sensor 2 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-658, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524714

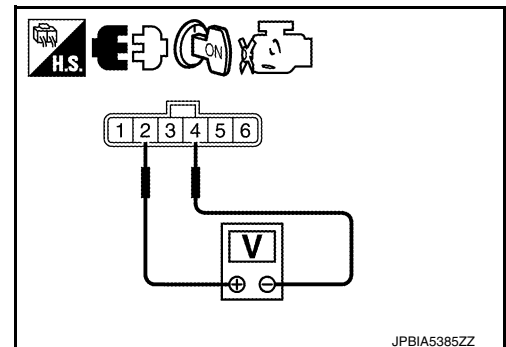
1. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY-1

- Turn ignition switch OFF.
- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector terminals.

| Electric throttle control actuator | | | Voltage (Approx.) |
|------------------------------------|---|---|----------------------|
| Connector | + | - | |
| F50 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 8.
 NO >> GO TO 2.



P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

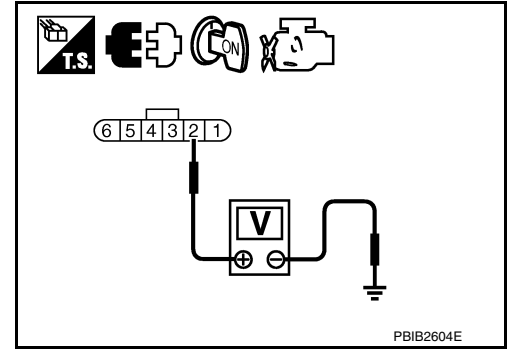
2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY-2

Check the voltage between electric throttle control actuator harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|-------------------|
| Connector | Terminal | | |
| F50 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F50 | 2 | F72 | 47 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair or replace error-detected parts.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| + | | - | | |
|-----------|----------|--------------------------|-----------|----------|
| ECM | | Sensor | | |
| Connector | Terminal | Name | Connector | Terminal |
| F72 | 47 | Throttle position sensor | F50 | 2 |
| E77 | 91 | APP sensor | E20 | 1 |

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.

- APP sensor (Refer to [EC-849, "Component Inspection"](#).)

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace malfunctioning components.

6. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

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P0122, P0123 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 4 | F72 | 66 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E77 | 115 | Ground | Existed |
| | 116 | | |
| F72 | 1 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

8. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 3 | F72 | 69 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Check throttle position sensor. Refer to [EC-660, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace electric throttle control actuator. Refer to [EM-166, "Exploded View"](#).

Component Inspection

INFOID:000000012524715

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform [EC-591, "Description"](#).
4. Turn ignition switch ON.
5. Set selector lever to D position.

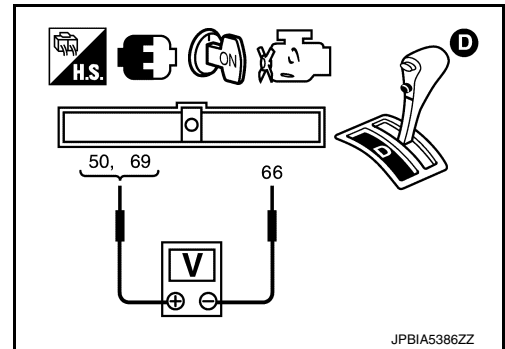
P0122, P0123 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

6. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----------|----|-----------------|------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 50 | 66 | Fully released | More than 0.36 V |
| | | | Fully depressed | Less than 4.75 V |
| | 69 | | Fully released | Less than 4.75 V |
| | | | Fully depressed | More than 0.36 V |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to [EM-166, "Exploded View"](#).

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P0125 ECT SENSOR

DTC Logic

INFOID:000000012524716

DTC DETECTION LOGIC

NOTE:

- If DTC P0125 is displayed with P0116, first perform the trouble diagnosis for DTC P0116. Refer to [EC-654, "DTC Logic"](#).
- If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to [EC-656, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0125 | ECT SENSOR (Insufficient engine coolant temperature for closed loop fuel control) | <ul style="list-style-type: none"> • Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. • Engine coolant temperature is insufficient for closed loop fuel control. | <ul style="list-style-type: none"> • Harness or connectors (High resistance in the circuit) • Engine coolant temperature sensor • Thermostat |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

 With CONSULT

1. Turn ignition switch ON.
2. Select "DATA MONITOR" mode with CONSULT.
3. Check that "COOLAN TEMP/S" is above 31°C (88°F).

 With GST

Follow the procedure "With CONSULT" above.

Is the temperature above 31°C (88°F)?

- YES >> INSPECTION END
 NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

 With CONSULT

1. Start engine and run it for 65 minutes at idle speed.
If "COOLAN TEMP/S" increases to more than 31°C (88°F) within 65 minutes, stop engine because the test result will be OK.

CAUTION:

Never overheat engine.

2. Check 1st trip DTC.

 With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-663, "Diagnosis Procedure"](#)
 NO >> INSPECTION END

P0125 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Diagnosis Procedure

INFOID:000000012524717

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor. Refer to [EC-663, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

2. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm that the engine coolant does not flow.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace thermostat. Refer to [CO-56, "Exploded View"](#).

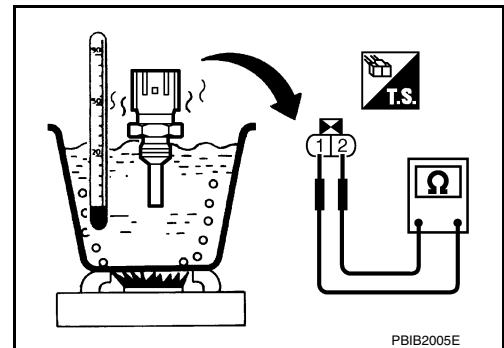
Component Inspection

INFOID:000000012524718

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).
4. Check resistance between engine coolant temperature sensor terminals as per the following.

| ECT sensor | | Condition | Resistance (kΩ) | |
|------------|---|--------------------------|-----------------|---------------|
| + | - | | | |
| Terminal | | | | |
| 1 | 2 | Temperature [°C (°F)] | 20 (68) | 2.10 – 2.90 |
| | | | 50 (122) | 0.68 – 1.00 |
| | | | 90 (194) | 0.236 – 0.260 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

P0127 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

P0127 IAT SENSOR

DTC Logic

INFOID:000000012524719

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0127 | IAT SENSOR-B1 (Intake air temperature too high) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor. | <ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted)• Intake air temperature sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Wait until engine coolant temperature is less than 96°C (205°F)
 - Turn ignition switch ON.
 - Select "DATA MONITOR" mode with CONSULT.
 - Check the engine coolant temperature.
 - If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.

NOTE:

Perform the following steps before engine coolant temperature is above 96°C (205°F).

2. Turn ignition switch ON.
3. Select "DATA MONITOR" mode with CONSULT.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.

CAUTION:

Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-664, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524720

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

P0127 IAT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Component Inspection

INFOID:000000012524721

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

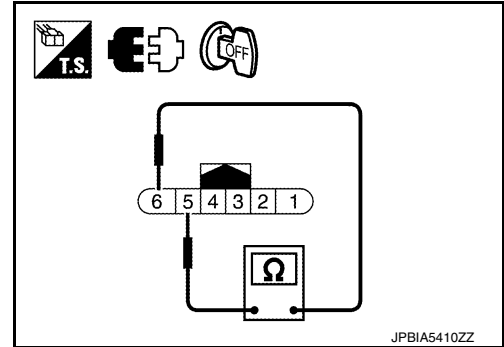
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

| Mass air flow sensor | | Condition | | Resistance (kΩ) |
|----------------------|---|-----------------------|---------|-----------------|
| + | - | | | |
| Terminal | | | | |
| 5 | 6 | Temperature [°C (°F)] | 25 (77) | 1.800 – 2.200 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).



P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0128 THERMOSTAT FUNCTION

DTC Logic

INFOID:000000012524722

DTC DETECTION LOGIC

NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308, first perform the trouble diagnosis for P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308. Refer to [EC-723, "DTC Logic"](#).

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.

This is due to a leak in the seal or the thermostat being stuck open.

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0128 | THERMSTAT FNCTN [Coolant thermostat (coolant temperature below thermostat regulating temperature)] | The engine coolant temperature does not reach to specified temperature even though the engine has run long enough. | <ul style="list-style-type: none">• Thermostat• Leakage from sealing portion of thermostat• Engine coolant temperature sensor |

DTC CONFIRMATION PROCEDURE

NOTE:

Never refuel before and during the following procedure.

1. PRECONDITIONING-I

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PRECONDITIONING-II

Ⓜ With CONSULT

1. Turn ignition switch ON.
2. Check the following conditions:

| | |
|---------------------|----------------------|
| Ambient temperature | -10°C (14°F) or more |
| A/C switch | OFF |
| Blower fan switch | OFF |

3. Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
4. Check the following conditions:

| | |
|---------------|---------------------------|
| COOLAN TEMP/S | -10°C – 52°C (14 – 126°F) |
|---------------|---------------------------|

Is the condition satisfied?

- YES >> GO TO 3.
NO >> 1. Satisfy the condition.
2. GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-I

Ⓜ With CONSULT

1. Start engine.
2. Drive the vehicle until the following condition is satisfied.

CAUTION:

Always drive vehicle at safe speed.

- **STEP 1**

P0128 THERMOSTAT FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Drive the vehicle under the conditions instructed below until the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" becomes at least 25°C (77°F).

| | |
|---------------|--|
| COOLAN TEMP/S | 71°C (160°F) or less |
| FUEL T/TMP SE | Less than the value calculated by subtracting 25°C (77°F) from "COOLAN TEMP/S".* |

- STEP 2

Drive the vehicle at 50 km/h (32 MPH) or more with the difference between "COOLAN TEMP/S" and "FUEL T/TMP SE" maintained at 25°C (77°F) or more.

NOTE:

Keep the accelerator pedal as steady as possible during cruising.

- STEP 3

Drive the vehicle at 50 km/h (32 MPH) or more until "COOLAN TEMP/S" increases by 6°C (43°F).

NOTE:

Keep the accelerator pedal as steady as possible during cruising.

Is the condition satisfied?

YES >> GO TO 4.

NO >> GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

ⓂWith CONSULT

1. Drive the vehicle until the following condition is satisfied.

| | |
|---------------|----------------------|
| COOLAN TEMP/S | 71°C (160°F) or more |
|---------------|----------------------|

CAUTION:

Always drive vehicle at safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-667, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524723

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor. Refer to [EC-667, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

2.CHECK THERMOSTAT

Check thermostat. Refer to [CO-56, "Exploded View"](#).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace thermostat. Refer to [CO-56, "Exploded View"](#).

Component Inspection

INFOID:000000012524724

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.

2. Disconnect engine coolant temperature sensor harness connector.

3. Remove engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

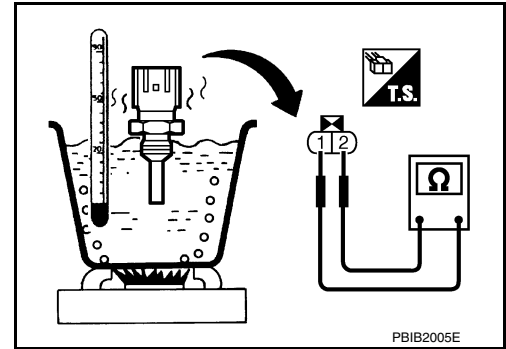
P0128 THERMOSTAT FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check resistance between engine coolant temperature sensor terminals as per the following.

| ECT sensor | | Condition | Resistance (kΩ) |
|------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 1 | 2 | Temperature [°C (°F)] | |
| | | 20 (68) | 2.10 – 2.90 |
| | | 50 (122) | 0.68 – 1.00 |
| | | 90 (194) | 0.236 – 0.260 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0130, P0150 A/F SENSOR 1

DTC Logic

INFOID:000000012524725

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal fluctuates according to fuel feedback control.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|--|--|
| P0130 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit] | A) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | <ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | |
| P0150 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit] | A) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V. | <ul style="list-style-type: none"> • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-671, "Diagnosis Procedure"](#).

NO-1 >> With CONSULT: GO TO 3.

NO-2 >> With GST: GO TO 7.

3. CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Does the indication fluctuate around 2.2 V?

YES >> GO TO 4.

NO >> Proceed to [EC-671, "Diagnosis Procedure"](#).

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

1. Select "A/F SEN1 (B1) P1276" (for DTC P0130) or "A/F SEN1 (B2) P1286" (for DTC P0150) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT.
2. Touch "START".
3. When the following conditions are met, "TESTING" will be displayed on the CONSULT screen.

P0130, P0150 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

| | |
|----------------|----------------------------|
| ENG SPEED | 850 - 3,200 rpm |
| VHCL SPEED SE | More than 64 km/h (40 mph) |
| B/FUEL SCHDL | 1.0 - 8.0 msec |
| Selector lever | D position |

If "TESTING" is not displayed after 20 seconds, retry from step 2.

CAUTION:

Always drive vehicle at a safe speed.

Is "TESTING" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Check A/F sensor 1 function again. GO TO 3.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

Release accelerator pedal fully.

NOTE:

Never apply brake when releasing the accelerator pedal.

Which does "TESTING" change to?

COMPLETED>>GO TO 6.

OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Proceed to [EC-671, "Diagnosis Procedure"](#).

7. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to [EC-670, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-671, "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524726

1. PERFORM COMPONENT FUNCTION CHECK

 **With GST**

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever to the D position, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

Never apply brake when releasing the accelerator pedal.

4. Repeat steps 2 and 3 for 5 times.
5. Stop the vehicle and turn ignition switch OFF.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 and 3 for 5 times.
8. Stop the vehicle.
9. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-671, "Diagnosis Procedure"](#).

NO >> INSPECTION END

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

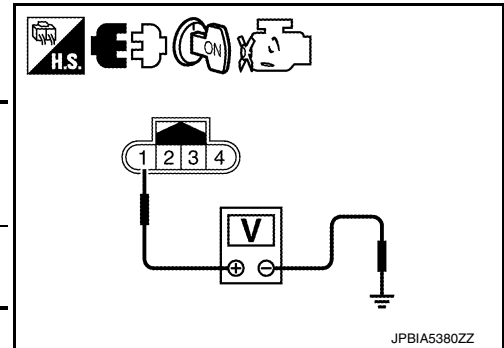
INFOID:000000012524727

Diagnosis Procedure

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Disconnect A/F sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage (Approx.) |
|-------|--------------|-----------|----------|--------|-------------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0130 | 1 | F65 | 1 | Ground | Battery voltage |
| P0150 | 2 | F5 | 1 | | |



Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0130 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0150 | 2 | F5 | 1 | | | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0130 | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| P0150 | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0130 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0150 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0130 | F72 | 56 | Ground | Not existed |
| | | 35 | | |
| P0150 | | 75 | | |
| | | 16 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-170. "Exploded View"](#).

NO >> Repair or replace error-detected parts.

P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0131, P0151 A/F SENSOR 1

DTC Logic

INFOID:000000012524728

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately low.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0131 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage] | • The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V. | • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| P0151 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2. CHECK A/F SENSOR 1 FUNCTION

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

With GST

Follow the procedure "With CONSULT" above.

Is the indication constantly approx. 0 V?

YES >> Proceed to [EC-674. "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch OFF, wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
4. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.

CAUTION:

Always drive vehicle at a safe speed.

5. Maintain the following conditions for approximately 20 consecutive seconds.

| | |
|----------------|----------------------------|
| ENG SPEED | 1,000 - 3,200 rpm |
| VHCL SPEED SE | More than 40 km/h (25 mph) |
| B/FUEL SCHDL | 1.5 - 9.0 msec |
| Selector lever | Suitable position |

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.

P0131, P0151 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.

6. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-674, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

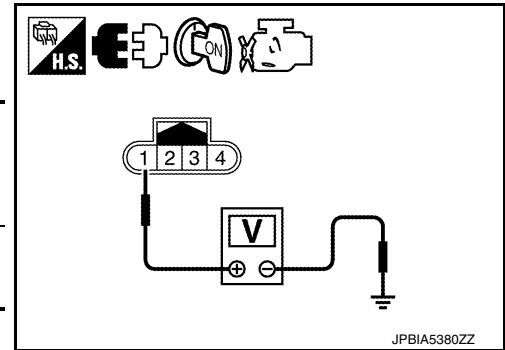
Diagnosis Procedure

INFOID:0000000012524729

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Disconnect A/F sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage (Approx.) |
|-------|--------------|-----------|----------|--------|-------------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0131 | 1 | F65 | 1 | Ground | Battery voltage |
| P0151 | 2 | F5 | 1 | | |



Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0131 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0151 | 2 | F5 | 1 | | | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0131 | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| P0151 | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

P0131, P0151 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0131 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0151 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0131 | F72 | 56 | Ground | Not existed |
| | | 35 | | |
| P0151 | | 75 | | |
| | | 16 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-170, "Exploded View"](#).

NO >> Repair or replace error-detected parts.

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P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0132, P0152 A/F SENSOR 1

DTC Logic

INFOID:000000012524730

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0132 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage] | • The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V. | • Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 |
| P0152 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2. CHECK A/F SENSOR 1 FUNCTION

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT.
3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

With GST

Follow the procedure "With CONSULT" above.

Is the indication constantly approx. 5 V?

YES >> Proceed to [EC-677. "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
4. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.

CAUTION:

Always drive vehicle at a safe speed.

5. Maintain the following conditions for approximately 20 consecutive seconds.

| | |
|----------------|----------------------------|
| ENG SPEED | 1,000 - 3,200 rpm |
| VHCL SPEED SE | More than 40 km/h (25 mph) |
| B/FUEL SCHDL | 1.5 - 9.0 msec |
| Selector lever | Suitable position |

NOTE:

- Keep the accelerator pedal as steady as possible during cruising.

P0132, P0152 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.

6. Check 1st trip DTC.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-677, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

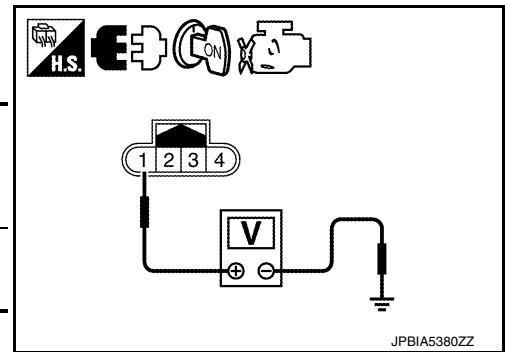
Diagnosis Procedure

INFOID:000000012524731

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Disconnect A/F sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | + | | | - | Voltage (Approx.) |
|-------|--------------|-----------|----------|--------|-------------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0132 | 1 | F65 | 1 | Ground | Battery voltage |
| P0152 | 2 | F5 | 1 | | |



Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | IPDM E/R | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0132 | 1 | F65 | 1 | E119 | 8 | Existed |
| P0152 | 2 | F5 | 1 | | | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0132 | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| P0152 | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

P0132, P0152 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0132 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0152 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0132 | F72 | 56 | Ground | Not existed |
| | | 35 | | |
| P0152 | | 75 | | |
| | | 16 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-170. "Exploded View"](#).

NO >> Repair or replace error-detected parts.

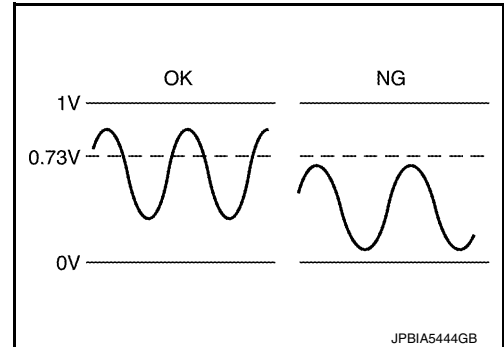
P0137, P0157 HO2S2

DTC Logic

INFOID:000000012524732

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0137 | HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit low voltage] | The maximum voltage from the sensor does not reach the specified voltage. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leakage |
| P0157 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit low voltage] | | |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

- YES >> GO TO 2.
- NO >> GO TO 5.

2.PRECONDITIONING

If DTC confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

Ⓜ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.

P0137, P0157 HO2S2

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

- OK >> INSPECTION END
- NG >> Proceed to [EC-681, "Diagnosis Procedure"](#).
- CAN NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-680, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-681, "Diagnosis Procedure"](#).

Component Function Check

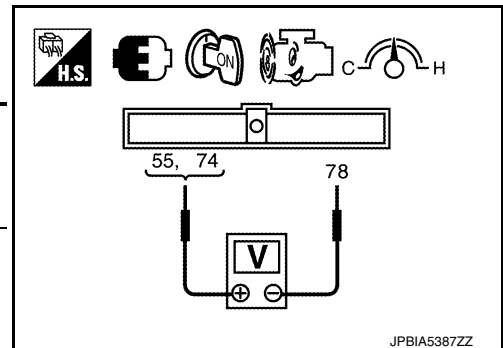
INFOID:0000000012524733

1.PERFORM COMPONENT FUNCTION CHECK-I

⊗ **Without CONSULT**

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | Condition | Voltage |
|-------|-----------|----------|--|---|
| | Connector | Terminal | | |
| P0137 | F72 | 55 | Revvng up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.73 V at least once during this procedure. |
| P0157 | | 74 | | |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

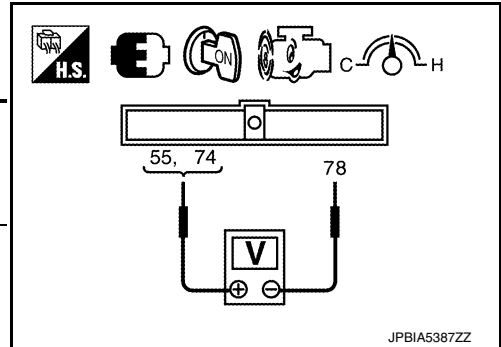
P0137, P0157 HO2S2

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----|----------|---------------------------------------|---|
| | Connector | + | - | | |
| | | | Terminal | | |
| P0137 | F72 | 55 | 78 | Keeping engine at idle for 10 minutes | The voltage should be above 0.73 V at least once during this procedure. |
| P0157 | | 74 | | | |



Is the inspection result normal?

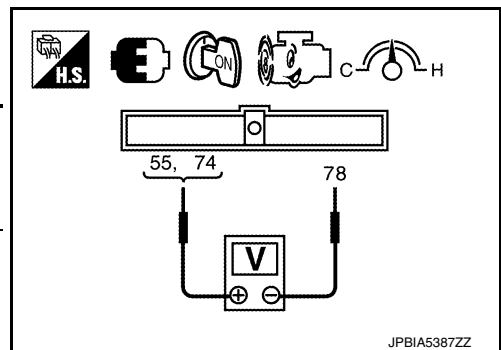
YES >> INSPECTION END

NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----|----------|--|---|
| | Connector | + | - | | |
| | | | Terminal | | |
| P0137 | F72 | 55 | 78 | Coasting from 80 km/h (50 MPH) with selector lever in the D position | The voltage should be above 0.73 V at least once during this procedure. |
| P0157 | | 74 | | | |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-681, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524734

1.CLEAR MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-594, "Description"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to [EC-705, "DTC Logic"](#).

NO >> GO TO 2.

2.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between heated oxygen sensor 2 (HO2S2) harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0137 | 1 | F74 | 1 | F72 | 78 | Existed |
| P0157 | 2 | F73 | 1 | | | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

P0137, P0157 HO2S2

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 3.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0137 | 1 | F74 | 4 | F72 | 55 | Existed |
| P0157 | 2 | F73 | 4 | | 74 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0137 | 1 | F74 | 4 | Ground | Not existed |
| P0157 | 2 | F73 | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0137 | F72 | 55 | Ground | Not existed |
| P0157 | | 74 | | |

3. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-682, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

Component Inspection

INFOID:0000000012524735

1. INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

- YES >> GO TO 2.
 NO >> GO TO 3.

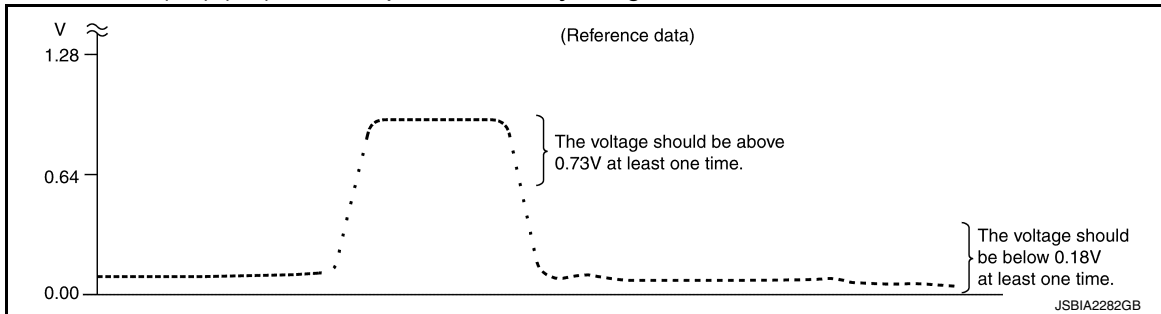
2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- Let engine idle for 1 minute.

< DTC/CIRCUIT DIAGNOSIS >

6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.73 V at least once when the "FUEL INJECTION" is + 25%.
 "HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is - 25%.

Is the inspection result normal?

YES >> INSPECTION END

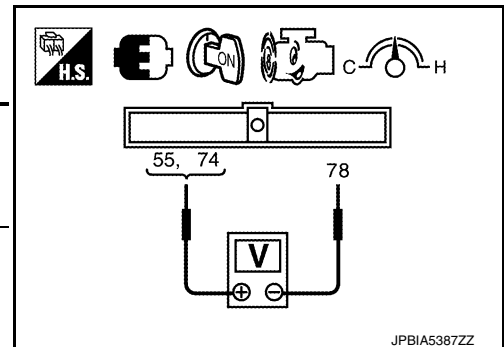
NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | Condition | Voltage |
|-----------|----------|--|--|
| Connector | Terminal | | |
| F72 | 55 | Reving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | |



Is the inspection result normal?

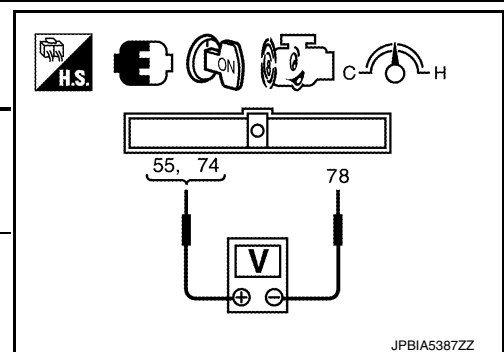
YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | Condition | Voltage |
|-----------|----------|---------------------------------------|--|
| Connector | Terminal | | |
| F72 | 55 | Keeping engine at idle for 10 minutes | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | |



Is the inspection result normal?

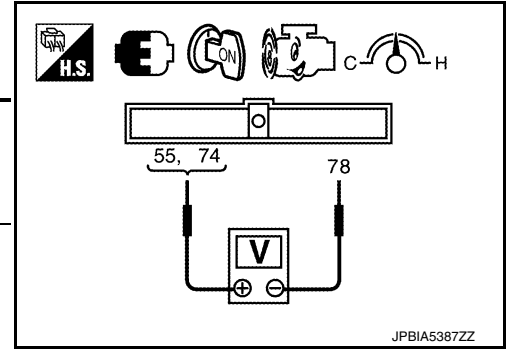
YES >> INSPECTION END

NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----------|----|--|--|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 55 | 78 | Coasting from 80 km/h (50 MPH) with selector lever in the D position | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | | |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

P0138, P0158 HO2S2

DTC Logic

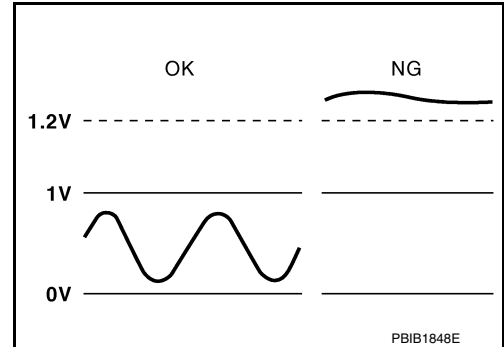
INFOID:000000012524736

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

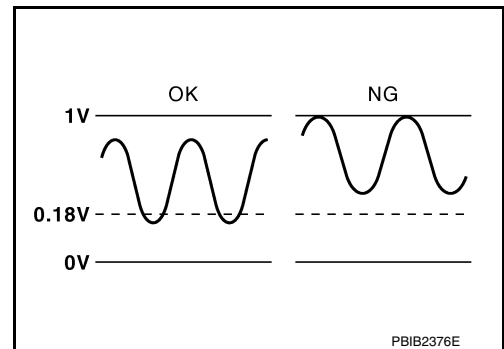
MALFUNCTION A

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel-cut.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|--|-------------------------|--|---|
| P0138 | HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit high voltage] | A) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 |
| | | B) | The minimum voltage from the sensor is not reached to the specified voltage. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector |
| P0158 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit high voltage] | A) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 |
| | | B) | The minimum voltage from the sensor is not reached to the specified voltage. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

< DTC/CIRCUIT DIAGNOSIS >

2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 2 minutes.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-688. "Diagnosis Procedure"](#).

NO-1 >> With CONSULT: GO TO 3.

NO-2 >> Without CONSULT: GO TO 5.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B**NOTE:**

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

1. Select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Proceed to [EC-688. "Diagnosis Procedure"](#).

CON NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to [EC-687. "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-688. "Diagnosis Procedure"](#).

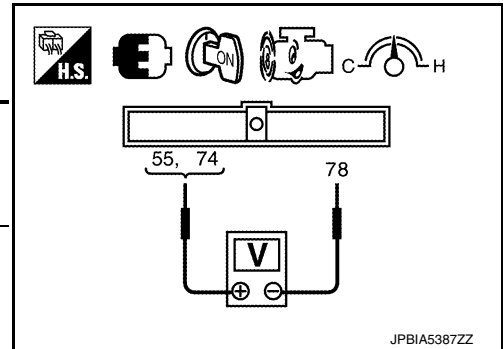
Component Function Check

1. PERFORM COMPONENT FUNCTION CHECK-I

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | | Condition | Voltage |
|-------|-----------|----------|----|--|---|
| | Connector | + | - | | |
| | | Terminal | | | |
| P0138 | F72 | 55 | 78 | Reving up to 4,000 rpm under no load at least 10 times | The voltage should be below 0.18 V at least once during this procedure. |
| P0158 | | 74 | | | |



Is the inspection result normal?

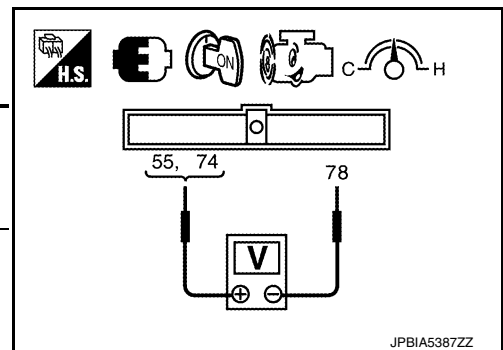
YES >> INSPECTION END

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | | Condition | Voltage |
|-------|----------------|----------|----|---|---|
| | Conne- ctor | + | - | | |
| | | Terminal | | | |
| P0138 | F72 | 55 | 78 | Keeping engine speed at idle for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. |
| P0158 | | 74 | | | |



Is the inspection result normal?

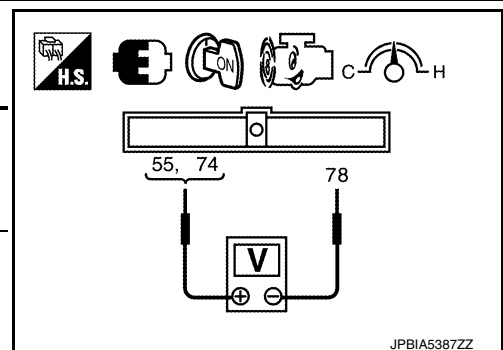
YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | | Condition | Voltage |
|-------|----------------|----------|----|--|---|
| | Conne- ctor | + | - | | |
| | | Terminal | | | |
| P0138 | F72 | 55 | 78 | Coasting from 80 km/h (50 MPH) with selector lever in the D position | The voltage should be below 0.18 V at least once during this procedure. |
| P0158 | | 74 | | | |



Is the inspection result normal?

YES >> INSPECTION END

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< DTC/CIRCUIT DIAGNOSIS >

NO >> Proceed to [EC-688. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524738

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-685. "DTC Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
- B >> GO TO 6.

2.CHECK HO2S2 CONNECTOR FOR WATER

1. Disconnect heated oxygen sensor 2 harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair or replace harness or connectors.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between heated oxygen sensor 2 (HO2S2) harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F74 | 1 | F72 | 78 | Existed |
| P0158 | 2 | F73 | 1 | | | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F74 | 4 | F72 | 55 | Existed |
| P0158 | 2 | F73 | 4 | | 74 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0138 | 1 | F74 | 4 | Ground | Not existed |
| P0158 | 2 | F73 | 4 | | |

< DTC/CIRCUIT DIAGNOSIS >

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0138 | F72 | 55 | Ground | Not existed |
| P0158 | | 74 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-690, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

6.CLEAR MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-594, "Description"](#).

2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to [EC-709, "DTC Logic"](#).

NO >> GO TO 7.

7.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 2 harness connector.

3. Disconnect ECM harness connector.

4. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F74 | 1 | F72 | 78 | Existed |
| P0158 | 2 | F73 | 1 | | | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0138 | 1 | F74 | 4 | F72 | 55 | Existed |
| P0158 | 2 | F73 | 4 | | 74 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0138 | 1 | F74 | 4 | Ground | Not existed |
| P0158 | 2 | F73 | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0138 | F72 | 55 | Ground | Not existed |
| P0158 | | 74 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-690. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

Component Inspection

INFOID:000000012524739

1. INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

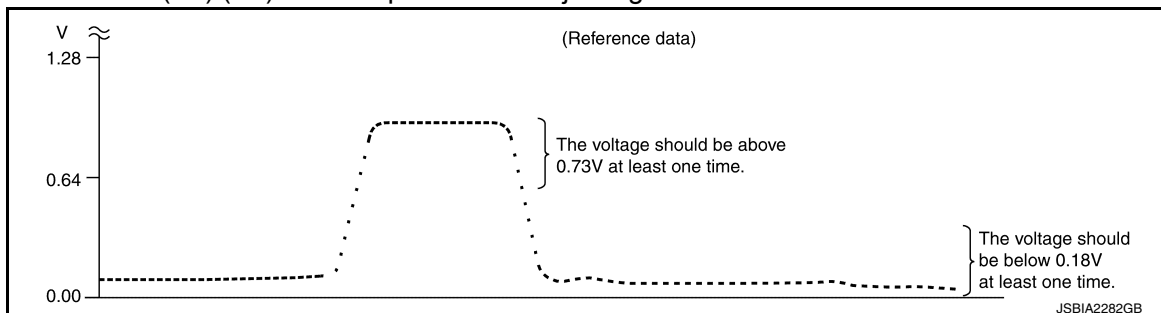
YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

Ⓢ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.73 V at least once when the "FUEL INJECTION" is + 25%.

"HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is - 25%.

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

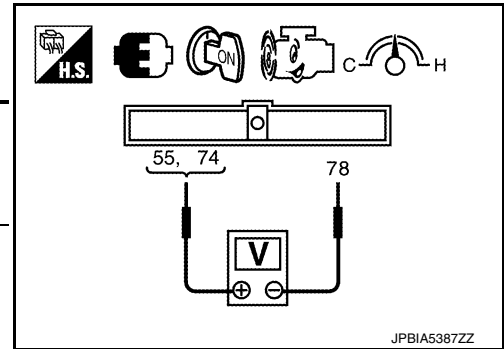
NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

3. CHECK HEATED OXYGEN SENSOR 2-I

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | Condition | Voltage |
|-----------|----------|--|--|
| Connector | Terminal | | |
| F72 | 55 | Reving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | |



Is the inspection result normal?

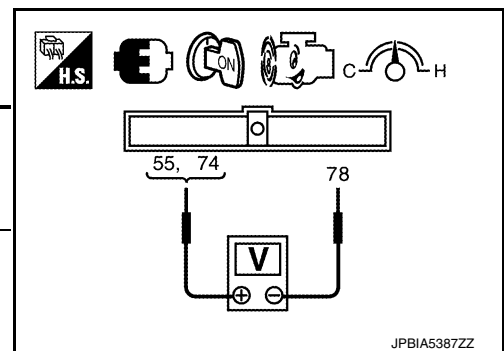
YES >> INSPECTION END

NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | Condition | Voltage |
|-----------|----------|---------------------------------------|--|
| Connector | Terminal | | |
| F72 | 55 | Keeping engine at idle for 10 minutes | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | |



Is the inspection result normal?

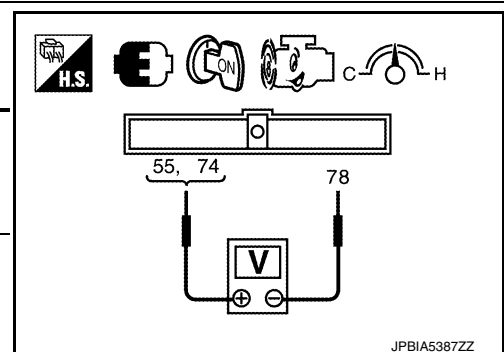
YES >> INSPECTION END

NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | Condition | Voltage |
|-----------|----------|--|--|
| Connector | Terminal | | |
| F72 | 55 | Coasting from 80 km/h (50 MPH) with selector lever in the D position | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | |



Is the inspection result normal?

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P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

YES >> INSPECTION END

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

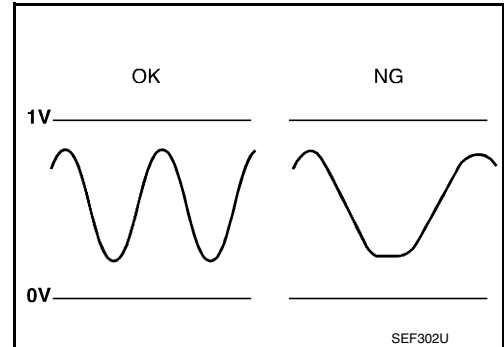
P0139, P0159 HO2S2

DTC Logic

INFOID:000000012524740

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0139 | HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit slow response] | The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel system • EVAP system • Intake air system |
| P0159 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit slow response] | | |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

- YES >> GO TO 2.
- NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.

< DTC/CIRCUIT DIAGNOSIS >

8. Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed.

CAUTION:

Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.

CAUTION:

- Enable the engine brake.
- Always drive carefully.
- Never apply brake when releasing the accelerator pedal.

11. Repeat step 9 and 10 at least 8 times.
12. Check the following item of "DATA MONITOR".

| DTC | Data monitor item | Status |
|-------|-------------------|--------|
| P0139 | HO2 S2 DIAG1 (B1) | CMPLT |
| | HO2 S2 DIAG2 (B1) | |
| P0159 | HO2 S2 DIAG1 (B2) | |
| | HO2 S2 DIAG2 (B2) | |

Is "CMPLT" displayed on CONSULT screen?

YES >> GO TO 6.

NO-1: "CMPLT" is not displayed on DIAG 1>>Perform DTC confirmation procedure again.

NO-2: "CMPLT" is not displayed on DIAG 2>>GO TO 4.

4.PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
3. Start engine and follow the instruction of CONSULT display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 6.


NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

6.PERFORM SELF-DIAGNOSIS

 **With CONSULT**

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to [EC-696. "Diagnosis Procedure"](#).

NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-695. "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-696. "Diagnosis Procedure"](#).

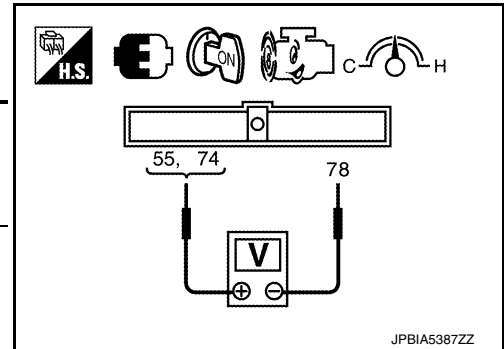
Component Function Check

1. PERFORM COMPONENT FUNCTION CHECK-I

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM Connector | Terminal | | Condition | Voltage |
|-------|------------------|----------|----|---|---|
| | | + | - | | |
| P0139 | F72 | 55 | 78 | Revving up to 4,000 rpm under no load at least 10 times | A change of voltage should be more than 0.8 V for 1 second during this procedure. |
| P0159 | | 74 | | | |



Is the inspection result normal?

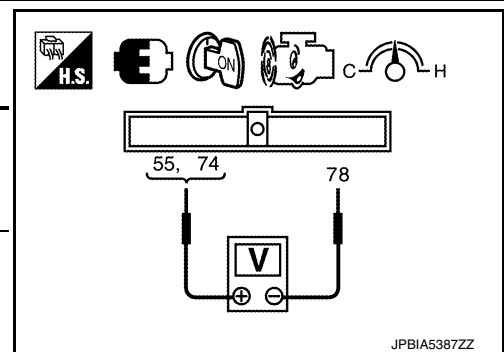
YES >> INSPECTION END

NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM Connector | Terminal | | Condition | Voltage |
|-------|------------------|----------|----|---------------------------------------|---|
| | | + | - | | |
| P0139 | F72 | 55 | 78 | Keeping engine at idle for 10 minutes | A change of voltage should be more than 0.8 V for 1 second during this procedure. |
| P0159 | | 74 | | | |



Is the inspection result normal?

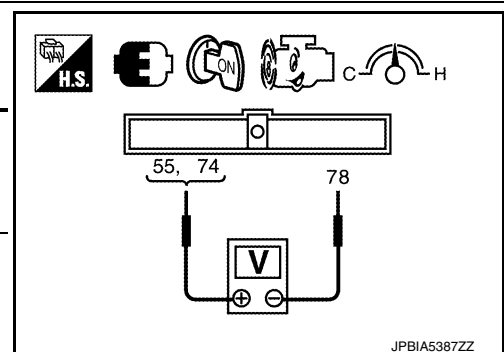
YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM Connector | Terminal | | Condition | Voltage |
|-------|------------------|----------|----|--|---|
| | | + | - | | |
| P0139 | F72 | 55 | 78 | Coasting from 80 km/h (50 MPH) in D position | A change of voltage should be more than 0.8 V for 1 second during this procedure. |
| P0159 | | 74 | | | |



Is the inspection result normal?

YES >> INSPECTION END

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< DTC/CIRCUIT DIAGNOSIS >

NO >> Proceed to [EC-696. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524742

1. CLEAR MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-594. "Description"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-705. "DTC Logic"](#) or [EC-709. "DTC Logic"](#).

NO >> GO TO 2.

2. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between heated oxygen sensor 2 (HO2S2) harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0139 | 1 | F74 | 1 | F72 | 78 | Existed |
| P0159 | 2 | F73 | 1 | | | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|-------|-------|-----------|----------|-----------|----------|------------|
| | HO2S2 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0139 | 1 | F74 | 4 | F72 | 55 | Existed |
| P0159 | 2 | F73 | 4 | | 74 | |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|-------|-----------|----------|--------|-------------|
| | HO2S2 | | | | |
| | Bank | Connector | Terminal | | |
| P0139 | 1 | F74 | 4 | Ground | Not existed |
| P0159 | 2 | F73 | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0139 | F72 | 55 | Ground | Not existed |
| P0159 | | 74 | | |

< DTC/CIRCUIT DIAGNOSIS >

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-697, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

Component Inspection

INFOID:000000012524743

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

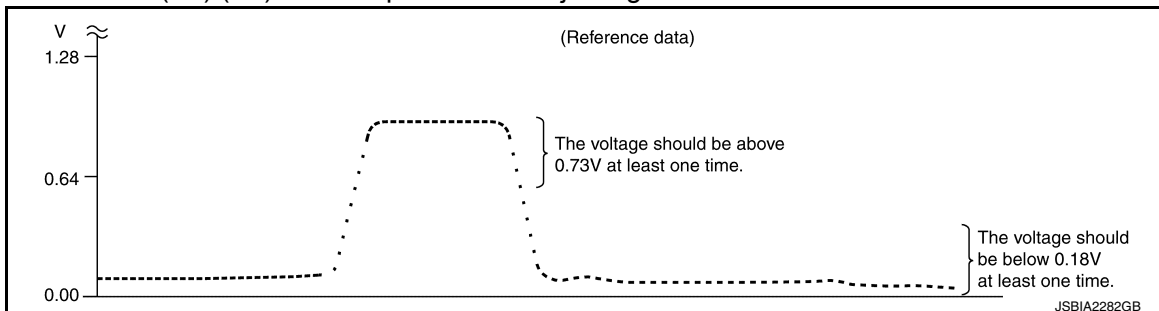
YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

 With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT.
7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.



"HO2S2 (B1)/(B2)" should be above 0.73 V at least once when the "FUEL INJECTION" is + 25%.

"HO2S2 (B1)/(B2)" should be below 0.18 V at least once when the "FUEL INJECTION" is - 25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5, "Exploded View"](#).

3.CHECK HEATED OXYGEN SENSOR 2-I

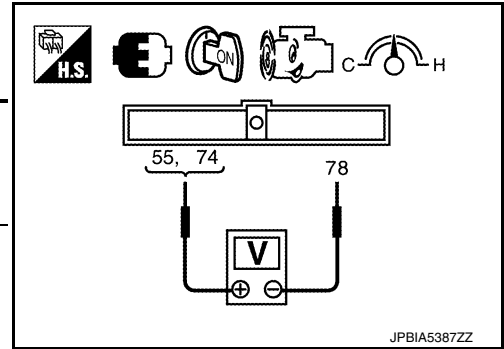
 Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.

< DTC/CIRCUIT DIAGNOSIS >

5. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----------|----|---|--|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 55 | 78 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | | |



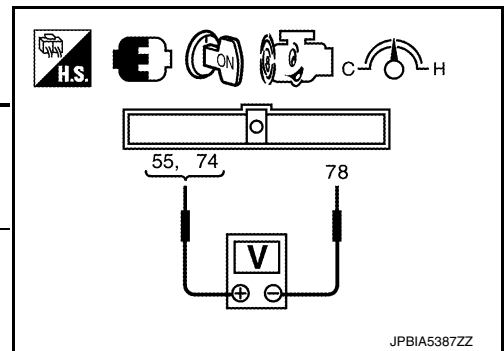
Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----------|----|---------------------------------------|--|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 55 | 78 | Keeping engine at idle for 10 minutes | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | | |



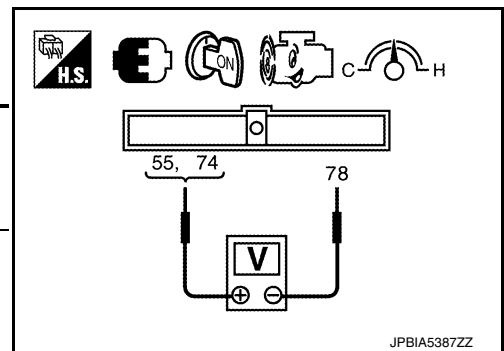
Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 5.

5.CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | Voltage |
|-----------|----------|----|--|--|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 55 | 78 | Coasting from 80 km/h (50 MPH) with selector lever in the D position | The voltage should be above 0.73 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure. |
| | 74 | | | |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning heated oxygen sensor 2. Refer to [EX-5. "Exploded View"](#).

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

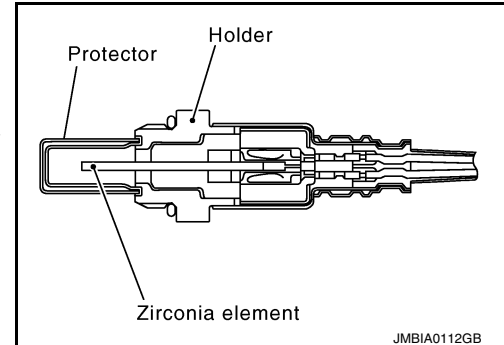
[VK56DE]

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

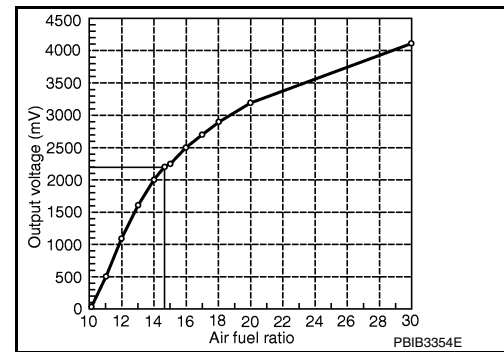
Description

INFOID:000000012524744

The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element. The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range. The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



DTC Logic

INFOID:000000012524745

DTC DETECTION LOGIC

To judge malfunctions, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible Cause |
|---------|--|---|--|
| P014C | Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response | <ul style="list-style-type: none"> The response time of a A/F sensor 1 signal delays more than the specified time computed by ECM. | <ul style="list-style-type: none"> Harness or connectors (The A/F sensor 1 circuit is open or shorted.) A/F sensor 1 |
| P014D | Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response | | |
| P015A | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P015B | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P014E | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P014F | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P015C | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |
| P015D | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

Do you have CONSULT?

YES >> GO TO 2.

NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓜ With CONSULT

1. Start the engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
8. Fully release accelerator pedal and then let engine idle for about 1 minute.
9. Check the items status of "DATA MONITOR" as follows.

NOTE:

If "PRCNT" changed to "ABSNP", refer to [EC-670, "Component Function Check"](#).

| DTC | Data monitor item | Status |
|---|---------------------|--------|
| <ul style="list-style-type: none">• P014C• P014D• P015A• P015B | A/F SEN1 DIAG3 (B1) | PRCNT |
| <ul style="list-style-type: none">• P014E• P014F• P015C• P015D | A/F SEN1 DIAG3 (B2) | |

Is "PRCNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

Ⓜ With CONSULT

Perform DTC confirmation procedure-1 again.

Is "PRCNT" displayed on CONSULT screen?

YES >> GO TO 4.

NO >> Refer to [EC-670, "Component Function Check"](#).

4.PERFORM DTC CONFIRMATION PROCEDURE-2

Ⓜ With CONSULT

1. Wait for about 20 seconds at idle.
2. Check the items status of "DATA MONITOR" as follows.

NOTE:

If "CMPLT" changed to "INCMPT", refer to [EC-670, "Component Function Check"](#).

| DTC | Data monitor item | Status |
|---|---------------------|--------|
| <ul style="list-style-type: none">• P014C• P014D• P015A• P015B | A/F SEN1 DIAG1 (B1) | CMPLT |
| | A/F SEN1 DIAG2 (B1) | |
| <ul style="list-style-type: none">• P014E• P014F• P015C• P015D | A/F SEN1 DIAG1 (B2) | |
| | A/F SEN1 DIAG2 (B2) | |

Is "CMPLT" displayed on CONSULT screen?

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- YES >> GO TO 5.
NO >> Refer to [EC-670, "Component Function Check"](#).

5.PERFORM SELF-DIAGNOSIS

With CONSULT

Check the "SELF-DIAG RESULT".

Is any DTC detected?

- YES >> Proceed to [EC-701, "Diagnosis Procedure"](#).
NO >> INSPECTION END

6.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

With GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service \$01 with GST.
3. Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications.

Is the total percentage within $\pm 15\%$?

- YES >> GO TO 8.
NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

8.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
7. Fully release accelerator pedal and then let engine idle for about 1 minute.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-701, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524746

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in [GI-45, "Circuit Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to [EM-170, "Removal and Installation"](#).

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

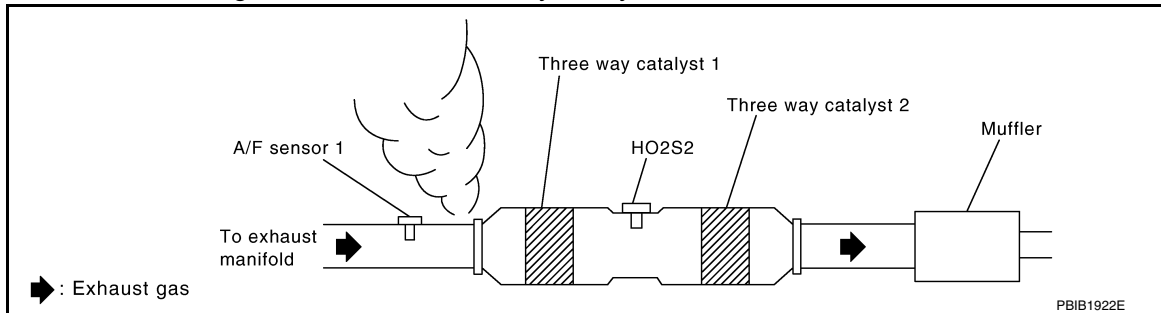
< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> GO TO 3.

3. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

- YES >> Repair or replace.
NO >> GO TO 4.

4. CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

- YES >> Repair or replace.
NO >> GO TO 5.

5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-594, "Description"](#).
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-705, "DTC Logic"](#) or [EC-709, "DTC Logic"](#).
NO >> GO TO 6.

6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect A/F sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | A/F sensor 1 | | | Ground | Voltage |
|---|--------------|-----------|----------|--------|-----------------|
| | Bank | Connector | Terminal | | |
| <ul style="list-style-type: none">• P014C• P014D• P015A• P015B | 1 | F65 | 1 | Ground | Battery voltage |
| <ul style="list-style-type: none">• P014E• P014F• P015C• P015D | 2 | F5 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 8.
NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E2, F32
- IPDM E/R harness connector E119
- 15 A fuse (No. 54)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | ECM | | Continuity |
|--|--------------|-----------|----------|-----------|----------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | |
| • P014C • P014D • P015A • P015B | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| • P014E • P014F • P015C • P015D | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | Ground | Continuity |
|--|--------------|-----------|----------|--------|-------------|
| | Bank | Connector | Terminal | | |
| • P014C • P014D • P015A • P015B | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| • P014E • P014F • P015C • P015D | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | ECM | | | Ground | Continuity |
|--|------|-----------|----------|--------|-------------|
| | Bank | Connector | Terminal | | |
| • P014C • P014D • P015A • P015B | 1 | F72 | 56 | Ground | Not existed |
| | | | 35 | | |
| • P014E • P014F • P015C • P015D | 2 | | 75 | | |
| | | | 16 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to [EC-631, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 13.

10. CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2).

Refer to [EC-641, "Component Inspection"](#).

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning mass air flow sensor.

11.CHECK PCV VALVE

Refer to [EC-903. "Inspection"](#).

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace PCV valve.

12.CHECK INTERMITTENT INCIDENT

Perform [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or replace.

13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

>> INSPECTION END

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000012524747

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator |
|--------------|--|------------------------|---------------|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector |

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0171 | FUEL SYS-LEAN-B1 [Fuel injection system too lean (bank 1)] | • Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | • Intake air leakage • A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection |
| P0174 | FUEL SYS-LEAN-B2 [Fuel injection system too lean (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to [EC-594, "Description"](#).
2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.

NO >> GO TO 4.

3. RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.

Crank engine while depressing accelerator pedal.

NOTE:

- **When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.**

Does engine start?

YES >> Proceed to [EC-706, "Diagnosis Procedure"](#).

NO >> Check exhaust and intake air leakage visually.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 10 minutes.
2. Check 1st trip DTC.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

- YES >> Proceed to [EC-706, "Diagnosis Procedure"](#).
- NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine.
3. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

| | |
|---------------|-----------------------------|
| VHCL SPEED SE | 50 - 120 km/h (31 - 75 MPH) |
|---------------|-----------------------------|

CAUTION:

Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

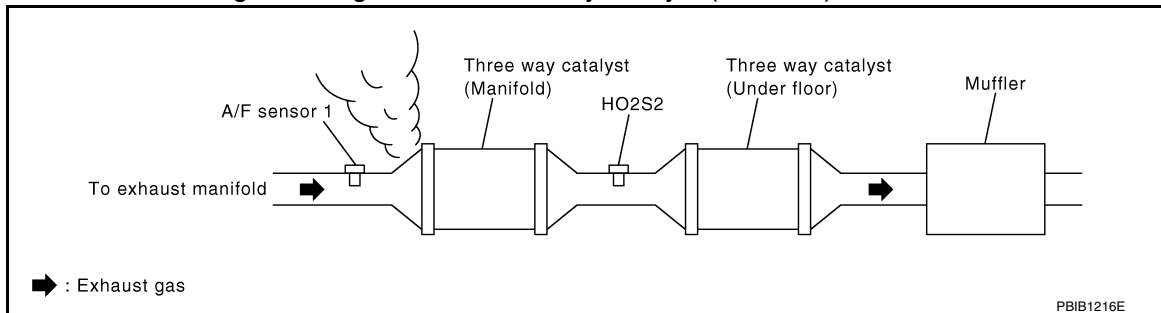
- YES >> Proceed to [EC-706, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524748

1.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

- YES >> Repair or replace malfunctioning part.
- NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAKAGE

1. Listen for an intake air leakage after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leakage detected?

- YES >> Repair or replace malfunctioning part.
- NO >> GO TO 3.

3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| DTC | + | | | - | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | A/F sensor 1 | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0171 | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| P0174 | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | + | | | - | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | A/F sensor 1 | | | | |
| | Bank | Connector | Terminal | | |
| P0171 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0174 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | + | | - | Continuity |
|-------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P0171 | F72 | 56 | Ground | Not existed |
| | | 35 | | |
| P0174 | | 75 | | |
| | | 16 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-596. "Work Procedure"](#).
2. Install fuel pressure gauge kit [SST (J-44321)] and check fuel pressure. Refer to [EC-596. "Work Procedure"](#).

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to [FL-18. "Disassembly and Assembly"](#).

NO >> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

 **With CONSULT**

1. Install all removed parts.

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in Service \$01 with GST.
For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

Is the measurement value within the specification?

YES >> GO TO 7.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-645, "Diagnosis Procedure"](#).

7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

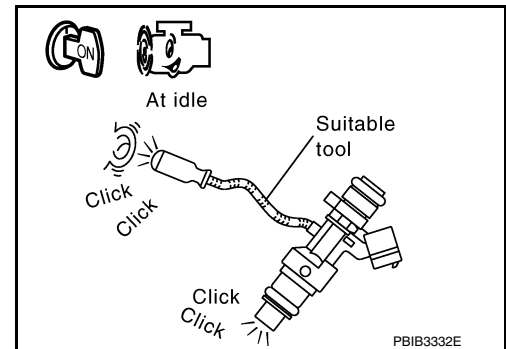
With GST

1. Let engine idle.
2. Listen to each fuel injector operating sound.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-877, "Diagnosis Procedure"](#).



8. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Remove fuel tube assembly. Refer to [EM-181, "Exploded View"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
5. For DTC P0171, reconnect fuel injector harness connectors on bank 1.
For DTC P0174, reconnect fuel injector harness connectors on bank 2.
6. Disconnect all ignition coil harness connectors.
7. Prepare pans or saucers under each fuel injector.
8. Crank engine for about 3 seconds.
For DTC P0171, check that fuel sprays out from fuel injectors on bank 1.
For DTC P0174, check that fuel sprays out from fuel injectors on bank 2.

Fuel should be sprayed evenly for each fuel injector.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.
Refer to [EM-181, "Exploded View"](#).

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:000000012524749

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

| Sensor | Input signal to ECM | ECM function | Actuator |
|--------------|--|------------------------|---------------|
| A/F sensor 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injector |

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0172 | FUEL SYS-RICH-B1 [Fuel injection system too rich (bank 1)] | • Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | • A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Mass air flow sensor |
| P0175 | FUEL SYS-RICH-B2 [Fuel injection system too rich (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to [EC-594. "Description"](#).
2. Start engine.

Is it difficult to start engine?

- YES >> GO TO 3.
NO >> GO TO 4.

3. RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:

- **When depressing accelerator pedal three-fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.**

Does engine start?

- YES >> Proceed to [EC-710. "Diagnosis Procedure"](#).
NO >> Check exhaust and intake air leakage visually.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Proceed to [EC-710. "Diagnosis Procedure"](#).
 NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine.
- Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

| | |
|---------------|-----------------------------|
| VHCL SPEED SE | 50 - 120 km/h (31 - 75 MPH) |
|---------------|-----------------------------|

CAUTION:

Always drive vehicle at a safe speed.

- Check 1st trip DTC.

Is 1st trip DTC detected?

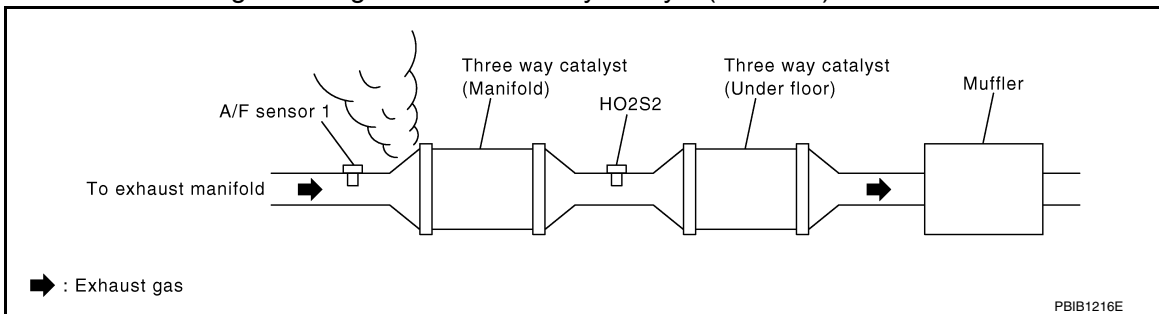
- YES >> Proceed to [EC-710. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524750

1. CHECK EXHAUST GAS LEAKAGE

- Start engine and run it at idle.
- Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

- YES >> Repair or replace malfunctioning part.
 NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

- YES >> Repair or replace malfunctioning part.
 NO >> GO TO 3.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect corresponding A/F sensor 1 harness connector.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | ECM | | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0172 | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| P0175 | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

- Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| DTC | A/F sensor 1 | | | Ground | Continuity |
|-------|--------------|-----------|----------|--------|-------------|
| | Bank | Connector | Terminal | | |
| P0172 | 1 | F65 | 3 | Ground | Not existed |
| | | | 4 | | |
| P0175 | 2 | F5 | 3 | | |
| | | | 4 | | |

| DTC | ECM | | Ground | Continuity |
|-------|-----------|----------|--------|-------------|
| | Connector | Terminal | | |
| P0172 | F72 | 56 | Ground | Not existed |
| | | 35 | | |
| 75 | | | | |
| P0175 | | 16 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-596, "Work Procedure"](#).
2. Install fuel pressure gauge kit [SST (J-44321)] and check fuel pressure. Refer to [EC-596, "Work Procedure"](#).

At idling: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace "fuel filter and fuel pump assembly". Refer to [FL-11, "Removal and Installation"](#).

5. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in "Service \$01" with GST.
For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

Is the measurement value within the specification?

YES >> GO TO 6.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-645, "Diagnosis Procedure"](#).

6. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

With GST

1. Let engine idle.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

[VK56DE]

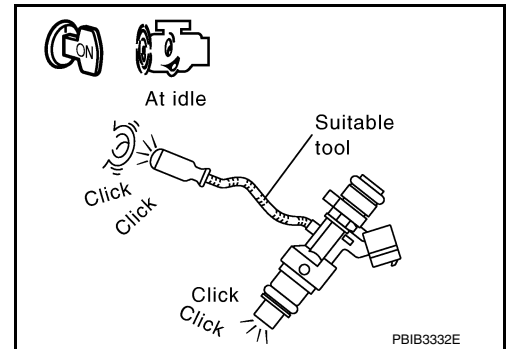
< DTC/CIRCUIT DIAGNOSIS >

2. Listen to each fuel injector operating sound.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-877, "Diagnosis Procedure"](#).



7. CHECK FUEL INJECTOR

1. Remove fuel injector assembly. Refer to [EM-181, "Exploded View"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each fuel injectors.
6. Crank engine for about 3 seconds.
Check fuel does not drip from fuel injector.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one. Refer to [EM-181, "Exploded View"](#).

P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0181 FTT SENSOR

DTC Logic

INFOID:000000012524751

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|---|--|
| P0181 | FTT SENSOR [Fuel tank temperature (FTT) sensor circuit range/performance] | A) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor. | <ul style="list-style-type: none"> • Harness or connectors (The FTT sensor circuit is open or shorted) • FTT sensor |
| | | B) | The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor and FTT sensor) shows that the voltage signal of the FTT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. | <ul style="list-style-type: none"> • Harness or connectors (High or low resistance in the FTT sensor circuit) • FTT sensor |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

- YES >> GO TO 7.
NO >> GO TO 2.

2.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-I

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-715, "Diagnosis Procedure"](#).
NO >> GO TO 4.

4.CHECK ENGINE COOLANT TEMPERATURE

With CONSULT

1. Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT.
2. Check "COOLAN TEMP/S" value.

With GST

Follow the procedure "With CONSULT" above.

"COOLAN TEMP/S" less than 60°C (140°F)?

- YES >> INSPECTION END
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-II

With CONSULT

1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).

< DTC/CIRCUIT DIAGNOSIS >

2. Wait at least 10 seconds.
3. Check 1st trip DTC.

 With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-715, "Diagnosis Procedure"](#).
 NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to [EC-714, "Component Function Check"](#).

NOTE:

Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-715, "Diagnosis Procedure"](#).

7. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Before performing the following procedure, do not add fuel.
- Before performing the following procedure, check that fuel level is between 1/4 and 4/4.
- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.

NOTE:

Cool the vehicle in an environment of ambient air temperature between -10°C (14°F) and 35°C (95°F).

3. Turn ignition switch OFF and soak the vehicle for 12 hours.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

The vehicle must be cooled with the hood open.

4. Start engine and let it idle for 5 minutes or more.

CAUTION:

Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-715, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Component Function Check

INFOID:000000012524752

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

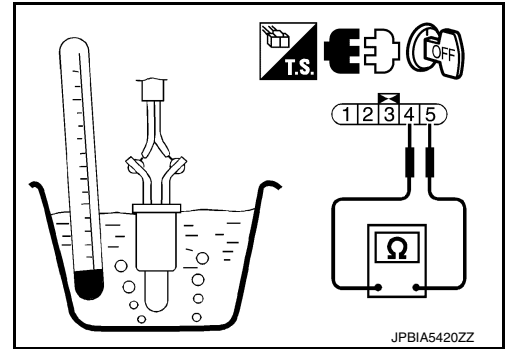
P0181 FTT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.

| Fuel level sensor unit and fuel pump | | Condition | Resistance (kΩ) |
|--------------------------------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 4 | 5 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 2.3 – 2.7 |
| | | | 0.79 – 0.90 |



Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Proceed to [EC-715, "Diagnosis Procedure"](#).

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-715, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524753

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-713, "DTC Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
- B >> GO TO 5.

2.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Proceed to [MWI-54, "Component Function Check"](#).

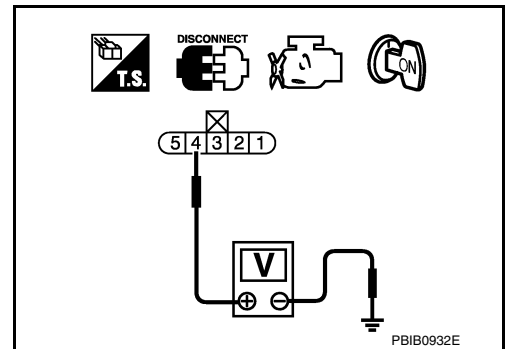
3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY

- Turn ignition switch OFF.
- Disconnect fuel level sensor unit and fuel pump (main) harness connector.
- Turn ignition switch ON.
- Check the voltage between fuel level sensor unit and fuel pump (main) harness connector and ground.

| Fuel level sensor unit and fuel pump (main) | | - | Voltage (Approx.) |
|---|----------|--------|-------------------|
| Connector | Terminal | | |
| C5 | 4 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> GO TO 4.



4.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between fuel tank temperature sensor (main) harness connector and ECM harness connector.

P0181 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| Fuel level sensor unit and fuel pump (main) | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C5 | 4 | E77 | 107 | Existed |

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

5. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between fuel level sensor unit and fuel pump (main) harness connector and combination meter harness connector.

| + | | - | | Continuity |
|---|----------|-------------------|----------|------------|
| Fuel level sensor unit and fuel pump (main) | | Combination meter | | |
| Connector | Terminal | Connector | Terminal | |
| C5 | 5 | M24 | 24 | Existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit, short to ground or short to power in harness or connector.

6. CHECK FUEL TANK TEMPERATURE SENSOR

Check fuel tank temperature sensor. Refer to [EC-716, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace fuel level sensor unit and fuel pump (main). Refer to [FL-11, "Removal and Installation"](#).

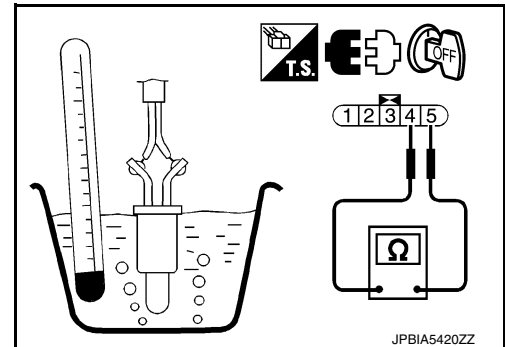
Component Inspection

INFOID:0000000012524754

1. CHECK FUEL TANK TEMPERATURE SENSOR

- Turn ignition switch OFF.
- Remove fuel level sensor unit. Refer to [FL-18, "Disassembly and Assembly"](#).
- Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Fuel level sensor unit and fuel pump | | Condition | Resistance (kΩ) |
|--------------------------------------|---|-----------------------|--------------------------|
| + | - | | |
| Terminal | | | |
| 4 | 5 | Temperature [°C (°F)] | 20 (68) 50 (122) |
| | | | 2.3 – 2.7 0.79 – 0.90 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel level sensor unit and fuel pump (main). Refer to [FL-18, "Disassembly and Assembly"](#).

P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0182, P0183 FTT SENSOR

DTC Logic

INFOID:000000012524755

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0182 | FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | • Harness or connectors (The sensor circuit is open or shorted.) • Fuel tank temperature sensor |
| P0183 | FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-717, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524756

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to [EC-713, "DTC Logic"](#).

Which malfunction is detected?

- A >> GO TO 2.
B >> GO TO 5.

2. CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Proceed to [MWI-54, "Component Function Check"](#).

3. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump (main) harness connector.
3. Turn ignition switch ON.

P0182, P0183 FTT SENSOR

[VK56DE]

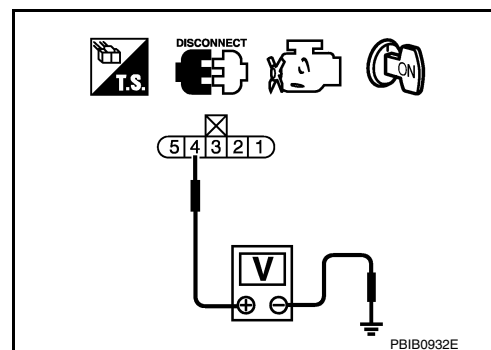
< DTC/CIRCUIT DIAGNOSIS >

4. Check the voltage between fuel level sensor unit and fuel pump (main) harness connector and ground.

| + | | - | | Voltage (Approx.) |
|-----------|----------|-----------|----------|-------------------|
| Connector | Terminal | Connector | Terminal | |
| C5 | 4 | Ground | | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 4.



4. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel tank temperature sensor (main) harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C5 | 4 | E77 | 107 | Existed |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump (main) harness connector and combination meter harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C5 | 5 | M24 | 24 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair open circuit, short to ground or short to power in harness or connector.

6. CHECK FUEL TANK TEMPERATURE SENSOR

Check fuel tank temperature sensor. Refer to [EC-718, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace fuel level sensor unit and fuel pump (main). Refer to [FL-11, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524757

1. CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Remove fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).

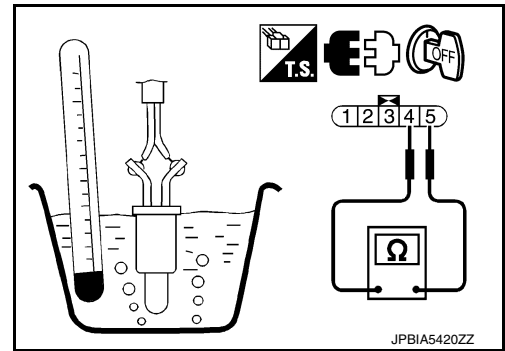
P0182, P0183 FTT SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check resistance between “fuel level sensor unit and fuel pump” terminals by heating with hot water as shown in the figure.

| Fuel level sensor unit and fuel pump | | Condition | Resistance (kΩ) |
|--------------------------------------|---|-----------------------|-----------------|
| + | - | | |
| Terminal | | | |
| 4 | 5 | Temperature [°C (°F)] | 20 (68) |
| | | | 50 (122) |
| | | | 2.3 – 2.7 |
| | | | 0.79 – 0.90 |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel level sensor unit and fuel pump (main). Refer to [FL-11. "Removal and Installation"](#).

A
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P0222, P0223 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0222, P0223 TP SENSOR

DTC Logic

INFOID:000000012524758

DTC DETECTION LOGIC

NOTE:

If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0222 | TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit low input) | An excessively low voltage from the TP sensor 1 is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (TP sensor 1 circuit is open or shorted.) Electric throttle control actuator (TP sensor 1) |
| P0223 | TP SEN 1/CIRC-B2 (Throttle position sensor 1 circuit high input) | An excessively high voltage from the TP sensor 1 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-720, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524759

1. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY

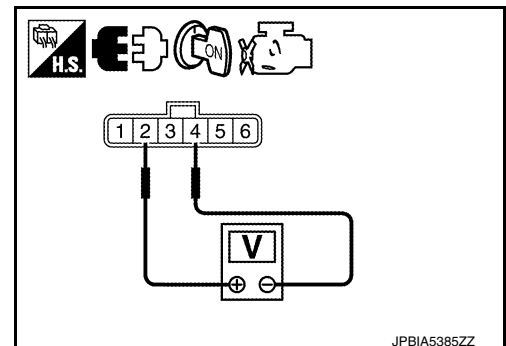
- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector terminals.

| Electric throttle control actuator | | | Voltage (Approx.) |
|------------------------------------|----------|---|----------------------|
| Connector | + | - | |
| | Terminal | | |
| F50 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY-2



P0222, P0223 TP SENSOR

[VK56DE]

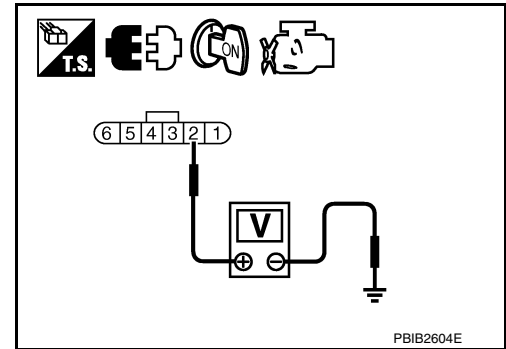
< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------------------------------|----------|--------|-------------------|
| Electric throttle control actuator | | | |
| Connector | Terminal | | |
| F50 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair or replace error-detected parts.



3. CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 4 | F72 | 66 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Repair or replace error-detected parts.

4. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | | |
| E77 | 115 | Ground | Existed |
| | 116 | | |
| F72 | 1 | | |

Is inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> Repair or replace error-detected parts.

5. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 1 | F72 | 50 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.

P0222, P0223 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR

Check throttle position sensor. Refer to [EC-722, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace electric throttle control actuator. Refer to [EM-166, "Exploded View"](#).

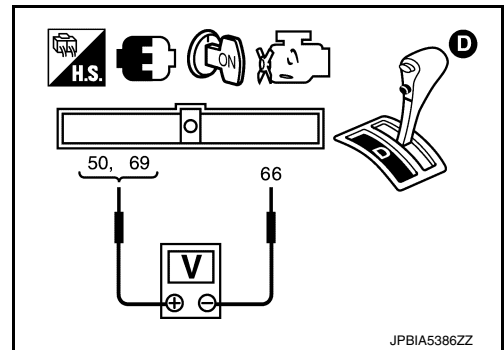
Component Inspection

INFOID:000000012524760

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform [EC-591, "Description"](#).
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | Condition | Voltage |
|-----------|----------|-----------------|------------------|
| Connector | Terminal | | |
| F72 | 50 | Fully released | More than 0.36 V |
| | | Fully depressed | Less than 4.75 V |
| | 69 | Fully released | Less than 4.75 V |
| | | Fully depressed | More than 0.36 V |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to [EM-166, "Exploded View"](#).

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

DTC Logic

INFOID:000000012524761

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input signal to ECM | ECM function |
|----------------------------------|---------------------|-------------------------------|
| Crankshaft position sensor (POS) | Engine speed | On board diagnosis of misfire |

The misfire detection logic consists of the following two conditions.

- One Trip Detection Logic (Three Way Catalyst Damage)**
On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
- Two Trip Detection Logic (Exhaust quality deterioration)**
For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|-----------------------------|--|
| P0300 | MULTI CYL MISFIRE (Multiple cylinder misfires detected) | Multiple cylinders misfire. | <ul style="list-style-type: none">• Improper spark plug• Insufficient compression• Incorrect fuel pressure• The fuel injector circuit is open or shorted• Fuel injector• Intake air leakage• The ignition signal circuit is open or shorted• Lack of fuel• Signal plate• A/F sensor 1• Incorrect PCV hose connection |
| P0301 | CYL 1 MISFIRE (No. 1 cylinder misfire detected) | No. 1 cylinder misfires. | |
| P0302 | CYL 2 MISFIRE (No. 2 cylinder misfire detected) | No. 2 cylinder misfires. | |
| P0303 | CYL 3 MISFIRE (No. 3 cylinder misfire detected) | No. 3 cylinder misfires. | |
| P0304 | CYL 4 MISFIRE (No. 4 cylinder misfire detected) | No. 4 cylinder misfires. | |
| P0305 | CYL 5 MISFIRE (No. 5 cylinder misfire detected) | No. 5 cylinder misfires. | |
| P0306 | CYL 6 MISFIRE (No. 6 cylinder misfire detected) | No. 6 cylinder misfires. | |
| P0307 | CYL 7 MISFIRE (No. 7 cylinder misfire detected) | No. 7 cylinder misfires. | |
| P0308 | CYL 8 MISFIRE (No. 8 cylinder misfire detected) | No. 8 cylinder misfires. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and let it idle for approximately 15 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-724. "Diagnosis Procedure"](#).
 NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.

Hold the accelerator pedal as steady as possible.

Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.

CAUTION:

Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

| | |
|--|--|
| Engine speed | Engine speed in the freeze frame data \pm 400 rpm |
| Vehicle speed | Vehicle speed in the freeze frame data \pm 10 km/h (6 MPH) |
| Basic fuel schedule | Basic fuel schedule in freeze frame data \times (1 \pm 0.1) |
| Engine coolant temperature (T) condition | When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F). |
| | When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F). |

Driving time varies according to the engine speed in the freeze frame data.

| Engine speed | Time |
|---------------------|---------------------------|
| Around 1,000 rpm | Approximately 10 minutes |
| Around 2,000 rpm | Approximately 5 minutes |
| More than 3,000 rpm | Approximately 3.5 minutes |

5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-724. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524762

1. CHECK GROUND CONNECTION

Check the following.

- Connection condition of the ground F2, F10 and F16
- Connection condition of the ground harness between the engine assembly and vehicle body (if equipped)

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace the error-detected parts.

2. CHECK FOR INTAKE AIR LEAKAGE AND PCV HOSE

1. Start the engine and run it at idle speed.
2. Listen for the sound of the intake air leakage.
3. Check PCV hose connection.

Is intake air leakage detected?

- YES >> Discover air leakage location and repair.
- NO >> GO TO 3.

3. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop the engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 4.
- YES-2 >> Without CONSULT: GO TO 5.
- NO >> Repair or replace malfunctioning part.

4. PERFORM POWER BALANCE TEST

With CONSULT

1. Start the engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> GO TO 5.

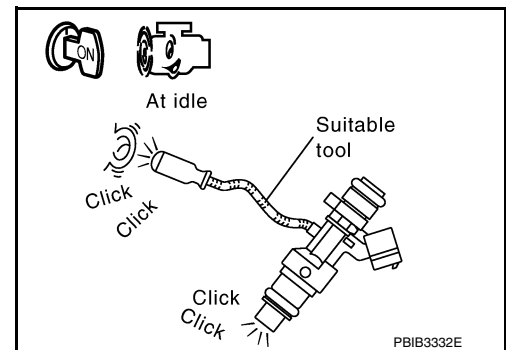
5. CHECK FUNCTION OF FUEL INJECTOR

1. Start the engine and let it idle.
2. Listen to each fuel injector make operation sound.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to [EC-877, "Diagnosis Procedure"](#).



6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse in IPDM E/R to release fuel pressure. Refer to [PCS-25, "Removal and Installation"](#).

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start the engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-178, "Exploded View"](#).
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

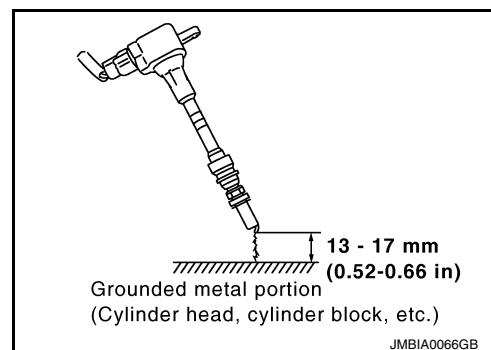
Spark should be generated.

CAUTION:

- During the operation, always stay 0.5 m (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.



Is the inspection result normal?

- YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

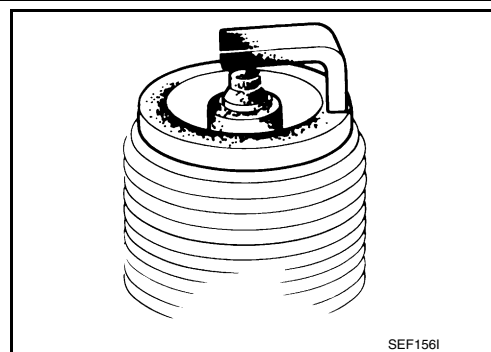
- YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to [EC-882, "Diagnosis Procedure"](#).

8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-257, "Standard and Limit"](#).
NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank the engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-257, "Standard and Limit"](#).

10. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to [EM-163, "Checking Compression Pressure"](#).

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Is the inspection result normal?

YES >> GO TO 11.

NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

11. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to [EC-596. "Work Procedure"](#).
3. Install fuel pressure gauge kit [SST (J-44321)] and check fuel pressure. Refer to [EC-596. "Work Procedure"](#).

At idle: Approximately 350 kPa (3.57 kg/cm², 51 psi)

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly". Refer to [FL-11. "Removal and Installation"](#).

NO >> Repair or replace malfunctioning part.

13. CHECK IGNITION TIMING

Check idle speed and ignition timing.

For procedure, refer to [EC-584. "Work Procedure"](#).

For specification, refer to [EC-905. "Idle Speed"](#) and [EC-905. "Ignition Timing"](#).

Is the inspection result normal?

YES >> GO TO 14.

NO >> Follow the [EC-584. "Work Procedure"](#).

14. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| + | | | - | | Continuity |
|--------------|-----------|----------|-----------|----------|------------|
| A/F sensor 1 | | | ECM | | |
| Bank | Connector | Terminal | Connector | Terminal | |
| 1 | F65 | 3 | F72 | 56 | Existed |
| | | 4 | | 35 | |
| 2 | F5 | 3 | | 75 | |
| | | 4 | | 16 | |

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| + | | | - | Continuity |
|--------------|-----------|----------|--------|-------------|
| A/F sensor 1 | | | | |
| Bank | Connector | Terminal | | |
| 1 | F65 | 3 | Ground | Not existed |
| | | 4 | | |
| 2 | F5 | 3 | | |
| | | 4 | | |

| | | | |
|-----------|----------|--------|-------------|
| + | | - | Continuity |
| ECM | | | |
| Connector | Terminal | | |
| F72 | 56 | Ground | Not existed |
| | 35 | | |
| | 75 | | |
| | 16 | | |

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

15. CHECK A/F SENSOR 1 HEATER

Check A/F sensor 1 heater. Refer to [EC-631, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace the malfunctioning A/F sensor 1. Refer to [EM-170, "Exploded View"](#).

16. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.

2. For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

With GST

1. Check mass air flow sensor signal in Service \$01 with GST.

2. For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

Is the measurement value within the specification?

YES >> GO TO 17.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to [EC-645, "Diagnosis Procedure"](#).

17. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in [EC-894, "Symptom Table"](#).

Is the inspection result normal?

YES >> GO TO 18.

NO >> Repair or replace malfunctioning part.

18. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to [EC-518, "CONSULT Function"](#).

>> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

P0327, P0328, P0332, P0333 KS

DTC Logic

INFOID:000000012524763

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detected condition | Possible cause |
|---------|---|---|--|
| P0327 | KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit low input] | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor |
| P0328 | KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit high input] | An excessively high voltage from the sensor is sent to ECM. | |
| P0332 | KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit low input] | An excessively low voltage from the sensor is sent to ECM. | |
| P0333 | KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit high input] | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-729, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524764

1. CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector and ECM harness connector.
2. Check the continuity between knock sensor harness connector and ground.

| DTC | + | | | - | Continuity |
|--------------|--------------|-----------|----------|--------|------------|
| | Knock sensor | | | | |
| | Bank | Connector | Terminal | | |
| P0327, P0328 | 1 | F213 | 2 | Ground | Existed |
| P0332, P0333 | 2 | F214 | 2 | | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

P0327, P0328, P0332, P0333 KS

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between knock sensor harness connector and ECM harness connector.

| DTC | + | | | - | | Continuity |
|--------------|--------------|-----------|----------|-----------|----------|------------|
| | Knock sensor | | | ECM | | |
| | Bank | Connector | Terminal | Connector | Terminal | |
| P0327, P0328 | 1 | F213 | 1 | F72 | 36 | Existed |
| P0332, P0333 | 2 | F214 | 1 | | 15 | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK KNOCK SENSOR

Check knock sensor. Refer to [EC-730, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Replace malfunctioning knock sensor. Refer to [EM-230, "Exploded View"](#).

Component Inspection

INFOID:0000000012524765

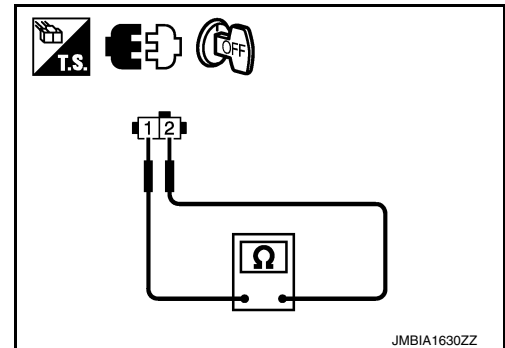
1. CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminal as per the following.

NOTE:

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

| Knock sensor | | Resistance |
|--------------|---|---------------------------------------|
| + | - | |
| Terminals | | |
| 1 | 2 | Approx. 532 - 588 kΩ [at 20°C (68°F)] |



CAUTION:

Never use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Replace malfunctioning knock sensor. Refer to [EM-230, "Exploded View"](#).

P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0335 CKP SENSOR (POS)

DTC Logic

INFOID:000000012524766

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0335 | CKP SEN/CIRCUIT [Crankshaft position sensor (POS) circuit] | <ul style="list-style-type: none">The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking.The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running.The crankshaft position sensor (POS) signal is not in the normal pattern during engine running. | <ul style="list-style-type: none">Harness or connectors [CKP sensor (POS) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.)Crankshaft position sensor (POS)Accelerator pedal position sensorEVAP control system pressure sensorRefrigerant pressure sensorSignal plate |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 5 seconds.
If engine does not start, crank engine for at least 2 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-731. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524767

1. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY

- Disconnect crankshaft position (CKP) sensor (POS) harness connector.
- Turn ignition switch ON.

P0335 CKP SENSOR (POS)

[VK56DE]

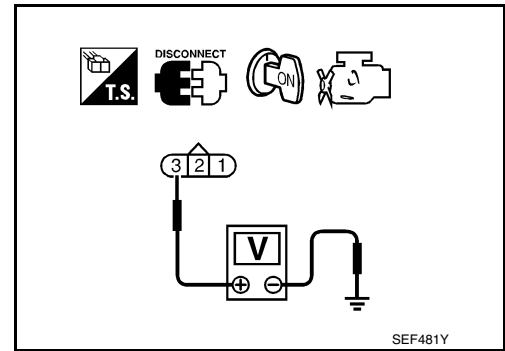
< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between CKP sensor (POS) harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| Connector | Terminal | | |
| F11 | 3 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.



2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

- Turn ignition switch ON.
- Disconnect IPDM E/R harness connector.
- Check the continuity between CKP sensor (POS) harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F11 | 3 | E119 | 4 | Existed |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

3. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F11 | 1 | F72 | 1 | Existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F11 | 2 | F72 | 13 | Existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK CRANKSHAFT POSITION SENSOR (POS)

Check crankshaft position sensor (POS). Refer to [EC-733, "Component Inspection"](#).

P0335 CKP SENSOR (POS)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace crankshaft position sensor (POS). Refer to [EM-230. "Exploded View"](#).

6. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace the signal plate. Refer to [EM-230. "Exploded View"](#).

Component Inspection

INFOID:0000000012524768

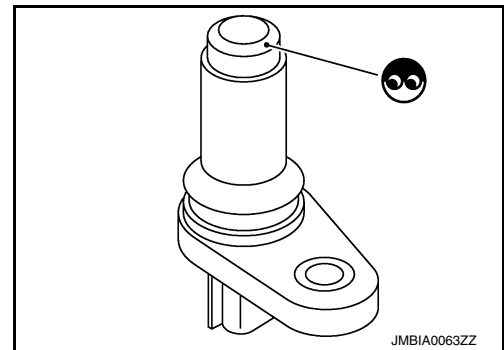
1. CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.

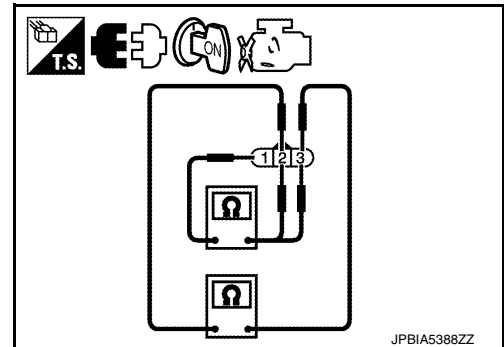
NO >> Replace crankshaft position sensor (POS). Refer to [EM-230. "Exploded View"](#).



2. CHECK CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance crankshaft position sensor (POS) terminals as per the following.

| Crankshaft position sensor (POS) | | Resistance [at 25°C (77°F)] |
|----------------------------------|---|-----------------------------|
| + | - | |
| Terminal (Polarity) | | Except 0 or ∞ Ω |
| 1 | 2 | |
| | 3 | |
| 2 | 3 | |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS). Refer to [EM-230. "Exploded View"](#).

P0340 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0340 CMP SENSOR (PHASE)

DTC Logic

INFOID:000000012524769

DTC DETECTION LOGIC

NOTE:

If DTC P0340 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0340 | CMP SEN/CIRC-B1 [Camshaft position sensor (PHASE) (bank 1) circuit] | <ul style="list-style-type: none">The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking.The cylinder No. signal is not sent to ECM during engine running.The cylinder No. signal is not in the normal pattern during engine running. | <ul style="list-style-type: none">Harness or connectors (The sensor circuit is open or shorted)Camshaft position sensor (PHASE)Camshaft (INT)Starter motor (Refer to STR-8, "System Description".)Starting system circuit (Refer to STR-8, "System Description".)Dead (Weak) battery |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and let it idle for at least 5 seconds.
If engine does not start, crank engine for at least 2 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-734, "Diagnosis Procedure"](#).
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

- Maintaining engine speed at more than 800 rpm for at least 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-734, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524770

1. CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

- YES >> GO TO 2.

P0340 CMP SENSOR (PHASE)

[VK56DE]

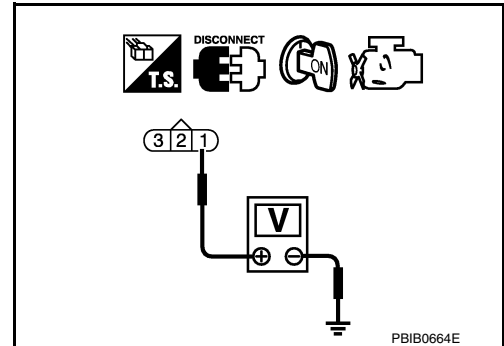
< DTC/CIRCUIT DIAGNOSIS >

NO >> Check starting system. (Refer to [CHG-10, "Work Flow \(With EXP-800 NI or GR8-1200 NI\)"](#) or [CHG-13, "Work Flow \(Without EXP-800 NI or GR8-1200 NI\)"](#).)

2.CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CMP sensor (PHASE) harness connector and ground.

| DTC | + | | - | Voltage (Approx.) |
|-------|--------------------|----------|--------|-------------------|
| | CMP sensor (PHASE) | | | |
| | Connector | Terminal | | |
| P0340 | F23 | 1 | Ground | Battery voltage |



Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| DTC | + | | - | | Continuity |
|-------|--------------------|----------|-----------|----------|------------|
| | CMP sensor (PHASE) | | ECM | | |
| | Connector | Terminal | Connector | Terminal | |
| P0340 | F23 | 1 | F72 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| DTC | + | | - | | Continuity |
|-------|--------------------|----------|-----------|----------|------------|
| | CMP sensor (PHASE) | | ECM | | |
| | Connector | Terminal | Connector | Terminal | |
| P0340 | F23 | 2 | F72 | 14 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Check camshaft position sensor (PHASE). Refer to [EC-736, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-187, "Camshaft Position Sensor \(PHASE\)"](#).

6.CHECK CAMSHAFT (INT)

Check the following.

P0340 CMP SENSOR (PHASE)

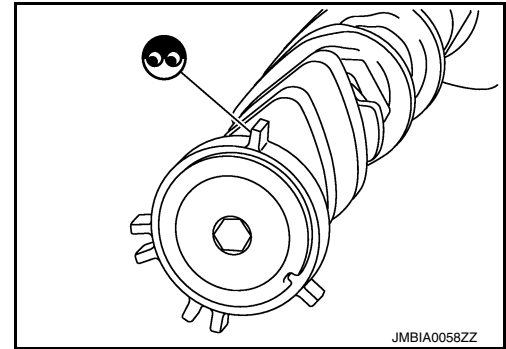
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to [EM-200, "Exploded View"](#).



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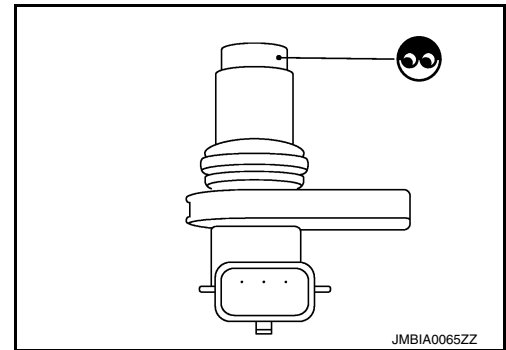
Component Inspection

1. CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position sensor (PHASE) harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-187, "Camshaft Position Sensor \(PHASE\)"](#).

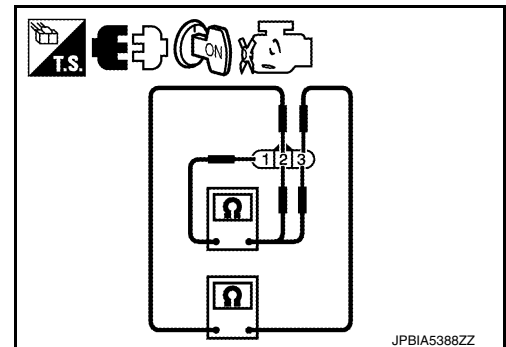


JMBIA0065ZZ

2. CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as per the following.

| CMP sensor (PHASE) | | Resistance [Ω at 25°C (77°F)] |
|----------------------|---|---------------------------------------|
| + | - | |
| Terminals (Polarity) | | Except 0 or ∞ |
| 1 | 2 | |
| | 3 | |
| 2 | 3 | |



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Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-187, "Camshaft Position Sensor \(PHASE\)"](#).

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

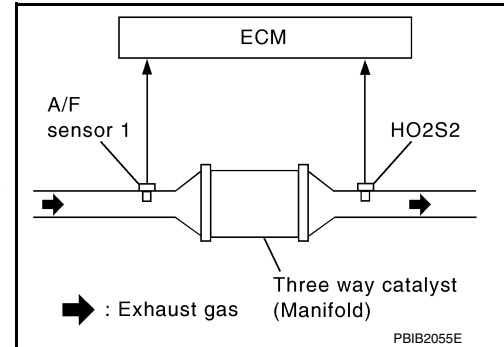
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DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.

A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.

When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0420 | TW CATALYST SYS-B1 [Catalyst system efficiency below threshold (bank 1)] | <ul style="list-style-type: none"> Three way catalyst (manifold) does not operate properly. Three way catalyst (manifold) does not have enough oxygen storage capacity. | <ul style="list-style-type: none"> Three way catalyst (manifold) Exhaust tube Intake air leakage Fuel injector Fuel injector leakage Spark plug Improper ignition timing |
| P0430 | TW CATALYST SYS-B2 [Catalyst system efficiency below threshold (bank 2)] | | |

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

YES >> GO TO 2.

NO >> GO TO 7.

2. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Do not maintain engine speed for more than the specified minutes below.

>> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-I

Ⓜ With CONSULT

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT.
11. Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of "CATALYST".

Which is displayed on CONSULT screen?

- CMPLT >> GO TO 6.
- INCMP >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Wait 5 seconds at idle.
2. Rev engine between 2,000 and 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).

Does the indication change to "CMPLT"?

- YES >> GO TO 6.
- NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

6.PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-739, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-738, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-739, "Diagnosis Procedure"](#).

Component Function Check

INFOID:0000000012524773

1.PERFORM COMPONENT FUNCTION CHECK

⊗ Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Open engine hood.

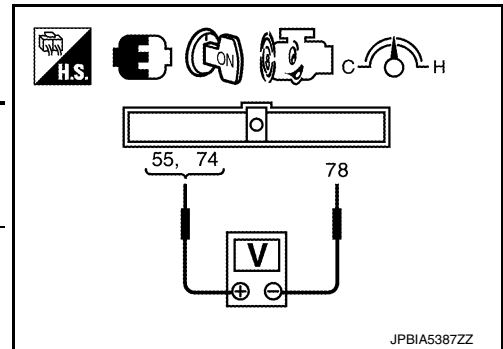
P0420, P0430 THREE WAY CATALYST FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

8. Check the voltage between ECM harness connector terminals under the following conditions.

| DTC | ECM | | Condition | Voltage (V) |
|-------|-----------|----------|--|---|
| | Connector | Terminal | | |
| P0420 | F72 | 55 | Keeping engine speed at 2,500 rpm constant under no load | The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0 |
| P0430 | | 74 | | |



Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-739, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524774

1. CHECK EXHAUST SYSTEM

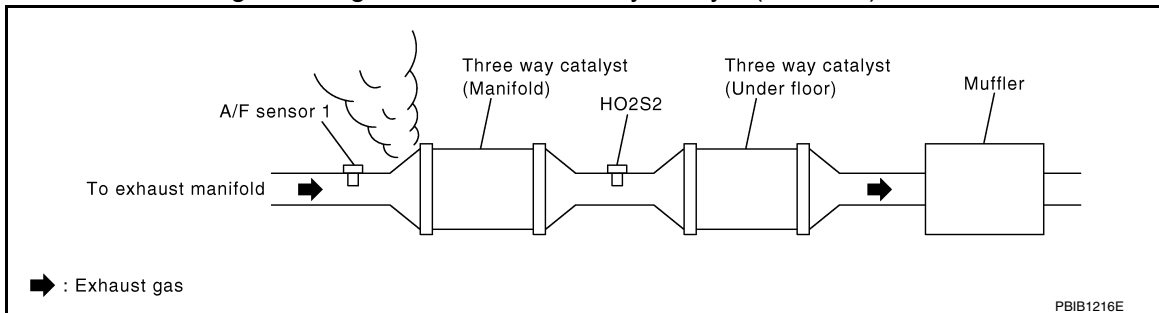
Visually check exhaust tubes and muffler for dents.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before the three way catalyst (manifold).



Is exhaust gas leakage detected?

- YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

- YES >> Repair or replace malfunctioning part.
NO >> GO TO 4.

4. CHECK IGNITION TIMING

Check idle speed and ignition timing.

For procedure, refer to [EC-584, "Work Procedure"](#).

For specification, refer to [EC-905, "Idle Speed"](#) and [EC-905, "Ignition Timing"](#).

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Follow the [EC-584, "Work Procedure"](#).

5. CHECK FUEL INJECTORS

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Check the fuel injector. Refer to [EC-877, "Component Function Check"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform [EC-877, "Diagnosis Procedure"](#).

6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse in IPDM E/R to release fuel pressure.

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-178, "Exploded View"](#).
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- During the operation, always stay 0.5 m (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.

NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

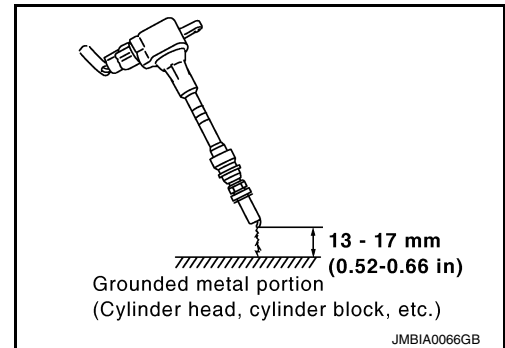
Spark should be generated.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Check ignition coil, power transistor and their circuit. Refer to [EC-882, "Diagnosis Procedure"](#).

8. CHECK SPARK PLUG



P0420, P0430 THREE WAY CATALYST FUNCTION

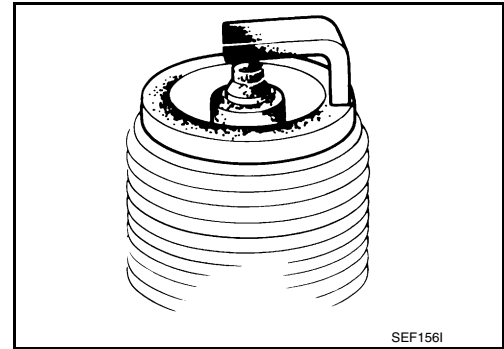
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-257, "Standard and Limit"](#).
NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-257, "Standard and Limit"](#).

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly. Refer to [EM-181, "Exploded View"](#). Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.
6. Check that the fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

- YES >> Replace the fuel injector(s) from which fuel is dripping. Refer to [EM-170, "Exploded View"](#).
NO >> GO TO 11.

11. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace three way catalyst assembly. Refer to [EM-170, "Exploded View"](#).
NO >> Repair or replace error-detected parts.

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0441 EVAP CONTROL SYSTEM

DTC Logic

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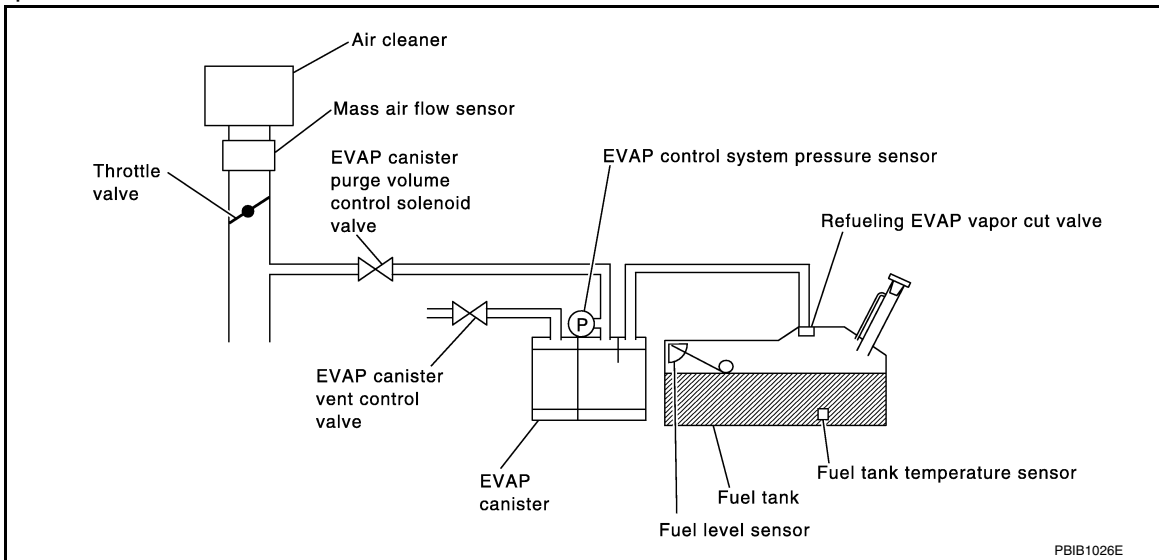
DTC DETECTION LOGIC

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0441 | EVAP PURG FLOW/MON (EVAP control system incorrect purge flow) | EVAP control system does not operate properly, EVAP control system has a leakage between intake manifold and EVAP control system pressure sensor. | <ul style="list-style-type: none"> • EVAP canister purge volume control solenoid valve stuck closed • EVAP control system pressure sensor and the circuit • Loose, disconnected or improper connection of rubber tube • Blocked rubber tube • Cracked EVAP canister • EVAP canister purge volume control solenoid valve circuit • Accelerator pedal position sensor • Blocked purge port • EVAP canister vent control valve |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

YES >> GO TO 2.

NO >> GO TO 6.

2.PRECONDITIONING

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
7. Touch "START".

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

| Selector lever | Suitable position |
|----------------|-----------------------------|
| VHCL SPEED SE | 32 - 120 km/h (20 - 75 mph) |
| ENG SPEED | 500 - 3,000 rpm |
| B/FUEL SCHDL | 1.0 - 12.0 msec |
| COOLAN TEMP/S | More than 0°C (32°F) |

CAUTION:

Always drive vehicle at a safe speed.

If "TESTING" does not change for a long time, retry from step 2.

Is "COMPLETED" displayed on CONSULT screen?

YES >> GO TO 5.

NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END

NG >> Proceed to [EC-744, "Diagnosis Procedure"](#).

6.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-744, "Component Function Check"](#).

NOTE:

Use component function check to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-744, "Diagnosis Procedure"](#).

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

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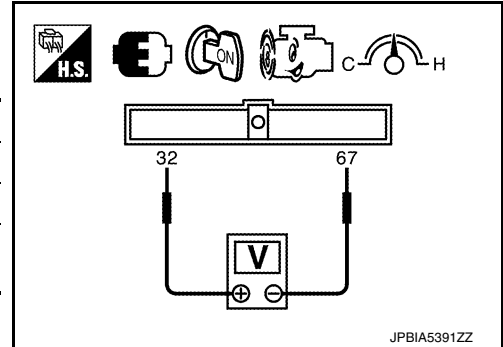
Component Function Check

1. PERFORM COMPONENT FUNCTION CHECK

⊗ Without CONSULT

1. Lift up drive wheels.
2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF, wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF, wait at least 10 seconds.
6. Start engine and wait at least 70 seconds.
7. Set voltmeter probes to ECM harness connector terminals under the following conditions.

| ECM | | |
|-----------|--|-----------------------|
| Connector | + | - |
| | Terminal | Terminal |
| F72 | 32 (EVAP control system pressure sensor signal) | 67 (Sensor ground) |



8. Check EVAP control system pressure sensor value at idle speed and note it.
9. Establish and maintain the following conditions for at least 1 minute.

| | |
|-----------------------------|-----------------------------------|
| Air conditioner switch | ON |
| Head lamp switch | ON |
| Rear window defogger switch | ON |
| Engine speed | Approx. 3,000 rpm |
| Gear position | Any position other than P, N or R |

10. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 6) for at least 1 second.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-744, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524777

1. CHECK EVAP CANISTER

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 2.
 YES-2 >> Without CONSULT: GO TO 3.
 NO >> Replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

2. CHECK PURGE FLOW

Ⓟ With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to [EC-498, "EVAPORATIVE EMISSION SYSTEM : System Description"](#).
2. Start engine and let it idle.
3. Select "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT.
4. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check vacuum existence.

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| PURG VOL C/V | Vacuum |
|--------------|-------------|
| 100% | Existed |
| 0% | Not existed |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

3. CHECK PURGE FLOW

⊗ Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to [EC-498. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).
4. Start engine and let it idle.
Do not depress accelerator pedal even slightly.
5. Check vacuum gauge indication before 60 seconds pass after starting engine.

Vacuum should not exist.

6. Rev engine up to 2,000 rpm after 100 seconds pass after starting engine.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 4.

4. CHECK EVAP PURGE LINE

1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
Refer to [EC-498. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

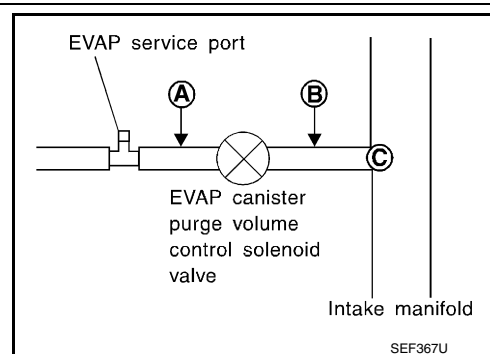
Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair EVAP purge line.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.
2. Blow air into each hose and EVAP purge port **C**.



P0441 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

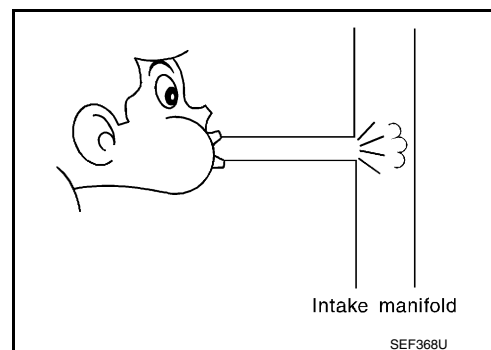
3. Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.

YES-2 >> Without CONSULT: GO TO 7.

NO >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Start engine.

2. Perform "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.

NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check EVAP canister purge volume control solenoid valve. Refer to [EC-751, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-166, "Exploded View"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Check EVAP control system pressure sensor function. Refer to [EC-768, "DTC Logic"](#) for DTC P0452, [EC-771, "DTC Logic"](#) for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Check EVAP canister vent control valve. Refer to [EC-758, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace EVAP canister vent control valve. Refer to [FL-13, "Removal and Installation"](#).

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leakage. Refer to [EC-498, "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair EVAP purge line.

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

A

EC

C

D

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P

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:000000012524778

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|--|---|
| P0443 | PURG VOLUME CONT/ V (EVAP canister purge volume control solenoid valve) | A | The canister purge flow is detected during the vehicle is stopped while the engine is running, even when EVAP canister purge volume control solenoid valve is completely closed. | <ul style="list-style-type: none">• EVAP control system pressure sensor• EVAP canister purge volume control solenoid valve (The valve is stuck open.)• EVAP canister vent control valve• EVAP canister• Hoses (Hoses are connected incorrectly or clogged.) |
| | | B | The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- Perform “DTC CONFIRMATION PROCEDURE” when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 60°C (41 to 140°F).
- Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.

Do you have CONSULT

- YES >> GO TO 2.
NO >> GO TO 4.

2. PERFORM DTC CONFIRMATION PROCEDURE A

With CONSULT

1. Turn ignition switch ON.
2. Check that the following condition are met.
FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
3. Start engine and wait at least 60 seconds.
4. Check 1st trip DTC.

IS 1st trip DTC detected?

- YES >> Proceed to [EC-749, "Diagnosis Procedure"](#).
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE B

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT.
7. Touch “START”.
8. Start engine and let it idle until “TESTING” on CONSULT changes to “COMPLETED”. (It will take approximately 10 seconds.)

If “TESTING” is not displayed after 5 minutes, retry from step 2.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

9. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

- YES >> INSPECTION END
- NO >> Proceed to [EC-749, "Diagnosis Procedure"](#).

4.PERFORM DTC CONFIRMATION PROCEDURE A

With GST

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

| | | | |
|-----------|----------|--------|----------------------|
| + | | - | Voltage (Approx.) |
| ECM | | | |
| Connector | Terminal | | |
| E77 | 107 | Ground | 3.1 - 4.0 V |

3. Start engine and wait at least 60 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-749, "Diagnosis Procedure"](#).
- NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE B

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 20 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC displayed?

- YES >> Proceed to [EC-749, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524779

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

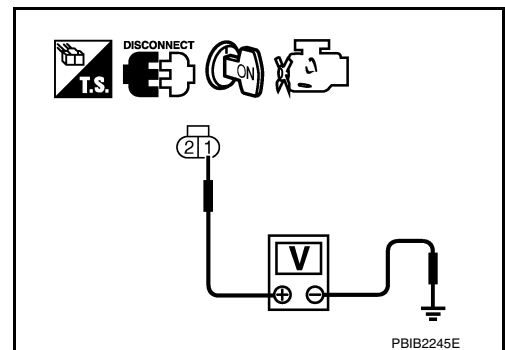
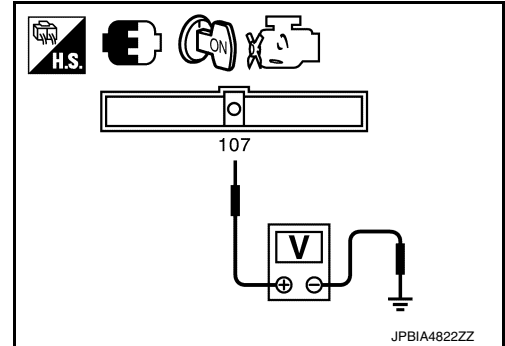
| | | | |
|---|----------|--------|----------------------|
| + | | - | Voltage (Approx.) |
| EVAP canister purge volume control solenoid valve | | | |
| Connector | Terminal | | |
| F15 | 1 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> GO TO 2.

2.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.



P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 1 | E119 | 4 | Existed |

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 2 | F72 | 45 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-766. "Component Inspection"](#).

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.

YES-2 >> Without CONSULT: GO TO 7.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Ⓟ **With CONSULT**

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Start the engine.
4. Perform "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.

NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check EVAP canister purge volume control solenoid valve. Refer to [EC-751, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-166, "Exploded View"](#).

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Check EVAP canister vent control valve. Refer to [EC-758, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace EVAP canister vent control valve. Refer to [FL-13, "Removal and Installation"](#).

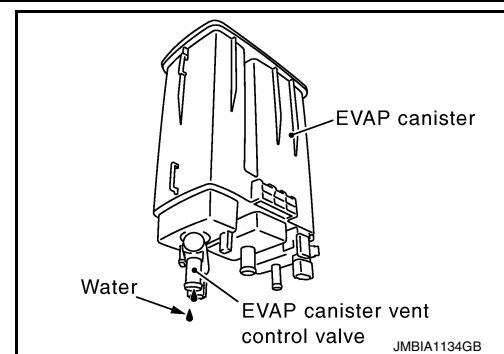
10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-13, "Removal and Installation"](#).

Does water drain from the EVAP canister?

YES >> GO TO 11.

NO >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.51 lb).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524780

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Start the engine.
5. Select "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT.

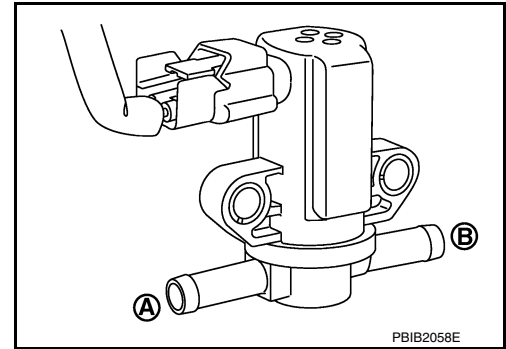
P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

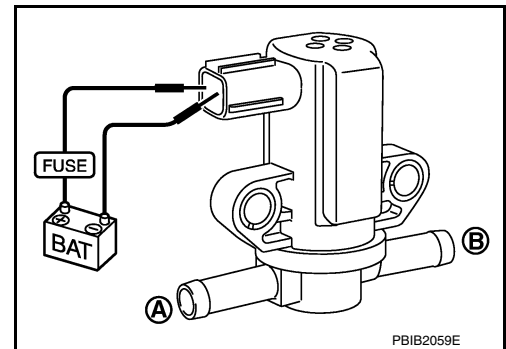
| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|---|
| 100% | Existed |
| 0% | Not existed |



⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12 V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |



Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-166. "Exploded View"](#).

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:000000012524781

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0444 | PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit open) | An excessively low voltage signal is sent to ECM through the valve | <ul style="list-style-type: none"> • Harness or connectors (The solenoid valve circuit is open or shorted.) • EVAP canister purge volume control solenoid valve |
| P0445 | PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit shorted) | An excessively high voltage signal is sent to ECM through the valve | <ul style="list-style-type: none"> • Harness or connectors (The solenoid valve circuit is shorted.) • EVAP canister purge volume control solenoid valve |

DTC CONFIRMATION PROCEDURE

1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-753, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524782

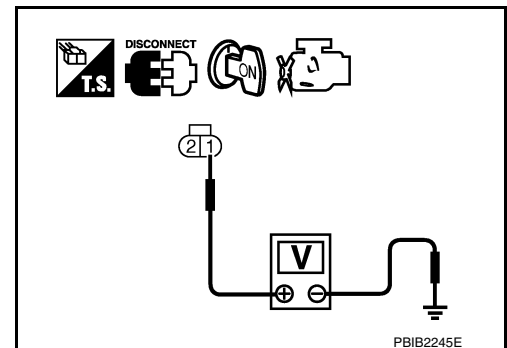
1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|-------------------|
| Connector | Terminal | | |
| F15 | 1 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.



P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 1 | E119 | 4 | Existed |

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| + | | - | | Continuity |
|---|----------|-----------|----------|------------|
| EVAP canister purge volume control solenoid valve | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F15 | 2 | F72 | 45 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 4.

YES-2 >> Without CONSULT: GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

 **With CONSULT**

1. Reconnect all harness connectors disconnected.
2. Start the engine.
3. Perform "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check EVAP canister purge volume control solenoid valve. Refer to [EC-754, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-166, "Exploded View"](#).

Component Inspection

INFOID:0000000012524783

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

 **With CONSULT**

1. Turn ignition switch OFF.

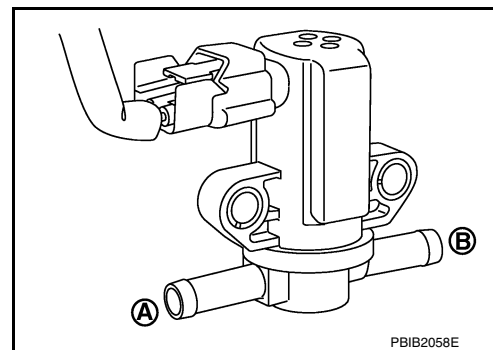
P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Start the engine.
5. Select "PURG VOL C/V" in "ACTIVE TEST" mode with CONSULT.
6. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

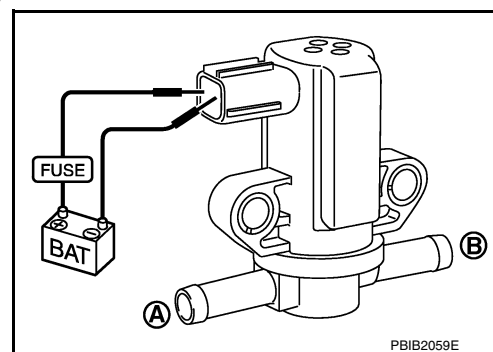
| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|---|
| 100% | Existed |
| 0% | Not existed |



⊗ Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12 V direct current supply between terminals 1 and 2 | Existed |
| No supply | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-166, "Exploded View"](#).

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:000000012524784

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0447 | VENT CONTROL VALVE (EVAP canister vent control valve circuit open) | An improper voltage signal is sent to ECM through EVAP canister vent control valve. | <ul style="list-style-type: none">• Harness or connectors (The valve circuit is open or shorted.)• EVAP canister vent control valve• Hoses (Hoses are connected incorrectly or clogged.) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-756. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524785

1. INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

- YES >> GO TO 2.
NO >> GO TO 3.

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT

1. Turn ignition switch OFF and then ON.
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON/OFF" on CONSULT screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister vent control valve harness connector.

P0447 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

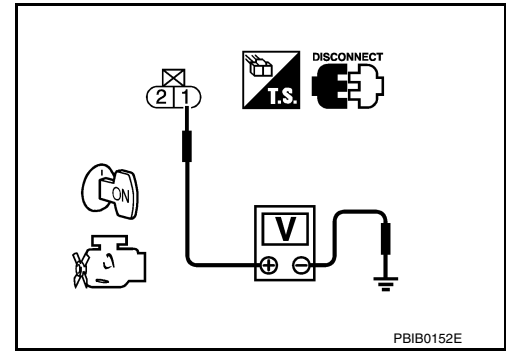
< DTC/CIRCUIT DIAGNOSIS >

3. Turn ignition switch ON.
4. Check the voltage between EVAP canister vent control valve harness connector and ground.

| + | | - | Voltage (Approx.) |
|----------------------------------|----------|--------|----------------------|
| EVAP canister vent control valve | | | |
| Connector | Terminal | Ground | Battery voltage |
| C6 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> GO TO 4.



4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|----------------------------------|----------|-----------|----------|------------|
| EVAP canister vent control valve | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | Existed |
| C6 | 1 | E119 | 3 | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and EVAP canister vent control valve harness connector.
Refer to Wiring Diagram.

| + | | - | | Continuity |
|----------------------------------|----------|-----------|----------|------------|
| EVAP canister vent control valve | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| C6 | 2 | E77 | 117 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 6.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> Clean the rubber tube using an air blower.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check EVAP canister vent control valve. Refer to [EC-758. "Component Inspection"](#).

P0447 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace EVAP canister vent control valve. Refer to [FL-13, "Removal and Installation"](#).

Component Inspection

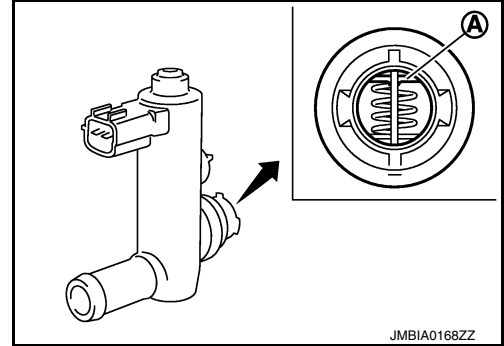
INFOID:000000012524786

1.CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-13, "Removal and Installation"](#).
2. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to [FL-13, "Removal and Installation"](#).
- NO >> GO TO 2.



2.CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

| Condition VENT CONTROL/V | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.

Check that new O-ring is installed properly.

| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

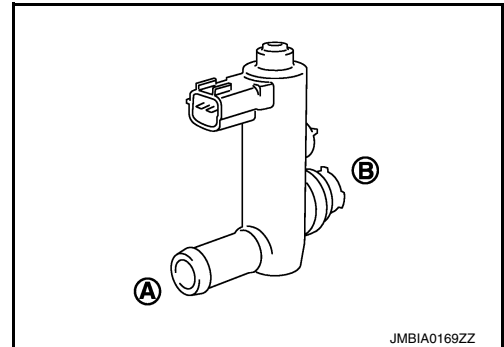
Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



P0447 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

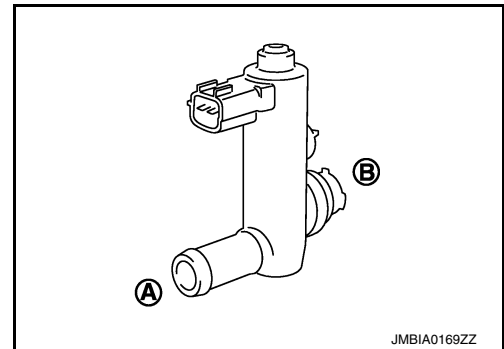
3. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

| Condition VENT CONTROL/V | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | No |
| OFF | Yes |

Operation takes less than 1 second.

⊗ Without CONSULT

- Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.



| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals (1) and (2) | No |
| OFF | Yes |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to [FL-13. "Removal and Installation"](#).

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P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0448 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:000000012524787

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0448 | VENT CONTROL VALVE (EVAP canister vent control valve close) | EVAP canister vent control valve remains closed under specified driving conditions. | <ul style="list-style-type: none">• EVAP canister vent control valve• EVAP control system pressure sensor and the circuit• Blocked rubber tube to EVAP canister vent control valve• EVAP canister is saturated with water |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

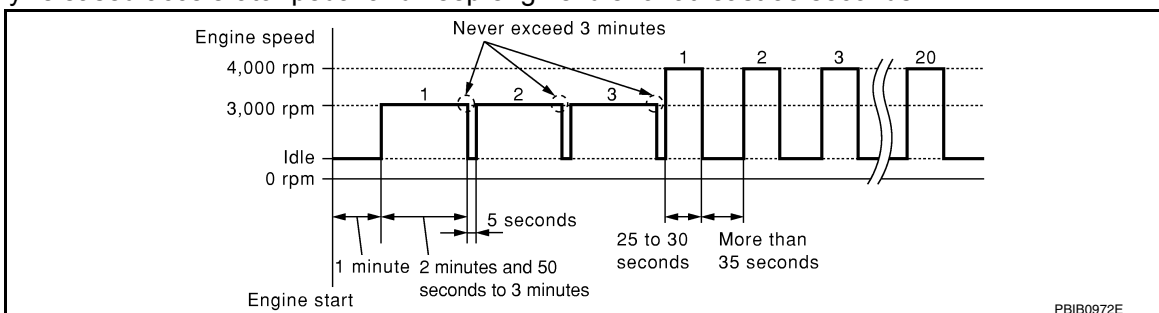
2. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT.
4. Start engine and let it idle for at least 1 minute.
5. Repeat next procedures 3 times.
 - Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.

Never exceed 3 minutes.

- Fully released accelerator pedal and keep engine idle for about 5 seconds.
6. Repeat next procedure 20 times.
 - Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.
 - Fully released accelerator pedal and keep engine idle for at least 35 seconds.



7. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-760, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524788

1. CHECK RUBBER TUBE

1. Turn ignition switch OFF.

P0448 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Clean rubber tube using an air blower.

2.CHECK EVAP CANISTER VENT CONTROL VALVE

Check EVAP canister vent control valve. Refer to [EC-762, "Component Inspection"](#).

Is the inspection result normal?

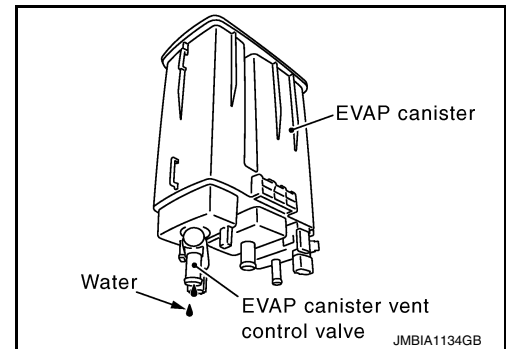
- YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to [FL-13, "Removal and Installation"](#).

3.CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-13, "Removal and Installation"](#).
2. Check if water will drain from the EVAP canister.

Does water drain from the EVAP canister?

- YES >> GO TO 4.
NO >> GO TO 6.



4.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.51 lb).

Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-766, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

INFOID:000000012524789

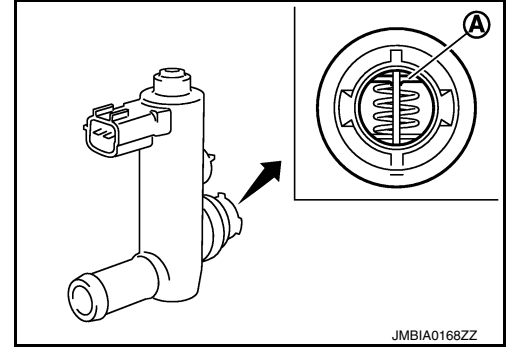
Component Inspection

1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister. Refer to [FL-13, "Removal and Installation"](#).
2. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

- YES >> Replace EVAP canister vent control valve. Refer to [FL-15, "Removal and Installation"](#).
- NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

| Condition VENT CONTROL/V | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.

Check that new O-ring is installed properly.

| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

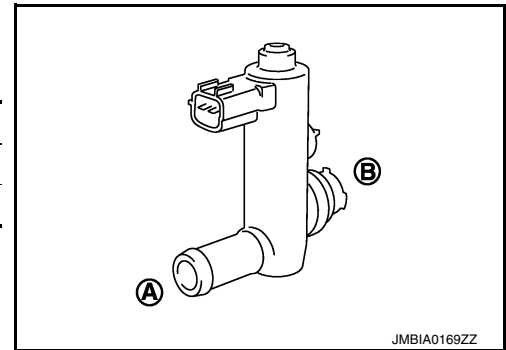
Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



P0448 EVAP CANISTER VENT CONTROL VALVE

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

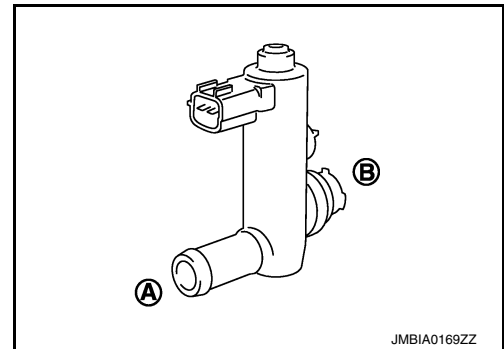
3. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

| Condition VENT CONTROL/V | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | No |
| OFF | Yes |

Operation takes less than 1 second.

⊗ Without CONSULT

- Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.



| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals (1) and (2) | No |
| OFF | Yes |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve. Refer to [FL-15. "Removal and Installation"](#).

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P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:000000012524790

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0451 | EVAP SYS PRES SEN (EVAP control system pressure sensor performance) | ECM detects a sloshing signal from the EVAP control system pressure sensor | <ul style="list-style-type: none">• Harness or connectors (EVAP control system pressure sensor circuit is shorted.)• EVAP control system pressure sensor |

DTC CONFIRMATION PROCEDURE

NOTE:

Never remove fuel filler cap during DTC confirmation procedure.

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

With CONSULT>>GO TO 2.

Without CONSULT>>GO TO 5.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

Ⓜ With CONSULT

1. Start engine and let it idle for least 40 seconds.

NOTE:

Do not depress accelerator pedal even slightly.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-765, "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

Ⓜ With CONSULT

1. Select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE".
2. Let it idle until "OFF" of "EVAP DIAG READY" changes to "ON".

NOTE:

It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".

3. Turn ignition switch OFF and wait at least 90 minutes.

NOTE:

Never turn ignition switch ON during 90 minutes.

4. Turn ignition switch ON.
5. Select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ENGINE".
6. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 4.

YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.

2. GO TO 1.

4. PERFORM DTC CONFIRMATION PROCEDURE-3

Ⓜ With CONSULT

Check 1st trip DTC.

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

- YES >> Proceed to [EC-765, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

5.PERFORM DTC CONFIRMATION PROCEDURE-4

 With GST

1. Start engine and let it idle for least 40 seconds.
NOTE:
Do not depress accelerator pedal even slightly.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-765, "Diagnosis Procedure"](#).
- NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-5

 With GST

1. Let it idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
NOTE:
Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-765, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524791

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace harness connector.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

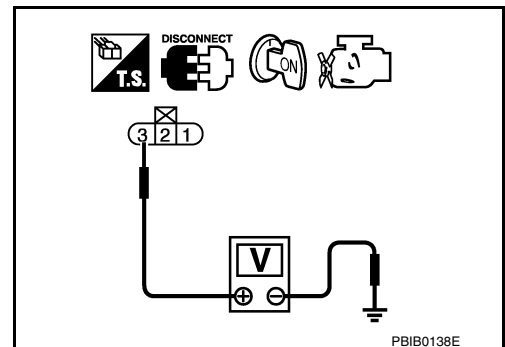
| + | | - | Voltage (Approx.) |
|-----------|----------|--------|-------------------|
| Connector | Terminal | | |
| C4 | 3 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> GO TO 3.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.



P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 3 | F72 | 48 | Existed |

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 1 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 2 | F72 | 32 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-766, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524792

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector. Refer to [FL-13, "Removal and Installation"](#).
Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.

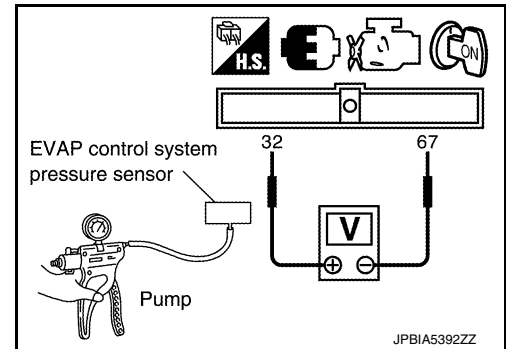
P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch ON and check output voltage between ECM terminals under the following conditions.

| ECM | | | Applied vacuum kPa (kg/cm ² , psi) | Voltage |
|-----------|----------|----|--|--|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 32 | 67 | Not applied | 1.8 - 4.8 V |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 V lower than above value |



CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:000000012524793

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0452 | EVAP SYS PRES SEN (EVAP control system pressure sensor low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select "DATA MONITOR" mode with CONSULT.
7. Check that "FUEL T/TMP SE" is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST

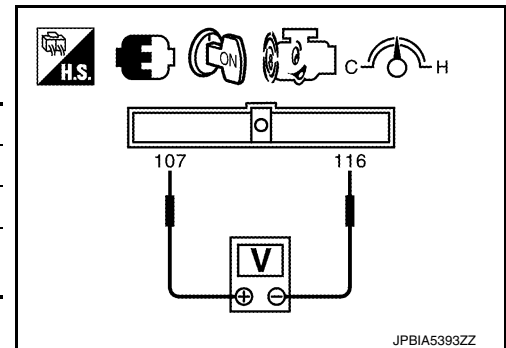
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.

| ECM | | |
|-----------|--|------------------------|
| Connector | + | - |
| | Terminal | Terminal |
| E77 | 107 (Fuel tank temperature sensor signal) | 116 (Sensor ground) |

3. Check that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-769. "Diagnosis Procedure"](#).
 NO >> INSPECTION END



P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

INFOID:000000012524794

Diagnosis Procedure

1. CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connector.

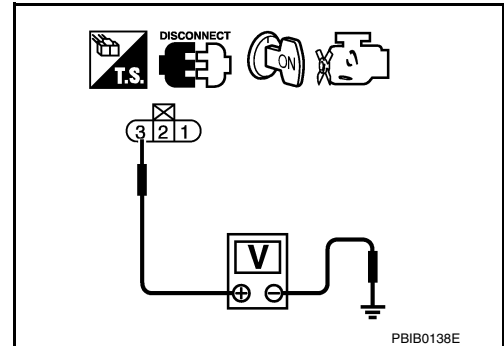
Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|-------------------|
| Connector | Terminal | | |
| C4 | 3 | Ground | 5 V |



Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C4 | 3 | F72 | 48 | Existed |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
 NO >> Repair or replace error-detected parts.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| C4 | 1 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 2 | F72 | 32 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-770. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

Component Inspection

INFOID:000000012524795

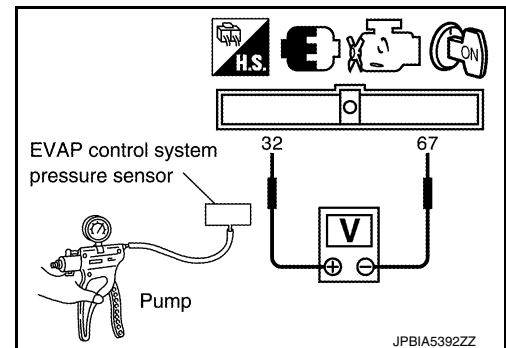
1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector. Refer to [FL-13. "Removal and Installation"](#).

Always replace O-ring with a new one.

3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM terminals under the following conditions.

| Connector | ECM | | Applied vacuum kPa (kg/cm ² , psi) | Voltage |
|-----------|-----|----|--|-------------------------------------|
| | + | - | | |
| F72 | 32 | 67 | Not applied | 1.8 - 4.8 V |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 V lower than above value |



CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:000000012524796

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0453 | EVAP SYS PRES SEN (EVAP control system pressure sensor high input) | An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor • EVAP canister vent control valve • EVAP canister • Rubber hose from EVAP canister vent control valve to vehicle frame |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select "DATA MONITOR" mode with CONSULT.
7. Check that "FUEL T/TMP SE" is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

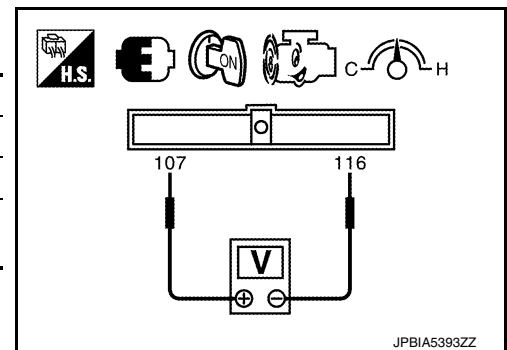
With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals.

| ECM | | |
|-----------|--|------------------------|
| Connector | + | - |
| | Terminal | Terminal |
| E77 | 107 (Fuel tank temperature sensor signal) | 116 (Sensor ground) |

3. Check that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?



P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Proceed to [EC-772. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524797

1. CHECK CONNECTOR

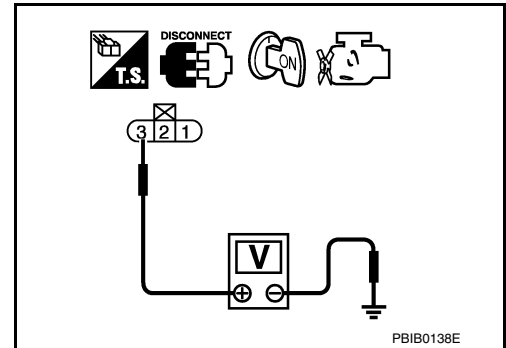
1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.



| + | | - | Voltage (Approx.) |
|-------------------------------------|----------|--------|-------------------|
| EVAP control system pressure sensor | | | |
| Connector | Terminal | Ground | 5 V |
| C4 | 3 | | |

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| C4 | 3 | F72 | 48 | |

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Repair or replace error-detected parts.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| C4 | 1 | F72 | 67 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------------------------|----------|-----------|----------|------------|
| EVAP control system pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| C4 | 2 | F72 | 32 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check EVAP canister vent control valve. Refer to [EC-758, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister vent control valve. Refer to [FL-13, "Removal and Installation"](#).

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-774, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

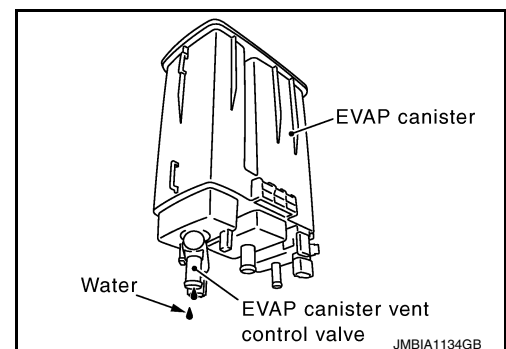
9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-13, "Removal and Installation"](#).
2. Check if water will drain from the EVAP canister.

Does water drain from the EVAP canister?

YES >> GO TO 10.

NO >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.51 lb).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 11.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524798

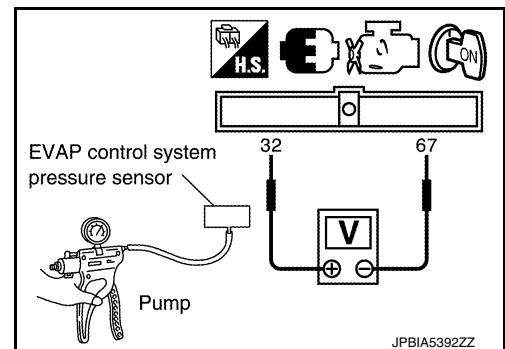
1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector. Refer to [FL-13, "Removal and Installation"](#).

Always replace O-ring with a new one.

3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM terminals under the following conditions.

| Connector | ECM | | Applied vacuum kPa (kg/cm ² , psi) | Voltage |
|-----------|-----|----|--|-------------------------------------|
| | + | - | | |
| Terminal | | | | |
| F72 | 32 | 67 | Not applied | 1.8 - 4.8 V |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 V lower than above value |



CAUTION:

- Always calibrate the vacuum pump gauge when using it.
- Never apply below -93.3 kPa (-0.952 kg/cm², -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm², 14.69 psi).

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13, "Removal and Installation"](#).

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0456 EVAP CONTROL SYSTEM

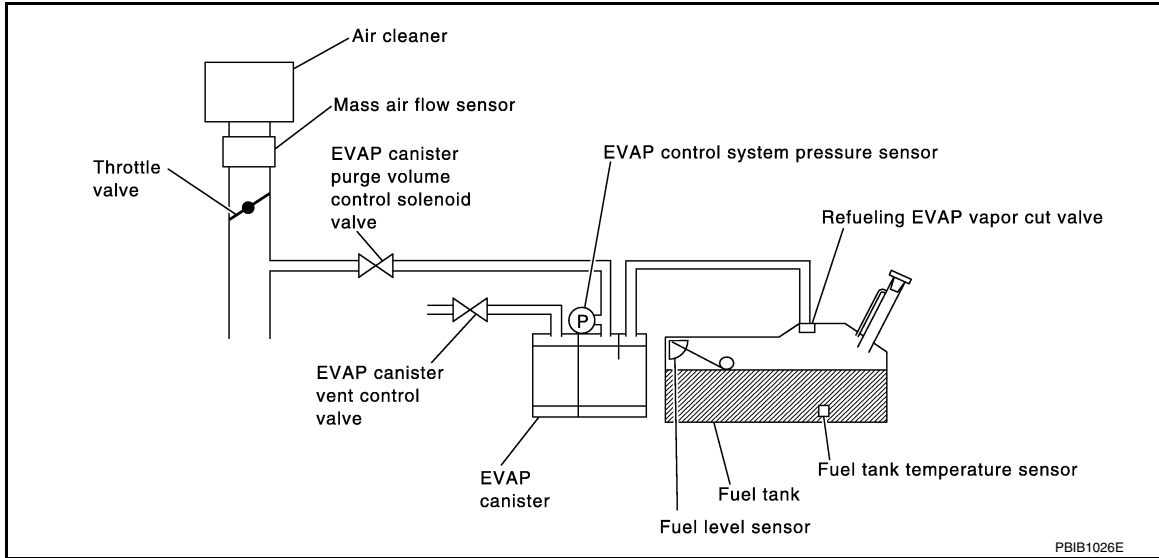
DTC Logic

INFOID:000000012524799

DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.

If ECM judges there are no leaks, the diagnosis will be OK.



| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0456 | EVAP VERY SML LEAK [Evaporative emission control system very small leakage (negative pressure check)] | <ul style="list-style-type: none"> • EVAP system has a very small leakage. • EVAP system does not operate properly. | <ul style="list-style-type: none"> • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or does not close. • Foreign matter caught in fuel filler cap. • Leakage is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leakage • EVAP purge line (pipe and rubber tube) leakage • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leakage • Fuel level sensor and the circuit • Foreign matter caught in EVAP canister purge volume control solenoid valve |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.
- If the fuel filler cap is not tightened properly, the MIL may illuminate.

P0456 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Use only a genuine NISSAN rubber tube as a replacement.

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Do you have CONSULT?

- YES >> GO TO 2.
NO >> GO TO 4.

2. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With CONSULT

1. Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
2. Start engine and wait at idle until "OFF" of "EVAP DIAG READY" changes to "ON".
NOTE:
It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON".
3. Turn ignition switch OFF and wait at least 90 minutes.
NOTE:
Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON and select "EVAP LEAK DIAG" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
5. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT?

- CMPLT >> GO TO 3.
YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3. PERFORM COMPONENT FUNCTION CHECK

Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-776. "Diagnosis Procedure"](#).
NO >> INSPECTION END

4. PERFORM DTC CONFIRMATION PROCEDURE

Ⓟ With GST

1. Start engine and wait engine idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
NOTE:
Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-776. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524801

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

P0456 EVAP CONTROL SYSTEM

[VK56DE]

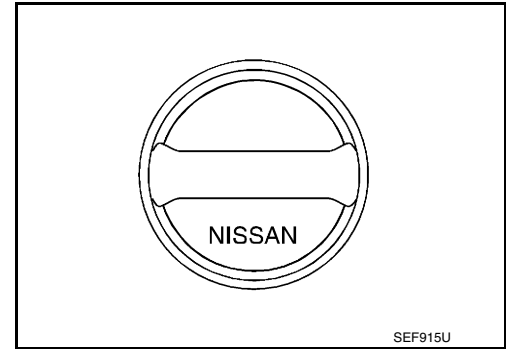
< DTC/CIRCUIT DIAGNOSIS >

2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace with genuine NISSAN fuel filler cap. Refer to [FL-6, "Removal and Installation"](#).



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Check fuel tank vacuum relief valve. Refer to [EC-780, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filler cap with a genuine one. Refer to [FL-6, "Removal and Installation"](#).

5. CHECK FOR EVAP LEAKAGE

Check for EVAP leakage. Refer to [EC-901, "Inspection"](#).

Is there any leakage in EVAP line?

YES >> Repair or replace malfunctioning part.

NO >> GO TO 6.

6. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

• EVAP canister vent control valve is installed properly.

Refer to [FL-13, "Removal and Installation"](#).

• EVAP canister vent control valve.

Refer to [EC-758, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to [FL-13, "Removal and Installation"](#).

7. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

P0456 EVAP CONTROL SYSTEM

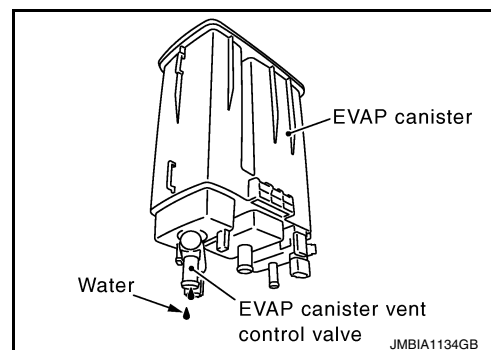
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-13, "Removal and Installation"](#).

Does water drain from the EVAP canister?

- YES >> GO TO 8.
- NO-1 >> With CONSULT: GO TO 10.
- NO-2 >> Without CONSULT: GO TO 11.



8. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.51 lb).

Is the inspection result normal?

- YES-1 >> With CONSULT: GO TO 10.
- YES-2 >> Without CONSULT: GO TO 11.
- NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to [FL-13, "Removal and Installation"](#).

10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
2. Start engine.
3. Perform "PURG VOL C/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL C/V" opening to 100%.
5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

- YES >> GO TO 13.
- NO >> GO TO 12.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

Is the inspection result normal?

- YES >> GO TO 14.
- NO >> GO TO 12.

12. CHECK VACUUM HOSE

P0456 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Check vacuum hoses for clogging or disconnection. Refer to [EC-498. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair or reconnect the hose.

13.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check EVAP canister purge volume control solenoid valve. Refer to [EC-751. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to [EM-166. "Exploded View"](#).

14.CHECK FUEL TANK TEMPERATURE SENSOR

Check fuel tank temperature sensor. Refer to [EC-716. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel level sensor unit. Refer to [FL-11. "Removal and Installation"](#).

15.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check EVAP control system pressure sensor. Refer to [EC-766. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP control system pressure sensor. Refer to [FL-13. "Removal and Installation"](#).

16.CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to [EC-498. "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or reconnect the hose.

17.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 18.

18.CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to [EC-487. "On Board Refueling Vapor Recovery \(ORVR\)"](#).

Is the inspection result normal?

YES >> GO TO 19.

NO >> Repair or replace hoses and tubes.

19.CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 20.

NO >> Repair or replace hose, tube or filler neck tube.

20.CHECK REFUELING EVAP VAPOR CUT VALVE

Check refueling EVAP vapor cut valve. Refer to [EC-890. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

21.CHECK FUEL LEVEL SENSOR

P0456 EVAP CONTROL SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check fuel level sensor. Refer to [MWI-55. "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

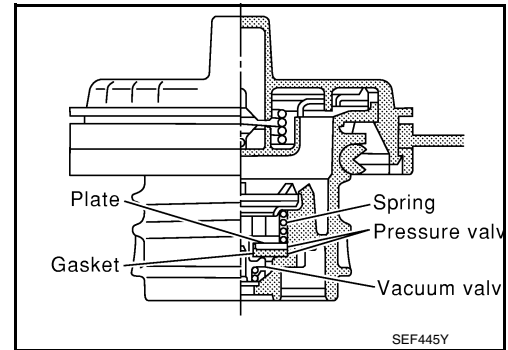
NO >> Replace fuel level sensor unit. Refer to [FL-11. "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524802

1. CHECK FUEL FILLER CAP

1. Turn ignition switch OFF.
2. Remove fuel filler cap. Refer to [FL-6. "Removal and Installation"](#).
3. Wipe clean valve housing.



4. Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
5. Check valve opening pressure and vacuum.

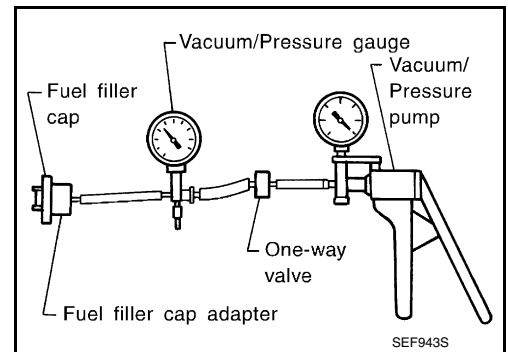
Pressure: 15.3 - 20.0 kPa (0.156 - 0.204 kg/cm², 2.22 - 2.90 psi)

Vacuum: -6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm², -0.87 to -0.48 psi)

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.



2. REPLACE FUEL FILLER CAP

Replace fuel filler cap. Refer to [FL-6. "Removal and Installation"](#).

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END

P0460 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0460 FUEL LEVEL SENSOR

DTC Logic

INFOID:000000012524803

DTC DETECTION LOGIC

NOTE:

- If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0460 | FUEL LEV SEN SLOSH (Fuel level sensor circuit noise) | Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait maximum of 2 consecutive minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-781, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524804

1. CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Proceed to [MWI-54, "Diagnosis Procedure"](#).

P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0461 FUEL LEVEL SENSOR

DTC Logic

INFOID:0000000012524805

DTC DETECTION LOGIC

NOTE:

- If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

Driving long distances naturally affect fuel gauge level.

This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0461 | FUEL LEVEL SENSOR (Fuel level sensor circuit range/performance) | The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor |

DTC CONFIRMATION PROCEDURE

1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-782, "Component Function Check"](#).

Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-783, "Diagnosis Procedure"](#).

Component Function Check

INFOID:0000000012524806

1. PRECONDITIONING

WARNING:

When performing the following procedure, always observe the handling of the fuel. Refer to [FL-11, "Removal and Installation"](#).

TESTING CONDITION:

Before starting component function check, preparation of draining fuel and refilling fuel is required.

Will CONSULT be used?

YES >> GO TO 2.

NO >> GO TO 3.

2. PERFORM COMPONENT FUNCTION CHECK

With CONSULT

NOTE:

Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to [EC-901, "Inspection"](#).
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT.
7. Check "FUEL LEVEL SE" output voltage and note it.

P0461 FUEL LEVEL SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

8. Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT.
9. Touch "ON" and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check "FUEL LEVEL SE" output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check "FUEL LEVEL SE" output voltage and note it.
13. Confirm whether the voltage changes more than 0.03 V during step 7 to 10 and 10 to 12.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-783, "Diagnosis Procedure"](#).

3.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line. Refer to [EC-901, "Inspection"](#).
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to [FL-11, "Removal and Installation"](#).
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-783, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524807

1.CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Proceed to [MWI-54, "Diagnosis Procedure"](#).

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0462, P0463 FUEL LEVEL SENSOR

DTC Logic

INFOID:000000012524808

DTC DETECTION LOGIC

NOTE:

- If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0462 | FUEL LEVL SEN/CIRC (Fuel level sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (The CAN communication line is open or shorted)• Harness or connectors (The sensor circuit is open or shorted)• Combination meter• Fuel level sensor |
| P0463 | FUEL LEVL SEN/CIRC (Fuel level sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-784, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524809

1. CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Proceed to [MWI-54, "Diagnosis Procedure"](#).

P0500 VSS

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0500 VSS

Description

INFOID:0000000012524810

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

DTC Logic

INFOID:0000000012524811

DTC DETECTION LOGIC

NOTE:

- If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0500 | VEH SPEED SEN/CIRC (Vehicle speed sensor) | At 20 km/h (13 MPH), ECM detects the following status continuously for 5 seconds or more: The difference between vehicle speed calculated by output speed sensor transmitted from TCM to ECM via CAN communication and vehicle speed indicated on the combination meter exceeds 15km/h (10 MPH). | <ul style="list-style-type: none">• Harness or connector (The CAN communication line is open or shorted.)• Combination meter• ABS actuator and electric unit (control unit)• Wheel sensor• TCM• Output speed sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine.
2. Shift the selector lever to D range and wait at least for 2 seconds.
3. Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-785, "Diagnosis Procedure"](#)
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524812

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-39, "CONSULT Function"](#).

Is the inspection result normal?

- YES >> GO TO 2.

P0500 VSS

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to [BRC-32, "CONSULT Function \(ABS\)"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble shooting relevant to DTC indicated.

3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform trouble shooting relevant to DTC indicated.

4.CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to [TM-93, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace or replace error-detected parts.

5.CHECK WHEEL SENSOR

Check wheel sensor. Refer to [BRC-77, "Diagnosis Procedure"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace or replace error-detected parts.

P0506 ISC SYSTEM

Description

INFOID:000000012524813

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:000000012524814

DTC DETECTION LOGIC

NOTE:

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0506 | ISC SYSTEM (Idle speed control system RPM lower than expected) | The idle speed is less than the target idle speed by 100 rpm or more. | <ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leakage |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the target idle speed is out of the specified value, perform [EC-592, "Description"](#), before conducting DTC CONFIRMATION PROCEDURE.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.
- Always perform the test at a temperature above -10°C(14°F).

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-787, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524815

1. CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.

P0506 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.

NO >> Replace ECM. Refer to [EC-904. "Removal and Installation"](#).

P0507 ISC SYSTEM

Description

INFOID:000000012524816

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.

The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:000000012524817

DTC DETECTION LOGIC

NOTE:

If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0507 | ISC SYSTEM (Idle speed control system RPM higher than expected) | The idle speed is more than the target idle speed by 200 rpm or more. | <ul style="list-style-type: none"> • Electric throttle control actuator • Intake air leakage • PCV system |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the target idle speed is out of the specified value, perform [EC-592, "Description"](#), before conducting DTC Confirmation Procedure.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.
- Always perform the test at a temperature above -10°C(14°F).

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-789, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524818

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

P0507 ISC SYSTEM

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace malfunctioning part.

2.CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.

2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.

NO >> Replace ECM. Refer to [EC-904, "Removal and Installation"](#).

P050A, P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P050A, P050E COLD START CONTROL

Description

INFOID:000000012524819

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Logic

INFOID:000000012524820

DTC DETECTION LOGIC

NOTE:

If DTC P050A or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P050A | COLD START CONTROL (Cold start idle air control system performance) | ECM does not control engine idle speed properly when engine is started with pre-warming up condition. | <ul style="list-style-type: none">Lack of intake air volumeFuel injection systemECM |
| P050E | COLD START CONTROL (Cold start engine exhaust temperature too low) | The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

④ With CONSULT

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
- Check the indication of "COOLAN TEMP/S".

④ With GST

Follow the procedure "With CONSULT" above.

Is the value of "COOLAN TEMP/S" between 5°C (41°F) and 36°C (97°F)?

YES >> GO TO 3.

NO-1 [If it is below 5°C (41°F)]>>Warm up the engine until the value of "COOLAN TEMP/S" reaches 5°C (41°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

④ With CONSULT

- Set the select lever in N range.
- Start the engine and warm up in idle with the value of "COOLAN TEMP/S" between 5°C (41°F) and 40°C (104°F) for more than 15 seconds.
- Check 1st trip DTC.

④ With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

P050A, P050E COLD START CONTROL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

YES >> Proceed to [EC-792. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524821

1.PERFORM IDLE AIR VOLUME LEARNING

Perform [EC-592. "Description"](#).

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 2.
NO >> Follow the instruction of Idle Air Volume Learning.

2.CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part

3.CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to [EC-705. "DTC Logic"](#).

Is the inspection result normal?

YES >> GO TO 4.
NO >> Proceed to [EC-706. "Diagnosis Procedure"](#) for DTC P0171, P0174.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
See [EC-791. "DTC Logic"](#).

Is the 1st trip DTC P050A or P050E displayed again?

YES >> Replace ECM. Refer to [EC-904. "Removal and Installation"](#).
NO >> INSPECTION END

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0550 PSP SENSOR

DTC Logic

INFOID:000000012524822

DTC DETECTION LOGIC

NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0550 | PW ST P SEN/CIRC (Power steering pressure sensor circuit) | An excessively low or high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted) Power steering pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-793, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524823

1. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

- Disconnect power steering pressure (PSP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between PSP sensor harness connector and ground.

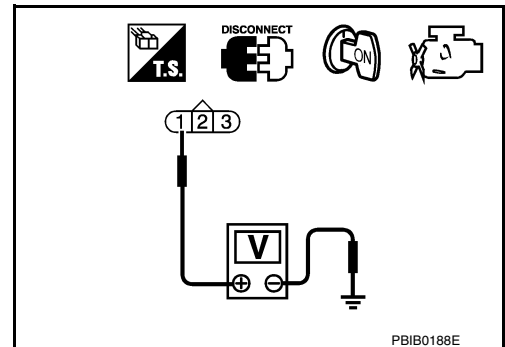
| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| Connector | Terminal | | |
| F46 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

2. CHECK PSP SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF
- Disconnect ECM harness connector.
- Check the continuity between PSP sensor harness connector and ECM harness connector.



P0550 PSP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| PSP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F46 | 1 | F72 | 68 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

3.CHECK PSP SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between PSP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| PSP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F46 | 3 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK PSP SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between PSP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| PSP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F46 | 2 | F72 | 12 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK PSP SENSOR

Refer to [EC-794, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace PSP sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

Component Inspection

INFOID:000000012524824

1.CHECK POWER STEERING PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and let it idle.

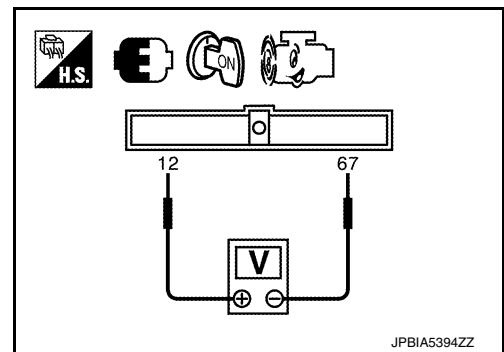
P0550 PSP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|----|------------------|-------------------|
| Connector | + | - | | |
| | Terminal | | | |
| F72 | 12 | 67 | Being turned | 0.5 - 4.5 V |
| | | | Not being turned | 0.4 - 0.8 V |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace power steering pressure sensor. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

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P0603 ECM

DTC Logic

INFOID:000000012933013

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0603 | ECM BACK UP CIRCUIT [Internal control module keep alive memory (KAM) error] | <ul style="list-style-type: none"> Malfunction in the internal back up RAM of ECM. Malfunction in the internal EEPROM system of ECM. | <ul style="list-style-type: none"> ECM power supply ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF and wait at least 10 seconds.
- Repeat step 1 and 2 for 10 times.
- Turn ignition switch ON.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-796, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012933014

1. CHECK ECM POWER SUPPLY AND GROUND CIRCUIT

Perform trouble diagnosis for ECM power supply and ground circuit. Refer to [EC-618, "Diagnosis Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace error-detected parts.

2. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to .

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair or replace error-detected parts.

3. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Erase DTC.
- Perform DTC confirmation procedure. Refer to [EC-796, "DTC Logic"](#).

Is the 1st trip DTC P0603 displayed again?

- YES >> Replace ECM. Refer to [EC-904, "Removal and Installation"](#).
 NO >> INSPECTION END

P0604 ECM

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0604 ECM

DTC Logic

INFOID:0000000012933015

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|----------------|
| P0604 | ECM [Internal control module random access memory (RAM) error] | Malfunction in the internal RAM of ECM. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait at least 20 minutes.

CAUTION:

Never start engine during this procedure.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-797, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012933016

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-797, "DTC Logic"](#).

Is the 1st trip DTC P0604 displayed again?

- YES >> Replace ECM. Refer to [EC-904, "Removal and Installation"](#).
NO >> INSPECTION END

P0605 ECM

DTC Logic

INFOID:000000012933017

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|----------------|
| P0605 | ECM [Internal control module read only memory (ROM) error] | Malfunction in the internal ROM of ECM. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 20 minutes.

CAUTION:

Never start engine during this procedure.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-798, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012933018

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-798, "DTC Logic"](#).

Is the 1st trip DTC P0605 displayed again?

- YES >> Replace ECM. Refer to [EC-904, "Removal and Installation"](#).
 NO >> INSPECTION END

P0606 ECM

DTC Logic

INFOID:000000012933019

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|-------------------------------|----------------|
| P0606 | CONTROL MODULE (Control module processor) | Malfunction in ECM processor. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Turn ignition switch ON (engine stopped) and wait at least 10 seconds.

CAUTION:

Never start engine during this procedure.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-799, "Diagnosis Procedure"](#).

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Start engine.
2. Rev up the engine quickly to approximately 3,000 rpm under unloaded condition and completely release the accelerator pedal.
3. Let the engine idle and wait at least 10 seconds.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-799, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012933020

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure for 3 times. Refer to [EC-799, "DTC Logic"](#).

Is the 1st trip DTC P0606 displayed again?

YES >> Replace ECM. Refer to [EC-904, "Removal and Installation"](#).

NO >> INSPECTION END

P0607 ECM

DTC Logic

INFOID:000000012933021

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|----------------|
| P0607 | ECM (Control module performance) | ECM internal communication system is malfunctioning. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 10 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-800. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012933022

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-800. "DTC Logic"](#).

Is the 1st trip DTC P0607 displayed again?

- YES >> Replace ECM. Refer to [EC-904. "Removal and Installation"](#).
- NO >> INSPECTION END

P060A ECM

DTC Logic

INFOID:000000012933023

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|----------------|
| P060A | CONTROL MODULE (Internal control module monitoring processor performance) | ECM internal monitoring processor is malfunctioning. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Repeat step 1 and 2 for 5 times.
4. Turn ignition switch ON.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-801, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012933024

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-801, "DTC Logic"](#).

Is the 1st trip DTC P060A displayed again?

- YES >> Replace ECM. Refer to [EC-904, "Removal and Installation"](#).
- NO >> INSPECTION END

P060B ECM

DTC Logic

INFOID:000000012933025

DTC DETECTION LOGIC

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|----------------|
| P060B | CONTROL MODULE (Internal control module A/ D processing performance) | ECM internal analog/digital conversion processing system is malfunctioning. | ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 10 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-802. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012933026

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to [EC-802. "DTC Logic"](#).

Is the 1st trip DTC P060B displayed again?

- YES >> Replace ECM. Refer to [EC-904. "Removal and Installation"](#).
- NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0643 SENSOR POWER SUPPLY

DTC Logic

INFOID:000000012524831

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0643 | SENSOR POWER/ CIRC (Sensor power supply circuit short) | ECM detects that the voltage of power source for sensor is excessively low or high. | <ul style="list-style-type: none"> • Harness or connectors (APP sensor 1 circuit is shorted.) (PSP sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1) • EVAP control system pressure sensor • Power steering pressure sensor • Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC

Is DTC detected?

- YES >> Proceed to [EC-803, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

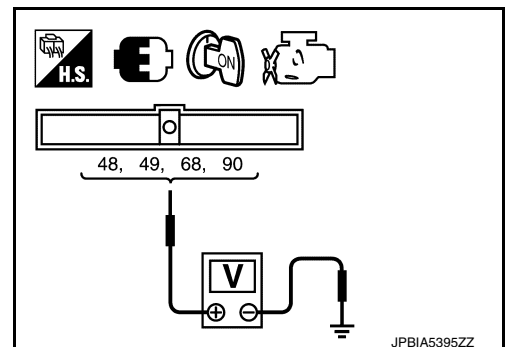
Diagnosis Procedure

INFOID:000000012524832

1. CHECK SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

| + | | - | Voltage (Approx.) |
|-----------|----------|--------|----------------------|
| ECM | | | |
| Connector | Terminal | Ground | 5 V |
| F72 | 48 | | |
| | 49 | | |
| | 68 | | |
| E77 | 90 | | |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

P0643 SENSOR POWER SUPPLY

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 2.

2.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| + | | - | | |
|-----------|----------|-------------------------------------|-----------|----------|
| ECM | | Sensor | | |
| Connector | Terminal | Name | Connector | Terminal |
| F72 | 48 | EVAP control system pressure sensor | C4 | 3 |
| | 49 | Refrigerant pressure sensor | E48 | 1 |
| | 68 | PSP sensor | F46 | 1 |
| E77 | 90 | APP sensor | E20 | 2 |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair short to ground or short to power in harness or connectors.

3.CHECK COMPONENTS

Check the following.

- EVAP control system pressure sensor
Refer to [EC-766, "Component Inspection"](#).
- Refrigerant pressure sensor
Refer to [EC-892, "Diagnosis Procedure"](#).
- Power steering pressure sensor
Refer to [EC-794, "Component Inspection"](#).
- Accelerator pedal position sensor
Refer to [EC-849, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning component.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P0850 PNP SWITCH

Description

INFOID:0000000012524833

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM.

DTC Logic

INFOID:0000000012524834

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0850 | P-N POS SW/CIRCUIT (Park/neutral position switch) | The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started. | <ul style="list-style-type: none"> Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] TCM |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

YES >> GO TO 2.

NO >> GO TO 5.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3.CHECK PNP SIGNAL

With CONSULT

- Turn ignition switch ON.
- Select "P/N POSI SW" in "DATA MONITOR" mode of "ENGINE" using CONSULT. Then check the "P/N POSI SW" signal as per the following conditions.

| Position (Selector lever) | Known-good signal |
|---------------------------|-------------------|
| N or P position | ON |
| Except above position | OFF |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Proceed to [EC-806, "Diagnosis Procedure"](#).

4.PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode of "ENGINE" using CONSULT.
- Start engine and warm it up to normal operating temperature.
- Maintain the following conditions for at least 50 consecutive seconds.

CAUTION:

Always drive vehicle at a safe speed.

| | |
|---------------|------------------------|
| ENG SPEED | 1,000 - 6,375 rpm |
| COOLAN TEMP/S | More than 70°C (158°F) |

P0850 PNP SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

| | |
|----------------|----------------------------|
| B/FUEL SCHDL | 2.0 - 31.8 msec |
| VHCL SPEED SE | More than 64 km/h (40 mph) |
| Selector lever | Suitable position |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-806. "Diagnosis Procedure"](#).

NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-806. "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-806. "Diagnosis Procedure"](#).

Component Function Check

INFOID:0000000012524835

1.PERFORM COMPONENT FUNCTION CHECK

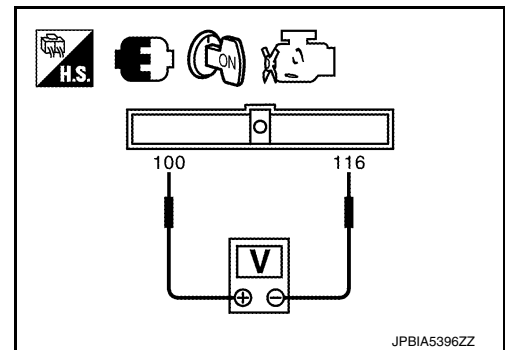
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|-----|-------------------------|--|
| Connector | + | - | | |
| | Terminal | | | |
| E77 | 100 | 116 | Selector lever position | P or N Except above Battery voltage 0 V |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-806. "Diagnosis Procedure"](#).



Diagnosis Procedure

INFOID:0000000012524836

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to [EC-545. "DTC Index"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.

NO >> Refer to [BCS-16. "COMMON ITEM : CONSULT Function \(BCM - COMMON ITEM\)"](#).

3.CHECK PNP INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/T assembly harness connector and ECM harness connector.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|--------------|----------|-----------|----------|------------|
| A/T assembly | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F9 | 9 | E77 | 100 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Repair or replace error-detected parts.

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P1140, P1145 IVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1140, P1145 IVT CONTROL POSITION SENSOR

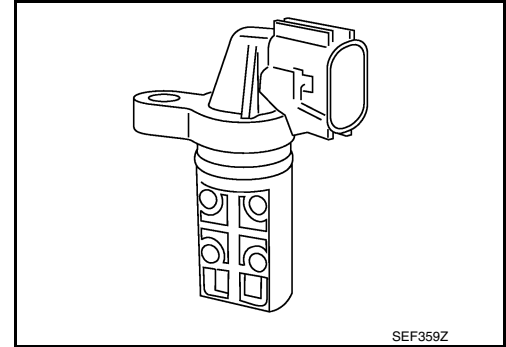
Description

INFOID:000000012524837

Intake valve timing control position sensors are located in the front of cylinder heads in both bank 1 and bank 2.

This sensor uses a Hall IC.

The cam position is determined by the intake camshaft sprocket concave (in four places). The ECM provides feedback to the intake valve timing control for appropriate target valve open-close timing according to drive conditions based on detected cam position.



DTC Logic

INFOID:000000012524838

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1140 | INTK TIM S/CIRC-B1 (Intake valve timing control position sensor circuit) | An excessively high or low voltage from the sensor is sent to ECM. | <ul style="list-style-type: none">• Harness or connectors (The sensor circuit is open or shorted)• Intake valve timing control position sensor• Crankshaft position sensor (POS)• Camshaft position sensor (PHASE)• Accumulation of debris to the signal pick-up portion of the camshaft sprocket |
| P1145 | INTK TIM S/CIRC-B2 (Intake valve timing control position sensor circuit) | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Turn ignition switch ON.
2. Maintain the following condition for at least 10 seconds.

| | |
|----------------|----------------------|
| ENG SPEED | More than idle speed |
| Selector lever | P or N position |

Is 1st trip DTC detected?

- YES >> Proceed to [EC-808. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524839

1. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

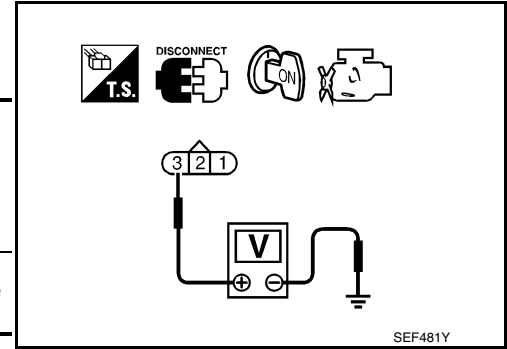
P1140, P1145 IVT CONTROL POSITION SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Disconnect intake valve timing control position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between intake valve timing control position sensor harness connector and ground.

| DTC | Bank | + | | - | Voltage |
|-------|------|---|----------|--------|-----------------|
| | | Intake valve timing control position sensor | | | |
| | | Connector | Terminal | | |
| P1140 | 1 | F62 | 3 | Ground | Battery voltage |
| P1145 | 2 | F64 | 3 | | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between intake valve timing control position sensor harness connector and ECM harness connector.

| DTC | Bank | + | | - | | Continuity |
|-------|------|---|----------|-----------|----------|------------|
| | | Intake valve timing control position sensor | | ECM | | |
| | | Connector | Terminal | Connector | Terminal | |
| P1140 | 1 | F62 | 1 | F72 | 1 | Existed |
| P1145 | 2 | F64 | 1 | | | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between intake valve timing control position sensor harness connector and ECM harness connector.

| DTC | Bank | + | | - | | Continuity |
|-------|------|---|----------|-----------|----------|------------|
| | | Intake valve timing control position sensor | | ECM | | |
| | | Connector | Terminal | Connector | Terminal | |
| P1140 | 1 | F62 | 2 | F72 | 72 | Existed |
| P1145 | 2 | F64 | 2 | | 53 | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

Check intake valve timing control position sensor. Refer to [EC-810, "Component Inspection \(Intake Valve Timing Control Position Sensor\)"](#).

Is the inspection result normal?

P1140, P1145 IVT CONTROL POSITION SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 5.

NO >> Replace malfunctioning intake valve timing control position sensor. Refer to [EM-186, "Intake Valve Timing Control Position Sensor \(LH\)"](#) or [EM-186, "Intake Valve Timing Control Position Sensor \(RH\)"](#).

5. CHECK CRANKSHAFT POSITION SENSOR (POS)

Check crankshaft position sensor (POS). Refer to [EC-733, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace crankshaft position sensor (POS). Refer to [EM-230, "Exploded View"](#).

6. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Check camshaft position sensor (PHASE). Refer to [EC-736, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to [EM-187, "Camshaft Position Sensor \(PHASE\)"](#).

7. CHECK CAMSHAFT (INT)

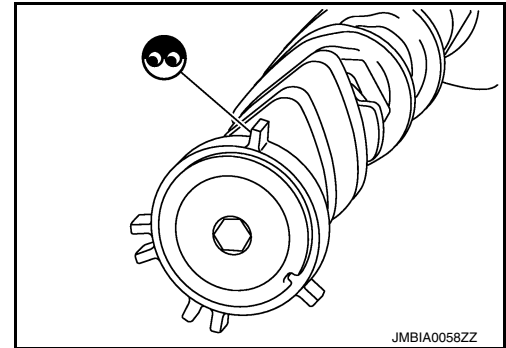
Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to [EM-187, "Camshaft Position Sensor \(PHASE\)"](#).

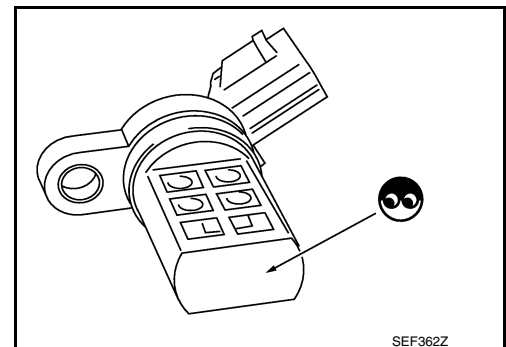


Component Inspection (Intake Valve Timing Control Position Sensor)

INFOID:000000012524840

1. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control position sensor harness connector.
3. Remove intake valve timing control position sensor. Refer to [EM-186, "Intake Valve Timing Control Position Sensor \(LH\)"](#) or [EM-186, "Intake Valve Timing Control Position Sensor \(RH\)"](#).
4. Visually check the sensor for chipping.



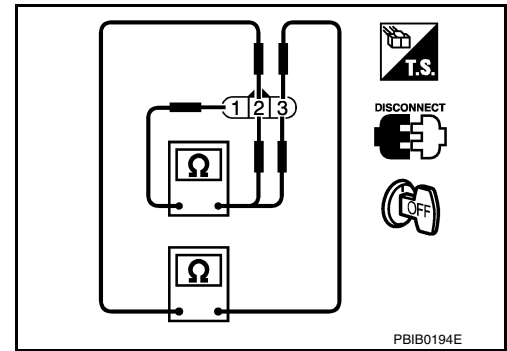
P1140, P1145 IVT CONTROL POSITION SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check resistance between intake valve timing control position sensor terminals as per the following.

| Intake valve timing control position sensor | | Resistance (Ω) [at 25°C (77°F)] |
|---|---|--|
| + | - | |
| Terminal | | Except 0 or ∞ |
| 3 | 1 | |
| 2 | 1 | |
| 3 | 2 | |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control position sensor. Refer to [EM-186. "Intake Valve Timing Control Position Sensor \(LH\)"](#) or [EM-186. "Intake Valve Timing Control Position Sensor \(RH\)"](#).

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P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

INFOID:000000012524841

DTC DETECTION LOGIC

NOTE:

DTC P1148 or P1168 is displayed with another DTC for A/F sensor 1. Perform the trouble diagnosis for the corresponding DTC.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1148 | CLOSED LOOP-B1 [Closed loop control function (bank 1)] | The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition. | <ul style="list-style-type: none">• Harness or connectors (The A/F sensor 1 circuit is open or shorted.)• A/F sensor 1• A/F sensor 1 heater |
| P1168 | CLOSED LOOP-B2 [Closed loop control function (bank 2)] | The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition. | |

Diagnosis Procedure

INFOID:000000012524842

DTC P1148 is displayed with DTC for A/F sensor 1.

When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.

Refer to [EC-545, "DTC Index"](#).

P1211 TCS CONTROL UNIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1211 TCS CONTROL UNIT

Description

INFOID:0000000012524843

The malfunction information related to TCS is transferred via the CAN communication line from “ABS actuator and electric unit (control unit)” to ECM.

Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000012524844

DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1211 | TCS/CIRC (TCS communication line) | ECM receives malfunction information from “ABS actuator and electric unit (control unit)”. | <ul style="list-style-type: none">• ABS actuator and electric unit (control unit)• TCS related parts |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-813. "Diagnosis Procedure"](#)

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524845

Perform the trouble diagnosis for TCS. Refer to [TM-62. "Work Flow"](#).

P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000012524846

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and "ABS actuator and electric unit (control unit)".

Be sure to erase the malfunction information such as DTC not only for "ABS actuator and electric unit (control unit)" but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000012524847

DTC DETECTION LOGIC

NOTE:

- If DTC P1212 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1212 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P1212 | TCS/CIRC (TCS communication line) | ECM cannot receive the information from "ABS actuator and electric unit (control unit)" continuously. | <ul style="list-style-type: none">• Harness or connectors (CAN communication line is open or shorted.)• ABS actuator and electric unit (control unit)• Dead (Weak) battery |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-814, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524848

Perform the trouble diagnosis for TCS. Refer to [TM-62, "Work Flow"](#).

NOTE:

If DTC P1212 is displayed with DTC UXXXX and/or P0607, perform the following trouble diagnosis.

- Trouble diagnosis for DTC UXXXX Refer to [EC-545, "DTC Index"](#).
- Trouble diagnosis for DTC P0607 Refer to [EC-800, "DTC Logic"](#).

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:000000012524849

DTC DETECTION LOGIC

NOTE:

- If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1217 | ENG OVER TEMP [Engine over temperature (Overheat)] | <ul style="list-style-type: none">• Cooling fan does not operate properly (Overheat).• Cooling fan system does not operate properly (Overheat).• Engine coolant was not added to the system using the proper filling method.• Engine coolant is not within the specified range. | <ul style="list-style-type: none">• Harness or connectors (Cooling fan circuit is open or shorted.)• IPDM E/R (Cooling fan relays)• Cooling fan motor• Radiator hose• Radiator• Radiator cap• Water pump• Thermostat |

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to [CO-44, "Changing Engine Coolant"](#). Also, replace the engine oil. Refer to [LU-26, "Changing Engine Oil"](#).

1. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to [MA-17, "FOR USA AND CANADA : Engine Coolant Recommendation"](#).
2. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

DTC CONFIRMATION PROCEDURE

1. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to [EC-815, "Component Function Check"](#).

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-816, "Diagnosis Procedure"](#).

Component Function Check

INFOID:000000012524850

1. PERFORM COMPONENT FUNCTION CHECK-I

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

P1217 ENGINE OVER TEMPERATURE

[VK56DE]

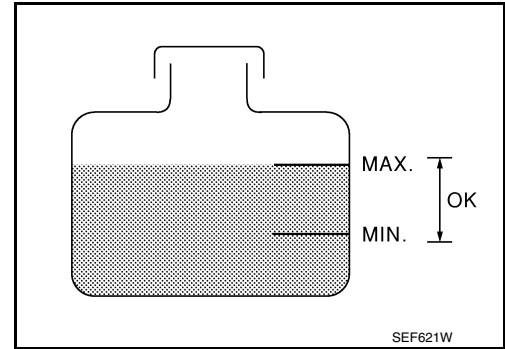
< DTC/CIRCUIT DIAGNOSIS >

Check the coolant level in the reservoir tank and radiator.

Allow engine to cool before checking coolant level.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

- YES >> Proceed to [EC-816, "Diagnosis Procedure"](#).
NO >> GO TO 2.



2.PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

- YES >> Proceed to [EC-816, "Diagnosis Procedure"](#).
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

With CONSULT

1. Turn ignition switch ON.
2. Perform "COOLING FAN" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Check that cooling fan motors-1 and -2 operate at each speed (LOW/MID/HI).

Without CONSULT

Activate IPDM E/R auto active test and check cooling fan motors operation, refer to [PCS-8, "Diagnosis Description"](#).

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-816, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:0000000012524851

1.CHECK COOLING FAN OPERATION

With CONSULT

1. Turn ignition switch ON.
2. Perform "COOLING FAN" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Check that cooling fans-1 and -2 operate at each speed (LOW/MID/HI).

Without CONSULT

1. Activate IPDM E/R auto active test and check cooling fan motors operation, refer to [PCS-8, "Diagnosis Description"](#).
2. Check that cooling fans-1 and -2 operate at each speed (Low/Middle/High).

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Proceed to [EC-873, "Diagnosis Procedure"](#).

2.CHECK COOLING SYSTEM FOR LEAKAGE-I

Check cooling system for leakage. Refer to [CO-43, "Inspection"](#).

Is leakage detected?

- YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK COOLING SYSTEM FOR LEAKAGE-II

Check the following for leakage.

- Hose
- Radiator
- Water pump

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap. Refer to [CO-43, "Inspection"](#).

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap. Refer to [CO-49, "Exploded View"](#).

5. CHECK THERMOSTAT

Check thermostat. Refer to [CO-56, "Removal and Installation"](#).

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat. Refer to [CO-56, "Exploded View"](#).

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Check engine coolant temperature sensor. Refer to [EC-655, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace the engine coolant temperature sensor. Refer to [EM-217, "Exploded View"](#).

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|--------|------|--|--|--|--|
| OFF | 1 | <ul style="list-style-type: none"> Blocked radiator Blocked condenser Blocked radiator grille Blocked bumper | <ul style="list-style-type: none"> Visual | No blocking | — |
| | 2 | <ul style="list-style-type: none"> Coolant mixture | <ul style="list-style-type: none"> Coolant tester | CO-43, "Inspection" | |
| | 3 | <ul style="list-style-type: none"> Coolant level | <ul style="list-style-type: none"> Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | CO-43, "Inspection" |
| | 4 | <ul style="list-style-type: none"> Radiator cap | <ul style="list-style-type: none"> Pressure tester | CO-43, "Inspection" | |
| ON*2 | 5 | <ul style="list-style-type: none"> Coolant leakage | <ul style="list-style-type: none"> Visual | No leakage | CO-43, "Inspection" |
| ON*2 | 6 | <ul style="list-style-type: none"> Thermostat | <ul style="list-style-type: none"> Touch the upper and lower radiator hoses | Both hoses should be hot | CO-56, "Removal and Installation" |
| ON*1 | 7 | <ul style="list-style-type: none"> Cooling fan | <ul style="list-style-type: none"> CONSULT | Operating | EC-873, "Component Function Check" |
| OFF | 8 | <ul style="list-style-type: none"> Combustion gas leakage | <ul style="list-style-type: none"> Color checker chemical tester 4 Gas analyzer | Negative | — |
| ON*3 | 9 | <ul style="list-style-type: none"> Coolant temperature gauge | <ul style="list-style-type: none"> Visual | Gauge less than 3/4 when driving | — |
| | | <ul style="list-style-type: none"> Coolant overflow to reservoir tank | <ul style="list-style-type: none"> Visual | No overflow during driving and idling | CO-43, "Inspection" |
| OFF*4 | 10 | <ul style="list-style-type: none"> Coolant return from reservoir tank to radiator | <ul style="list-style-type: none"> Visual | Should be initial level in reservoir tank | CO-43, "Inspection" |
| OFF | 11 | <ul style="list-style-type: none"> Cylinder head | <ul style="list-style-type: none"> Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | EM-221, "Inspection After Disassembly" |
| | 12 | <ul style="list-style-type: none"> Cylinder block and pistons | <ul style="list-style-type: none"> Visual | No scuffing on cylinder walls or piston | EM-231, "Disassembly and Assembly" |

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (56 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to [CO-41, "Troubleshooting Chart"](#).

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

P1225 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1225 TP SENSOR

DTC Logic

INFOID:000000012524852

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P1225 | CTP LEARNING-B1 (Closed throttle position learning performance) | Closed throttle position learning value is excessively low. | • Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-819, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

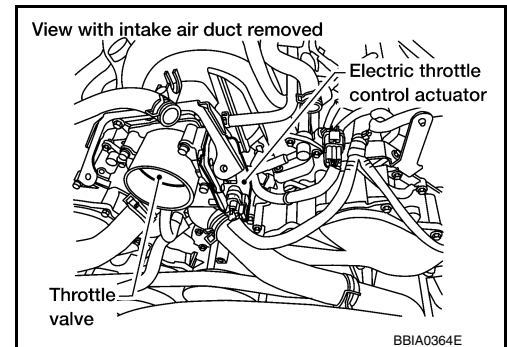
INFOID:000000012524853

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-165, "Exploded View"](#).
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-591, "Description"](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator. Refer to [EM-166, "Exploded View"](#).
2. Go to [EC-592, "Description"](#).

>> INSPECTION END

P1226 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1226 TP SENSOR

DTC Logic

INFOID:000000012524854

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P1226 | CTP LEARNING-B2 (Closed throttle position learning performance) | Closed throttle position learning is not performed successfully, repeatedly. | • Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-820, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

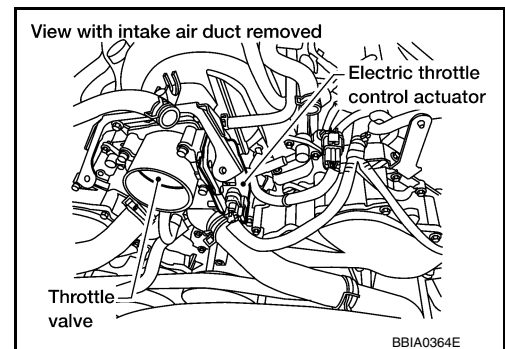
INFOID:000000012524855

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-165, "Exploded View"](#).
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-591, "Description"](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator. Refer to [EM-166, "Exploded View"](#).
2. Go to [EC-592, "Description"](#).

>> INSPECTION END

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1564 ASCD STEERING SWITCH

DTC Logic

INFOID:000000012524856

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-798, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1564 | ASCD SW (ASCD steering switch) | <ul style="list-style-type: none"> An excessively high voltage signal from the ASCD steering switch is sent to ECM. ECM detects that input signal from the ASCD steering switch is out of the specified range. ECM detects that the ASCD steering switch is stuck ON. | <ul style="list-style-type: none"> Harness or connectors (ASCD steering switch circuit is open or shorted.) ASCD steering switch ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 10 seconds.
- Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-821, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524857

1. CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT

- Turn ignition switch ON.
- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
- Check each item indication as per the following conditions.

| Monitor item | Condition | Indication | |
|--------------|---------------|------------|-----|
| MAIN SW | MAIN switch | Pressed | ON |
| | | Released | OFF |
| CANCEL SW | CANCEL switch | Pressed | ON |
| | | Released | OFF |

P1564 ASCD STEERING SWITCH

[VK56DE]

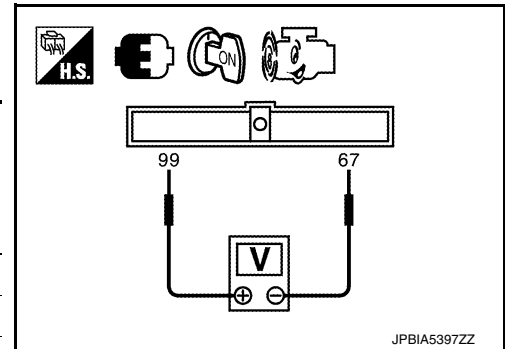
< DTC/CIRCUIT DIAGNOSIS >

| Monitor item | Condition | | Indication |
|---------------|--------------------------|----------|------------|
| RESUME/ACC SW | RESUME/ACCELERATE switch | Pressed | ON |
| | | Released | OFF |
| SET SW | COAST/SET switch | Pressed | ON |
| | | Released | OFF |

⊗ Without CONSULT

- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | | Condition | Voltage (Approx.) |
|----------------|---------------|----------------|---------------|--------------------------------------|-------------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E77 | 99 | F72 | 67 | MAIN switch: Pressed | 0 V |
| | | | | CANCEL switch: Pressed | 1 V |
| | | | | COAST/SET switch: Pressed | 2 V |
| | | | | RESUME/ACCELERATE switch: Pressed | 3 V |
| | | | | All ASCD steering switches: Released | 4 V |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
 NO >> GO TO 2.

2. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Disconnect combination switch (spiral cable) harness connector.
- Check the continuity between combination switch (spiral cable) harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------------------------------|----------|-----------|----------|------------|
| Combination switch (spiral cable) | | ECM | | |
| Terminal | Terminal | Connector | Terminal | |
| M30 | 32 | F72 | 67 | Existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair or replace error-detected parts.

3. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Check the continuity between combination switch (spiral cable) harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------------------------------|----------|-----------|----------|------------|
| Combination switch (spiral cable) | | ECM | | |
| Terminal | Terminal | Connector | Terminal | |
| M30 | 25 | E77 | 99 | Existed |

P1564 ASCD STEERING SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK ASCD STEERING SWITCH

Check ASCD steering switch. Refer to [EC-823, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace ASCD steering switch. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

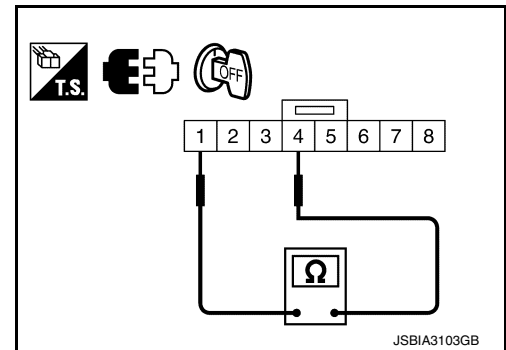
Component Inspection

INFOID:000000012524858

1.CHECK ASCD STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector.
3. Check resistance between combination switch harness connector terminals as per the following.

| Combination switch | | | Condition | Resistance (Approx.) |
|--------------------|---|---|--------------------------------------|----------------------|
| Connector | + | - | | |
| M102 | 1 | 4 | MAIN switch: Pressed | 0 Ω |
| | | | CANCEL switch: Pressed | 250 Ω |
| | | | SET/COAST switch: Pressed | 660 Ω |
| | | | RESUME/ACCELERATE switch: Pressed | 1,480 Ω |
| | | | All ASCD steering switches: Released | 4,000 Ω |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1572 ASCD BRAKE SWITCH

Description

INFOID:000000012524859

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal). Refer to [EC-496, "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for the ASCD function.

DTC Logic

INFOID:000000012524860

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-798, "DTC Logic"](#).
- This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|--|--|
| P1572 | ASCD BRAKE SW (ASCD brake switch) | A) | When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time. | <ul style="list-style-type: none">• Harness or connectors (The stop lamp switch circuit is shorted.)• Harness or connectors (The ASCD brake switch circuit is shorted.)• Stop lamp switch• ASCD brake switch• Incorrect stop lamp switch installation• Incorrect ASCD brake switch installation• ECM |
| | | B) | ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine (VDC switch OFF).
2. Press MAIN switch and make sure that CRUISE lamp illuminates.
3. Drive the vehicle for at least 5 consecutive seconds as per the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

P1572 ASCD BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

| | |
|----------------|----------------------------|
| Vehicle speed | More than 30 km/h (19 mph) |
| Selector lever | Suitable position |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-825, "Diagnosis Procedure"](#).
- NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds as per the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

| | |
|------------------|---|
| Vehicle speed | More than 30 km/h (19 mph) |
| Selector lever | Suitable position |
| Driving location | Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed. |

2. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-825, "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524861

1.CHECK OVERALL FUNCTION-1

Ⓜ With CONSULT

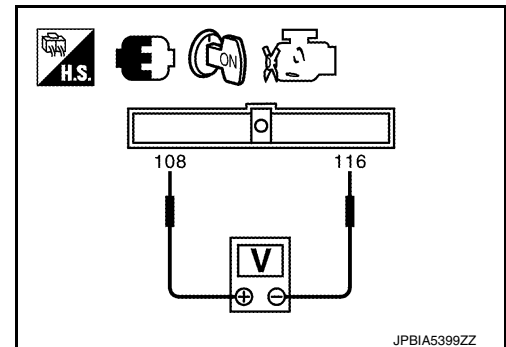
1. Turn ignition switch ON.
2. Select "BRAKE SW1" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "BRAKE SW1" indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| | Brake pedal | Fully released | ON |

ⓧ Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|-----|---------------------|-------------------|
| Connector | + | - | | |
| | Terminal | | | |
| E77 | 108 | 116 | Slightly de-pressed | 0 V |
| | | | Fully released | Battery voltage |



Is the inspection result normal?

- YES >> GO TO 2.
- NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-2

P1572 ASCD BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Ⓜ With CONSULT

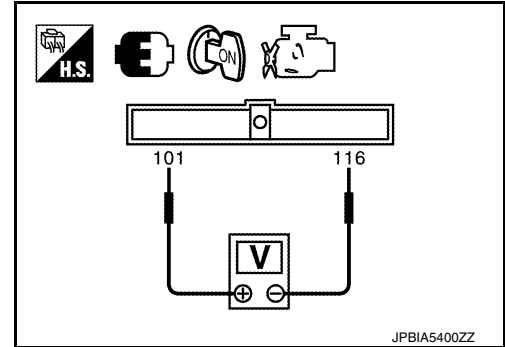
Select "BRAKE SW2" and check indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| | | Fully released | OFF |

ⓧ Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | Condition | Voltage (Approx.) |
|-----------|----------|-----|--------------------|-------------------|
| Connector | + | - | | |
| | Terminal | | | |
| E77 | 101 | 116 | Slightly depressed | Battery voltage |
| | | | Fully released | 0 V |



Is the inspection result normal?

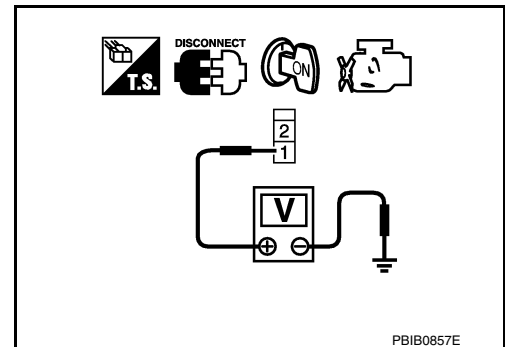
YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> GO TO 6.

3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

| + | | - | Voltage |
|-------------------|----------|--------|-----------------|
| ASCD brake switch | | | |
| Connector | Terminal | | |
| E37 | 1 | Ground | Battery voltage |



Is the inspection result normal?

YES >> GO TO 4.

NO >> Perform the trouble diagnosis for power supply circuit.

4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------|----------|-----------|----------|------------|
| ASCD brake switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E37 | 2 | E77 | 108 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ASCD BRAKE SWITCH

Refer to [EC-827, "Component Inspection \(ASCD Brake Switch\)"](#)

Is the inspection result normal?

P1572 ASCD BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace ASCD brake switch. Refer to [BR-22. "Exploded View"](#).

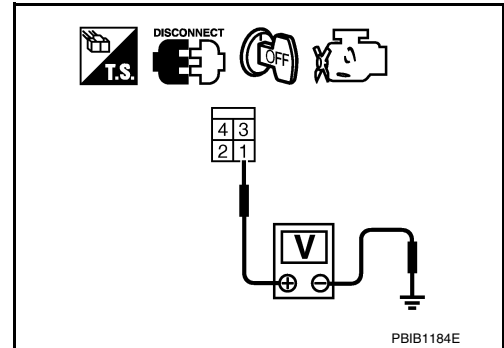
6. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the voltage between stop lamp switch harness connector and ground.

| + | | - | Voltage |
|------------------|----------|--------|-----------------|
| Stop lamp switch | | | |
| Connector | Terminal | Ground | Battery voltage |
| E38 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 7.
- NO >> Perform the trouble diagnosis for power supply circuit.



7. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------|----------|-----------|----------|------------|
| Stop lamp switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| E38 | 2 | E77 | 101 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 8.
- NO >> Repair or replace error-detected parts.

8. CHECK STOP LAMP SWITCH

Check the stop lamp switch. Refer to [EC-828. "Component Inspection \(Stop Lamp Switch\)"](#)

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace stop lamp switch. Refer to [BR-22. "Exploded View"](#).

Component Inspection (ASCD Brake Switch)

INFOID:000000012524862

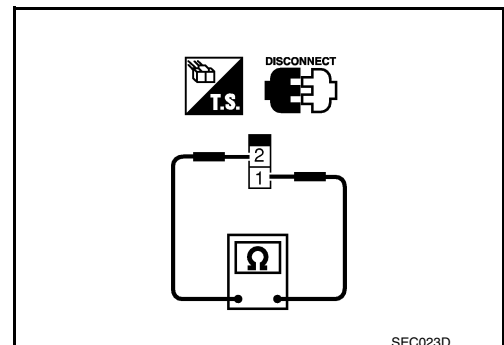
1. CHECK ASCD BRAKE SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|--------------------|-------------|
| + | - | | |
| Terminals | | Brake pedal | Existed |
| 1 | 2 | | |
| | | Slightly depressed | Not existed |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.



P1572 ASCD BRAKE SWITCH

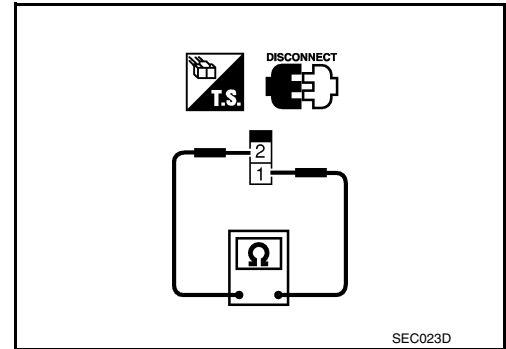
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK ASCD BRAKE SWITCH-2

1. Adjust ASCD brake switch installation. Refer to [BR-10. "Inspection and Adjustment"](#).
2. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Existed |
| | | Slightly de-pressed | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to [BR-22. "Exploded View"](#).

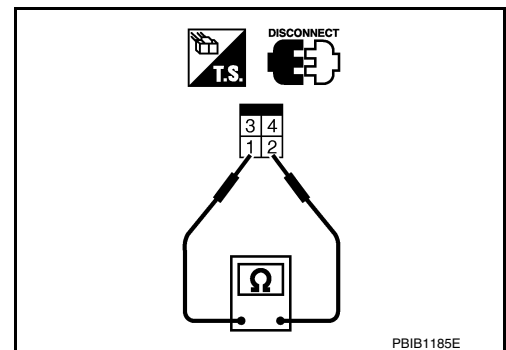
Component Inspection (Stop Lamp Switch)

INFOID:000000012524863

1. CHECK STOP LAMP SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

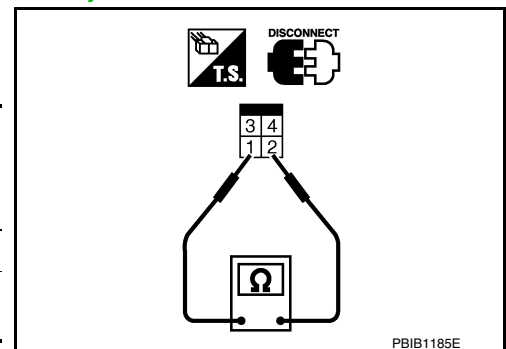
YES >> INSPECTION END

NO >> GO TO 2.

2. CHECK STOP LAMP SWITCH-2

1. Adjust stop lamp switch installation. Refer to [BR-10. "Inspection and Adjustment"](#).
2. Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|----------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to [BR-22. "Exploded View"](#).

P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000012524864

The ECM receives two vehicle speed signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to [EC-496, "AUTOMATIC SPEED CONTROL DEVICE \(ASCD\) : System Description"](#) for ASCD functions.

DTC Logic

INFOID:0000000012524865

DTC DETECTION LOGIC

NOTE:

- If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to [EC-785, "DTC Logic"](#).
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-798, "DTC Logic"](#).
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P1574 | ASCD VHL SPD SEN (ASCD vehicle speed sensor) | The difference the between two vehicle speed signals is out of the specified range. | <ul style="list-style-type: none">• Harness or connectors (CAN communication line is open or shorted.)• Combination meter• ABS actuator and electric unit (control unit)• Wheel sensor• TCM• ECM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-829, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000012524866

1. CHECK DTC WITH TCM

P1574 ASCD VEHICLE SPEED SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Check DTC with TCM. Refer to [TM-39. "CONSULT Function"](#).

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to [BRC-32. "CONSULT Function \(ABS\)"](#).

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace malfunctioning part.

3.CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to [MWI-17. "CONSULT Function \(METER/M&A\)"](#).

>> INSPECTION END

P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1715 INPUT SPEED SENSOR (PRIMARY SPEED SENSOR)

Description

INFOID:000000012524867

ECM receives input speed sensor signal from TCM via the CAN communication line. ECM uses this signal for engine control.

DTC Logic

INFOID:000000012524868

DTC DETECTION LOGIC

NOTE:

- If DTC P1715 is displayed with DTC UXXXX first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to [EC-731, "DTC Logic"](#).
- If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to [EC-734, "DTC Logic"](#).
- If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to [EC-798, "DTC Logic"](#).
- If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to [EC-800, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1715 | IN PULY SPEED [Input speed sensor (TCM output)] | Input speed sensor signal is different from the theoretical value calculated by ECM from output speed sensor signal and engine rpm signal. | <ul style="list-style-type: none">• Harness or connectors (CAN communication line is open or shorted)• Harness or connectors (Input speed sensor circuit is open or shorted)• TCM |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Drive vehicle at a speed of more than 50 km/h (31 MPH) for at least 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-831, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524869

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to [TM-48, "DTC Index"](#).

Is the inspection result normal?

- YES >> Replace TCM. Refer to [TM-171, "Exploded View"](#).
NO >> Perform trouble shooting relevant to DTC indicated.

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P1805 BRAKE SWITCH

DTC Logic

INFOID:000000012524870

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P1805 | BRAKE SW/CIRCUIT (Stop lamp switch) | Stop lamp switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | <ul style="list-style-type: none"> Harness or connectors (Stop lamp switch circuit is open or shorted.) Stop lamp switch |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Fully depress the brake pedal for at least 5 seconds.
- Erase the DTC.
- Check 1st trip DTC.

Is 1st trip DTC detected?

- YES >> Proceed to [EC-832. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524871

1. CHECK STOP LAMP SWITCH CIRCUIT

- Turn ignition switch OFF.
- Check the stop lamp when depressing and releasing the brake pedal.

| Brake pedal | Stop lamp |
|--------------------|-----------------|
| Fully released | Not illuminated |
| Slightly depressed | Illuminated |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 2.

2. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- Disconnect stop lamp switch harness connector.
- Check the voltage between stop lamp switch harness connector and ground.

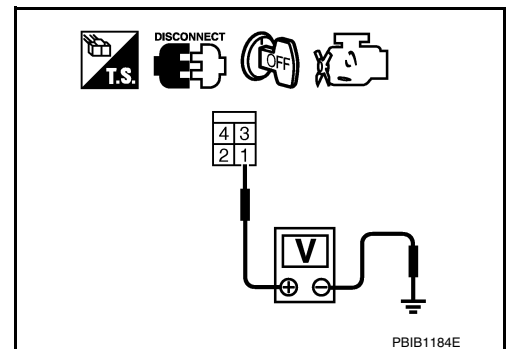
| + | | - | Voltage |
|------------------|----------|--------|-----------------|
| Stop lamp switch | | | |
| Connector | Terminal | | |
| E38 | 1 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Perform the trouble diagnosis for power supply circuit.

3. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT

- Disconnect stop lamp switch harness connector.
- Disconnect ECM harness connector.
- Check the continuity between stop lamp switch harness connector and ECM harness connector.



P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|------------------|----------|-----------|----------|------------|
| Stop lamp switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E38 | 2 | E77 | 101 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK STOP LAMP SWITCH

Refer to [EC-833, "Component Inspection \(Stop Lamp Switch\)"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace stop lamp switch. Refer to [BR-22, "Exploded View"](#).

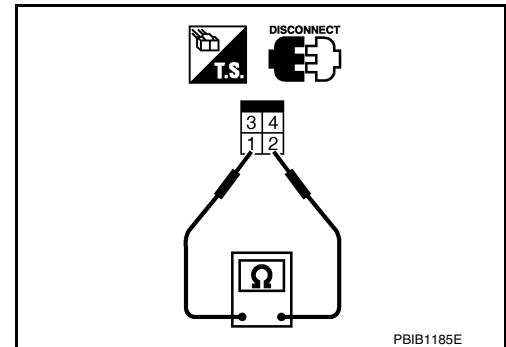
Component Inspection (Stop Lamp Switch)

INFOID:000000012524872

1.CHECK STOP LAMP SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|---------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

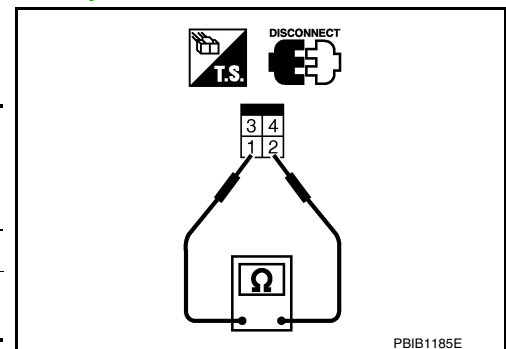
YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-2

1. Adjust stop lamp switch installation. Refer to [BR-10, "Inspection and Adjustment"](#).
2. Check the continuity between stop lamp switch terminals as per the following conditions.

| Stop lamp switch | | Condition | Continuity |
|------------------|---|---------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Fully released | Not existed |
| | | Slightly de-pressed | Existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to [BR-22, "Exploded View"](#).

P2096, P2097, P2098, P2099 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2096, P2097, P2098, P2099 A/F SENSOR 1

DTC Logic

INFOID:000000012933310

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|---|--|---|
| P2096 | POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too lean bank 1) | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period. | <ul style="list-style-type: none">• A/F sensor 1 (bank 1)• A/F sensor 1 heater• Heated oxygen sensor 2 (bank 1)• Fuel pressure |
| P2097 | POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too rich bank 1) | The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period. | <ul style="list-style-type: none">• Fuel injector• Intake air leaks• Exhaust gas leaks |
| P2098 | POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too lean bank 2) | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period. | <ul style="list-style-type: none">• A/F sensor 1 (bank 2)• A/F sensor 1 heater• Heated oxygen sensor 2 (bank 2)• Fuel pressure |
| P2099 | POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too rich bank 2) | The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period. | <ul style="list-style-type: none">• Fuel injector• Intake air leaks• Exhaust gas leaks |

Diagnosis Procedure

INFOID:000000012933367

1. RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to [EM-170, "Exploded View"](#).

>> GO TO 2.

2. CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas leak detected?

- YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK FOR INTAKE AIR LEAKAGE

1. Start engine and run it at idle.
2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

- YES >> Repair or replace malfunctioning part.
NO >> GO TO 4.

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to [EC-594, "Description"](#).
2. Run the engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

- YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to [EC-705, "DTC Logic"](#) or [EC-709, "DTC Logic"](#).
NO >> GO TO 5.

5. CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Check harness connector for water.

P2096, P2097, P2098, P2099 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Water should not exit.

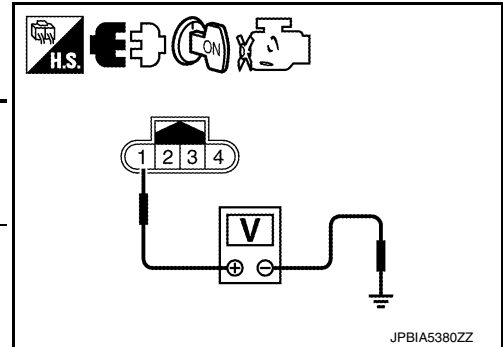
Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair or replace harness connector.

6. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY

1. Disconnect A/F sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | Bank | + | | - | Voltage |
|----------------|------|------------|----------|--------|-----------------|
| | | A/F sensor | | | |
| | | Connector | Terminal | | |
| P2096 P2097 | 1 | F65 | 1 | Ground | Battery voltage |
| P2098 P2099 | 2 | F5 | 1 | | |



Is the inspection result normal?

- YES >> GO TO 8.
- NO >> GO TO 7.

7. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

| DTC | Bank | + | | - | | Continuity |
|----------------|------|--------------|----------|-----------|----------|------------|
| | | A/F sensor 1 | | IPDM E/R | | |
| | | Connector | Terminal | Connector | Terminal | |
| P2096 P2097 | 1 | F65 | 1 | E119 | 8 | Existed |
| P2098 P2099 | 2 | F5 | 1 | | | |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | Bank | + | | - | | Continuity |
|----------------|------|--------------|----------|-----------|----------|------------|
| | | A/F sensor 1 | | ECM | | |
| | | Connector | Terminal | Connector | Terminal | |
| P2096 P2097 | 1 | F65 | 3 | F72 | 56 | Existed |
| | | | 4 | | 35 | |
| P2098 P2099 | 2 | F5 | 3 | | 75 | |
| | | | 4 | | 16 | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

P2096, P2097, P2098, P2099 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| DTC | Bank | + | | - | Continuity |
|----------------|------|--------------|----------|--------|-------------|
| | | A/F sensor 1 | | | |
| | | Connector | Terminal | | |
| P2096 P2097 | 1 | F65 | 3 4 | Ground | Not existed |
| P2098 P2099 | 2 | F5 | 3 4 | | |

| DTC | + | | - | Continuity |
|----------------|-----------|----------|--------|-------------|
| | ECM | | | |
| | Connector | Terminal | | |
| P2096 P2097 | F72 | 56 | Ground | Not existed |
| | | 35 | | |
| P2098 P2099 | | 75 | | |
| | | 16 | | |

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to [EC-631, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 12.

10. CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to [EC-697, "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning heated oxygen sensor 2.

11. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Perform [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to [EM-170, "Exploded View"](#).

NO >> Repair or replace error-detected parts.

12. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1.

CAUTION:

- Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.
- Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).

Do you have CONSULT?

YES >> GO TO 13.

NO >> GO TO 14.

13. CONFIRM A/F ADJUSTMENT DATA

 With CONSULT

P2096, P2097, P2098, P2099 A/F SENSOR 1

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
3. Make sure that "0.000" is displayed CONSULT screen.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> GO TO 14.

14. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to [EC-594. "Description"](#).

Do you have CONSULT?

- YES >> GO TO 15.
NO >> INSPECTION END

15. CONFIRM A/F ADJUSTMENT DATA

 **With CONSULT**

1. Turn ignition switch ON.
2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT.
3. Make sure that "0.000" is displayed CONSULT screen.

>> INSPECTION END

A

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P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

INFOID:000000012524873

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P2100 | ETC MOT PWR-B1 (Throttle control motor relay circuit open) | ECM detects a voltage of power source for throttle control motor is excessively low. | <ul style="list-style-type: none">• Harness or connectors (Throttle control motor relay circuit is open)• Throttle control motor relay |
| P2103 | ETC MOT PWR (Throttle control motor relay circuit short) | ECM detect the throttle control motor relay is stuck ON. | <ul style="list-style-type: none">• Harness or connectors (Throttle control motor relay circuit is shorted)• Throttle control motor relay |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V.

Which DTC is detected?

- P2100 >> GO TO 2.
- P2103 >> GO TO 3.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-838. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

3. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-838. "Diagnosis Procedure"](#).
- NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524874

1. CHECK THROTTLE CONTROL MOTOR RELAY CONTROL SIGNAL

1. Turn ignition switch OFF.

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

[VK56DE]

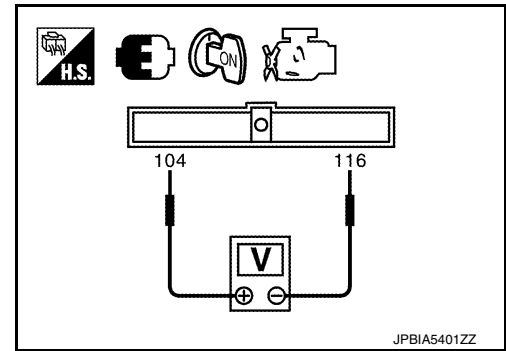
< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between ECM harness connector and ground.

| ECM | | | Voltage |
|-----------|----------|-----|-----------------|
| Connector | + | - | |
| | Terminal | | |
| E77 | 104 | 116 | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> GO TO 2.



2. CHECK THROTTLE CONTROL MOTOR RELAY CONTROL SIGNAL CIRCUIT

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 104 | E122 | 47 | Existed |

- Also check harness for short to ground.

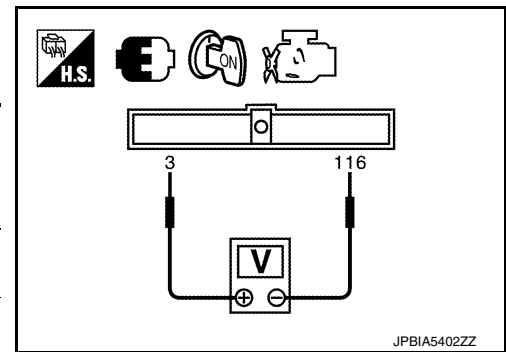
Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace error-detected parts.

3. CHECK THROTTLE CONTROL MOTOR POWER SUPPLY

Check the voltage between ECM harness connector and ground as per the following conditions.

| ECM | | | | Condition | Voltage (Approx.) |
|-----------|----------|-----------|----------|----------------------|-------------------|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F72 | 3 | E77 | 116 | Ignition switch: OFF | 0 V |
| | | | | Ignition switch: ON | Battery voltage |



Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> GO TO 4.

4. CHECK THROTTLE CONTROL MOTOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F72 | 3 | E119 | 6 | Existed |

- Also check harness for short to ground and to power.

Is the inspection result normal?

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

-
- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
NO >> Repair or replace error-detected parts.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

DTC Logic

INFOID:000000012524875

DTC DETECTION LOGIC

NOTE:

- If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to [EC-838, "DTC Logic"](#).
- If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to [EC-846, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P2101 | ETC FNCTN/CIRC-B1 (Electric throttle control performance) | Electric throttle control function does not operate properly. | <ul style="list-style-type: none"> • Harness or connectors (Throttle control motor circuit is open or shorted) • Electric throttle control actuator |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-841, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

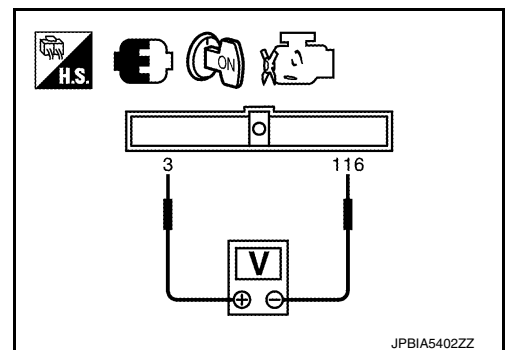
Diagnosis Procedure

INFOID:000000012524876

1. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL

Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | | Condition | Voltage (Approx.) |
|-----------|----------|-----------|----------|-------------------------|----------------------|
| + | | - | | | |
| Connector | Terminal | Connector | Terminal | | |
| F72 | 3 | E77 | 116 | Ignition switch: OFF | 0 V |
| | | | | Ignition switch: ON | Battery voltage |



Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 2.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| F72 | 3 | E119 | 6 | Existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Check the continuity between ECM harness connector and IPDM E/R harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| ECM | | IPDM E/R | | |
| Connector | Terminal | Connector | Terminal | |
| E77 | 104 | E122 | 47 | Existed |

2. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.

NO >> Repair or replace error-detected parts.

4. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector. Refer to [EM-25, "Exploded View"](#).
3. Disconnect ECM harness connector.
4. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|-------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 5 | F72 | 5 | Not existed |
| | | | 4 | Existed |
| | 6 | | 5 | Existed |
| | | | 4 | Not existed |

5. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct. Refer to [EM-165, "Exploded View"](#).

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

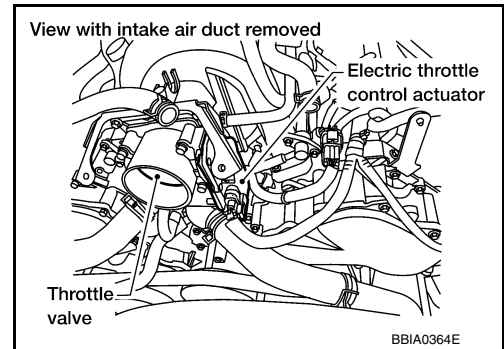
[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

- YES >> GO TO 6.
 NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-591, "Description"](#).



6.CHECK THROTTLE CONTROL MOTOR

Check the throttle control motor. Refer to [EC-843, "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
 NO >> Replace electric throttle control actuator. Refer to [EM-166, "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524877

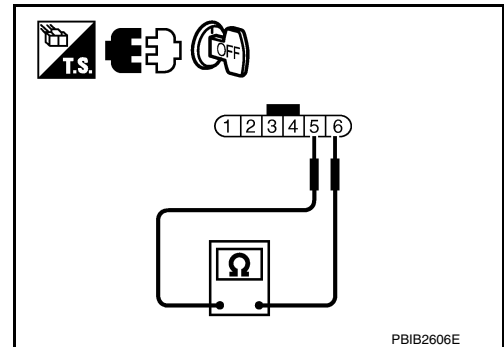
1.CHECK THROTTLE CONTROL MOTOR

- Turn ignition switch OFF.
- Disconnect electric throttle control actuator harness connector. Refer to [EM-166, "Exploded View"](#).
- Check the resistance between electric throttle control actuator terminals as per the following.

| Electric throttle control actuator | | Resistance (Approx.) |
|------------------------------------|---|---------------------------|
| + | - | |
| Terminals | | |
| 5 | 6 | 1 - 15 Ω [at 25°C (77°F)] |

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Replace electric throttle control actuator. Refer to [EM-166, "Removal and Installation"](#).



P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2118 THROTTLE CONTROL MOTOR

DTC Logic

INFOID:000000012524878

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P2118 | ETC MOT-B1 (Throttle control motor circuit short) | ECM detects short in both circuits between ECM and throttle control motor. | <ul style="list-style-type: none"> Harness or connectors (Throttle control motor circuit is shorted.) Electric throttle control actuator (Throttle control motor) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 2 seconds.
- Start engine and let it idle for 5 seconds.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-844. "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524879

1. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Disconnect electric throttle control actuator harness connector.
- Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|----------|-----------|----------|-------------|
| Electric throttle control actuator | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| F50 | 5 | F72 | 5 | Not existed |
| | | | 4 | Existed |
| | 6 | | 5 | Existed |
| | | | 4 | Not existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair or replace malfunctioning part.

2. CHECK THROTTLE CONTROL MOTOR

Check throttle control motor. Refer to [EC-845. "Component Inspection"](#).

P2118 THROTTLE CONTROL MOTOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace electric throttle control actuator. Refer to [EM-166. "Exploded View"](#).

Component Inspection

INFOID:0000000012524880

EC

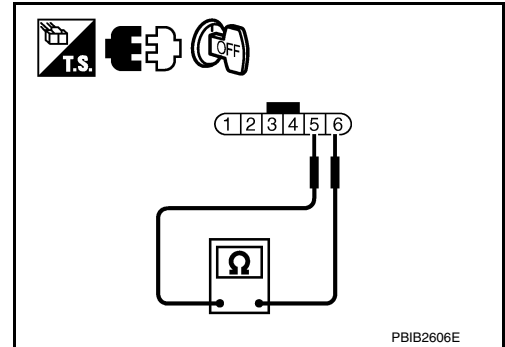
1. CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector. Refer to [EM-166. "Exploded View"](#).
3. Check the resistance between electric throttle control actuator terminals as per the following.

| Electric throttle control actuator | | Resistance (Approx.) |
|------------------------------------|---|---------------------------|
| + | - | |
| Terminals | | |
| 5 | 6 | 1 - 15 Ω [at 25°C (77°F)] |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace electric throttle control actuator. Refer to [EM-166. "Removal and Installation"](#).



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P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic

INFOID:000000012524881

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | | Possible cause |
|---------|---|-------------------------|---|------------------------------------|
| P2119 | ETC ACTR-B1 (Electric throttle control actuator) | A) | Electric throttle control actuator does not function properly due to the return spring malfunction. | Electric throttle control actuator |
| | | B) | Throttle valve opening angle in fail-safe mode is not in specified range. | |
| | | C) | ECM detects that the throttle valve is stuck open. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to the D position and wait at least 3 seconds.
3. Shift selector lever to the P position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Shift selector lever to the D position and wait at least 3 seconds.
7. Shift selector lever to the P position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-846. "Diagnosis Procedure"](#).
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to the D position and wait at least 3 seconds.
3. Shift selector lever to the N or P position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-846. "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524882

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to [EM-165. "Exploded View"](#).

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

[VK56DE]

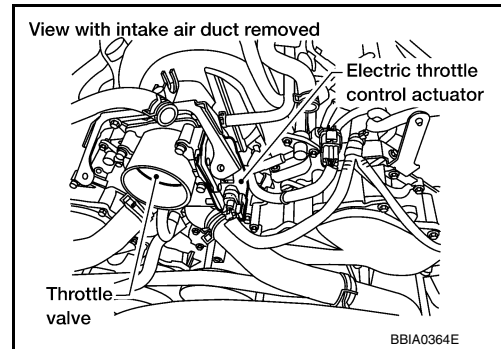
< DTC/CIRCUIT DIAGNOSIS >

3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to [EC-591, "Description"](#).



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator. Refer to [EM-165, "Exploded View"](#).
2. Go to [EC-592, "Description"](#).

>> INSPECTION END

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P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2122, P2123 APP SENSOR

DTC Logic

INFOID:000000012524883

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P2122 | APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit low input) | An excessively low voltage from the APP sensor 1 is sent to ECM. | <ul style="list-style-type: none"> • Harness or connectors (APP sensor 1 circuit is open or shorted.) • Accelerator pedal position sensor (APP sensor 1) |
| P2123 | APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit high input) | An excessively high voltage from the APP sensor 1 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-848, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524884

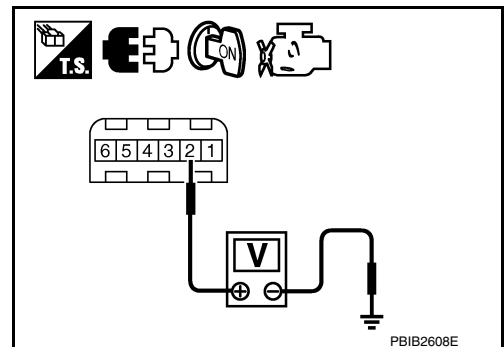
1. CHECK APP SENSOR 1 POWER SUPPLY

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|----------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.



P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 4 | E77 | 82 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 3 | E77 | 106 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR

Check APP sensor. Refer to [EC-849, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace accelerator pedal assembly. Refer to [ACC-3, "Removal and Installation"](#).

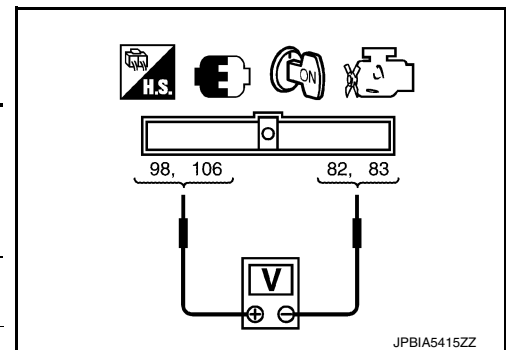
Component Inspection

INFOID:000000012524885

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | | Condition | Voltage |
|----------------|---------------|----------------|---------------|----------------------|---------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E77 | 106 | E77 | 82 | Fully re- leased | 0.5 - 1.0 V |
| | | | 83 | Fully de- pressed | 4.2 - 4.8 V |
| | 98 | | 82 | Fully re- leased | 0.25 - 0.50 V |
| | | | 83 | Fully de- pressed | 2.0 - 2.5 V |



P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly. Refer to [ACC-3. "Removal and Installation"](#).

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2127, P2128 APP SENSOR

DTC Logic

INFOID:000000012524886

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P2127 | APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit low input) | An excessively low voltage from the APP sensor 2 is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (APP sensor 2 circuit is open or shorted.) (TP sensor circuit shorted.) Accelerator pedal position sensor (APP sensor 2) Electric throttle control actuator (TP sensor 1 and 2) |
| P2128 | APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit high input) | An excessively high voltage from the APP sensor 2 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-851, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524887

1. CHECK APP SENSOR 2 POWER SUPPLY

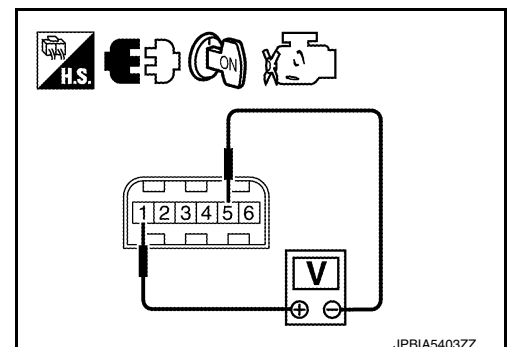
- Turn ignition switch OFF.
- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector terminals.

| Connector | APP sensor | | Voltage (Approx.) |
|-----------|------------|---|----------------------|
| | + | - | |
| E20 | 1 | 5 | 5 V |

Is the inspection result normal?

- YES >> GO TO 8.
 NO >> GO TO 2.

2. CHECK APP SENSOR 2 POWER SUPPLY-2



P2127, P2128 APP SENSOR

[VK56DE]

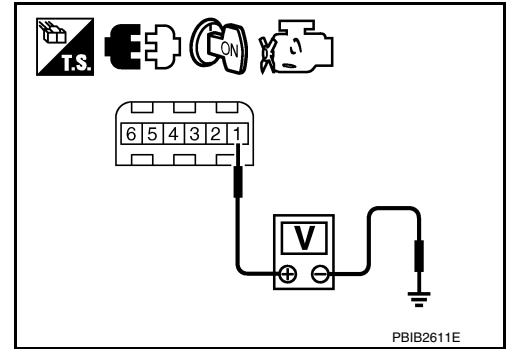
< DTC/CIRCUIT DIAGNOSIS >

Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|-------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 3.



3. CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 1 | E77 | 91 | Existed |

Is inspection result normal?

- YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| + | | - | | |
|-----------|----------|--------------------------|-----------|----------|
| ECM | | Sensor | | |
| Connector | Terminal | Name | Connector | Terminal |
| F72 | 47 | Throttle position sensor | F50 | 2 |
| E77 | 91 | APP sensor | E20 | 1 |

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.

- Throttle position sensor (Refer to [EC-660, "Component Inspection"](#).)

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace malfunctioning components.

6. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 5 | E77 | 83 | Existed |

P2127, P2128 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | Ground | Existed |
| E77 | 115 | | |
| | 116 | | |
| F72 | 1 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

8. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | Existed |
| E20 | 6 | E77 | 98 | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK APP SENSOR

Check APP sensor. Refer to [EC-853, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

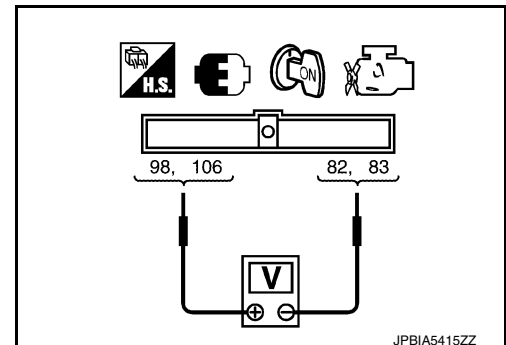
NO >> Replace accelerator pedal assembly. Refer to [ACC-3, "Removal and Installation"](#).

Component Inspection

INFOID:000000012524888

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals as per the following conditions.



P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| ECM | | | | Condition | Voltage |
|----------------|---------------|----------------|----------------------|----------------------|-------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E77 | 106 | E77 | 82 | Fully re- leased | 0.5 - 1.0 V |
| | | | 83 | Fully de- pressed | 4.2 - 4.8 V |
| | 98 | | Fully re- leased | 0.25 - 0.50 V | |
| | | | Fully de- pressed | 2.0 - 2.5 V | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly. Refer to [ACC-3. "Removal and Installation"](#).

P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2135 TP SENSOR

DTC Logic

INFOID:000000012524889

DTC DETECTION LOGIC

NOTE:

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P2135 | TP SENSOR-B1 (Throttle position sensor circuit range/performance) | Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2. | <ul style="list-style-type: none"> Harness or connector (TP sensor 1 or 2 circuit is open or shorted.) Electric throttle control actuator (TP sensor 1 or 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-855, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524890

1. CHECK THROTTLE POSITION SENSOR POWER SUPPLY

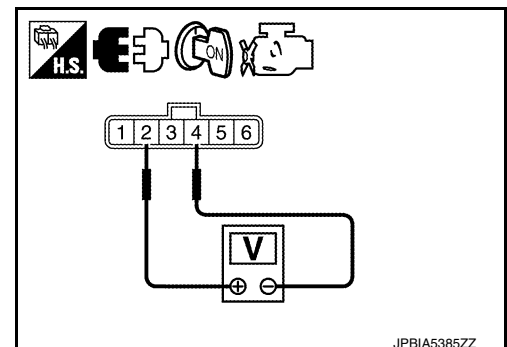
- Turn ignition switch OFF.
- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector terminals.

| Electric throttle control actuator | | | Voltage (Approx.) |
|------------------------------------|---|---|----------------------|
| Connector | + | - | |
| F50 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> GO TO 2.

2. CHECK THROTTLE POSITION SENSOR POWER SUPPLY-2



P2135 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

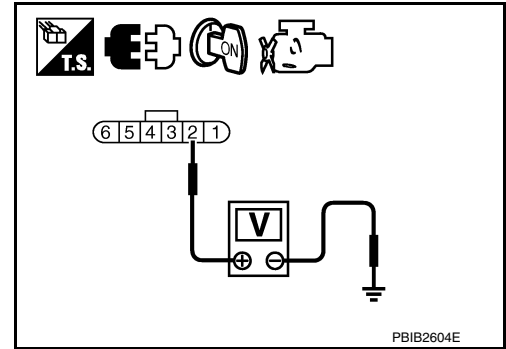
Check the voltage between electric throttle control actuator harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------------------------------|-----------|--------|-------------------|
| Electric throttle control actuator | Connector | | |
| | Terminal | Ground | 5 V |
| F50 | 2 | | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.



3. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|-----------|-----------|----------|------------|
| Electric throttle control actuator | Connector | ECM | Terminal | |
| | Terminal | Connector | Terminal | Existed |
| F50 | 4 | F72 | 66 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | Ground | Existed |
| E77 | 115 | | |
| | 116 | | |
| F72 | 1 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

5. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------------------------------|-----------|-----------|----------|------------|
| Electric throttle control actuator | Connector | ECM | Terminal | |
| | Terminal | Connector | Terminal | Existed |
| F50 | 1 | F72 | 50 | |
| | 3 | | 69 | |

2. Also check harness for short to ground and short to power.

P2135 TP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 6.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK THROTTLE POSITION SENSOR

Check throttle position sensor. Refer to [EC-857. "Component Inspection"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).
- NO >> Replace electric throttle control actuator. Refer to [EM-166. "Exploded View"](#).

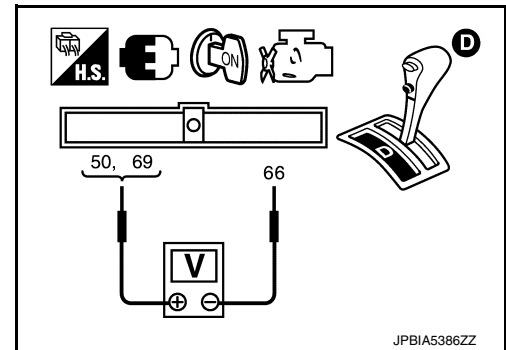
Component Inspection

INFOID:0000000012524891

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform [EC-591. "Description"](#).
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals under the following conditions.

| Connector | ECM | | Condition | Voltage |
|-----------|----------|----|-----------------|------------------|
| | + | - | | |
| | Terminal | | | |
| F72 | 50 | 66 | Fully released | More than 0.36 V |
| | | | Fully depressed | Less than 4.75 V |
| | 69 | | Fully released | Less than 4.75 V |
| | | | Fully depressed | More than 0.36 V |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Replace electric throttle control actuator. Refer to [EM-166. "Exploded View"](#).

P2138 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P2138 APP SENSOR

DTC Logic

INFOID:000000012524892

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to [EC-803, "DTC Logic"](#).

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P2138 | APP SENSOR (Accelerator pedal position sensor circuit range/performance) | Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2. | <ul style="list-style-type: none"> Harness or connector (APP sensor 1 or 2 circuit is open or shorted.) (TP sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 1 or 2) Electric throttle control actuator (TP sensor 1 and 2) |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

- YES >> Proceed to [EC-858, "Diagnosis Procedure"](#).
 NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524893

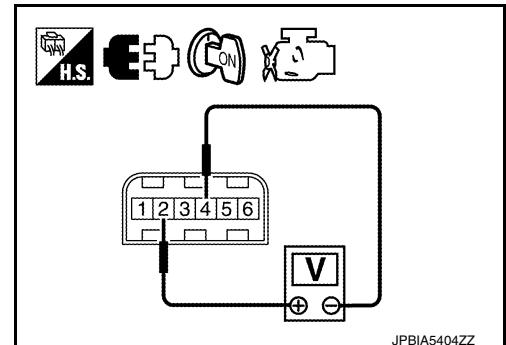
1. CHECK APP SENSOR 1 POWER SUPPLY-1

- Turn ignition switch OFF.
- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector terminals.

| Connector | APP sensor | | Voltage (Approx.) |
|-----------|------------|---|-------------------|
| | + | - | |
| | Terminal | | |
| E20 | 2 | 4 | 5 V |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 2.



P2138 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

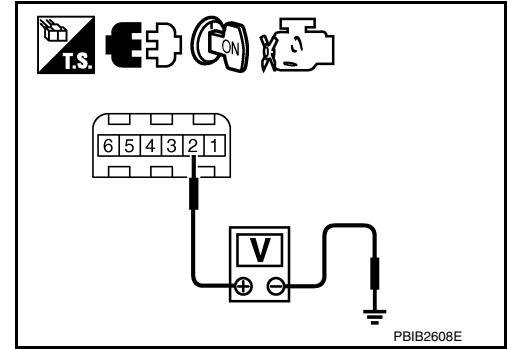
2. CHECK APP SENSOR 1 POWER SUPPLY-2

Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|-------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 2 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 9.
- NO >> GO TO 3.



3. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 2 | E77 | 90 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

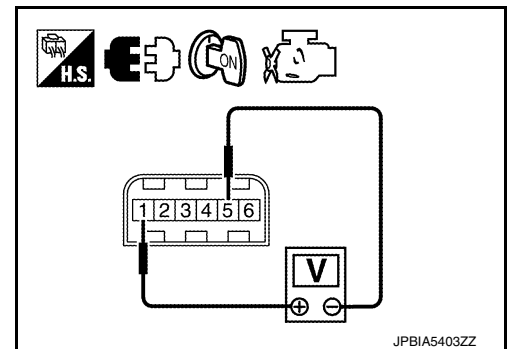
4. CHECK APP SENSOR 2 POWER SUPPLY-1

Check the voltage between APP sensor harness connector and ground.

| Connector | APP sensor | | Voltage (Approx.) |
|-----------|------------|---|-------------------|
| | + | - | |
| | Terminal | | |
| E20 | 1 | 5 | 5 V |

Is the inspection result normal?

- YES >> GO TO 12.
- NO >> GO TO 5.



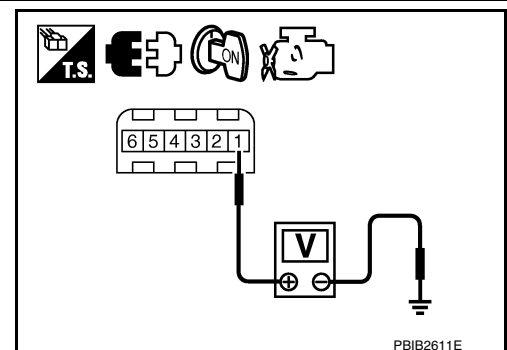
5. CHECK APP SENSOR 2 POWER SUPPLY-2

Check the voltage between APP sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|------------|----------|--------|-------------------|
| APP sensor | | | |
| Connector | Terminal | | |
| E20 | 1 | Ground | 5 V |

Is the inspection result normal?

- YES >> GO TO 10.
- NO >> GO TO 6.



6. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT

A
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P2138 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 1 | E77 | 91 | Existed |

4. Also check harness for short to ground.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| + | | - | | |
|---------------------|---------------|--------------------------|----------------|----------|
| ECM | | Sensor | | |
| Con- nec- tor | Termi- nal | Name | Connec- tor | Terminal |
| F72 | 47 | Throttle position sensor | F50 | 2 |
| E77 | 91 | APP sensor | E20 | 1 |

Is the inspection result normal?

- YES >> GO TO 8.
NO >> Repair short to ground or short to power in harness or connectors.

8.CHECK COMPONENTS

Check the following.

- Throttle position sensor (Refer to [EC-861, "Component Inspection"](#).)

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Replace malfunctioning components.

9.CHECK APP SENSOR 1 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 4 | E77 | 82 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 11.
NO >> Repair or replace error-detected parts.

10.CHECK APP SENSOR 2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

P2138 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 5 | E77 | 83 | Existed |

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair or replace error-detected parts.

11.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| ECM | | | |
| Connector | Terminal | Ground | Existed |
| E77 | 115 | | |
| | 116 | | |
| F72 | 1 | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Repair or replace error-detected parts.

12.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|------------|----------|-----------|----------|------------|
| APP sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E20 | 3 | E77 | 106 | Existed |
| | 6 | | 98 | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

13.CHECK APP SENSOR

Check APP sensor. Refer to [EC-861, "Component Inspection"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace accelerator pedal assembly. Refer to [ACC-3, "Removal and Installation"](#).

Component Inspection

INFOID:0000000012524894

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.

2. Turn ignition switch ON.

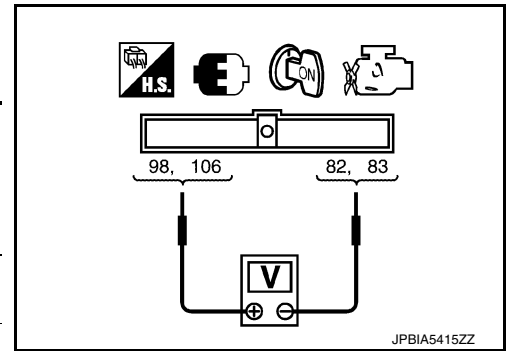
P2138 APP SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check the voltage between ECM harness connector terminals as per the following conditions.

| ECM | | | | Condition | Voltage |
|----------------|---------------|----------------|---------------|----------------------|---------------|
| + | | - | | | |
| Con- nector | Termi- nal | Con- nector | Termi- nal | | |
| E77 | 106 | E77 | 82 | Fully re- leased | 0.5 - 1.0 V |
| | | | | Fully de- pressed | 4.2 - 4.8 V |
| | 98 | | 83 | Fully re- leased | 0.25 - 0.50 V |
| | | | | Fully de- pressed | 2.0 - 2.5 V |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace accelerator pedal assembly. Refer to [ACC-3, "Removal and Installation"](#).

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

P219A, P219B AIR FUEL RATIO

DTC Logic

INFOID:0000000012524895

DTC DETECTION LOGIC

NOTE:

If DTC P219A or P219B is displayed with other DTC, first perform the trouble diagnosis for the other DTC. Refer to [EC-545. "DTC Index"](#).

| DTC No. | CONSULT screen terms (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P219A | AIR FUEL RATIO IMBALANCE B1 (Air-fuel ratio imbalance bank 1) | ECM detects a lean/rich air fuel ratio state in any cylinder for a specified length of time. | <ul style="list-style-type: none">• Fuel injector• Exhaust gas leaks• Incorrect fuel pressure• Mass air flow sensor• Intake air leaks• Lack of fuel• Incorrect PCV hose connection• Improper spark plug• Insufficient compression• The fuel injector circuit is open or shorted• Ignition coil• The ignition signal circuit is open or shorted |
| P219B | AIR FUEL RATIO IMBALANCE B2 (Air-fuel ratio imbalance bank 2) | | |

DTC CONFIRMATION PROCEDURE

1. PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2. PRECONDITIONING-2

1. Turn ignition switch ON.
2. Clear the mixture ratio self-learning value. Refer to [EC-594. "Description"](#).

Will CONSULT be used?

- YES >> GO TO 3.
NO >> GO TO 6.

3. PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Turn ignition switch ON.
2. Select "COOLAN TEMP/S" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Start engine.
4. Make sure that "COOLAN TEMP/S" indicates more than 80°C (176°F).

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Select "SYSTEM 1 DIAGNOSIS A B1", "SYSTEM 1 DIAGNOSIS B B1", "SYSTEM 1 DIAGNOSIS A B2", and "SYSTEM 1 DIAGNOSIS B B2" in "DATA MONITOR" mode of "ENGINE" using CONSULT.

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

2. Drive vehicle under the following conditions for at least 5 consecutive seconds.

CAUTION:

- Always drive vehicle at a safe speed.

| | |
|-------------------------|------------------------|
| ENG SPEED | 1,050 – 1,600rpm |
| COOLAN TEMP/S | More than 80°C (176°F) |
| B/FUEL SCHDL | 4 – 6 msec |
| Selector lever | D position |
| SYSTEM 1 DIAGNOSIS B B1 | PRSENT |
| SYSTEM 1 DIAGNOSIS B B2 | PRSENT |

NOTE:

- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during cruising.

3. Check “SYSTEM 1 DIAGNOSIS A B1” and “SYSTEM 1 DIAGNOSIS A B2” indication.

Is “CMPLT” displayed?

YES >> GO TO 5.

NO >> GO TO 2.

5.PERFORM DTC CONFIRMATION PROCEDURE-3


Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-864, "Diagnosis Procedure"](#).

NO >> INSPECTION END

6.PERFORM DTC CONFIRMATION PROCEDURE-4

 Without CONSULT

1. Start the engine and warm it up to normal operating temperature.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.

CAUTION:

- Always drive vehicle at a safe speed.

| | |
|-----------------------|------------------------|
| Engine speed | 1,050 – 1,600 rpm |
| Calculated load value | 24 – 33 % |
| COOLAN TEMP/S | More than 80°C (176°F) |
| Selector lever | D position |

NOTE:

- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during cruising.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to [EC-864, "Diagnosis Procedure"](#).

NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524896

1.CHECK FOR INTAKE AIR LEAK

1. Stop engine and check the following for connection.
 - Air duct
 - Vacuum hoses
 - PCV hose
 - Intake air passage between air duct to intake manifold
2. Start engine and let it idle.
3. Listen for an intake air leak after the mass air flow sensor.

P219A, P219B AIR FUEL RATIO

[VK56DE]

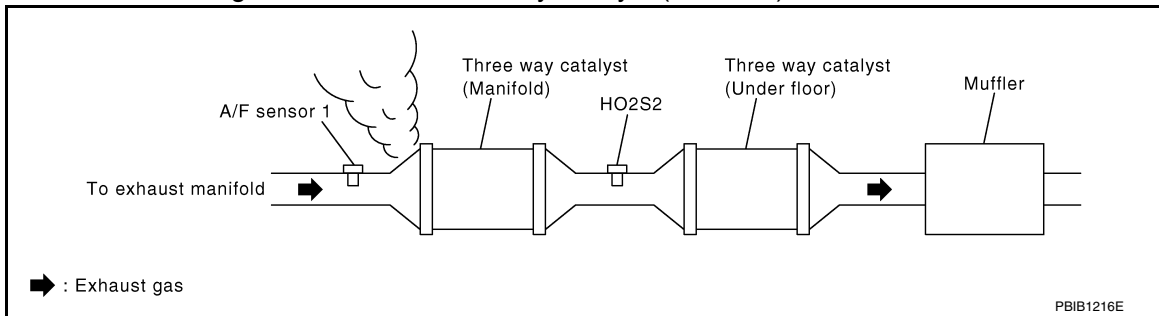
< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Repair or replace error-detected parts.

2.CHECK EXHAUST GAS LEAK

1. Stop engine and visually check exhaust tube, three way catalyst and muffler for dents connection.
2. Start engine and let it idle.
3. Listen for an exhaust gas leak before three way catalyst (manifold).



Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair or replace error-detected parts.

3.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to [EC-596, "Work Procedure"](#).
2. Check fuel pressure. Refer to [EC-596, "Work Procedure"](#).

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> GO TO 9.

4.CHECK MASS AIR FLOW SENSOR

Ⓜ With CONSULT

Check "MASS AIR FLOW" in "DATA MONITOR" mode of "ENGINE" using CONSULT.

For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

Ⓜ With GST

Check mass air flow sensor signal in Service \$01 using GST.

For specification, refer to [EC-905, "Mass Air Flow Sensor"](#).

Is the inspection result normal?

- YES >> GO TO 5.
- NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to [EC-639, "Diagnosis Procedure"](#).

5.CHECK FUNCTION OF FUEL INJECTOR-1

Ⓜ With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

Ⓧ Without CONSULT

1. Let engine idle.

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

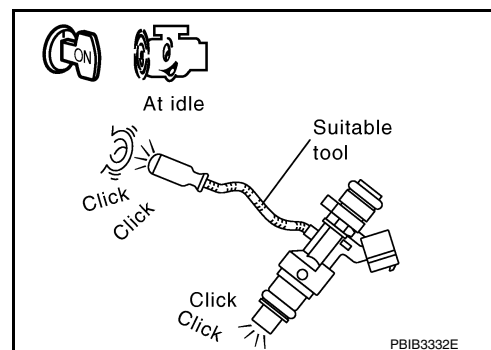
- Listen to each fuel injector operating sound.

Clicking noise should be heard.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform trouble diagnosis for fuel injector, refer to [EC-877. "Component Function Check"](#).



6. CHECK FUNCTION OF FUEL INJECTOR-2

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

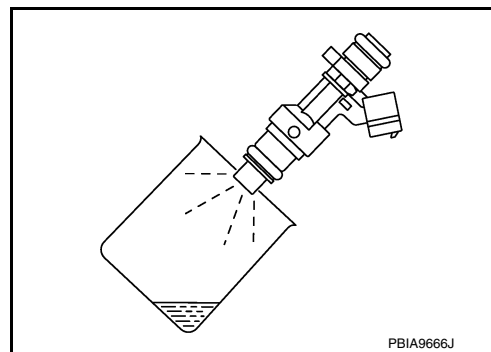
- Turn ignition switch OFF.
- Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- Disconnect all fuel injector harness connectors.
- Remove fuel tube assembly. Refer to [EM-181. "Removal and Installation"](#).
Keep fuel hose and all fuel injectors connected to fuel tube.
- Disconnect all ignition coil harness connectors.
- Prepare pans or saucers under each fuel injector.
- Crank engine for approximately 3 seconds.

- Fuel should be sprayed evenly for each fuel injector.**
- Fuel must not drip from the tip of fuel injector.**

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace fuel injector. Refer to [EM-181. "Removal and Installation"](#).



7. CHECK FUNCTION OF IGNITION COIL-1

CAUTION:

Perform the following steps in a well-ventilated area with no combustibles.

- Turn ignition switch OFF.
- Remove fuel pump fuse from IPDM E/R to release fuel pressure.
NOTE:
CONSULT must not be used to release fuel pressure. It develops again during the following steps, if released by using CONSULT.
- Start the engine.
- After an engine stall, crank the engine two or three times to release all the fuel pressure.
- Turn ignition switch OFF.
- Disconnect all the harness connectors of ignition coil to prevent electric discharge from occurring in ignition coil.
- Remove ignition coil assembly and spark plug of cylinder. Refer to [EM-178. "Removal and Installation"](#).
- Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
- Connect spark plug and harness connector to ignition coil.

P219A, P219B AIR FUEL RATIO

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

10. Allow a 13-17mm (0.52-0.66 in) spacing between spark plug and grounded metal portion as shown in the figure to fix the ignition coil with a rope or an equivalent.
11. Crank the engine for approximately 3 seconds to see if sparking occurs between spark plug and the grounded metal portion.

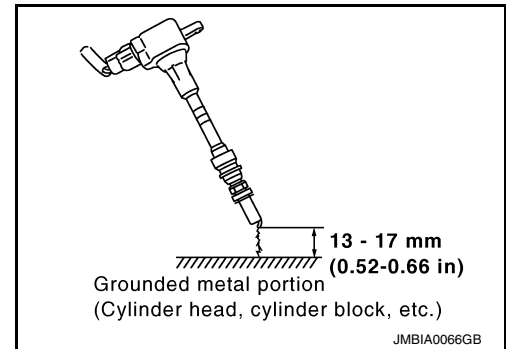
Spark should be generated.

CAUTION:

- The discharge voltage becomes 20 kV or higher. Therefore, always stay away from the spark plug and ignition coil at least 50 cm (19.7 in) during the inspection.
- Leaving a space of more than 17mm (0.66 in) may damage the ignition coil.

NOTE:

When the gap is less than 13 mm (0.52 in), a the spark might be generated even if the coil is malfunctioning.



Is the inspection result normal?

- YES >> GO TO 8.
NO >> GO TO 10.

8.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to [EM-163, "Checking Compression Pressure"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

9.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

- YES >> Replace fuel filter and fuel pump assembly. Refer to [FL-11, "Removal and Installation"](#).
NO >> Repair or replace error-detected parts.

10.CHECK FUNCTION OF IGNITION COIL-2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

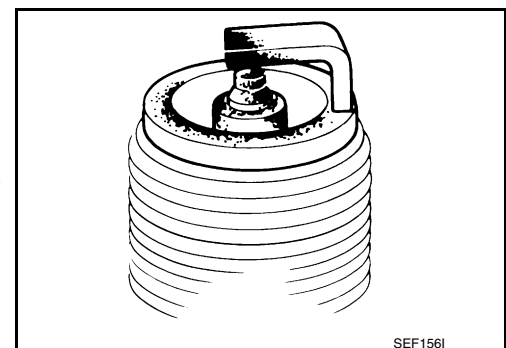
- YES >> GO TO 11.
NO >> Check ignition coil, power transistor and their circuits. Refer to [EC-882, "Component Function Check"](#).

11.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

- YES >> 1. Repair or clean spark plug. Refer to [MA-39, "SPARK PLUG : Removal and Installation"](#).
2. GO TO 12.
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-257, "Standard and Limit"](#).



12.CHECK FUNCTION OF IGNITION COIL-3

P219A, P219B AIR FUEL RATIO

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to [EM-257, "Standard and Limit"](#).

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

ASCD BRAKE SWITCH

Component Function Check

INFOID:000000012524899

1. CHECK ASCD BRAKE SWITCH FUNCTION

With CONSULT

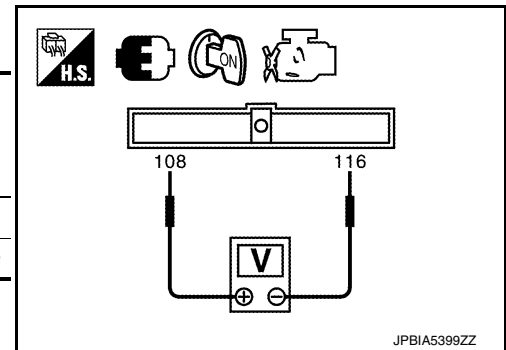
1. Turn ignition switch ON.
2. Select "BRAKE SW1" in "DATA MONITOR" mode of "ENGINE" using CONSULT.
3. Check "BRAKE SW1" indication as per the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| | | Fully released | ON |

Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

| ECM Connector | Terminal | | Condition | Voltage (Approx.) |
|---------------|----------|-----|--------------------|-------------------|
| | + | - | | |
| E77 | 108 | 116 | Slightly depressed | 0 V |
| | | | Fully released | Battery voltage |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-869. "Diagnosis Procedure"](#).

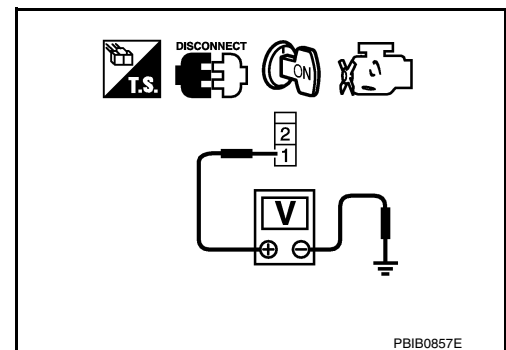
Diagnosis Procedure

INFOID:000000012524900

1. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

| + | | - | Voltage |
|-------------------|----------|--------|-----------------|
| ASCD brake switch | | | |
| Connector | Terminal | Ground | Battery voltage |
| E37 | 1 | | |



Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuse block (J/B) harness connector.
3. Check the continuity between ASCD brake switch harness connector and fuse block (J/B) harness connector.

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| + | | - | | Continuity |
|-------------------|----------|------------------|----------|------------|
| ASCD brake switch | | Fuse block (J/B) | | |
| Connector | Terminal | Connector | Terminal | |
| E37 | 1 | E51 | 2T | Existed |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
- NO >> Repair or replace error-detected parts.

3. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| + | | - | | Continuity |
|-------------------|----------|-----------|----------|------------|
| ASCD brake switch | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E37 | 2 | E77 | 108 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 4.
- NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK ASCD BRAKE SWITCH

Check ASCD brake switch. Refer to [EC-870, "Component Inspection \(ASCD Brake Switch\)"](#).

Is the inspection result normal?

- YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).
- NO >> Replace ASCD brake switch. Refer to [BR-22, "Exploded View"](#).

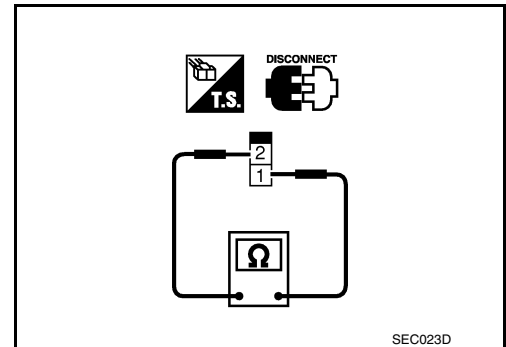
Component Inspection (ASCD Brake Switch)

INFOID:000000012524901

1. CHECK ASCD BRAKE SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|-------------|------------------------------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal | Fully released Existed |
| | | | Slightly de-pressed Not existed |



Is the inspection result normal?

- YES >> INSPECTION END
- NO >> GO TO 2.

2. CHECK ASCD BRAKE SWITCH-2

1. Adjust ASCD brake switch installation. Refer to [BR-10, "Inspection and Adjustment"](#).

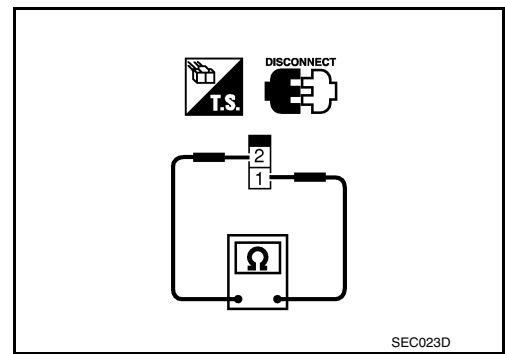
ASCD BRAKE SWITCH

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check the continuity between ASCD brake switch terminals as per the following conditions.

| ASCD brake switch | | Condition | Continuity |
|-------------------|---|--------------------------------|-------------|
| + | - | | |
| Terminals | | | |
| 1 | 2 | Brake pedal Fully released | Existed |
| | | Brake pedal Slightly depressed | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to [BR-22. "Exploded View"](#).

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ASCD INDICATOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

ASCD INDICATOR

Component Function Check

INFOID:000000012524902

1.CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator as per the following conditions.

| ASCD indicator | Condition | | Specification |
|----------------|---------------------|---|---------------|
| CRUISE | Ignition switch: ON | MAIN switch: Pressed at the 1st time →at the 2nd time | ON → OFF |

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-872, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524903

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

- YES >> GO TO 2.
- NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to [MWI-17, "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
- NO >> Repair or replace malfunctioning part.

3.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace combination meter. Refer to [MWI-68, "Exploded View"](#).
- NO >> Repair or replace error-detected parts.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

COOLING FAN

Component Function Check

INFOID:000000012524904

1.CHECK COOLING FAN FUNCTION

 With CONSULT

1. Turn ignition switch ON.
2. Perform "COOLING FAN" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Touch "LOW" and "HI" on the CONSULT screen.
4. Check that cooling fan operates.

 Without CONSULT

1. Activate IPDM E/R auto active test and check cooling fan motor operation. Refer to [PCS-8. "Diagnosis Description"](#).
2. Check that cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-873. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524906

1.CHECK IPDM E/R GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| IPDM E/R | | | |
| Connector | Terminal | Ground | Existed |
| E122 | 38 | | |
| E124 | 59 | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.CHECK COOLING FAN MOTOR CONTROL SIGNAL CIRCUIT

1. Disconnect cooling fan motor harness connector.
2. Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector.

| - | | + | | Continuity |
|-----------|----------|-------------------|----------|------------|
| IPDM E/R | | Cooling fan motor | | |
| Connector | Terminal | Connector | Terminal | Existed |
| E120 | 20 | E113 | 1 | |
| | 24 | | 3 | |

3. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK COOLING FAN MOTOR GROUND CIRCUIT

1. Check the continuity between cooling fan motor harness connector and ground.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

| | | | |
|-------------------|----------|--------|------------|
| + | | - | Continuity |
| Cooling fan motor | | | |
| Connector | Terminal | Ground | Existed |
| E113 | 2 | | |
| | 4 | | |

2. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK COOLING FAN MOTOR

Check the cooling fan motor. Refer to [EC-874, "Component Inspection \(Cooling Fan Motor\)"](#).

YES >> INSPECTION END

NO >> Replace cooling motor. Refer to [CO-53, "Removal and Installation \(Motor driven type\)"](#).

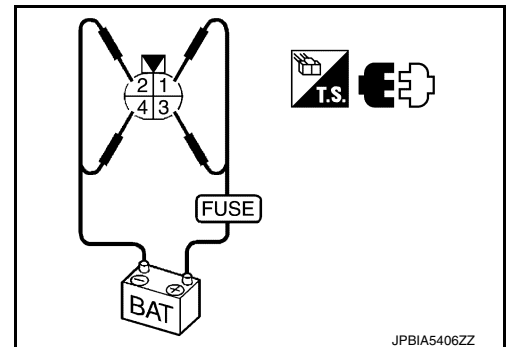
Component Inspection (Cooling Fan Motor)

INFOID:0000000012524907

1. CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connectors. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Supply cooling fan motor terminals with battery voltage and check operation.

| | | |
|-----------------------------|---------|-------------------|
| Cooling fan motor terminals | | Cooling fan speed |
| + | - | |
| Terminal | | Low |
| 1 | 2 and 4 | |
| 3 | | |
| 1 and 3 | | |
| | | High |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan motor. Refer to [CO-53, "Removal and Installation \(Motor driven type\)"](#).

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

ELECTRICAL LOAD SIGNAL

Description

INFOID:000000012524909

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication.

Component Function Check

INFOID:000000012524910

1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Connect CONSULT and select "DATA MONITOR" mode of "ENGINE".
3. Select "LOAD SIGNAL" and check indication as per the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-----------------------------|------------|-----|
| LOAD SIGNAL | Rear window defogger switch | ON | ON |
| | | OFF | OFF |

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Proceed to [EC-875, "Diagnosis Procedure"](#).

2. CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication as per the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-----------------|--------------------|-----|
| LOAD SIGNAL | Lighting switch | ON at 2nd position | ON |
| | | OFF | OFF |

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Proceed to [EC-875, "Diagnosis Procedure"](#).

3. CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication as per the following conditions.

| Monitor item | Condition | Indication | |
|---------------|---------------------------|------------|-----|
| HEATER FAN SW | Heater fan control switch | ON | ON |
| | | OFF | OFF |

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-875, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524911

1. INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to [EC-875, "Component Function Check"](#).

Which circuit is related to the incident?

- Rear window defogger >> GO TO 2.
Headlamp >> GO TO 3.
Heater fan >> GO TO 4.

2. CHECK REAR WINDOW DEFOGGER SYSTEM

Check rear window defogger system. Refer to [DEF-25, "Work Flow"](#).

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Check headlamp system. Refer to [EXL-88, "Work Flow"](#).

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Check heater fan control system. Refer to [HAC-125, "FRONT MANUAL AIR CONDITIONING SYSTEM : System Description"](#).

>> INSPECTION END

FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

FUEL INJECTOR

Component Function Check

INFOID:000000012524912

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.

NO >> Proceed to [EC-877, "Diagnosis Procedure"](#).

2.CHECK FUEL INJECTOR FUNCTION

Ⓜ With CONSULT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

ⓧ Without CONSULT

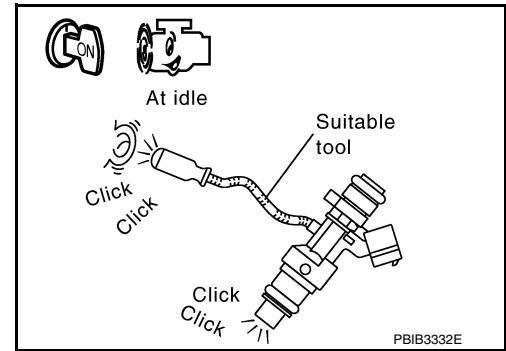
1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to [EC-877, "Diagnosis Procedure"](#).



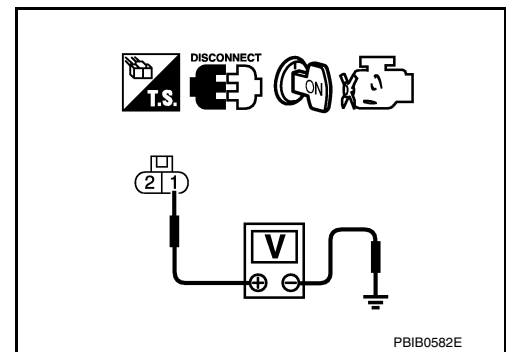
INFOID:000000012524913

Diagnosis Procedure

1.CHECK FUEL INJECTOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel injector harness connector and ground.

| Cylinder | + | | - | Voltage |
|----------|---------------|----------|--------|-----------------|
| | Fuel injector | | | |
| | Connector | Terminal | | |
| 1 | F30 | 1 | Ground | Battery voltage |
| 2 | F18 | 1 | | |
| 3 | F41 | 1 | | |
| 4 | F20 | 1 | | |
| 5 | F42 | 1 | | |
| 6 | F22 | 1 | | |
| 7 | F45 | 1 | | |
| 8 | F31 | 1 | | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

FUEL INJECTOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

| Cylinder | + | | - | | Continuity |
|----------|---------------|----------|-----------|----------|------------|
| | Fuel injector | | ECM | | |
| | Connector | Terminal | Connector | Terminal | |
| 1 | F30 | 2 | F72 | 23 | Existed |
| 2 | F18 | 2 | | 42 | |
| 3 | F41 | 2 | | 22 | |
| 4 | F20 | 2 | | 41 | |
| 5 | F42 | 2 | | 21 | |
| 6 | F22 | 2 | | 40 | |
| 7 | F45 | 2 | | 44 | |
| 8 | F31 | 2 | | 63 | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK FUEL INJECTOR

Check fuel injector. Refer to [EC-878, "Component Inspection"](#).

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> Replace malfunctioning fuel injector. Refer to [EM-181, "Exploded View"](#).

4.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to [PCS-25, "Removal and Installation"](#).
 NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:0000000012524914

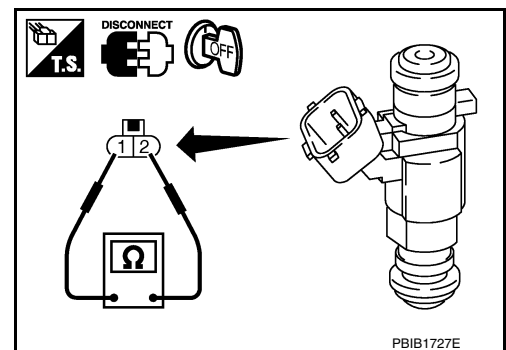
1.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check resistance between fuel injector terminals as per the following.

| Fuel injector | | Resistance |
|---------------|---|---|
| + | - | |
| Terminal | | |
| 1 | 2 | 11.1 - 14.5 Ω [at 10 - 60°C (50 - 140°F)] |

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Replace malfunctioning fuel injector. Refer to [EM-181, "Exploded View"](#).



FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

FUEL PUMP

Component Function Check

INFOID:000000012524915

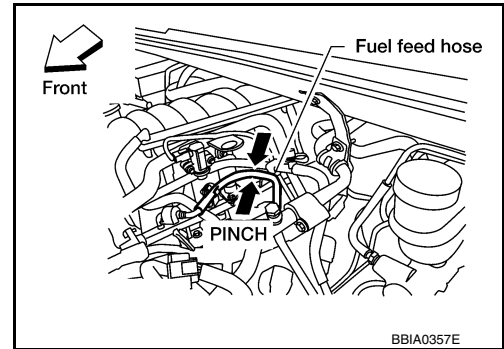
1. CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-879, "Diagnosis Procedure"](#).



Diagnosis Procedure

INFOID:000000012524916

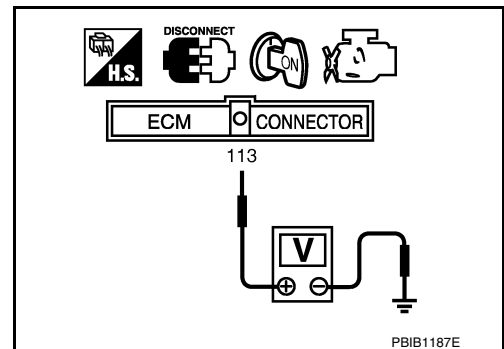
1. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-1

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECM harness connector and ground.

| | | | |
|-----------|----------|--------|-----------------|
| + | | - | Voltage |
| ECM | | | |
| Connector | Terminal | | |
| E77 | 113 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.



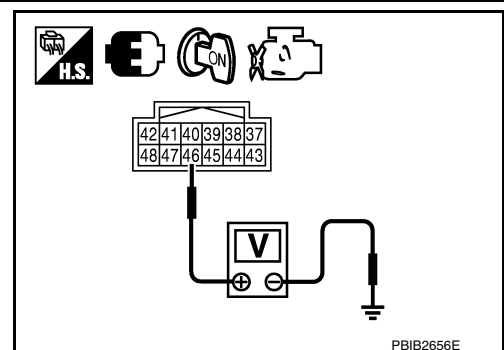
2. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-2

Check the voltage between IPDM E/R harness connector and ground.

| | | | |
|-----------|----------|--------|-----------------|
| + | | - | Voltage |
| IPDM E/R | | | |
| Connector | Terminal | | |
| E122 | 46 | Ground | Battery voltage |

Is the inspection result normal?

- YES >> Repair or replace error-detected parts.
 NO >> GO TO 8.



3. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-3

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect "fuel level sensor unit and fuel pump" harness connector.
4. Turn ignition switch ON.

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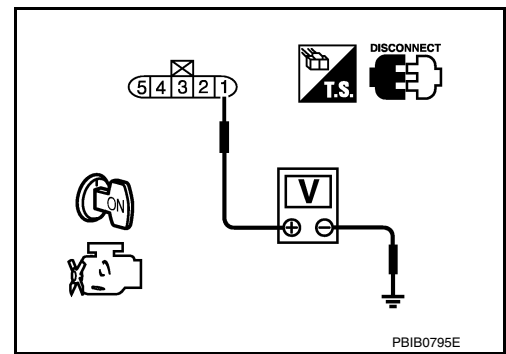
FUEL PUMP

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between “fuel level sensor unit and fuel pump” harness connector and ground.

| + | | - | Voltage |
|--------------------------------------|----------|--------|---|
| Fuel level sensor unit and fuel pump | | | |
| Connector | Terminal | | |
| C5 | 1 | Ground | Battery voltage should exist for 1 second after ignition switch is turned ON. |



Is the inspection result normal?

- YES >> GO TO 6.
NO >> GO TO 4.

4.CHECK 15A FUSE

- Turn ignition switch OFF.
- Disconnect 15A fuse (No. 48) from IPDM E/R.
- Check 15 A fuse.

Is the inspection result normal?

- YES >> GO TO 5.
NO >> Replace fuse.

5.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-4

- Disconnect IPDM E/R harness connector.
- Check the continuity between IPDM E/R harness connector and “fuel level sensor unit and fuel pump” harness connector.

| + | | - | | Continuity |
|-----------|----------|--------------------------------------|----------|------------|
| IPDM E/R | | Fuel level sensor unit and fuel pump | | |
| Connector | Terminal | Connector | Terminal | |
| E119 | 13 | C5 | 1 | Existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> GO TO 8.
NO >> Repair or replace error-detected parts.

6.CHECK FUEL PUMP GROUND CIRCUIT

- Turn ignition switch OFF.
- Check the continuity between “fuel level sensor unit and fuel pump” harness connector and ground.

| + | | - | Continuity |
|--------------------------------------|----------|--------|------------|
| Fuel level sensor unit and fuel pump | | | |
| Connector | Terminal | | |
| C5 | 3 | Ground | Existed |

- Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK FUEL PUMP

Refer to [EC-881, "Component Inspection"](#).

Is the inspection result normal?

FUEL PUMP

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

- YES >> GO TO 8.
NO >> Replace fuel pump. Refer to [FL-11, "Removal and Installation"](#).

8.CHECK INTERMITTENT INCIDENT

Refer to [GI-43, "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace IPDM E/R. Refer to [PCS-25, "Removal and Installation"](#).
NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:0000000012524917

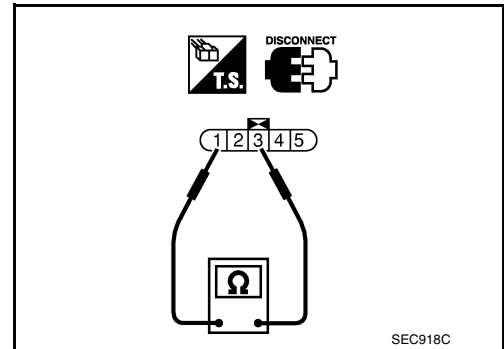
1.CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect "fuel level sensor unit and fuel pump" harness connector. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

| Fuel pump | | Resistance |
|-----------|---|----------------------------|
| + | - | |
| Terminal | | |
| 1 | 3 | 0.2 - 5.0 [at 25°C (77°F)] |

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Replace fuel level sensor unit and fuel pump. Refer to [FL-11, "Removal and Installation"](#).



SEC918C

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

IGNITION SIGNAL

Component Function Check

INFOID:000000012524918

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

- YES-1 >> With CONSULT: GO TO 2.
- YES-2 >> Without CONSULT: GO TO 3.
- NO >> Proceed to [EC-882, "Diagnosis Procedure"](#).

2.CHECK IGNITION SIGNAL FUNCTION

With CONSULT

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
2. Check that each circuit produces a momentary engine speed drop.

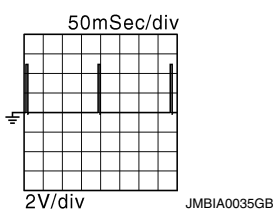
Is the inspection result normal?

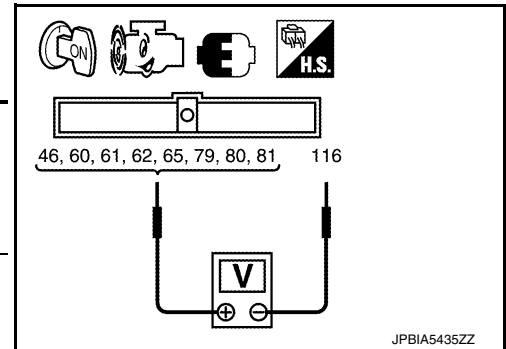
- YES >> INSPECTION END
- NO >> Proceed to [EC-882, "Diagnosis Procedure"](#).

3.CHECK IGNITION SIGNAL FUNCTION

Without CONSULT

1. Let engine idle.
2. Read the voltage signal between ECM harness connector terminals with an oscilloscope.

| ECM | | | | Voltage signal |
|------------|----------|------------|----------|---|
| + | | - | | |
| Connec-tor | Terminal | Connec-tor | Terminal | |
| F72 | 46 | E77 | 116 |  |
| | 60 | | | |
| | 61 | | | |
| | 62 | | | |
| | 65 | | | |
| | 79 | | | |
| | 80 | | | |
| 81 | | | | |



NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

- YES >> INSPECTION END
- NO >> Proceed to [EC-882, "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524919

1.CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.

IGNITION SIGNAL

[VK56DE]

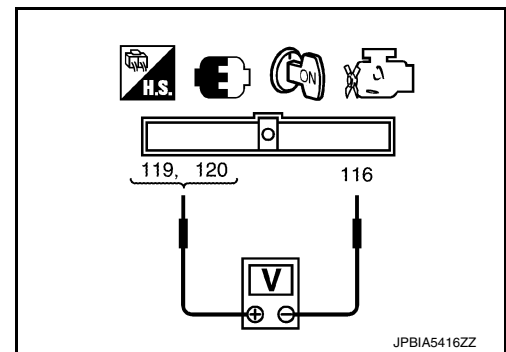
< DTC/CIRCUIT DIAGNOSIS >

- Check the voltage between ECM harness connector terminals.

| ECM | | | Voltage |
|-----------|----------|-----|-----------------|
| Connector | + | - | |
| | Terminal | | |
| E77 | 119 | 116 | Battery voltage |
| | 120 | | |

Is the inspection result normal?

- YES >> GO TO 2.
 NO >> Refer to [EC-618, "Diagnosis Procedure"](#).



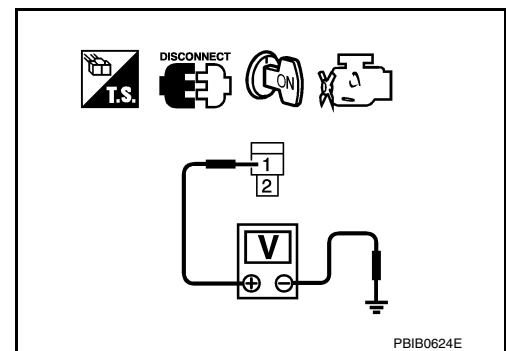
2.CHECK CONDENSER POWER SUPPLY

- Turn ignition switch OFF.
- Disconnect condenser harness connector.
- Turn ignition switch ON.
- Check the voltage between condenser harness connector and ground.

| + | | - | Voltage |
|-----------|----------|--------|-----------------|
| Condenser | | | |
| Connector | Terminal | Ground | Battery voltage |
| F21 | 1 | | |

Is the inspection result normal?

- YES >> GO TO 4.
 NO >> GO TO 3.



3.CHECK CONDENSER POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect IPDM E/R harness connector.
- Check the continuity between IPDM E/R harness connector and condenser harness connector.

| + | | - | | Continuity |
|-----------|----------|-----------|----------|------------|
| IPDM E/R | | Condenser | | |
| Connector | Terminal | Connector | Terminal | |
| E119 | 3 | F21 | 1 | Existed |

- Also check harness for short to ground and short to power.

Is the inspection result normal?

- YES >> Refer to [EC-618, "Diagnosis Procedure"](#).
 NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Check the continuity between condenser harness connector and ground.

| + | | - | Continuity |
|-----------|----------|--------|------------|
| Condenser | | | |
| Connector | Terminal | Ground | Existed |
| F21 | 2 | | |

- Also check harness for short to power.

Is the inspection result normal?

- YES >> GO TO 5.
 NO >> Repair open circuit or short to power in harness or connectors.

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

5. CHECK CONDENSER

Check condenser. Refer to [EC-886. "Component Inspection \(Condenser\)"](#)

Is the inspection result normal?

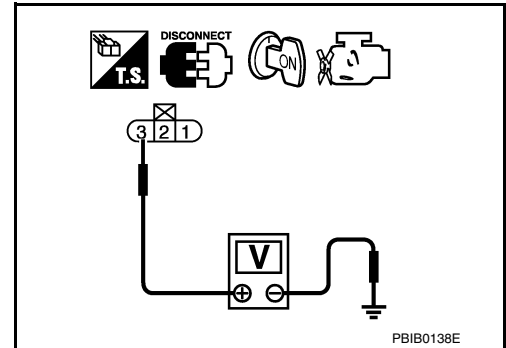
YES >> GO TO 6.

NO >> Replace condenser.

6. CHECK IGNITION COIL POWER SUPPLY

1. Reconnect all harness connectors disconnected.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

| Cylinder | + | | - | Voltage |
|----------|---------------|----------|--------|-----------------|
| | Ignition coil | | | |
| | Connector | Terminal | | |
| 1 | F47 | 3 | Ground | Battery voltage |
| 2 | F6 | 3 | | |
| 3 | F48 | 3 | | |
| 4 | F7 | 3 | | |
| 5 | F49 | 3 | | |
| 6 | F8 | 3 | | |
| 7 | F51 | 3 | | |
| 8 | F52 | 3 | | |



Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace harness or connectors.

7. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

| Cylinder | + | | - | Continuity |
|----------|---------------|----------|--------|------------|
| | Ignition coil | | | |
| | Connector | Terminal | | |
| 1 | F47 | 2 | Ground | Existed |
| 2 | F6 | 2 | | |
| 3 | F48 | 2 | | |
| 4 | F7 | 2 | | |
| 5 | F49 | 2 | | |
| 6 | F8 | 2 | | |
| 7 | F51 | 2 | | |
| 8 | F52 | 2 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair open circuit or short to power in harness or connectors.

8. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

2. Check the continuity between ignition coil harness connector and ECM harness connector.

| Cylinder | + | | - | | Continuity |
|----------|---------------|----------|-----------|----------|------------|
| | Ignition coil | | ECM | | |
| | Connector | Terminal | Connector | Terminal | |
| 1 | F47 | 1 | F72 | 62 | Existed |
| 2 | F6 | 1 | | 81 | |
| 3 | F48 | 1 | | 61 | |
| 4 | F7 | 1 | | 80 | |
| 5 | F49 | 1 | | 60 | |
| 6 | F8 | 1 | | 79 | |
| 7 | F51 | 1 | | 46 | |
| 8 | F52 | 1 | | 65 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK IGNITION COIL WITH POWER TRANSISTOR

Check ignition coil with power transistor. Refer to [EC-885, "Component Inspection \(Ignition Coil with Power Transistor\)"](#).

Is the inspection result normal?

YES >> Check intermittent incident. Refer to [GI-43, "Intermittent Incident"](#).

NO >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-178, "Exploded View"](#).

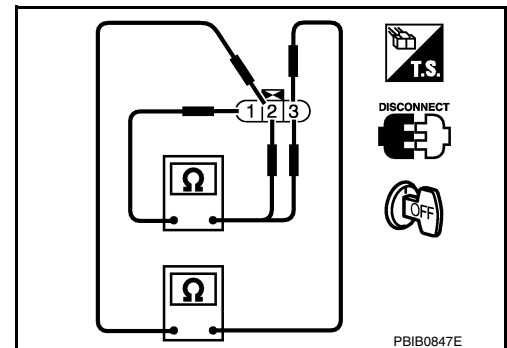
Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000012524920

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.

| Ignition coil with power transistor | | Resistance [Ω at 25°C (77°F)] |
|-------------------------------------|---|---------------------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | Except 0 or ∞ |
| | 3 | Except 0 |
| 2 | 3 | |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-178, "Exploded View"](#).

2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Remove fuel pump fuse in IPDM E/R to release fuel pressure. Refer to [PCS-25, "Removal and Installation"](#).

NOTE:

Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

IGNITION SIGNAL

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

4. Start engine.
5. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked. Refer to [EM-178, "Exploded View"](#).
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

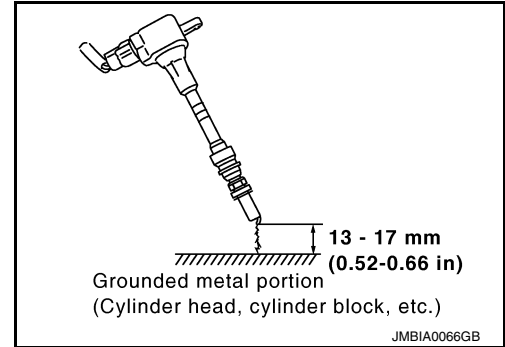
Spark should be generated.

CAUTION:

- During the operation, always stay 0.5 m (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.
- It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.

NOTE:

When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning ignition coil with power transistor. Refer to [EM-178, "Exploded View"](#).

Component Inspection (Condenser)

INFOID:000000012524921

1. CHECK CONDENSER

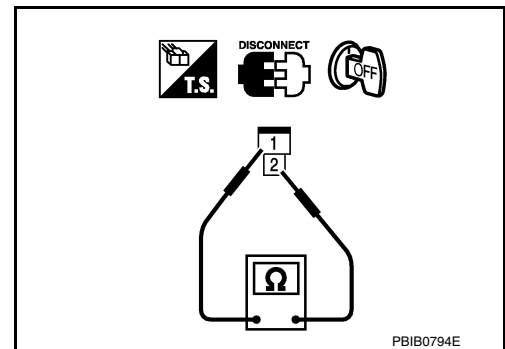
1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as per the following.

| Condenser-1 | | Resistance |
|-------------|---|-----------------------------|
| + | - | |
| Terminal | | |
| 1 | 2 | Above 1 MΩ [at 25°C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.



MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

MALFUNCTION INDICATOR LAMP

Component Function Check

INFOID:000000012524922

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Check that MIL illuminates.

Is the inspection result normal?

- YES >> INSPECTION END
NO >> Proceed to [EC-887. "Diagnosis Procedure"](#).

Diagnosis Procedure

INFOID:000000012524923

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

- YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to [MWI-17. "CONSULT Function \(METER/M&A\)"](#).

Is the inspection result normal?

- YES >> GO TO 3.
NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

- YES >> Replace combination meter. Refer to [MWI-68. "Exploded View"](#).
NO >> Repair or replace error-detected parts.

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ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:000000012524924

1.CHECK ORVR FUNCTION

Check whether the following symptoms are present.

- Fuel odor from EVAP canister is strong.
- Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Are any symptoms present?

- YES >> Proceed to [EC-888, "Diagnosis Procedure"](#).
NO >> INSPECTION END

Diagnosis Procedure

INFOID:000000012524925

1.INSPECTION START

Check whether the following symptoms are present.

- A: Fuel odor from EVAP canister is strong.
B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

A or B

- A >> GO TO 2.
B >> GO TO 7.

2.CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-13, "Removal and Installation"](#).
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.51 lb).

Is the inspection result normal?

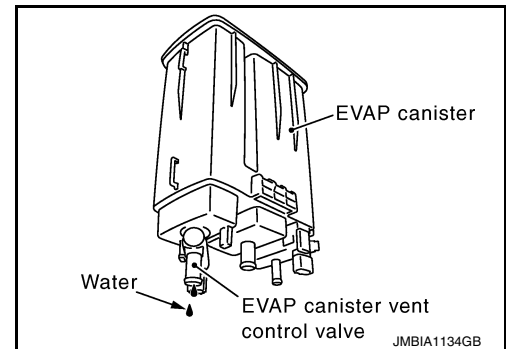
- YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister

Does water drain from the EVAP canister?

- YES >> GO TO 4.
NO >> GO TO 6.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-13, "Removal and Installation"](#).

>> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to [FL-13, "Removal and Installation"](#).

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Check refueling EVAP vapor cut valve. Refer to [EC-890, "Component Inspection"](#).

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

7. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to [FL-13. "Removal and Installation"](#).

2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.51 lb).

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 9.

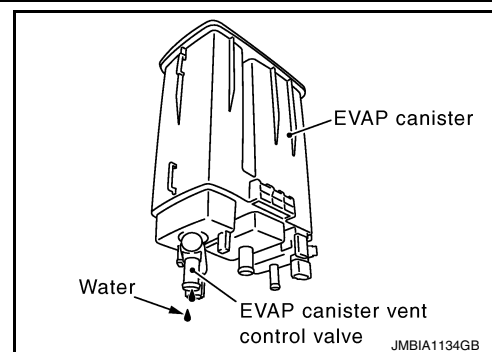
8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

YES >> GO TO 6.

NO >> GO TO 11.



9. REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to [FL-13. "Removal and Installation"](#).

>> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to [FL-13. "Removal and Installation"](#).

11. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace hoses and tubes.

12. CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace filler neck tube.

13. CHECK REFUELING EVAP VAPOR CUT VALVE

Check refueling EVAP vapor cut valve. Refer to [EC-890. "Component Inspection"](#).

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube. Refer to [FL-6. "Removal and Installation"](#).

15.CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 16.

NO >> Repair or replace one-way fuel valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

16.CHECK ONE-WAY FUEL VALVE-II

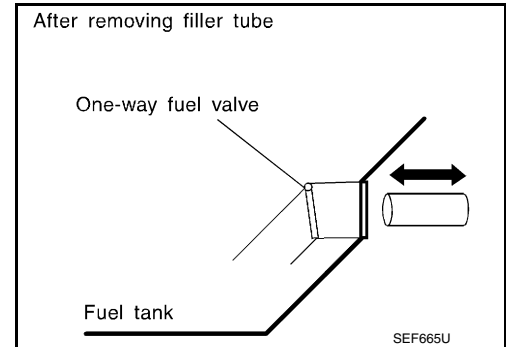
1. Check that fuel is drained from the tank.
2. Remove fuel filler tube and hose. Refer to [FL-6. "Removal and Installation"](#).
3. Check one-way fuel valve for operation as per the following.
When a stick is inserted, the valve should open, when removing stick it should close.

Do not drop any material into the tank.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).



INFOID:000000012524926

Component Inspection

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK REFUELING EVAP VAPOR CUT VALVE

Ⓟ **With CONSULT**

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
3. Drain fuel from the tank as per the following:
 - Remove fuel feed hose located on the fuel gauge retainer. Refer to [EM-181. "Exploded View"](#).
 - Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
 - Drain fuel using "FUEL PUMP RELAY" in "ACTIVE TEST" mode of "ENGINE" using CONSULT.
4. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as per the following.
 - Connect vacuum pump to hose end.
 - Remove fuel gauge retainer with fuel gauge unit. Refer to [FL-11. "Removal and Installation"](#).

Always replace O-ring with new one.

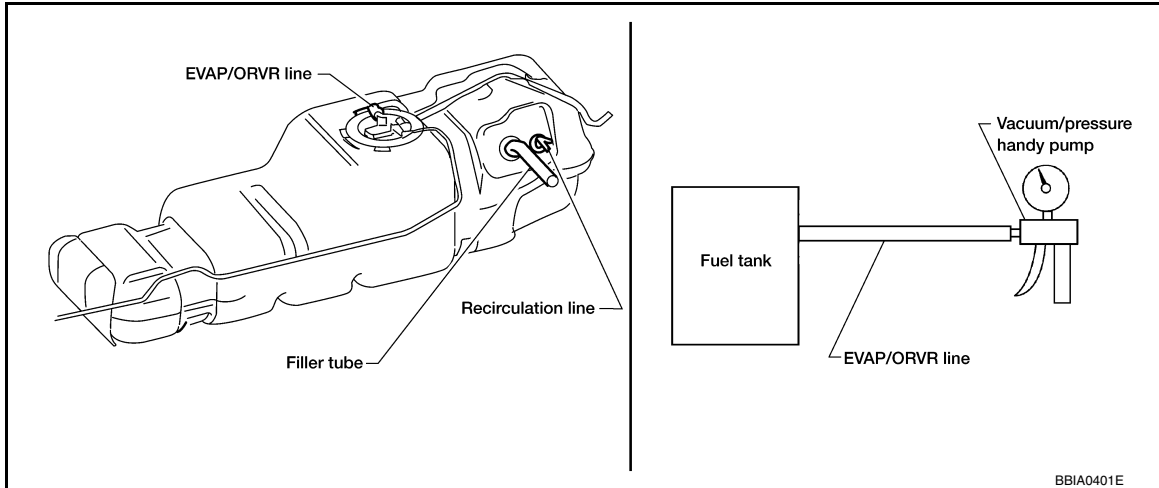
 - Turn fuel tank upside down.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

- Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm³, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

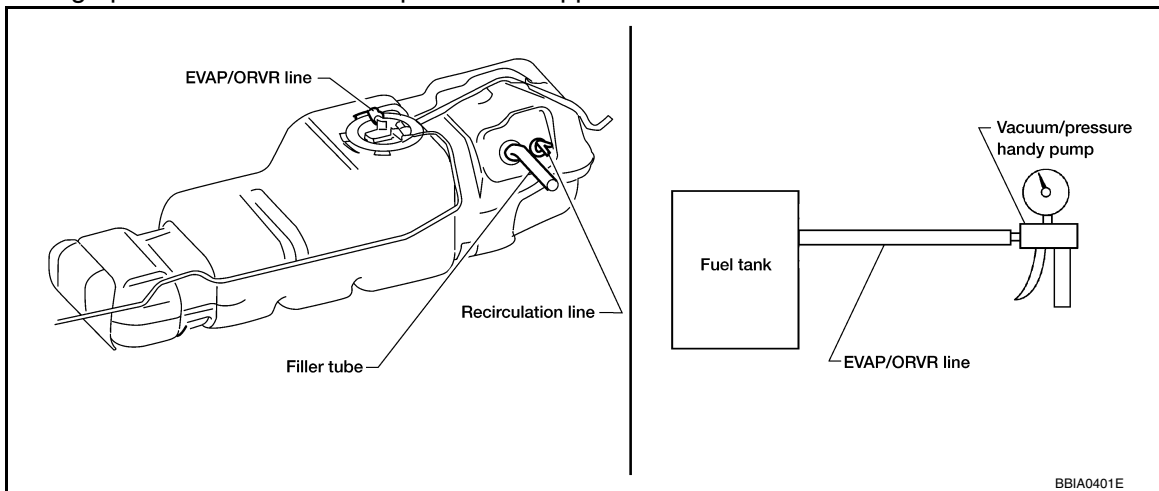
YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

3. CHECK REFUELING EVAP VAPOR CUT VALVE

⊗ Without CONSULT

1. Turn ignition switch OFF.
 2. Remove fuel tank. Refer to [FL-6. "Removal and Installation"](#).
 3. Drain fuel from the tank as per the following:
 - Remove fuel gauge retainer.
 - Drain fuel from the tank using a handy pump into a fuel container.
 4. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
 5. Check refueling EVAP vapor cut valve for being stuck to open as per the following.
 - Connect vacuum pump to hose end.
 - Remove fuel gauge retainer with fuel gauge unit. Refer to [FL-11. "Removal and Installation"](#).
- Always replace O-ring with new one.**
- Turn fuel tank upside down.
 - Apply vacuum pressure to hose end [-13.3 kPa (-0.136 kg/cm³, -1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to [FL-6. "Removal and Installation"](#).

REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56DE]

REFRIGERANT PRESSURE SENSOR

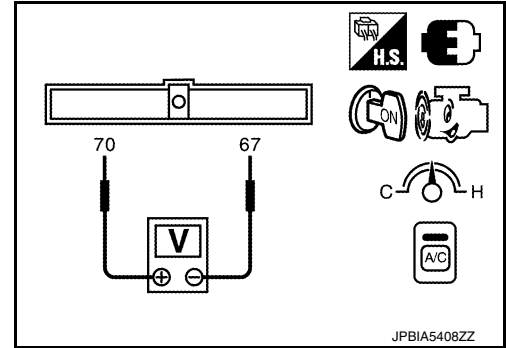
Component Function Check

INFOID:000000012524927

1. CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check the voltage between ECM harness connector terminals as per the following conditions.

| Connector | ECM | | Voltage |
|-----------|--|-----------------------|-------------|
| | + | - | |
| Terminal | | | |
| F72 | 70 (Refrigerant pressure sensor signal) | 67 (Sensor ground) | 1.0 - 4.0 V |



Is the inspection result normal?

- YES >> INSPECTION END
 NO >> Proceed to [EC-892, "Diagnosis Procedure"](#).

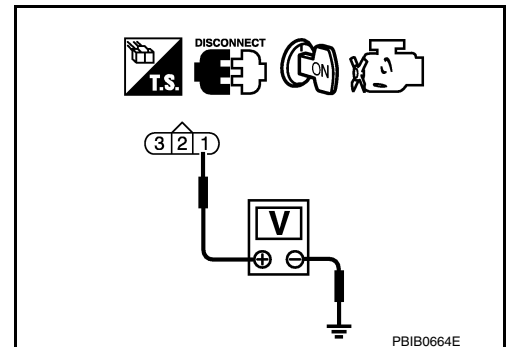
Diagnosis Procedure

INFOID:000000012524928

1. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

| + | | - | Voltage (Approx.) |
|---------------------------------------|----------|--------|-------------------|
| Refrigerant pressure sensor Connector | Terminal | | |
| E48 | 1 | Ground | 5 V |



Is the inspection result normal?

- YES >> GO TO 3.
 NO >> GO TO 2.

2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|---------------------------------------|----------|---------------|----------|------------|
| Refrigerant pressure sensor Connector | Terminal | ECM Connector | Terminal | |
| E48 | 1 | F72 | 49 | Existed |

Is the inspection result normal?

- YES >> Perform the trouble diagnosis for power supply circuit.
 NO >> Repair or replace error-detected parts.

3. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

REFRIGERANT PRESSURE SENSOR

[VK56DE]

< DTC/CIRCUIT DIAGNOSIS >

3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------------------------|----------|-----------|----------|------------|
| Refrigerant pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E48 | 3 | F72 | 67 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| + | | - | | Continuity |
|-----------------------------|----------|-----------|----------|------------|
| Refrigerant pressure sensor | | ECM | | |
| Connector | Terminal | Connector | Terminal | |
| E48 | 2 | F72 | 70 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to [GI-43. "Intermittent Incident"](#).

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to [HAC-215. "Removal and Installation"](#).

NO >> Repair or replace error-detected parts.

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:000000012524929

SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|--|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | EC-879 |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-596 |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-877 |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | | EC-498 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 1 | | EC-486 |
| | Incorrect idle speed adjustment | | | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-584 |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | EC-841 , EC-846 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-584 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-882 |
| Power supply and ground circuit | | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | EC-618 |
| Mass air flow sensor circuit | | 1 | | | 2 | | | | | | | | | | EC-639 , EC-645 |
| Engine coolant temperature sensor circuit | | | | | | | 3 | | | | 3 | | | | EC-656 , EC-662 |
| Air fuel ratio (A/F) sensor 1 circuit | | | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | EC-669 , EC-673 , EC-676 , EC-834 |
| Throttle position sensor circuit | | | | | | | 2 | | | 2 | | | | | EC-658 , EC-720 , EC-819 , EC-820 , EC-855 |
| Accelerator pedal position sensor circuit | | | | 3 | 2 | 1 | | | | | | | | | EC-803 , EC-848 , EC-851 , EC-858 |
| Knock sensor circuit | | | | 2 | | | | | | | | 3 | | | EC-729 |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

| | SYMPTOM | | | | | | | | | | | | | Reference page |
|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-------------------------|
| | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Crankshaft position sensor (POS) circuit | 2 | 2 | | | | | | | | | | | | EC-731 |
| Camshaft position sensor (PHASE) circuit | 3 | 2 | | | | | | | | | | | | EC-734 |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | EC-785 |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | — |
| Intake valve timing control solenoid valve circuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | EC-636 |
| PNP signal circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-805 |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | EC-892 |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | EC-875 |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | HAC-138 |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | BRC-32 |

1 - 6: The numbers refer to the order of inspection.
(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

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ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

| | | SYMPTOM | | | | | | | | | | | | Reference page | | | | |
|-----------------------|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|---------------------------------|----------------------------|---------------------------|----------------|-----------------------------|--|---|------------------------|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATSWATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) | | | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | | | | |
| Fuel | Fuel tank | 5 | 5 | | | | | | | | | | | | FL-6 | | | |
| | Fuel piping | | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | FL-5 | | | |
| | Vapor lock | | | | | | | | | | | | | | | — | | |
| | Valve deposit | | | | | | | | | | | | | | | — | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | — | | |
| Air | Air duct | | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | EM-165 | | | |
| | Air cleaner | | | | | | | | | | | | | | EM-165 | | | |
| | Air leakage from air duct (Mass air flow sensor — electric throttle control actuator) | | | | | | | | | | | | | | EM-165 | | | |
| | Electric throttle control actuator | 5 | | | | | | | | | | | | | 5 | 5 | 5 | EM-166 |
| | Air leakage from intake manifold/Collector/Gasket | | | | | | | | | | | | | | EM-166 | | | |
| Cranking | Battery | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | PG-95 | | | |
| | Generator circuit | | | | | | | | | | | | | | | CHG-10 CHG-13 | | |
| | Starter circuit | | | | | | | | | | | | | | 3 | STR-17 STR-21 | | |
| | Signal plate | | | | | | | | | | | | | | 6 | EM-200 | | |
| | PNP signal | | | | | | | | | | | | | | 4 | TM-88 | | |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 3 | EM-217 | | | |
| | Cylinder head gasket | | | | | | | | | | | | | | | | | |
| | Cylinder block | | | | | | | | | | | | | | | | | |
| | Piston | | | | | | | | | | | | 4 | | | | | |
| | Piston ring | | | | | | | | | | | | | | | | | |
| | Connecting rod | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | EM-231 | | |
| | Bearing | | | | | | | | | | | | | | | | | |
| Crankshaft | | | | | | | | | | | | | | | | | | |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

[VK56DE]

| | | SYMPTOM | | | | | | | | | | | | Reference page | |
|---|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|----------------|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Valve mechanism | Timing chain | | | | | | | | | | | | | | EM-194 |
| | Camshaft | | | | | | | | | | | | | | EM-200 |
| | Intake valve timing control | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-185, EM-185, EM-186, EM-186 |
| | Intake valve | | | | | | | | | | | | 3 | | EM-217 |
| | Exhaust valve | | | | | | | | | | | | | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-170, EX-6 |
| | Three way catalyst | | | | | | | | | | | | | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | LU-25, LU-28, LU-29, LU-31 |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | LU-25 |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | CO-49 |
| | Thermostat | | | | | | | | | 5 | | | | | CO-56 |
| | Water pump | | | | | | | | | | | | | | CO-54 |
| | Water gallery | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | CO-39 |
| | Cooling fan | | | | | | | | | | | | | | CO-52, CO-53 |
| | Coolant level (Low)/Contaminated coolant | | | | | | | | | 5 | | | | | CO-43 |
| NVIS (NISSAN Vehicle Immobilizer System — NATS) | | 1 | 1 | | | | | | | | | | | | SEC-36 |

1 - 6: The numbers refer to the order of inspection.

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NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS >

[VK56DE]

NORMAL OPERATING CONDITION

Description

INFOID:000000012524930

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,800 rpm under no load (for example, the selector lever position is P or N and engine speed is over 2,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,000 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, [EC-491](#), "[MULTIPOINT FUEL INJECTION SYSTEM : System Description](#)".

PERIODIC MAINTENANCE

IDLE SPEED

Inspection

INFOID:0000000012524931

EC

1. CHECK IDLE SPEED

 **With CONSULT**

Check idle speed in "DATA MONITOR" mode of "ENGINE" using CONSULT.

 **With GST**

Check idle speed with Service \$01 of GST.

>> INSPECTION END

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IGNITION TIMING

< PERIODIC MAINTENANCE >

[VK56DE]

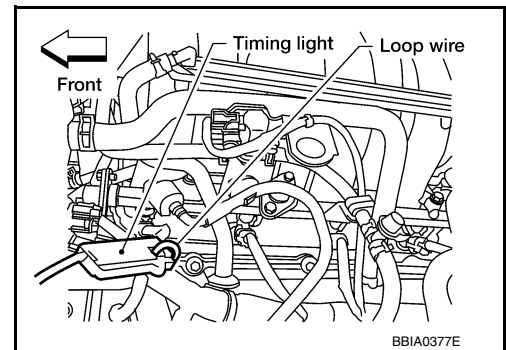
IGNITION TIMING

Inspection

INFOID:000000012524932

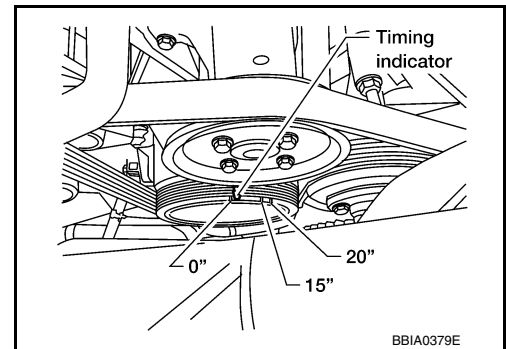
1. CHECK IGNITION TIMING

1. Attach timing light to loop wires as shown.



2. Check ignition timing.

>> INSPECTION END



EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

[VK56DE]

EVAP LEAK CHECK

Inspection

INFOID:000000012524933

CAUTION:

- Never use compressed air or a high pressure pump.
- Never exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

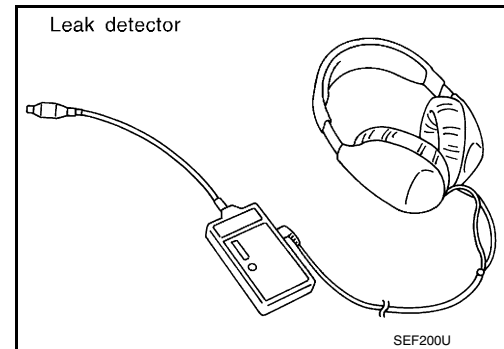
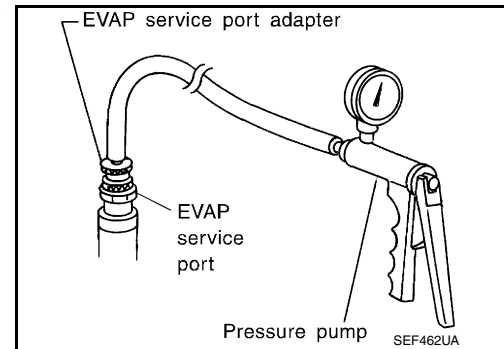
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leakage.

1. EVAP LEAK CHECK

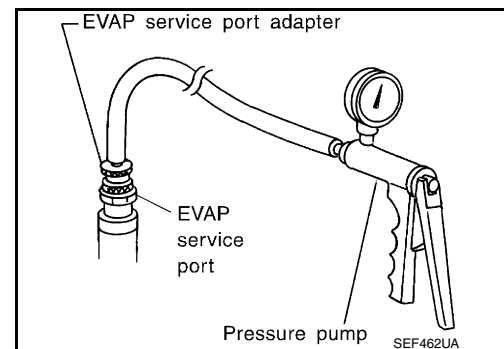
④ With CONSULT

1. To locate the EVAP leakage, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Turn ignition switch ON.
3. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" of "ENGINE" using CONSULT.
4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).
7. Locate the leakage using a leakage detector (commercial service tool). Refer to [EC-498, "EVAPORATIVE EMISSION SYSTEM : System Description"](#).



⊗ Without CONSULT

1. To locate the EVAP leakage, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
3. To locate the leakage, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi).
4. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump. Refer to [EC-471, "ENGINE CONTROL SYSTEM : Component Parts Location"](#).



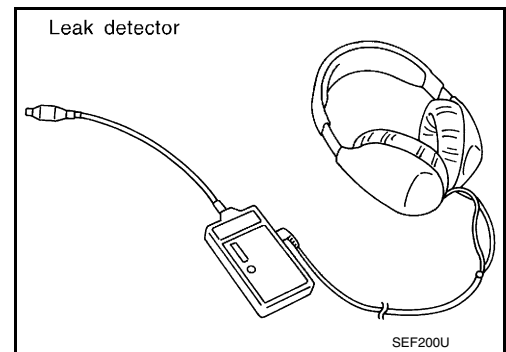
EVAP LEAK CHECK

[VK56DE]

< PERIODIC MAINTENANCE >

5. Locate the leakage using a leak detector (commercial service tool). Refer to [EC-498, "EVAPORATIVE EMISSION SYSTEM : System Description"](#).

>> INSPECTION END



POSITIVE CRANKCASE VENTILATION

< PERIODIC MAINTENANCE >

[VK56DE]

POSITIVE CRANKCASE VENTILATION

Inspection

INFOID:000000012524934

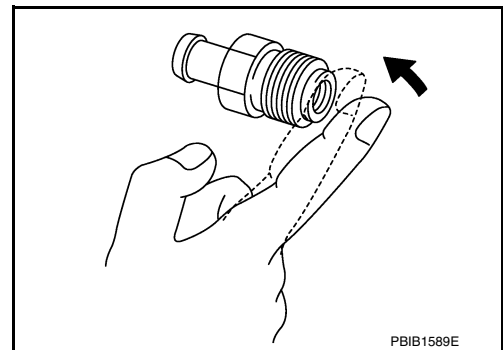
1. CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. Refer to [EM-179, "Exploded View"](#). A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace PCV valve. Refer to [EM-179, "Exploded View"](#)



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REMOVAL AND INSTALLATION

ECM

Removal and Installation

INFOID:000000012524935

CAUTION:

Perform **ADDITIONAL SERVICE WHEN REPLACING ECM**. Refer to [EC-588, "Description"](#).

REMOVAL

1. Remove battery. Refer to [PG-95, "Removal and Installation"](#).
2. Remove IPDM E/R. Refer to [PCS-25, "Removal and Installation"](#).
3. Disconnect ECM harness connectors. Refer to [PG-7, "Harness Connector"](#).
4. Remove ECM mounting nuts, and then remove ECM. Refer to [EC-471, "ENGINE CONTROL SYSTEM: Component Parts Location"](#).

INSTALLATION

Install in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VK56DE]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000012524936

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 600 ± 50 rpm |

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:0000000012524937

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 15 ± 2° BTDC |

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000012524938

| Condition | Specification (Using CONSULT or GST) |
|--------------|--------------------------------------|
| At idle | 14 – 33 % |
| At 2,500 rpm | 12 – 25 % |

Mass Air Flow Sensor

INFOID:0000000012524939

| | |
|--|--|
| Supply voltage | Battery voltage (11 – 14 V) |
| Output voltage at idle (in N position) | 0.9 – 1.3 V* |
| Mass air flow (Using CONSULT or GST) | 3.0 – 9.0 g/s at idle* 9.0 – 28.0 g/s at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no load.